July 9, 2026

Stasia Ferby
Project Assessment Director
BC Environmental Assessment Office
By Email: Stasia.Ferbey@gov.bc.ca

SUBJECT: Overall Final EAO Water Information Request Response Summary

Dear Ms. Ferbey:

Telkwa Mining Limited (Telkwa Mining) is pleased to provide an overall summary of our final EAO Water Information Request response summary and organization which proivdes the complete respoonse to the EAO water IR as follows:

ATTACHMENT A provides the January 29, 2026 that represents the Water Information that was approved for submission after discussions with the EAO and the line agencies of Ministry of Environment and Parks (MENV) and Minsitry of Mining and Critical Minerals (MMCM) on the September 15, 2026 EAO Water IR submission for review.

ATTACHMENT B provides the response to the follow up information requests from MENV on April 15, 2026.

ATTACHMENT C provides the response to the follow up information requests from MMCM on May 15, 2026.

ATTACHMENT D provides the response to the follow up information request 8 and 9 from MENVe on May 22, 2026.

ATTACHMENT E provides the response to the follow up Information request 8 from MENV and MMCM on June 25, 2026.

If you have any questions please do not hesitate to contact Dan Farmer at 604-220-5703 or dan.farmer@telkwa-mining.ca.

Sincerely,

Daniel J. Farmer
Project and Development Manager
Telkwa Mining Limited

Cc: Elise Matzanke, Project Assessment Officer, EAO, email: Elise.Matzanke@gov.bc.ca
Matt Scarr, Project Assessment Director, EAO, email: Matthew.Scarr@gov.bc.ca
Jessy Chaplin, Ecosystems Biologist, Telkwa Mining, email: Jessy.chaplin@telkwa-mining.ca
File

Attachments:

Attachment A: Telkwa Mining Response submitted January 29, 2206 to the Overall EAO Water IR issued by EAO to Telkwa Mining on November 23rd, 2022

Attachment B: Telkwa Mining Response to the follow up information requests from MENV on April 15, 2026

Attachment C: Telkwa Mining Response to the follow up information requests from MCMM on May 15, 2026

Attachment D: Telkwa Mining Response to the follow up information requests 8 and 9 from MENV on May 22, 2026

Attachment E: Telkwa Mining Response to the follow up information request 8 from MENV and MCMM on June 25, 2026

Attachment A: Telkwa Mining Response submitted January 29, 2206 to the Overall EAO Water IR issued by EAO to Telkwa Mining on November 23rd, 2022

MEMORANDUM

TO: Stasia Ferbey, Project Assessment Director, BC Environmental Assessment Office

Elise Matzanke, Project Assessment Officer, BC Environmental Assessment Office

FROM: Dan Farmer, Project, and Development Manager, Telkwa Mining Limited

DATE: January 29, 2026

SUBJECT: **Tenas Project Water Quality EAO Information Request Response**

0. INTRODUCTION

In response to the Information Request (IR) related to water dated November 23, 2022, for Telkwa Mining Limited's (Telkwa Mining) Tenas Project's (Project) Environmental Assessment Certificate (EAC) Application submitted in early 2022 please find Telkwa Mining's response to the questions raised by the British Columbia Environmental Assessment Office (BC EAO) working group.

As part of Telkwa Mining's commitment to undertake additional water flow monitoring for Four, Goathorn, and Tenas Creeks as recommended by SRK Consulting (Canada) Inc. (SRK), the water and load balance model (WLBM) has been updated to reflect the water monitoring completed in 2021 and 2022 for these creeks, see **Appendix 1: Tenas Project, Water and Load Balance Modeling Report (Updated 2025), SRK**. In summary the following was found:

- Goathorn Creek high flows were underestimated by the WLBM provided by the EAC Project Case (August 2022). Low flows were slightly overestimated by the WLBM provided by the EAC Project Case (August 2022), so low flows were reduced for Goathorn Creek in the Final EAC Project Cases (2024).
- Tenas Creek flows measured were comparable to the EAC Project Case (August 2022) for low and high flows and if anything were underestimated by the EAC Project Case (August 2022) model, so the parameter concentrations provided were conservative. High flows were updated for Tenas Creek but no change to low flows were made as part of the Final EAC Project Cases (2024).
- Four Creek flows measured were again comparable to the EAC Project Case (2022) for low and high flows and if anything were underestimated by the EAC Project Case

(August 2022) model. High flows were updated for Four Creek but no change to low flows were made as part of the Final EAC Project Cases (2024).

Additional years of precipitation data have been gathered since the EAC Application was submitted, and it was found that precipitation values in the EAC Project Case (August 2022) model were under reporting annual precipitation values, so these were increased in the Updated and Final EAC Project Cases (2024) versus the EAC Project Case (August 2022)'s WLBM. Please see **Appendix 2: Tenas Project, Hydrometeorological Baseline and Model Development Report (Update 2025), SRK**. Telkwa Mining continued monitoring for Four, Tenas, and Goathorn Creeks in October 2023, and will review stream flow levels again if the Project moves into the permitting process.

Telkwa Mining commenced an acid rock drainage (ARD) barrel program in late 2019 to better understand the potential ARD and metal leaching (ML) characteristics of the material rock zones and overburden recovered within the EA Open Pit. Telkwa Mining has continued testing material seepage from these barrels since 2019. Key observations based on this testing is as follows:

- Only one of the potentially acid generating (PAG) barrels (Barrel 6) has gone **acidic after approximately 4 years** of monitoring. The onset of acidic drainage under field conditions may be accelerated because the barrel samples have been crushed to minus 1/4 inch (8 millimetres [mm]) as the material was the same as used in the humidity cells. There will be a mixture of grain sizes in the commercial operation with several grains much larger than the barrel material size. In addition, the barrel contains a mixture of rock from Zones 6, and 7 and had a weighted Neutralizing Potential Ratio (NPR) of Neutralizing Potential (NP) to Acid Potential (AP) of 0.55. The average weighted NPRs of Zones 6, and 7 in the drillhole database were 1.8 and 1.7, respectively (SRK 2025). The material in Barrel 6 therefore provides a conservative estimate of the lag time to the formation of acidic conditions.
- The source terms for some parameters were overstated (higher concentrations) while others were understated (lower concentrations) in the water and load balance provided in the EAC Project Case (August 2022) based on the laboratory measurements of the effluent collected from these barrels due to assumed scaling factors that were not site-specific. SRK developed updated source terms for *non-PAG* rock, PAG rock Flush term, EA Open Pit Walls, and overburden using the barrel results provided in: **Appendix 3: Geochemical Field Barrel Results Interpretation, Tenas Project, SRK;** and **Appendix 4: Updated Water Quality Source Terms, SRK.**

These source terms were further reviewed and modified for the *non-PAG* rock backfilled into the EA Open Pit by Okane Consultants using a more detailed model that accounted for dimensionality in the *non-PAG* rock backfill (backfill) and oxygen convection and diffusion for several different cover scenarios. Okane Consultants developed a distributed 3-dimensional model focused on

water infiltration and storage, and oxygen levels based on the material properties and the rock backfill pile construction methodology employed by the Project with their report included in **Appendix 5: Tenas Project - Suboxic Evaluation of Non-Acid Generating Mine Rock, Okane**. This modelling exercise modified the source terms for parameters being potentially leached from the backfill and was used for the Final EAC Project Case (2024).

Several updates were made in the water and load balance model since the EAC Project Case (August 2022). The new Project Case was titled "Final EAC Project Case (2024) (as found in **Appendix 1, Tenas Project, Water and Load Balance Modeling Report (Updated 2025), SRK)**, and the integrated changes are described as follows:

- Incorporate the effects of progressive reclamation and backfill/dam/buttress development (for progressively covered areas of *non-PAG*).
- Use of seasonal background parameter concentrations (50th percentile) to reflect the seasonality of the background/baseline parameter quality concentrations related to winter (November to March) and summer (April to October) seasons to develop predicted concentrations from the Project more accurately in the receiving environment.
- Incorporation of blasthole liners for the source control of nitrogen species. This Best Management Practice (BMP) was identified through the additional mitigations assessment.
- Revision of how downstream parameter concentrations in relation to groundwater seepage was calculated based on updated values from the hydrogeological model and to account for dilution from non-contact groundwater to the streams.
- Updates to reflect the recently published climate change models from 2023 versus the 2018 versions that were used in the EAC Project Case (August 2022).

Through the Best Achievable Technology (BAT) assessment, it was determined that the introduction of water treatment through In-situ Active Gravel Bed Reactors (GBR) and/or active water treatment using Reverse Osmosis with an Anaerobic Bioreactor and High-Density Sludge Lime Treatment were not recommended but should only be incorporated using a Trigger Action Response Plan based on site monitoring during all phases of the Project. Further information on the Final EAC Project Case (2024) can be found under **Theme 1**.

Error! Not a valid bookmark self-reference. below provides a summary of the EAC Project Case (August 2022) and the Final EAC Project Case (2024) for parameters that were exceeding water quality guidelines for the EAC Project Case (August 2022). As demonstrated the Final EAC Project Case (2024) does not have exceedances in the receiving environment except for parameters that are already in exceedance for background conditions and a short duration (4 year) exceedance of cobalt in Four Creek which is likely not to occur if attenuation mechanisms in groundwater were accounted for in the water model.

Table 0-1: Water Quality (Maximum Monthly Mean) Results for the EAC Project Case (August 2022) and the Final EAC Project Case (2024) in Post-Closure at Relevant Prediction Nodes Using Expected Source Terms and Average Hydrology Conditions

Location Creek	Parameter	BC WQG (2025) (mg/L)	EAC Project Case (August 2022) (mg/L)	Final EAC Project Case (2024) (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0013	Not Available	0.0016
WQS06 Goathorn Creek	Copper (d)	0.0013	0.0019	0.0016
WQS03_DS Four Creek	Cadmium (d)	0.00023	0.00026	0.000012
	Cobalt (d)	0.00050	0.00066	0.00063
	Nitrite (t)	0.020	0.038	0.0090
	Sulfate (t)	309	360	33
	Selenium (t)	0.0020	0.0058	0.00081
WQS04 Tenas Creek	Cobalt (d)	0.00045	0.00082	0.00029
	Copper (d)	0.0026	0.0031	0.0013
	Nickel (d)	0.0025	0.0031	0.00063
	Nitrite (t)	0.020	0.045	0.0056
	Sulfate (t)	218	260	24
	Selenium (t)	0.0020	0.0041	0.00079

Notes: BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligrams per litre; WQG=water quality guideline.
Red text indicates exceedances of WQGs.
Please note that dissolved copper exceeds the WQGs under background conditions.

1. INFORMATION REQUEST (IR) THEMES 1-8

The IRs provided by the EAO have been grouped into a series of themes for subsequent discussion.

- **Theme 1**: Design alternative treatment options and/or provide additional mitigation measures which are capable of meeting BC Chronic Water Quality Guidelines for the Protection of Aquatic Life (BC WQGs) near appropriately sited discharge locations;
- **Theme 2**: Substantially review the Water Balance Model. The Water Balance Model is key to assessing mitigations against effects to many Valued Components not only water quality;
- **Theme 3**: Have a Qualified Professional (QP) identify lentic areas in the receiving environment which may receive selenium from mine operations, and ensure that background concentrations of selenium in water, sediment, invertebrate, and fish tissues are collected and compiled in those lentic areas;
- **Theme 4**: Conduct additional water quality predictions using recent sensitivity analysis of the semi-permeable pond liner;
- **Theme 5**: Ensure all planned discharges are incorporated into the Water Balance Model and water quality predictions;
- **Theme 6**: Other comments not specified in BC EAO's IR request letter, but provided in the ITT table;
- **Theme 7**: EMLI Geoscience clarifications and information requests; and,
- **Theme 8**: EMLI Geotechnical clarifications and information requests.

Please note:

The order in which the themes are addressed is not the same as the list specified above since Themes 5, and 2 need to be completed prior to commencing Theme 1 which entails a BAT assessment to review alternative treatment technologies/additional mitigations as it is dependent on the WLBM being accepted and understood by the Working Group as it forms the basis of the BAT assessment.

2. RESPONSES TO INFORMATION REQUEST THEMES 1 THROUGH 8

THEME 5: ENSURE ALL PLANNED DISCHARGES ARE INCORPORATED INTO THE WATER BALANCE MODEL AND WATER QUALITY PREDICTIONS

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

The WLBM is missing data from all planned discharges.

507 ITT TABLE AND 516 ITT TABLE

Table 6.2-1 of the Discharge MP lists many surface discharges that are not incorporated into the Water and Load Balance Model. The WLBM application considers the discharges from the Tenas Control Pond, the Management Ponds, and the Rail Infrastructure Pond. For all other discharges, please indicate where each is characterized in the application including source term assessment, water quality predictions, frequency and duration of discharge, mitigation strategies (include liner permeability where applicable), identification of parameters of concern, and residual effects assessment. For all unlined ponds and other discharges to ground, evaluate the discharge following the guidance in ENV "Authorizing Point and Non-point source discharges to ground" (https://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/mining-smelt-energy/guidance-documents/7276_env_rob_dtg_factsheet.pdf) [EA Information Requirement].

IR LETTER NEW AND 516 ITT TABLE

Table 6.2-1 of the Discharge Management Plan lists many surface discharges that are not incorporated into the WLBM. The WLBM application considers the discharges from the Tenas Control Pond, the Management Ponds, and the Rail Infrastructure Pond.

1. *For all other discharges, indicate where each is characterized in the Application, including: source term assessment; water quality predictions; frequency and duration of discharge; mitigation strategies (include liner permeability where applicable); identification of parameters of concern; and residual effects assessment.*
2. *For all unlined ponds and other discharges to ground, evaluate the discharge following the guidance in ENV's Authorizing Point and Non-point source discharges to ground.*

RESPONSE 507 ITT TABLE AND 516 ITT TABLE

This IR request stems from the fact that some of the sedimentation ponds that discharge to ground were not included as part of the WLBM in the EAC Application prepared by SRK and presented in **Appendix 1.0-E Water and Load Balance Modeling Report of the Environmental Assessment Certificate (EAC) Application**. Specifically, the following sedimentation ponds were not included in the overall WLBM:

- Explosive Facility;
- Explosive Magazine;
- Rock Quarry;
- Gravel Quarry 1 and 2; and,
- East and West TAC.

The Explosive Facility, and Rock Quarry sedimentation ponds are lined with impermeable geomembrane liners or equivalent while the remaining sedimentation ponds are unlined.

The reasons why these sedimentation ponds were not considered in the site WLBM when it was developed were:

- They are geographically separate from the EA Open Pit, management and control ponds, and material storage pile water management systems.
- These sedimentation ponds are small and were developed to manage very defined catchments which are not connected to overall water management system for the open pit and material storage structures and have very low flow rates compared to the discharge from mine components through the Tenas Control Pond.
- These sedimentation ponds are expected to only discharge during freshet and storm events as their watersheds are small and defined.
- These sedimentation ponds collect water from inert material such as gravels and soils currently exposed within their catchment area.
- Total Suspended Solids (TSS) is the main parameter of concern for majority of these sedimentation ponds excluding the Explosive Facility and Rock Quarry Sedimentation Ponds where nitrogen species are also potential parameters of concern.
- To control TSS, the sedimentation ponds have been designed according to BC ENV *Technical Guidance 7: Assessing Design Size and Operation of Sediment Ponds* (December 2015). The sedimentation ponds are designed to produce a monthly mean maximum TSS level of 35 mg/L to align with the proposed federal *Coal Mine Effluent Regulations* which is considered protective of the receiving environment.

POND DESCRIPTIONS

The Explosive Magazine Sedimentation Pond captures run off from a 50 by 50-metre (m) pad where the three (3) explosive magazine steel buildings are located. The pad is comprised of crushed gravel at a 1% grade leading to the sedimentation pond. TSS is the only parameter of concern for this pond as no blasting agents are being offloaded or loaded at this location. Furthermore, traffic volumes (4 to 6 trips on dayshift only) at this location will be low as only authorized personnel are permitted to access this location. Only packaged explosive products and blasting accessories are stored at this location inside weatherproof steel buildings and no bulk explosive products are delivered to this location so there is little chance of a spill releasing nitrogen species to the environment. The water discharged from this sedimentation pond will be to the ground via a controlled pumping system and from seepage from the floor of the pond itself.

The Explosive Facility Sedimentation Pond captures run off from a 100 by 100-m pad comprised of crushed gravel at 1 percent (%) grade leading to the sedimentation pond where the one (1)

silo of emulsion (35 tonnes) and one (1) silo of Ammonium Nitrate Prill (50 tonnes) are stored. A closed loop wash bay / maintenance building for washing and maintaining the explosive transport trucks provided by the authorized explosive vendor is also located at this pad. The two parameters of concern identified for this pond are TSS and nitrogen species from potential spills of ammonium nitrate (AN) prill and/or emulsion blasting agents on the pad. This sedimentation pond is lined with a bituminous liner or equivalent and will discharge to ground via a controlled pumping system. Monitoring of the water in the sedimentation pond will be completed in compliance with regulatory approvals and if nitrate/nitrite/ammonia concentrations are above permit approved limits the water will be pumped to the onsite evaporator which is part of the wash bay/maintenance building for the Explosive Facility for treatment. The precipitate will either be shipped offsite for disposal at an approved and licensed facility or combined with blasting agents for detonation as part of the blasting process. In the permitting phase the Explosive Facility Pad and Magazine Pad will be combined into one site with a size of 100 by 100-m thereby reducing the two sedimentation ponds in the EAC application to one for permitting.

The two (2) sedimentation ponds for the Gravel Quarry only collect contact water from activities involving disturbing overburden materials, sands, gravels, and water in contact with gravel from the existing approved Quarry. The two Gravel Quarry Sedimentation Ponds service distinct phases of the Gravel Quarry already approved by Ministry of Mines and Critical Minerals (MCMM) and operated by Telkwa Mining. The two Gravel Quarry Sedimentation Ponds service small catchment areas associated with two gravel pits that will produce approximately 35,000 cubic metres (m^3) of material over the life of the Quarries which is approximately 10 years. These two sedimentation ponds will not operate concurrently, rather the Gravel Quarry Sedimentation Pond 1 will operate for roughly four (4) years until the Gravel Quarry 1 area is exhausted and will be reclaimed and then the Gravel Quarry Sedimentation Pond 2 will operate for the remaining six (6) years until the Gravel Quarry 2 area is exhausted. Furthermore, these ponds will also not be used year around but will only be required during when the quarries are active between Jun and September of the first 10 years. Based on the static geochemical test work conducted for the Rock Quarry, Gravel Quarries, and Tenas Access Corridor (TAC), the overburden and rock materials draining to these sedimentation ponds are *non-PAG* material using an NPR cut off of 2 to 1; however, these materials will be subject to verification testing as detailed in the **Metal Leaching/Acid Rock Drainage (ML/ARD) Management Plan (S13.0-C12)** of the **EAC Application**. These ponds only operate during the first 10 years of the Operation Phase at which time both phases of the gravel quarry are exhausted and reclaimed including the sedimentation ponds.

The two (2) sedimentation ponds adjacent to Goathorn Creek are constructed in support of the **Construction Environmental Management Plan (CEMP) (S13.0-S4)** of the **EAC Application** to provide contingency sedimentation capacity for construction activities being undertaken in this valley on both sides of Goathorn Creek. Again, these two sedimentation ponds only service small

catchment areas on either side of Goathorn Creek (approximately 1 hectare [ha] on each side) and will treat contact water from cut and fill activities taking place if already implemented sediment and erosion control measures are insufficient. Again, TSS is the only parameter of concern as only surficial materials are being disturbed by improvements to the Forest Service Roads (FSRs) and no blasting is envisioned for road construction activities in the Goathorn Creek Valley. As these ponds are constructed primarily in highly permeably material, water discharge from these facilities will be to ground either from the base of the ponds. Once the Construction Phase is complete and the reclamation of the cut and fill slopes for the TAC is complete, these ponds will be decommissioned and reclaimed. The materials excavated and disturbed within the Goathorn Creek Valley have been evaluated and been determined to be *non-PAG* using an NPR cut off of 2.0 to 1; however, these materials excavated will be subject to verification testing as detailed in the **Metal Leaching/Acid Rock Drainage (ML/ARD) Management Plan (S13.0-C12)** of the **EAC Application**.

The Rock Quarry Sedimentation Pond services the catchment of Rock Quarry activities roughly 2.5 ha in size and located 7 kilometres (kms) west of the mine site. The materials have been evaluated and been determined to be *non-PAG* using an NPR cut off of 2.0 to 1. This material will be subject to verification testing of blastholes and/or free dig material as specified in the **Metal Leaching/Acid Rock Drainage (ML/ARD) Management Plan (S13.0-C12)** of the **EAC Application**. The Rock Quarry will only be developed once the gravel quarries are completed which is estimated to occur in Year 10 so the Rock Quarry and two Gravel Sedimentation Ponds will not be in operation concurrently. The two parameters of concern identified for this Rock Quarry were TSS and nitrogen species and it will also discharge to ground and is not lined. Roughly 45,000 m^3 of material will be excavated for road surfacing materials over its 12-year life. Monitoring of the water in the Rock Quarry Sedimentation Pond will be completed in compliance with regulatory approvals.

Table 2-1 below summarizes the operating periods of the various sedimentation ponds not included in the overall WLBM.

Figure 2-1 through **Figure 2-6** illustrate the location of the various sedimentation ponds during four time periods associated with the Project: Construction Phase, Operation Phase Years 1 to 4, Operation Phase Years 5 to 10, Operation Phase Years 11 to 21, Decommissioning and Reclamation Phase, and the Post-closure phase.

Table 2-1: Summary of Operating Timeframes for Sedimentation Ponds not Included in the WLBM

Period	Explosive Facility Sedimentation Pond	Explosive Magazine Sedimentation Pond	Goathorn East and West Sedimentation Ponds	Gravel Quary 1 Sedimentation Pond	Gravel Quarry 2 Sedimentation Pond	Rock Quarry Sedimentation Pond
Construction Phase	No	No	Yes	No	No	No
Years 0 to 4	Yes	Yes	No	Yes	No	No
Years 5 to 10	Yes	Yes	No	No	Yes	Yes
Years 11 to 21	Yes	Yes	No	No	No	Yes
Decommissioning and Reclamation Phase	No	No	No	No	No	No
Post-closure Phase	No	No	No	No	No	No

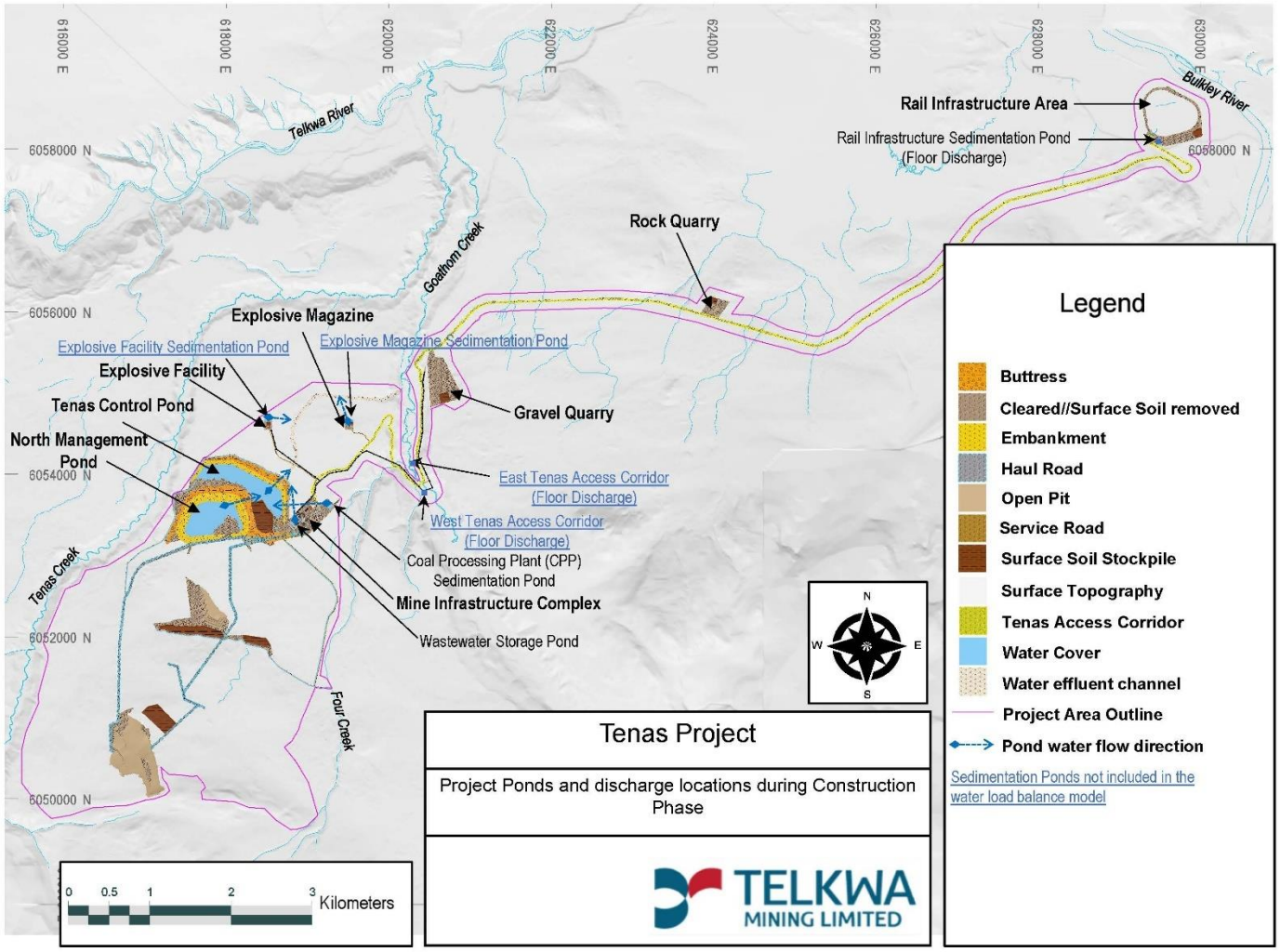

Figure 2-1: Sedimentation Ponds Location and Operation During Construction Phase not Included in WLBM

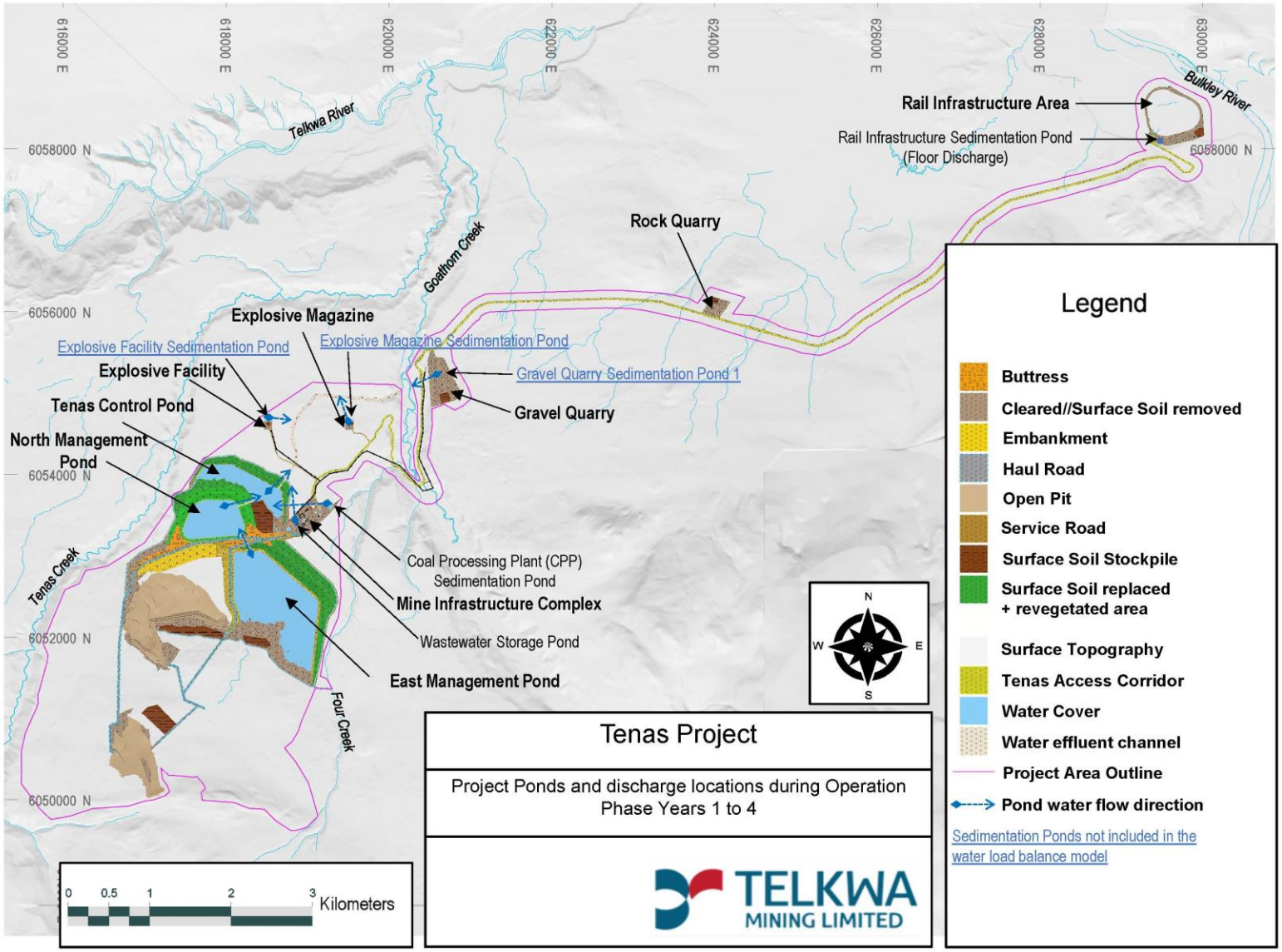

Figure 2-2: Sedimentation Ponds Location and Operation During Operation Phase Years 1 to 4 not Included in WLBM

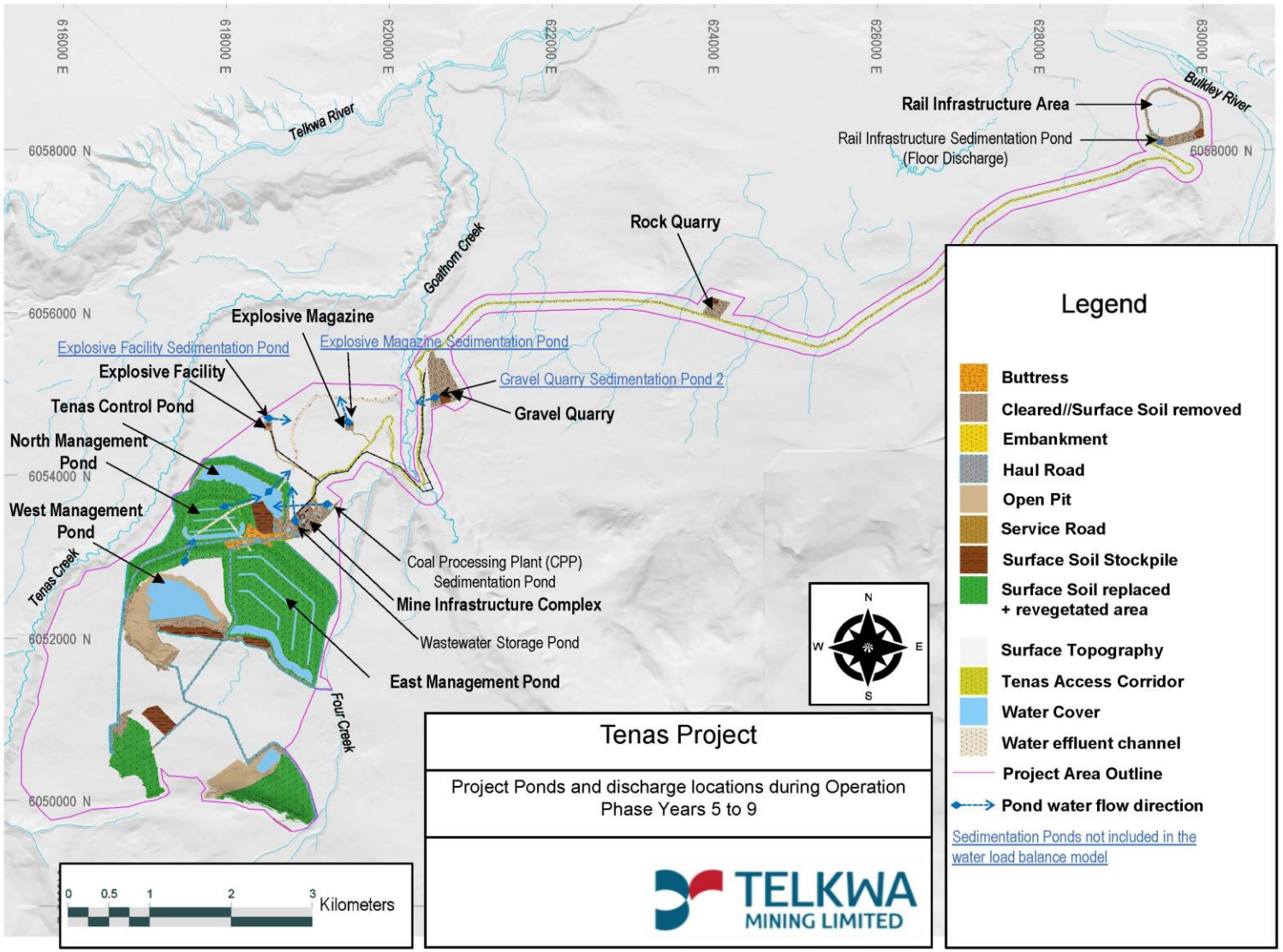

Figure 2-3: Sedimentation Ponds Location and Operation During Operation Phase Years 5 to 9 not Included in WLBM

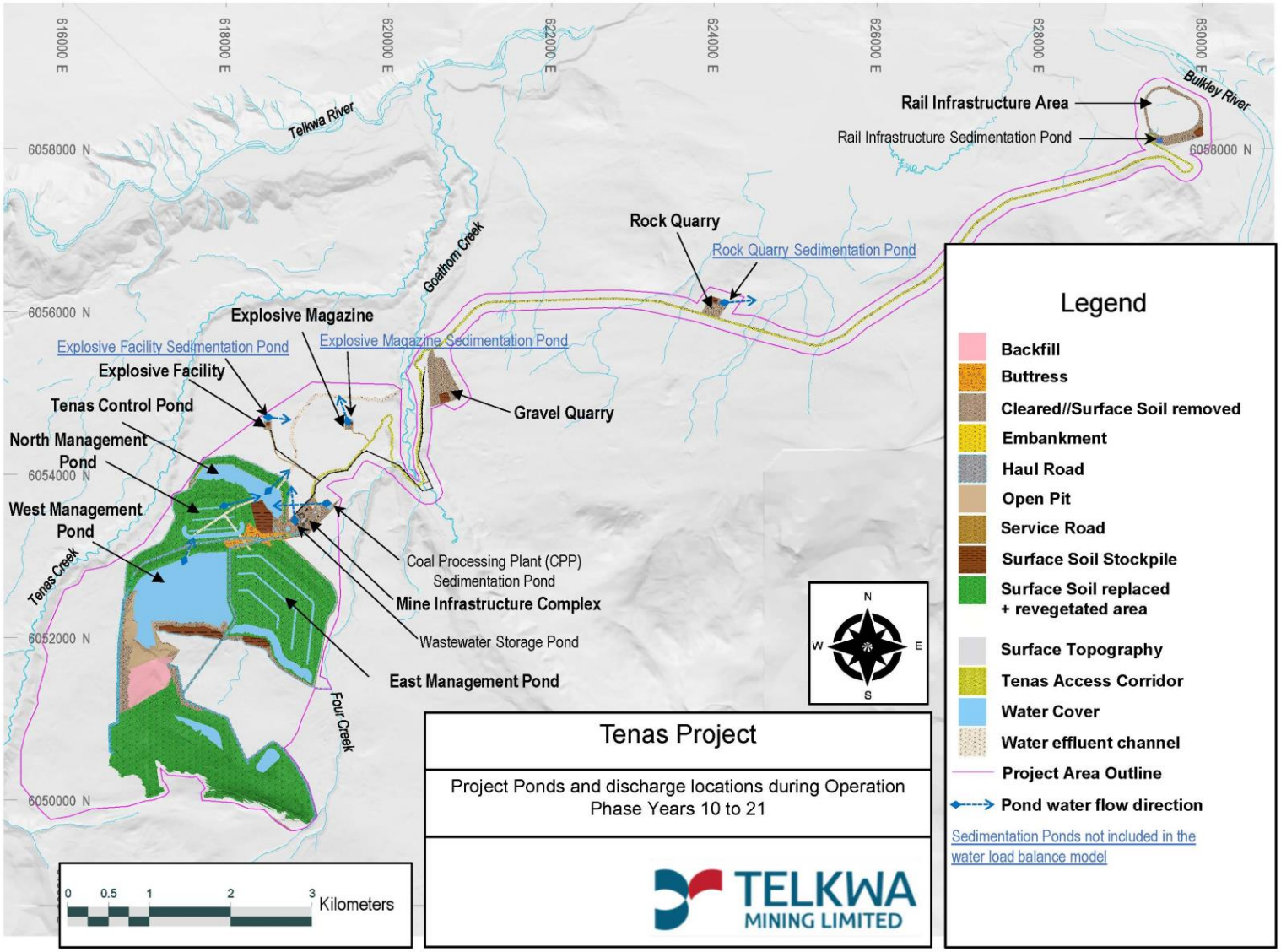

Figure 2-4: Sedimentation Ponds Location and Operation During Operation Phase Years 10 to 21 not Included in WLBM

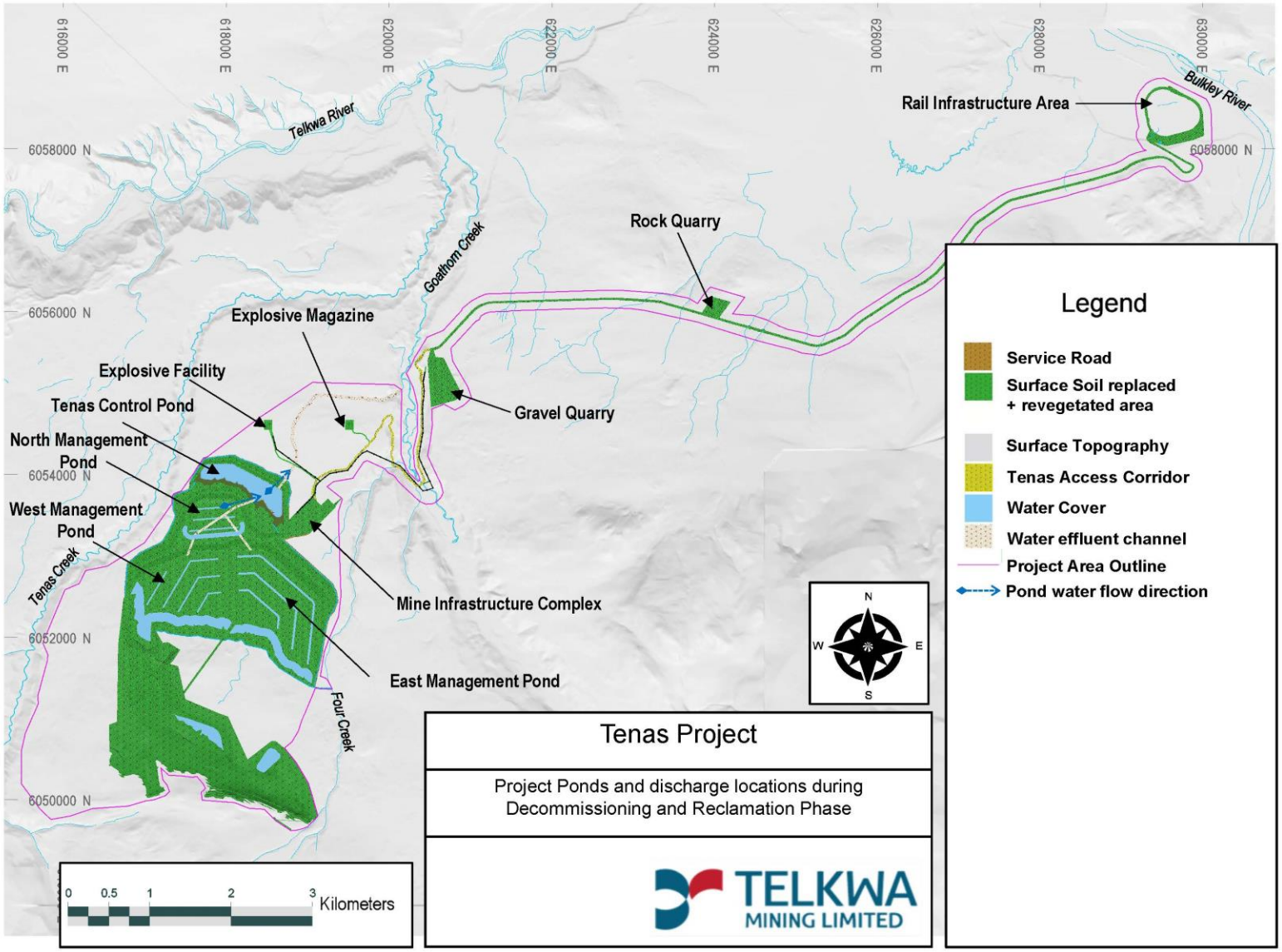

Figure 2-5: Sedimentation Ponds Location and Operation During Decommissioning & Reclamation Phase not Included in WLBM

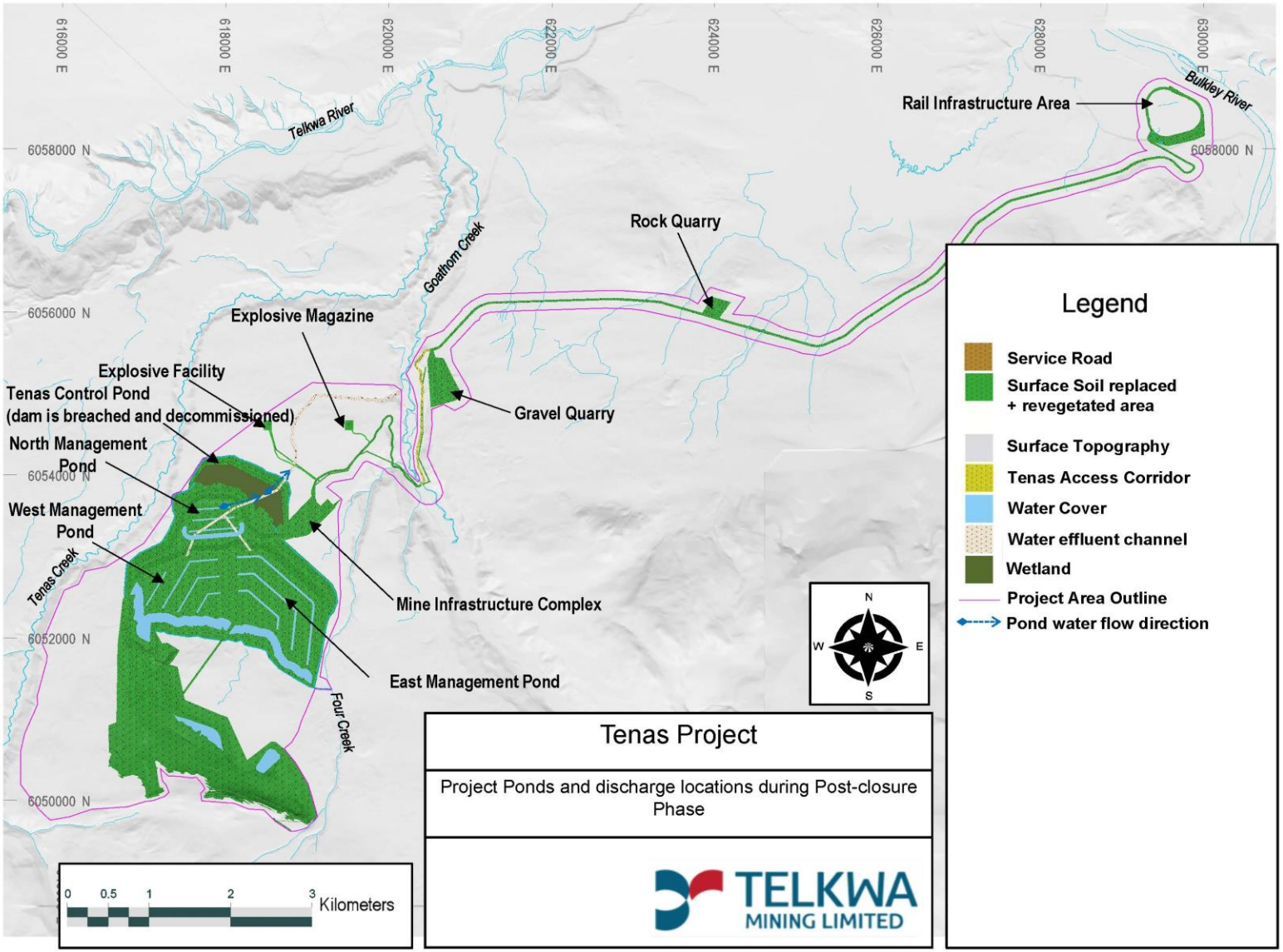

Figure 2-6: Sedimentation Ponds Location and Operation During Post closure Phase not Included in WLBM

Based on the above information the sedimentation ponds identified that the:

- Explosive Facility;
- Explosive Magazine;
- Rock Quarry;
- Gravel Quarry 1 and 2; and,
- East and West TAC

were not included in the overall WLBM completed by SRK for the EAC Application for the Project as including them would have no effect on the water quality and quantity modelled values presented for the prediction nodes nor on the subsequent effects assessments conducted for Surface Water Valued Component.

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by the BC Ministry of Environment (ENV) about the WLBM.

The following discharges have been accounted for in the WLBM:

- Tenas Control Pond;
- CPP Sedimentation Pond;
- Rail Infrastructure Sedimentation Pond;
- Potable Water Storage Pond; and,
- Wastewater Storage Pond.

The Tenas Control Pond is described in **subsections 1.9 Existing Infrastructure and Project Phases**, **1.10 Project Component Summary**, **1.16 Mine Infrastructure Complex (MIC)**, and **1.17 Water Management** in **1.0 Overview of Project Proponent Description** of the **EAC Application**. This pond is the main sedimentation pond for the Project and where mine impacted water is released during the open water season via a surface water discharge into an improved upon natural ephemeral water channel to prevent erosion and sediment release that leads into Goathorn Creek.

The CPP Sedimentation Pond is described in **subsections 1.9 Existing Infrastructure and Project Phases**, **1.10 Project Component Summary**, **1.16 Mine Infrastructure Complex (MIC)**, and **1.17 Water Management** in **1.0 Overview of Project Proponent Description** of the **EAC Application**. The EAC Application has water from the CPP Sedimentation Pond being pumped to the Tenas Control Pond and therefore this pond is not uniquely characterized but is combined with the discharge/seepage quality planned for the Tenas Control Pond. The CPP Sedimentation Pond is lined with a bituminous or alternate lining system. The CPP Sedimentation Pond will have a primary pumping system for pumping flows and a complete duplicate system to provide the

necessary redundancy for any potential pump failures. Furthermore, there will be a spare pump for each one of these systems in case of a pump failure and a backup diesel generator to run these pumps in case of grid power outages.

The discharge from the Wastewater Storage Pond is assessed as part of the overall surface flow discharge from the Tenas Control Pond. The Wastewater Storage Pond is lined with a bituminous or alternate lining system. The discharge from this pond will be via a pumped system to ensure a blending target ratio of 10 to 1 is maintained between flow from the Wastewater Storage Pond and the Tenas Control Pond. This pond has been sized to store a full year of treated wastewater from the sewage treatment plant.

The discharge from the Potable Water Storage Pond is non-contact water from water that is collected by the C02 Channel above the East Management Pond and EA Open Pit and directs this water to Four Creek or to the Potable Water Treatment Plant.

FOLLOWUP COMMENTS

FOLLOW UP 302 ITT TABLE

The discharge of effluent from sedimentation ponds for overland flow to downstream watercourses does not follow best management practices. Erosion resulting from the discharge has the potential to increase the primary POPC (TSS) to receiving waters. The cumulative effects of these additional discharges to the receiving environment have not been accounted for the IDZ study and need to be quantified. Will any mine contact water be directed to the sedimentation ponds [Clarification]?"

RESPONSE FOLLOW UP 302 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

FOLLOWUP COMMENTS

508 ITT TABLE

This conceptual design brief and budgetary estimate does not state the effluent quality or discharge rate to the receiving environment. Please provide this information in a QP certified memo. If the sediment pond to which the effluent will be collected is not lined, please provide the infiltration rate. [Permitting Information Requirement]

RESPONSE 508 ITT TABLE

The Sewage Treatment Plant proposed is a secondary stage treatment plant and is targeting the following average monthly maximum discharge parameters in milligrams per litre (mg/L) at a maximum rate of 5,400 m^3 per year:

- 43 mg/L Nitrate, as nitrogen;
- 0.10 mg/L Nitrite, as nitrogen;
- 2.0 mg/L Ammonia, as nitrogen;
- 20 mg/L Biochemical Oxygen Demand (BOD); and,

- 20 mg/L TSS.

The Sewage Treatment Plant has been designed to allow it to be upgraded to a tertiary style plant in the future if discharge requirements change. The wastewater storage pond where the effluent will be collected from the Sewage Treatment Plant is lined with a bituminous liner or equivalent as is the channel transporting this wastewater to the overall mine discharge channel from the Tenas Control Pond at which point this wastewater is mixed with discharge from the Tenas Control Pond. The wastewater pond has been designed to store a complete year of effluent to provide adequate time for controlled releases from the Wastewater Storage Pond to get an adequate mixing target of approximately 10 to 1 in Goathorn Creek. Please see the attached report from Radloff Engineering and Bionest on the wastewater system in **Appendix 7: Water and Wastewater Treatment Design Report and BioNest Assurance Letter, Radloff**.

Telkwa Mining believes the details above address the requirements set forth in IR **Theme 5**.

THEME 2: SUBSTANTIALLY REVIEW THE WATER BALANCE MODEL. THE WATER BALANCE MODEL IS KEY TO ASSESSING MITIGATION AGAINST EFFECTS TO MANY VALUED COMPONENTS NOT ONLY WATER QUALITY

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Model input values and resulting predictions for the same management structures are inconsistent between the WLBM and the Groundwater model.

509 ITT TABLE

Table 3-16 and Table 3-17 present groundwater connections to mining facilities throughout the life of mine for the expected case and high case. There are some notable differences between these tables and the corresponding tables in Appendix 4.4-A (Tables 6-6, 6-7 and 6-11). For example, the WBM does not appear to consider any groundwater connection to the NMP, while the Groundwater Model predicts seepage from the NMP throughout the life of mine. In other instances, the results appear to be different between the version of the groundwater model used in the WBM and the model presented in the application. For instance, the expected seepage rate from the WMP in Post Closure is 720 m3/d in Appendix 4.4-A while the prediction is 610 m3/d in Appendix 4.3-A. This could increase the predicted post-closure exceedances of selenium at WQS04 as both the NMP and WMP contribute to loadings at this location (based on Table 3-20 in Appendix 4.3-A). Conversely, predicted seepage from EMP in post-closure under the expected case are lower in the Appendix 4.4-A than in Appendix 4.3-A (277 m3/d vs 395 m3/d, respectively) which would reduced to the loading to the receiving environment through groundwater pathways, but may impact the expected surface discharge from the EMP, routed through the NMP and into Goathorn Creek. Please provide water balance and water quality results using inputs from the Groundwater Model provided as part of the application. [EA Information Requirement, QP Response Required].

IR LETTER NEW AND 517 ITT TABLE

There are several inconsistencies in values between Table 3-16 and Table 3-17 and the corresponding groundwater tables in Appendix 4.4-A (Tables 6-6, 6-7 and 6-11) which have provided contradictory information and predictions related to seepage throughout the life of mine, specifically related to selenium loading.

- *Have a QP provide water balance and water quality results using inputs from the Groundwater Model provided as part of the Application.*

RESPONSE 517 AND 509 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM and **Appendix 8: Tenas Project, Hydrogeology Technical Report, SRK**.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Significant uncertainty remains in WLBM calibration, preventing a scientifically defensible effects assessment.

510 ITT TABLE

Section 3.1.2 describes the stochastic model used in Alternative Case 6, but this section does not demonstrate that the stochastic model adequately reproduces the temperature and precipitation variation defined in the baseline characterization (Appendix 1-R).

a) *Please provide plots and tables showing the selected stochastic model parameters produce temperature and precipitation distributions that are representative of the baseline characterization.*

b) *Please provide a rationale to demonstrate 100 model realizations are sufficient to describe climate variability and indicate the range of return periods modeled by this set of realizations. [EA Information Requirement, QP Response Required]*

IR LETTER NEW AND 518 ITT TABLE

Section 3.1.2 describes the stochastic model used in Alternative Case 6, but this section does not demonstrate that the stochastic model adequately reproduces the temperature and precipitation variation defined in the baseline characterization (Appendix 1-R).

1. *Have a QP provide plots and tables showing the selected stochastic model parameters produce temperature and precipitation distributions that are representative of the baseline characterization.*
2. *Have a QP provide a rationale to demonstrate 100 model realizations are sufficient to describe climate variability and indicate the range of return periods modeled by this set of realizations.*

RESPONSE 518 and 510 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Significant uncertainty remains in WLBM calibration, preventing a scientifically defensible effects assessment.

511 ITT TABLE

Please provide or indicate where in the application I can find, annual water balance tables for major mine facilities (Open Pit, EMP, NMP, WMP, Tenas Control Pond) quantifying all modeled inflows, outflows and storage for Operations and Post Closure under a range of climate conditions (average, wet and dry). [EA Information Requirement, QP Response Required]

IR LETTER NEW AND 519 ITT TABLE

Have a QP provide annual water balance tables for major mine facilities (Open Pit, East, West and North Management Ponds, Tenas Control Pond) quantifying all modeled inflows, outflows and storage for Operations and Post Closure under a range of climate conditions (e.g., average, wet and dry).

RESPONSE 511 and 519 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Model nodes need to be appropriately located near planned discharge locations rather than many kilometers downstream.

IR LETTER NEW AND 515 ITT TABLE

a) Have a QP add additional model nodes to represent conditions at:

- *Tributary receiving discharge above confluence with Goathorn Creek.*
- *Goathorn Creek below confluence with tributary receiving discharge.*

Have a QP provide water quantity and quality results for these nodes over the life of mine for the following assessment cases:

- *Project Case*
- *Alternative Case 1, 2, 3, 4 and 5*

Have a QP provide water quality results in figures and table with comparison to relevant water quality guidelines, as provided in Appendix 6 & G of Appendix 4.3-A of the application.

IR LETTER OVERVIEW

Seasonal and monthly variability of background water quality concentrations may affect predicted water quality parameter concentrations.

IR LETTER NEW AND 515 ITT TABLE

b) Have a QP clarify if the background water quality inputs used in the model were annual median values or if monthly (or seasonal) median values were used (section 3.10.1 of Appendix 04.3-A, the Water & Load Balance Modeling Report). If monthly or seasonal background concentrations were used, please provide a table describing their values and ranges. If monthly or seasonal median values were not used, have a QP re-run the Project Assessment Case and Alternative Assessment Case 5 (see Table 2-3 in Appendix 04.3-A) to generate water quality predictions using either monthly (or seasonal) median background values or the annual 95th percentile of background; present results in a format similar to Appendix 6 of Appendix 04.3-A.

RESPONSE 515 ITT TABLE

The following prediction node have been added to the WLBM:

- WQEA1 which represents Goathorn Creek below confluence with tributary receiving discharge; and,
- A prediction node was not added for the tributary receiving discharge above confluence with Goathorn Creek as its quality has been assumed to be same as the end of pipe discharge due to the lack of water in this tributary.

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM. In summary the background water quality inputs used in the EAC Project Case (August 2022) WLBM were monthly mean values while seasonal values are used in both the Updated and Final EAC Project Cases (2024).

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Significant uncertainty remains in WLBM calibration, preventing a scientifically defensible effects assessment.

FOLLOW UP 293 ITT TABLE

"Thank you for the response. I note that the derived synthetic and measured site precipitation appear correlated, as demonstrated in the slides; however, the monthly linear relationships (pg 14) do not demonstrate a relationship approaching 1:1, which would indicate the synthetic approximates the measured data.

- *a) To clarify, were these monthly relationships used to further adjust the derived synthetic record to improve the fit to the measured data? [Clarification, QP response required]*
- *b) Please provide a figure showing concurrent cumulative precipitation records (i.e., double mass curve) and a table with monthly and annual precipitation from both the measured record and final derived/synthetic record(s) that was:*
  - *i. used as input to the water balance model, and*
  - *ii. used to characterize site precipitation and estimate extreme precipitation. If separate records were used, please present both. [EA information requirement, QP response required]"*

IR LETTER NEW AND NEW 293 ITT TABLE

Monthly linear relationships do not demonstrate a relationship approaching 1:1 which would indicate the synthetic approximates the measured data.

1. *Have a QP clarify if monthly relationships were used to further adjust the derived synthetic record to improve the fit to the measured data;*
2. *Have a QP provide a figure showing concurrent cumulative precipitation records (i.e., double mass curve) and a table with monthly and annual precipitation from both the measured record and final derived/synthetic record(s) that was:*

a. *used as input to the WLBM; and used to characterize site precipitation and estimate extreme precipitation (if separate records were used, present both).*

RESPONSE FOLLOW UP 293 ITT TABLE AND NEW 293 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Significant uncertainty remains in WLBM calibration, preventing a scientifically defensible effects assessment.

FOLLOW UP 294 ITT TABLE

Thank you for the response. I'm struggling to understand why this linear regression (Figure 4-16) was selected by the QP as appropriate for this analysis, given the issues described in the response. Without being able to attribute the difference unit runoff/discharge from these similarly located stations to a physical attribute or rationalize an incremental unit runoff of roughly 80 l/s/km2 for the area between these stations, using a 0.8 or 0.85 ratio to scale the historic Goathorn WSC record to the site station represents flawed logic, in my opinion. In particular, the high flow regression is driven, in large part, by the extrapolated high flow section of the site rating curve, where the curve is not supported by stage-discharge measurements.

As Goathorn Creek is the receiving environment for surface discharge from the proposed project and seepage from the management ponds in Post-Closure, the selected regression could have a notable impact on water quality predictions in the receiving environment, thus introducing considerable uncertainty into the assessment of impacts from the proposed project. I understand that this synthetic record was used, in part, to calibrate the rainfall-runoff model used in the water balance model. Using an updated regression (scale by drainage area or refined with

published data), please describe, and quantify the bias that was introduced into the baseline characterization, model calibration and results and impact assessment by the selected regression. Please consider comments ID 295 and 296 in your response. [EA information requirement, QP response required]

294 IR LETTER

Given the minor difference in drainage area between Goathorn-Hydro and Goathorn (08EE008) (1% difference), the selected linear regression (Fig 4-16) describes a surprisingly large difference in unit discharge.
Have a QP use an updated regression (scale by drainage area or refined with published data) to describe and quantify the bias that was introduced into the baseline characterization, model calibration, and results and impact assessment by the selected regression.

RESPONSE 294 IR LETTER AND FOLLOW UP 294 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

INITIAL COMMENTS

295 ITT TABLE

Please provide figures showing mean monthly measured and rainfall-runoff modelled streamflow for Tenas-Hydro, Goathorn-Hydro, and Telkwa-Hydro. It is hard to see the match of hydrograph shape and amplitude at moderate and low flows from the figures provided. As results from the GoldSim model are presented monthly, I am also interested in the visual match at a monthly timestep, over the daily timestep provided. [Information Request]

RESPONSE 295 ITT TABLE

See Attachment #295-1 for mean monthly streamflow from measured and modelled datasets. For measured streamflow, monthly average values were only calculated for months missing less than 5 days of data.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Significant uncertainty remains in WLBM calibration, preventing a scientifically defensible effects assessment.

FOLLOW UP 295 ITT TABLE

Thank you for the plots. It appears the rainfall-runoff model underpredicts the freshet, particular in 2018, and typically predicts that the freshet peaks in June, rather than in April or May as shown in the measured record. In addition, the model appears to be underpredicting summer low flows, with the exception of 2018 at Tenas-Hydro only. As this model was used in the water balance model to predict runoff for unimpacted watersheds as well as reclaimed mine impacted areas, this calibration introduces considerable uncertainty into the water management and water quality predictions. In your response to the following questions, please consider comments ID 294 and 296.

a) *What sensitivity analysis was completed on this model calibration? Were other rainfall-runoff model frameworks attempted and shown to be worse? In particular, I'm interested to know if a model with a more dynamic infiltration/runoff component was considered given the model application.*

b) *If the model were better calibrated to freshet conditions, please describe, and quantify the impact this would have on predicted surface discharge quantity and quality over the life of mine and over a range of climatic conditions?*

c) *If the model were better calibrated to summer low flow conditions, please describe, and quantify the impact this model improvement would have on predicted water quality in the receiving environment during low flow periods over the life of mine over a range of climatic conditions.*

d) *What data collection efforts are underway to support refining/recalibrating/redeveloping this model?*

e) *Why was this calibration considered sufficient for impact assessment? I note the QP has "strongly suggested that this study be revisited and that the model be recalibrated when longer ... records are available... and when all WSC flow data are published".*

RESPONSE FOLLOW UP 295 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Significant uncertainty remains in WLBM calibration, preventing a scientifically defensible effects assessment.

FOLLOW UP IR LETTER 295/296 AND 295 ITT TABLE

The rainfall – runoff model, used in the WLBM to predict runoff from unimpacted and reclaimed watersheds, appears to underpredict the median and range of flow conditions by a sizeable margin in Goathorn Creek, Tenas Creek and Telkwa River when compared to the synthetic records. The rainfall-runoff model also appears to poorly match the hydrograph shape, specifically the magnitude and timing of the freshet and the summer low flows when compared to the measured record. This poor calibration introduces considerable uncertainty into the water management and water quality predictions based on the WLBM results.

- *Have a QP provide a robust demonstration that the model is sufficiently calibrated to available measured and synthetic datasets with a focus on common flow conditions (the annual range of average flow conditions). Where modeled results deviate considerably from baseline characterization, describe and quantity the impact to predicted surface discharge quantity and quality, and predicted water quality in the receiving environment over the life of mine and for the applicable assessment cases caused by model bias.*

  OR

- *Have a QP recalibrate the rainfall-runoff model to provide the evidence outlined above. Describe the impact on surface water discharge quantity and quality, water management (waste management pond water levels), and receiving environment water quality over the life of mine. Provide revised results in a format consistent with Appendix 6 and G Appendix 4.3-A of the application for all assessment cases.*

RESPONSE FOLLOW UP 295 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Significant uncertainty remains in WLBM calibration, preventing a scientifically defensible effects assessment.

FOLLOW UP IR LETTER 295/296 AND 296 ITT TABLE

Thank you for the plots. It appears the rainfall-runoff model underpredicts the median and range of flow conditions by a sizeable margin in Goathorn Creek, Tenas Creek and Telkwa River when compared to the synthetic records. The flows at the 50% probability of exceedance in Telkwa River appear to be underestimated by over 10 m3/s and the estimated mean annual discharge (MAD) at this location is 27.3 m3/s (Table 4-24). Based on the provided flow duration curve (FDC) figure in the response, MAD has a 70% probability of exceedance using the synthetic record while the modelled record gives MAD a 45% probability of exceedance. Similarly, for Tenas Creek, at the 50% probability of exceedance, the modelled record is roughly 0.1 m3/s lower than the synthetic record, and the estimated MAD at this location is 0.5 m3/s. Based on the FDC for Tenas, MAD has a 26% probability of exceedance using the synthetic record, and the difference between the synthetic and modeled is roughly 0.15 m3/s, indicating the MAD is modeled roughly a third lower than the synthetic record suggests. At Goathorn Creek, the modeled record underpredicts the synthetic, which is likely also underestimated (see ID 294).

a) Why was this calibration considered sufficient for impact assessment?

b) Please calibrate the model to the bulk of flow conditions and describe and quantify the impact on surface water discharge quantity and quality, water management (waste management pond water levels), and receiving environment water quality over a range a flow conditions over the life of mine.

[EA information requirement, QP response required]

RESPONSE FOLLOW UP 296 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM.

Telkwa Mining believes **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** with the answers provided above addresses the requirements set forth in IR **Theme 2**.

THEME 1: DESIGN ALTERNATIVE TREATMENT OPTIONS WHICH ARE CAPABLE OF MEETING WATER QUALITY GUIDELINES (WQGS) NEAR APPROPRIATELY SITED DISCHARGE LOCATIONS

FOLLOWUP COMMENTS

175 ITT TABLE

EMLI is consulting with ENV on water quality monitoring and water management measures for this project. Telkwa Coal will need to propose conceptual design of management structures as part of the current application to demonstrate that the Project as proposed is capable of managing water not suitable for discharge and meeting WQGs.

176a ITT TABLE

EMLI understands that ENV's review of the surface water quality effects assessment and proposed water quality benchmarks is ongoing. EMLI notes that based on that review additional water quality mitigation for the Project may be required. Should water treatment or other mitigation measures be proposed for the Project, EMLI will review the information at that time. Telkwa Coal is encouraged to engage as soon as possible with EMLI on any proposed water treatment, especially if any passive or semi-passive technologies are proposed.

RESPONSE 176a ITT TABLE

Telkwa Mining understands if water treatment becomes a requirement that EMLI will need to be engaged with these technologies, whether they are passive, semi-passive or active. Telkwa Mining has started engagement with EMLI as of Q3, 2024.

LETTER IR 176 AND 176b ITT TABLE

1. *Provide conceptual design of alternative treatment options, mitigation measures, and management structures that can manage water not suitable for discharge and that meet BC WQGs.*

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

The Water and Load Balance Model (WLBM) is key to assessing the effectiveness of mitigation against effects to many VCs, including water quality.

- *Source control and mitigation or treatment options included in the WLBM do not demonstrate that Water Quality Guidelines (WQG) will be met near discharge locations and will lead to exceedance of WQGs over many kilometres of multiple watercourses.*

FOLLOW UP IR LETTER NEW AND 514 ITT TABLE

Provide design alternative treatment options which are capable of meeting WQGs near appropriately sited discharge locations. Describe the reliability, control-effectiveness, and treatment efficiency of each mitigation option including the currently proposed option – refer to BC ENV Best Achievable Technology (BAT) guidance. BAT assessments are required prior to the development of Initial Dilution Zones (IDZs) – also refer to BC IDZ development guidance.
When considering discharge standards, follow these best practices and minimum standards:

a) *The discharge must not be acutely toxic.*

Telkwa Mining completed a two-step process to determine if the discharges are potentially acutely toxic as follows:

1. A review was conducted of the end of pipe discharge concentrations versus the relevant BC Water Quality Acute Guidelines with any parameter having a concentration less than these guidelines not being acutely toxic; and,
2. For the few parameters that had end of pipe concentrations higher than the BC Water Quality Acute Guidelines, Borealis Environmental Consulting Inc was retained to review these concentrations versus the relevant acute toxicity limits for rainbow trout and Daphne Magna and determined that the modelled concentrations at end of pipe are not acutely toxic. Please see **Appendix 9: Evaluation of Acute Daphnia Magna and Rainbow Trout LC50 Toxicity Supporting Tenas Project Best Available Technology Assessment Study – Parameters of Concern: Nitrite, Iron (Total) and Iron (Dissolved)**.

Telkwa Mining commits to toxicity testing of final effluent discharges utilizing the methodology provided by BC government via Section F Toxicity Test Methods (https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/monitoring/emre/manuals/environmental-lab-manual/2023-09-18-bc-elm-2022-section-f.pdf).

b) If the untreated effluent contains constituents that exceed 80% of an applicable WQG, BMPs and BAT must be applied. Chronic WQG for the protection of freshwater aquatic life are most typically used as the guideline. However, if more sensitive uses or values are downstream (e.g., drinking water, irrigation, livestock, wildlife) the most protective WQG will be applied.

c) If the effluent still does not meet WQGs, repeat step (b). Document this iterative process.

d) If the effluent still does not meet WQGs after all reasonable BMPs and BAT are applied, an IDZ may be considered during the permitting process. Some chronic toxicity may be tolerated in the IDZ, but water quality should meet WQGs at the end of the IDZ. An IDZ will not be considered during permitting without an adequate BAT assessment.

e) If the water quality at the end of the IDZ still exceeds chronic WQGs, an SPO may be considered during the permitting process. SPOs must be protective of the site-specific environment. An SPO will not be considered during permitting without an adequate BAT assessment.

514 ITT TABLE

Within the bounds of the above best practices and minimum standards, the proponent, and their qualified professionals (QPs) are normally best suited to consider which site-specific factors should be evaluated regarding feasibility, reliability, control effectiveness, and cost effectiveness. To improve efficiency, it may be useful to have a conversation with the ENV on the file once an outline for the BAT assessment has been developed. In practice, the depth and detail of the BAT assessment submittal will be proportionate to the projected effluent quality. If the selected BAT will achieve BC WQGs at the point of discharge, the submittal can be brief and will likely be readily advanced. If the selected BAT is not capable of meeting BC WQGs in the receiving environment, the submittal must be more substantial and will be subjected to a more intensive review, as it must justify the greater risk to the environment.

Some of the technologies TCL has proposed to consider during the BAT assessment are likely to be effective mitigation measures for the Tenas project. TCL may need to consider a set (a series or train) of technologies to address all contaminants of concern. During an EA process, technologies must be at a readiness level of 7 to be considered as primary mitigation. At permitting, technologies must be at a readiness level of 8 or 9 to be considered as primary mitigation. ENV and EMLI consider some of the proposed technologies to be below the appropriate technology

readiness level (TRL) for the Tenas project. The proponent may conduct a Technology Readiness Assessment (TRA) (refer to technical guidance 21 on the Mining and Smelting Guidance webpage) for consideration by ENV and EMLI to demonstrate the technological readiness of any proposed technology. TCL is encouraged to engage with ENV and EMLI prior to undertaking a TRA.

FOLLOW UP 353 ITT AND 355 ITT TABLE

As a result of the BAT conducted for waste rock and tailings management, the selected strategy (subaqueous storage) will provide a good degree of source control in terms of ML/ARD rate, thereby improving effluent quality. However, a BAT assessment is also required to consider appropriate strategies for the management of mine effluent that will be discharged to the environment.

Discharges to ground and non-point source discharges to the environment must be assessed in addition to discharges to surface water. Standard thresholds for discharges to ground are outlined in the ENV guidance document, which is located here: https://www2.gov.bc.ca/assets/gov/environment/waste-management/industrial-waste/industrial-waste/mining-smelt-energy/guidance-documents/7276_env_rob_dtg_factsheet.pdf

The water quality model predicts that, due to a slowly advancing groundwater plume, the project will result in WQG exceedances in Four and Tenas Creeks. Although these impacts may not occur until after the target coal has been extracted, they are predicted to persist for generations.

The response to the initial comment includes an explanation that assumes an Initial Dilution Zone (IDZ). Similar to the SPOs, an IDZ will not be assessed or authorized unless a BAT assessment is first conducted (following the ENV guidance document). Following BAT, these considerations (SPOs and IDZ) can be assessed through the permitting process under the Environmental Management Act but are not appropriate for inclusion in this review under the Environmental Assessment Act. [Permitting Information Requirement]

IR LETTER OVERVIEW

Reviewers have identified that the current Application shows potential for significant adverse effects to water quality and aquatic biota as there is insufficient water quality mitigation measures to protect the receiving environment.

- *The predicted water quality and the approach to use a few small watercourses as effluent conveyance will result in residual effects to aquatic valued components (VCs) that cannot be reliably managed in BC Environmental Management Act permitting.*

Alternative treatment options capable of meeting WQGs at appropriately sited discharge locations are missing from the Application.

Additional conceptual design of alternative treatment options, mitigation measures, and management structures are needed to prevent the discharge of water that is not suitable for release to the environment.

IR LETTER OVERVIEW

The Water and Load Balance Model (WLBM) is key to assessing the effectiveness of mitigation against effects to many VCs, including water quality.

- *Source control and mitigation or treatment options included in the WLBM do not demonstrate that Water Quality Guidelines (WQG) will be met near discharge locations and will lead to exceedance of WQGs over many kilometres of multiple watercourses.*

LETTER IR 350 AND 350 ITT TABLE

Provide additional mitigation measures to address the significant exceedance of WQGs in frequency and duration for selenium, nitrite, sulphate and dissolved cadmium in Four Creek and Tenas Creek.

RESPONSE IR 175, 176b, 514, 350, 353, and 355

Final EAC Project Case (2024) Development

Telkwa Mining considered incorporating multiple additional mitigation controls in developing the Final EAC Project Case (2024) consisting of the following additional mitigation controls/best management practices (BMP) and/or technologies:

- Management and Control Pond liner design modifications (technology);
- Additional use of water by the CPP (BMP);
- Blasthole Liners (BMP);
- Passive/Active Flocculation(technology);
- Storage and Use of Freshet Water (BMP);
- Water treatment for surface water flows (technology); and
- Water treatment of seepage flows (technology).

The Final EAC Project Case (2024) does not have exceedances in the receiving environment except for parameters that are already in exceedance for background/baseline conditions and a short duration (4 year) exceedance of cobalt in Four Creek which is likely not to occur if attenuation mechanisms in groundwater were accounted for in the water model.

The following sections provide a description of each additional mitigation control/technology and modelled parameter concentrations compared to the Updated EAC Project Case (2024). Please see **Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK.**

Management and Control Pond Liner Modifications (technology)

Table 2-2 provides a summary of the liner systems presented in the EAC Application. These liners were incorporated into the various management and control ponds for the control of seepage from these structures primarily towards the downstream watercourses of Tenas, Four, and Goathorn Creeks.

Table 2-2: Environmental Assessment Certificate (EAC) Liner Designs

Location	Liner Type	Details
Tenas Control Pond	Bituminous	A bituminous liner installed on compacted existing overburden

Location	Liner Type	Details
North Management Pond (floor, embankment face)	Soil-Bentonite	30-centimetre (cm)-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a 16-ounce filter fabric protection layer all installed on top of compacted existing overburden
East Management Pond (floor, embankment face)	Soil-Bentonite	30-cm-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a 16-ounce filter fabric protection layer all installed on top of compacted existing overburden
West Management Pond (overburden floor, overburden in the pit and embankment face)	Soil-Bentonite	30-cm-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a 16-ounce filter fabric protection layer all installed on top of compacted existing overburden
West Management Pond (bedrock floor)	None	No liner prescribed
West Management Pond (bedrock south end EA Open Pit wall)	None	No liner prescribed

SRK completed an option analysis for Telkwa Mining on various liner modifications with the aim of reducing the potential impact of groundwater seepage to the receiving environment. **Table 2-3** provides two modified liner designs that were considered as a potential technology for BAT assessment provided in **Appendix 11: Tenas Project Best Achievable Technology Assessment Updated, SRK**.

Table 2-3: Revised Liner Designs Investigated

Location	Liner Type	Revised Liner Design Details
Tenas Control Pond	Soil-Bentonite with Bituminous Line Above	15-centimetre (cm)-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a bituminous geomembrane liner on top of this installed on compacted existing overburden.
North Management Pond (floor, embankment face)	Soil-Bentonite	56-cm-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a 30-cm thick layer of compacted overburden protection layer installed above the liner.
East Management Pond (floor, embankment face)	Soil-Bentonite with Bituminous	Option 1: 56-cm-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a 30-cm layer of compacted overburden protection layer installed above the liner. Option 2: 56-cm-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a bituminous geomembrane liner followed by

Location	Liner Type	Revised Liner Design Details
		a 30-cm layer of compacted overburden protection layer installed above the liner.
West Management Pond (overburden floor, overburden in the pit and embankment face)	Soil-Bentonite	56-cm-thick soil bentonite liner that is blended into existing overburden and compacted and then followed by a 30-cm layer of compacted overburden protection layer installed above the liner.
West Management Pond (bedrock floor)**	None**	No liner prescribed**
West Management Pond (bedrock south end wall)	None	No liner prescribed

Notes:

**There is still the possibility to introduce a soil-bentonite liner in the West Management Pond bedrock floor portions during the Operation Phase if parameters of concern are found to be higher in the North, and East Management Ponds than predicted in the EA.

The revised liners specified in **Table 2-3** above were incorporated into the groundwater model to determine seepage levels from these facilities with the revised technical report provided in **Appendix 8: Tenas Project, Hydrogeology Technical Report, SRK**. **Table 2-4** provides a summary of the changes in net seepage values achieved for the above structures.

Table 2-4: Seepage Values in m^3 per day with Revised Liner Designs at End of Mining for Options 1 and 2

CASE	WMP	NMP	EMP	TCP
Updated EAC Project Case (2024)	836	198	458	140
Option 1	373	87	277	8
Option 2	373	87	63	8

These revised seepage values were then used as inputs for the water and load balance model to look at potential mitigations compared to a base case without the use of liners. This was completed by SRK in Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK with **Table 2-5** providing a summary of these results for relevant prediction nodes. Based on the information in **Table 2-5** it was decided to carry this mitigation control forward into the BAT assessment process to determine if this mitigation control is recommended to be incorporated into the Final EAC Project Case (2024).

Table 2-5: Water Quality (Maximum Monthly Mean) Results for Revised Liner Designs in Post-closure using Typical Source Terms and Average Hydrology at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2024) (mg/L)	Updated EAC Project Case (2024) (mg/L)	Liner Option 1 (mg/L)	Liner Option 2 (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021	0.0021
WQSO6 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021	0.0021
WQS03-DS Four Creek	Cobalt (t)	0.004	0.00068	0.00092	0.00050
	Nitrite (t)	0.020	0.015	0.0084	0.00027
	Sulphate (t)	309	33	18	6
	Selenium (t)	0.0020	0.00081	0.00045	0.00013
WQS04 Tenas Creek	Copper (d)	0.0026	0.0015	0.0015	0.0015
	Nitrite (t)	0.020	0.0090	0.0084	0.0080
	Sulfate (t)	218	24	22	20
	Selenium (t)	0.0020	0.00078	0.00072	0.00063

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligrams per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.
Please note that dissolved copper exceeds the WQGs under background conditions.

Additional Water Use by the CPP

The current EAC application has the CPP producing a dry (25% moisture) processed rock stream that is then hauled and placed into the management ponds. The primary reason for this was to limit water use by the Project. However, as the Project discharges water every year when in operation even during drought conditions there is an opportunity to go to a conventional wet slurry system for the processed rock stream by the CPP. This will increase the amount of water required by the CPP with the benefit of permanently tying up this water into the coarse and fine processed rock products. Water from the open pit would be used for this additional use and would improve water quality discharged by the Project. The change in water use by the CPP was incorporated into the WLBM report completed by SRK which is provided in **Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK** with **Table 2-6** below providing a summary of these results for the relevant prediction nodes. Based on these

results and the increased water usage this mitigation control was not carried forward into the Final EAC Project Case (2024).

Table 2-6: Water Quality (Maximum Monthly Mean) Results for Additional Water Use by the CPP during Operation in Post-closure using Typical Source Terms and Average Hydrology at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2024) (mg/L)	Updated EAC Project Case (2024) (mg/L)	Additional CPP Water Use (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021
WQSO6 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021
WQS03-DS Four Creek	Cobalt (t)	0.004	0.00068	0.00069
	Nitrite (t)	0.020	0.015	0.015
	Sulphate (t)	309	33	34
	Selenium (t)	0.0020	0.00081	0.00085
WQS04 Tenas Creek	Copper (d)	0.0026	0.0015	0.0015
	Nitrite (t)	0.020	0.0090	0.0091
	Sulfate (t)	218	24	24
	Selenium (t)	0.0020	0.00078	0.00082

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligrams per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.
Please note that dissolved copper exceeds the WQGs under background conditions.

Blasthole Liners

Telkwa Mining has incorporated the use of blasthole liners for holes in rock requiring the addition of blasting agents into the Final EAC Project Case (2024) using a 75% effectiveness on the portion of nitrogen species being produced from blasting which is conservative compared to the actual 95% effectiveness observed at current operations in BC.

The change in nitrogen species was incorporated into the WLBM report completed by SRK which is provided in **Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK**, with **Table 2-7** below providing a summary of these results for the relevant prediction nodes. Based on these results this mitigation control was incorporated into the Final EAC Project Case (2024).

Table 2-7: Water Quality (Maximum Monthly Mean) Results for Use of Blasthole Liners during Operation in Post Closure using Typical Source Terms and Average Hydrology at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2024) (mg/L)	Updated EAC Project Case (2024) (mg/L)	Use of Blasthole Liners (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021
WQSO6 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021
WQS03-DS Four Creek	Cobalt (t)	0.004	0.00068	0.00068
	Nitrite (t)	0.020	0.015	0.010
	Sulphate (t)	309	33	33
	Selenium (t)	0.0020	0.00081	0.00081
WQS04 Tenas Creek	Copper (d)	0.0026	0.0015	0.0015
	Nitrite (t)	0.020	0.0090	0.0060
	Sulfate (t)	218	24	24
	Selenium (t)	0.0020	0.00078	0.00078

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligrams per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.
Please note that dissolved copper exceeds the WQGs under background conditions.

Passive/Active Flocculation

The EAC Application had a target of producing a maximum TSS concentration for 35 mg/L discharging from sedimentation ponds. To reduce total concentrations of parameters such as Iron and Aluminium, passive and active flocculation can be added to the TCP to reduce the designed maximum TSS concentrations from 35 mg/L to 5 mg/L.

The change in TSS was incorporated into the WLBM report completed by SRK which is provided in **Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK**, with **Table 2-8** below providing a summary of these results for the relevant prediction nodes. Based on the information in **Table 2-8** it was decided to carry this mitigation control forward into the BAT assessment process to determine if this mitigation control is recommended to be incorporated into the Final EAC Project Case (2024).

Table 2-8: Water Quality (Maximum Monthly Mean) Results for the Use of Passive/Active Flocculation During Operation in Post-closure using Typical Source Terms and Average Hydrology at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2024) (mg/L)	Final EAC Project Case (2024) (mg/L)	Decrease TSS levels to 5 mg/L (mg/L)
Tenas Control Pond	Aluminum (t)	0.27	0.39	0.07
	Iron (t)	1.0	1.5	0.2

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; WQG=water quality guidelines. Red text indicates exceedances of WQGs.

Storage and Use of Freshet Water

Telkwa Mining has investigated the storage and use of Freshet water from Channel C02 that diverts water around the Project into Four Creek. The use of water from the C02 channel is to improve the robustness of the water cover for PAG material in the management ponds especially the East Management Pond.

The change in the storage and use of freshet water was incorporated into the WLBM report completed by SRK which is provided in **Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK**, with **Table 2-9** below providing a summary of these results for the relevant prediction nodes. Given the minor reductions in parameter concentrations in the receiving environment and that this option is inconsistent with the best management practice of keeping noncontact water out of the Project, this mitigation control was not carried forward into the Final EAC Project Case (2024).

Table 2-9: Water Quality (Maximum Monthly Mean) Results for the Storage and Use of Freshet Water at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2024) (mg/L)	Updated EAC Project Case (2024) (mg/L)	Additional C02 Water to MPs (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0012	0.0021	0.0021
WQSO6 Goathorn Creek	Copper (d)	0.0012	0.0021	0.0021
WQS03-DS Four Creek	Cobalt (t)	0.004	0.00068	0.00056
	Nitrite (t)	0.020	0.015	0.011
	Sulphate (t)	309	33	26
	Selenium (t)	0.0020	0.00081	0.00063

Location Creek	Parameter	BC WQG (2024) (mg/L)	Updated EAC Project Case (2024) (mg/L)	Additional C02 Water to MPs (mg/L)
WQS04 Tenas Creek	Copper (d)	0.0026	0.0015	0.0015
	Nitrite (t)	0.020	0.0090	0.0079
	Sulfate (t)	218	24	22
	Selenium (t)	0.0020	0.00078	0.00065

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligrams per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.
Please note that dissolved copper exceeds the WQGs under background conditions.

Active Water Treatment

This mitigation control allows for the treatment of surface flows via various methods prior to water being discharged. This mitigation control was reviewed further using the subsequent BAT assessment process to select the appropriate technology for this Project and then determine if this technology was recommended.

Summary of BMP Assessment Process

Based on analysis above, **Table 2-10** below was generated which summarizes the results of the BMP Assessment process indicating which BMPs were selected for incorporation into the Final EAC Project Case (2024) and which technologies should be reviewed further in the BAT Assessment Process.

Table 2-10: Summary of the BMP Assessment Process

BMP / Technology	Incorporation into the Final EAC Project Case (2024)	Carried forward into the BAT Assessment Process	Comment
Additional use of water by the CPP	No	N/A	Not effective for the reduction of POCs in either seepage or surface discharge
Blasthole Liners	Yes	N/A	Incorporate into Final EAC Project Case (2024) as a source control technology
Storage and Use of Freshet Water	No	N/A	Not effective for the reduction of Parameters of Concern (POCs) in either seepage or surface discharges
Management and Control Pond Liner Modifications	N/A	Yes	Effective for reduction of seepage reaching downstream creeks
Passive/Active Flocculation	N/A	Yes	Effective for reduction some total parameter concentraions such as Iron
Active Water Treatment	N/A	Yes	Effective for reduction of POCs in surface water discharge to Goathorn Creek

BAT Assessment

As a reminder the Final EAC Project Case (2024) does not have exceedances in the receiving environment except for parameters that are already in exceedance for background/baseline conditions and a short duration (4 year) exceedance of cobalt in Four Creek which is likely not to occur if attenuation mechanisms in groundwater were accounted for in the water model.

As provided above the following mitigations were carried forward into the BAT process:

- Modified liners in the management and control ponds;
- Passive/Active Flocculation; and,
- Active water Treatment.

SRK identified several Parameters of Concern (POCs) based on the guidance definition provide by the Ministry of Environment for the Updated EAC Project Case (2024) WLBM using typical source terms. Potential water treatments could be applied to try and meet BC WQGs at the end of pipe and the receiving environment. To that effect, Telkwa Mining contracted SRK to complete a BAT assessment on available treatment technologies for these POCs using the guidance provided by the BC provincial government and SRK's full report is provided in **Appendix 11: Tenas Project Best Achievable Technology Assessment Updated, SRK**. A multi-step process that mirrored the 2024 guidance provided by BC ENV was followed as summarized by **Figure 2-7** below.

Table 2-11 below summarizes the results obtained by the MAA for the various water treatment technologies that were carried forward from screening analysis.

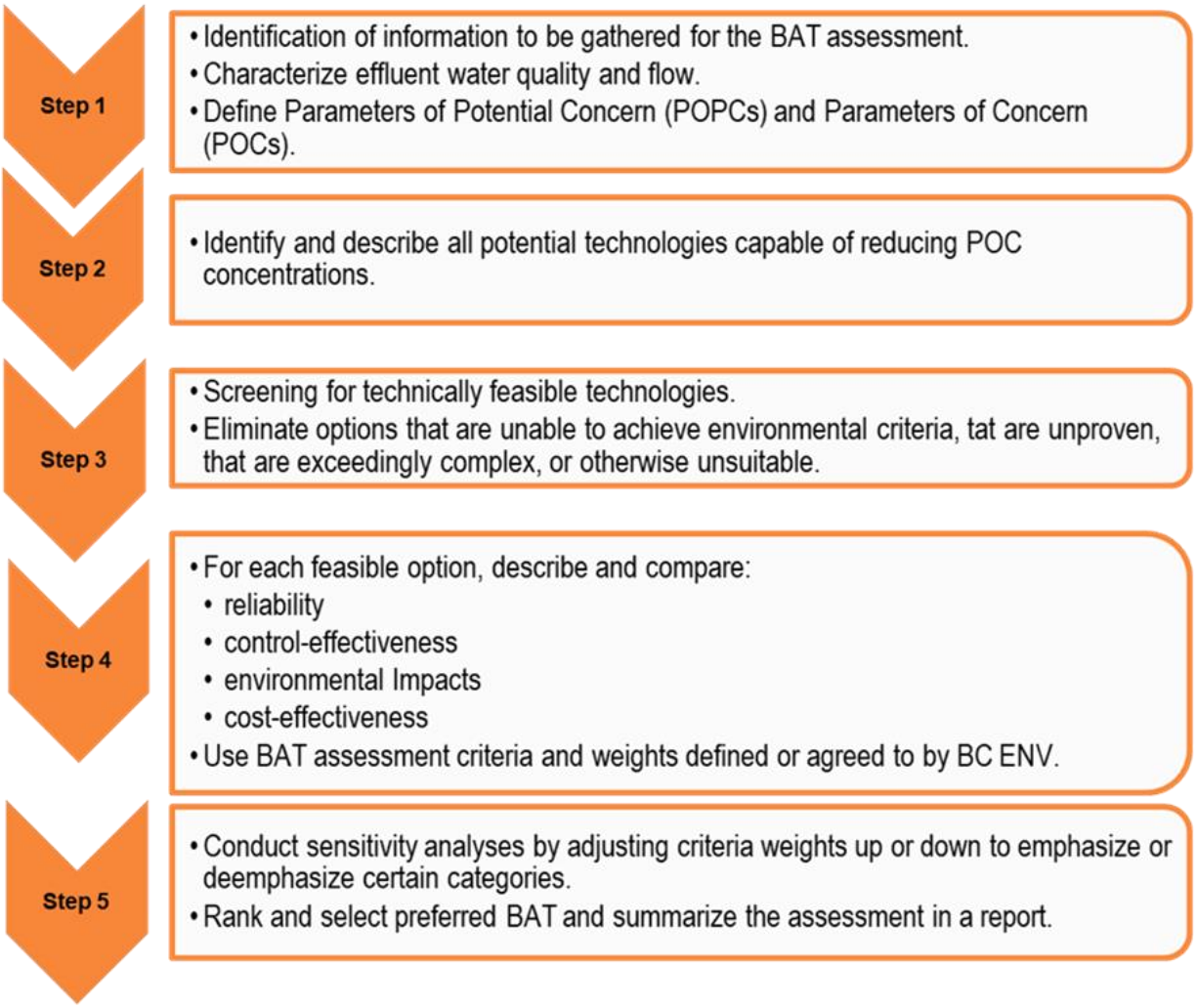

Figure 2-7: Bat Methodology Based on BC ENV's 2024 Guidance Document

Table 2-11: Summary of MAA Rankings for Active Water Treatment Technologies that Met Screening Requirements

		Base Case with BMPs	Passive/Active Flocculation	In-situ Active (GBR)	RO + MBBR	RO + MBBR + HDS Lime	RO + MBBR + Sulphide	RO + MBBR + Ferric	RO + MBBR + Ion Exchange	Zero Liquid Discharge	Modified Liners in Water Management Ponds
Assessment Criterion	**Weight**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Option 6**	**Option 7**	**Option 8**	**Option 9**	**Option 10**
Reliability	**20**	**17**	**16**	**14**	**15**	**14**	**14**	**15**	**14**	**12**	**16**
Risk Assessment	5	3	3	3	4	4	3	4	4	4	3
Robustness	5	5	3	3	4	3	4	4	3	4	5
Scalability	5	4	5	4	3	3	3	3	3	2	3
Long-term Viability	5	5	5	4	4	4	4	4	4	2	5
Control-Effectiveness	**30**	**13**	**13**	**20**	**20**	**22**	**22**	**20**	**26**	**28**	**13**
Pollutant Reduction	20	1	1	2.5	2.5	3	3	2.5	4	4.5	1
Toxicity Reduction	10	4.5	4.5	5	5	5	5	5	5	5	4.5
Environmental & Socio-Cultural Impacts	**25**	**23**	**23**	**22**	**20**	**17**	**17**	**17**	**17**	**10**	**22**
Energy Efficiency	5	5	5	4.5	3.5	3.5	3.5	3.5	3.5	1	5
Greenhouse Gas Emission	6	5	5	4.5	4	3.5	3.5	3.5	3.5	1	3.5
Footprint	4	5	5	4.5	4	3	3	3	3	3	5
Secondary Waste Production	5	5	5	4.5	4	3	3	3	2.5	1	5
Adherence to Yintah Management Directives	5	3	3	4	4	4	4	4	4	4	4
Cost-Effectiveness	**25**	**25**	**25**	**22**	**14**	**12**	**12**	**12**	**12**	**5**	**19**
Efficient Use of Existing Resources	3	5	5	4	2	2	2	2	2	1.5	3
Life Cycle Cost Analysis	22	5	5	4.5	3	2.5	2.5	2.5	2.5	1	4
Total	**100**	**78**	**77**	**78**	**69**	**65**	**65**	**64**	**69**	**55**	**71**

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/BAT Assessment/Telkwa BAT Tech Screening REV01.xlsx

Based on the above table, the top ranking of the water treatment technologies is:

1. In-situ Active GBR and Base Case with BMPS/BATS with no additional mitigations;
2. Passive/Active Flocculation;
3. Modified Liners in Management and Control Ponds;
4. RO + MBBR and RO + MBBR + Ion Exchange; and,
5. RO + MBBR + HDS Lime and RO + MBBR + Sulphide.

The modelled water quality output for two selected water treatment systems (Options 1 In-situ Active GBR and 5 RO + MBBR + HDS Lime) is provided in **Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK**, with **Table 2-12** providing a summary of these results for the selected nodes. Given the results of the BAT assessment, and the impact on water quality in the receiving environment these two additional mitigations were not selected to be incorporated into the Final EAC Project Case (2024) as no exceedance was found in the receiving environment but rather these mitigations will only be incorporated via an approved Trigger Action Response Plan in permitting.

Table 2-12: Water Quality (Maximum Monthly Mean) Results for Active Water Treatment of Surface Flows in Post-closure using Typical Source Terms and Average Hydrology at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2024) (mg/L)	Updated EAC Project Case (2024) (mg/L)	In-situ Active GBR Treatment (mg/L)	Active Treatment RO+MBBR+HDS Lime (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021	0.0020
WQSO6 Goathorn Creek	Copper (d)	0.0013	0.0021	0.0021	0.0020
WQS03-DS Four Creek	Cobalt (t)	0.004	0.00068	0.00075	0.00069
	Nitrite (t)	0.020	0.015	0.010	0.015
	Sulphate (t)	309	33	44	34
	Selenium (t)	0.0020	0.00081	0.00066	0.00085
WQS04 Tenas Creek	Copper (d)	0.0026	0.0015	0.0016	0.0015
	Nitrite (t)	0.020	0.0090	0.0033	0.0091
	Sulfate (t)	218	24	36	24
	Selenium (t)	0.0020	0.00078	0.00033	0.00079

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligram per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.

Please note that dissolved copper exceeds the WQGs under background conditions.
Please note the current proposed configuration active water treatment does not affect groundwater seepage which is the causes of elevated POCs in Four and Tenas Creeks

Incorporation of Further Mitigations for the Final EAC Project Case (2024) based on the BAT and BMP Assessments

A review of the mitigation options was completed based on the BMP and BAT assessments completed above with the results summarized in the **Table 2-13** below to help guide how and when mitigations will be incorporated into the Final EAC Project Case (2024).

Table 2-13: Summary of Further Mitigations/Technologies Incorporated or Discarded for the Final EAC Project Case (2024) Based on the BAT and BMP Assessments

Mitigation	BAT or BMP	Recommendations
Management and Control Pond Liners	BAT	• Do not adopt in the Final EAC Project Case (2024). • Adopt as a contingency to be implemented via a Trigger Action Response Plan in permitting for West Management Pond. • Submit during Permitting phase for regulatory approvals.
Use of Blasthole Lines	BMP	• Adopt this option for the Final EAC Project Case (2024).
Use of passive/active flocculation in TCP and Rail Infrastructure Sedimentation Pond	BAT	• Do not adopt in the Final EAC Project Case (2024). • Adopt as a contingency to be implemented via a Trigger Action Response Plan in permitting. • Submit during Permitting phase for regulatory approvals.
Active Treatment of surface flows using RO+MBBR+HDS Lime	BAT	• Do not adopt in the Final EAC Project Case (2024). • Adopt as a contingency to be implemented via a Trigger Action Response Plan in permitting. • Develop Permit level Design. • Submit during Permitting phase for regulatory approvals.
Passive Treatment of surface and seepage flows via Gravel Bed Reactors	BAT	• Do not adopt in the Final EAC Project Case (2024). • Adopt as contingency to be implemented via a Trigger Action Response Plan in permitting. • Develop Permit Level Design. • Submit during Permitting phase for regulatory approvals.

Based on the above information the Final EAC Project Case (2024) will incorporate blasthole liners as a further BMP beyond those already provided in the Updated EAC Project Case (2024) and EAC Project Case (August 2022).

Contingency Mitigations, in accordance with a Trigger Action Response Plan

Following a meeting with EAO, BC Ministry of Environment, and BC Ministry of Mining & Critical Minerals on December 8, 2025, Telkwa Mining understands that the Province of BC is concerned

with potential uncertainty associated with the predictive modelling of water quality from greenfield mining projects and the use of In-situ Active GBRs as a primary mitigation means for addressing POCS. Telkwa Mining had SRK review and modify the BAT report to:

- Clearly recommend that RO+MBBR+HDS Lime is the primary mitigation to address future water quality concerns.

To deal with potential technology readiness concerns with the In-situ Active GBR water treatment technology, Telkwa Mining will commit to designing, permitting, and constructing a pilot In-situ Active GBR water treatment system in the CPP Sedimentation Pond or alternative pond as part of the Construction Phase so that this system is in place for monitoring its effectiveness for treating contact water and seepage from the Project to increase the technology level of this method to 8 or 9 for identified POCs (such as nitrogen species, selenium, metals).

Furthermore, to deal with potential uncertainty risks in the WLBM Telkwa Mining commits to designing both a permit level In-situ Active GBR and RO+MBBR+HDS Lime water treatment systems and applying for permit approvals for both contingency mitigations. By having permit approvals and permit level designs in place for constructing the In-situ Active GBR and/or the RO+MBBR+HDS Lime active water treatment systems will allow them to be constructed within approximately one year of making a final execution decision based on measured POC concentrations at the end of pipe, in the seepage, in the management and control ponds, and in the receiving environment during the Construction and Operation Phases prior to the POCs exceeding the BC WQGs in the receiving environment.

During annual monitoring specified during the permitting process, if it becomes evident that POCs will trend to be above the BC WQGs in the future, some or all the following additional contingency mitigations can be implemented for the Project based on a Trigger Action Response Plan that will be provided and approved during permitting:

- Implement water treatment for surface and seepage water flows using the In-situ Active GBR water treatment method in the management ponds as these ponds will be constructed with the necessary infrastructure already incorporated to allow for the construction of this water treatment process.
- Implement passive/active flocculation for the reduction of total parameter concentrations in sedimentation and control ponds.
- Implement RO+MBBR+HDS lime active water treatment into the Water Management Plan.
- As the liner for the WMP will not be constructed till after year 5 which allows the implementation of liner Modifications for the WMP prior to PAG being placed into the management pond if TARP indicates this is a requirement.

Construction and implementation of any of these contingency mitigations will be contingent upon, and in accordance with, an agreed upon consensus-based Trigger Action Response Plan (TARP) to be developed during the BC provincial permitting process. As an example, exceedances of defined parameter of concern concentrations measured by the water quality monitoring program at agreed upon locations, all as defined in the TARP, would trigger the construction of the RO+MBBR+HDS Lime (TRL 8 or 9) water treatment system. Construction of the water treatment system will not necessarily be during the Construction Phase or even during the Operation Phase of the Project, but rather will be based on monitoring of Parameters of Concern and modelling demonstrating that there will be exceedances of the identified permit limits in the future that will likely cause measured adverse impacts to aquatic receptors, and that the RO+MBBR+HDS Lime system would be able to treat. The TARP would have similar provisions for the other contingency mitigations noted above. This commitment is also contingent on the responsible permitting agencies agreeing to not incorporate the permitted water treatment facility (or other contingency mitigations) into bonding requirements until such time as the treatment facility (or other contingency mitigation) achieves commercial operation.

The Final EAC Project Case (2024) does not reflect the impact of adding these contingency mitigations to the predictions provided in the WLBM. However, TML had SRK investigate adding active water treatment technology **in Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK** and is also included in **Appendix 12: Environmental Effects Assessment - Surface Water Valued Component** and provided in **Table 2-12** above. The Final EAC Project Case (2024) was included in the WLBM completed by SRK without active water treatment and is provided in **Appendix 1: Tenas Project, Water and Load Balance Modeling Report (Updated 2025), SRK**.

Summary of Final EAC Project Case (2024) Submitted

With the completion of the BAT assessment process and implementation of recommended additional mitigation controls the modelled effluent still does not meet all WQGs at discharge(end of pipe).

Telkwa Mining's and SRK's view is that all reasonable BMPs and BATs have been implemented for the Project and while the Project is not in the permitting phase, the implementation of an IDZ can be considered during the EAC application process for point source surface water discharges to provide modelled parameters in the receiving environment. After applying an IDZ which is provided in **Appendix 13, Tenas Project - Initial Dilution Zone Assessment (Final), SRK**, identified that POCs due to the Project meet the BC WQGs for the protection of aquatic life at the edge of the IDZ except for parameters that already exceed the guidelines under background/baseline conditions.

Table 2-14 below summarizes the results of the EAC Project Case (August 2022), and the Final EAC Project Case (2024) against the BC WQGs at selected prediction nodes after the application of an IDZ for surface water discharge into Goathorn Creek. The Final EAC Project Case (2024) is provided in **Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK**.

Table 2-14: Water Quality (Maximum Monthly Mean) Results for EAC Project Case (August 2022), Updated EAC Project Case (2024), and Final EAC Project Case (2024) in Post-closure at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2025) (mg/L)	EAC Project Case (August 2022) (mg/L)	Final EAC Project Case (2024) (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0013	Not Available	0.0016
WQS06 Goathorn Creek	Copper (d)	0.0013	0.0019	0.0016
WQS03_DS Four Creek	Cadmium (d)	0.00023	0.00026	0.000012
	Cobalt (d)	0.00050	0.00066	0.00063
	Nitrite (t)	0.020	0.038	0.0090
	Sulfate (t)	309	360	33
	Selenium (t)	0.0020	0.0058	0.00081
WQS04 Tenas Creek	Cobalt (d)	0.00045	0.00082	0.00029
	Copper (d)	0.0026	0.0031	0.0013
	Nickel (d)	0.0025	0.0031	0.00063
	Nitrite (t)	0.020	0.045	0.0056
	Sulfate (t)	218	260	24
	Selenium (t)	0.0020	0.0041	0.00079

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligram per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.
Please note that dissolved copper exceeds the WQGs under background conditions.

In the EAC Application, Telkwa Coal submitted water quality and quantity predictions based on a Project development scenario. Telkwa Mining, with support from SRK, then completed an assessment of implementing new mitigations requested by the ENV and EMLI to determine if POC concentrations can get closer and ideally below BC WQGs in the receiving environment. The additional mitigation of incorporating blasthole liners was incorporated into what is now considered the Final EAC Project Case (2024) for water quality and quantity predictions. This case does not have exceedances of any parameters in the receiving environment except for dissolved cobalt for a short duration (four years) at one of the downstream Prediction Node in Four Creek.

Dissolved copper was also in exceedances in Goathorn Creek, but this parameter was above the WQG in the background/baseline. The effects assessment on the Surface Water Valued Component was updated to reflect the results of the Final EAC Project Case (2024) and using a local study area which is provided **Appendix 12: Environmental Effects Assessment - Surface Water Valued Component**. In summary, there is no change to the conclusion that was presented in the EAC Application submitted in 2022 which stated "**no significant adverse residual effects**" from the Project on the Surface Water Valued Component are expected.

Telkwa Mining believes the information in the attached appendices and the above information addresses the requirements set forth in IR **Theme 1**.

THEME 4: CONDUCT ADDITIONAL WATER QUALITY PREDICTIONS USING RECENT SENSITIVITY ANALYSIS OF THE SEMI-PERMEABLE POND LINER

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Recent sensitivity analysis of the semi-permeable pond liner to conduct additional water quality predictions is missing from the Application.

FOLLOW UP 1 - 356a ITT TABLE

Thank you for conducting the additional analysis and presenting the results at WQS03_DS and WQS04 at (post?) closure in the memo. Neither of these locations would be affected by the resultant increase in the surface discharge to Goathorn Creek, which was the concern underlying the original comment.

For discussion purposes, please consider Figure 4-8 of Appendix 4.3A: Water and Load Balance Modelling Report. Between 2045 and 2050, the cover water in the NMP has a higher selenium concentration than the pore water. Assuming a lower permeability liner, more cover water would be discharged to Goathorn Creek via the proposed surface discharge, commensurate with the reduction in pore water seepage under the ponds. This could result in an increase in selenium concentration in Goathorn Creek downstream from the discharge point.

Cover water concentrations also exceed pore water concentrations while the ponds are being actively loaded with the PAG material.

Using the 15% seepage reduction model (and commensurate increase in surface discharge), please provide a QP certified memo, including graphs predicting water quality (POCs only) at WQS06 from operations through post closure. Estimate water quality in Goathorn Creek at the effluent discharge point and WQS06. [EA Information Requirement]

IR LETTER 356 AND FOLLOW UP 2 – 356b ITT TABLE

Have a QP run three new WLBM scenarios:

- *Reduce the seepages through the management pond liners by 90% relative to the project case (with a commensurate increase in surface discharge). This scenario simulates blinding of the pond liners.*
- *Reduce the seepages through the management pond liners by 90% and assume low flow conditions (modified alternate case 5: 7Q10 low flow).*
- *Reduce the seepages through the management pond liners by 90% and assume high source term conditions (modified alternate case 2: high source terms).*

RESPONSE 356 ITT TABLE AND 356 ITT TABLE

This request is in relation to the request by ENV about the range in permeability that the soil-bentonite liner may experience due to construction variability which was provided during the round 1 IR as +/- 15%. Telkwa Mining has been requested to provide revised water quality predictions at EA1 assuming a 15% decrease in seepage under typical hydrology conditions, an 90% decrease in seepage under typical hydrology conditions, 90% decrease in seepage using 7Q10 low flows, and for a 90% decrease in seepage and high source terms under typical hydrology conditions.

While Telkwa Mining understands the need to review various scenarios, the 7Q10 scenario is not likely as during low flows the various management and control ponds will not be discharging to the environment as the Project will be keeping all water on site during this event to ensure the water covers are maintained for the various management ponds.

Table 2-15 below provides the summary of the results at relevant prediction nodes for the various parameters.

Table 2-15: Water Quality Results (Maximum Monthly Mean) for Seepage Scenarios at in Post-closure using Typical Source Terms and Average Hydrology at Relevant Prediction Nodes

Location Creek	Parameter	BC WQG (2025) (mg/L)	Final EAC Project Case (2024) (mg/L)	15% reduction in seepage and expected source terms (mg/L)	90% reduction in seepage and expected source terms (mg/L)	90% reduction in seepage, 7Q10 flows, and expected source terms (mg/L)	90% reduction in seepage and High source terms (mg/L)
WQSEA1 Goathorn Creek	Copper (d)	0.0013	0.0016	0.0016	0.0016	0.0016	0.0016
	Selenium (t)	0.0020	0.0013	0.0011	0.0020	0.0025	0.0032
WQSO6 Goathorn Creek	Copper (d)	0.0012	0.0017	0.0017	0.0017	0.0017	0.0017
	Selenium (t)	0.0020	0.0015	0.0011	0.0020	0.0025	0.0032
WQS03-DS Four Creek	Cadmium (d)	0.00023	0.000012	NA	0.0000079	0.000011	0.0000089
	Cobalt (d)	0.00056	0.00063	NA	0.00015	0.00060	0.00039
	Nitrite (t)	0.020	0.0090	NA	0.0016	0.0079	0.0049
	Sulphate (t)	309	33	NA	6.4	31	19
	Selenium (t)	0.0020	0.00081	NA	0.00013	0.00073	0.00048
WQS04 Tenas Creek	Cobalt (d)	0.00045	0.00029	NA	0.00025	0.00021	0.00072
	Copper (d)	0.0026	0.0013	NA	0.0013	0.0012	0.0013
	Nitrite (t)	0.020	0.0056	NA	0.0049	0.0039	0.016
	Sulfate (t)	218	24	NA	20	17	67
	Selenium (t)	0.0020	0.00079	NA	0.00063	0.00050	0.0024

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligram per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.
Please note that dissolved copper exceeds the WQGs under background conditions.

FOLLOWUP COMMENTS

IR LETTER 356 AND 356 ITT TABLE

Add a new node to the WLBM in Goathorn Creek, 100m downstream of the confluence with the tributary into which the effluent is discharged. For the 3 scenarios listed above, for each node where a parameter is predicted to exceed a chronic BC WQG PAL, graphically illustrate water quality (for the exceeding parameters only) at those nodes from baseline through to post closure. On each graph, show the chronic BC WQG for the most sensitive use or value.

RESPONSE 356 ITT TABLE

This prediction node has been added to the WLBM and is identified as WQSEA1. Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** which is a technical memo addressing the IR questions posed by ENV about the WLBM for a complete list of parameter concentrations and supporting graphs.

IR LETTER 356 AND 356 ITT TABLE

[Figures 2.2-2.4 of Appx 4.3 (WLBM report) show Four Creek joining Goathorn Creek at WQS05, instead of WQS06. Is this an error in the diagram? If so, has this error been incorporated into the model?]

Four Creek joins Goathorn Creek above WQSO6 (even above EA1) while Tenas Creek joins Goathorn Creek above WQS05 which has been verified as correct in the model. The figures have been corrected and included in **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK**.

Telkwa Mining believes the responses above in addition to those provided in the attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK** address the requirements set forth in IR **Theme 4**.

THEME 3: HAVE A QUALIFIED PROFESSIONAL IDENTIFY LENTIC AREAS IN THE RECEIVING ENVIRONMENT WHICH MAY RECEIVE SELENIUM FROM MINE OPERATIONS, AND ENSURE THAT BACKGROUND CONCENTRATIONS OF SELENIUM IN WATER, SEDIMENT, INVERTEBRATE, AND FISH TISSUES ARE COLLECTED AND COMPILED IN THOSE LENTIC AREAS

FOLLOWUP COMMENTS

IR LETTER NEW AND 520 ITT TABLE

Have a qualified professional identify lentic areas in the receiving environment which may receive selenium from mine operations, and ensure that background concentrations of selenium in water, sediment, invertebrate, and fish tissues are collected and compiled in those lentic areas.

RESPONSE 520 ITT TABLE

There are no lentic areas in the current receiving environment based on a review by Palmer Environmental as provided in **Appendix 14: Tenas Coal Mine Information Request # 498, 500-504, and 520 - Expert Advice Regarding Fish and Fish Habitat Within the Project Area, Palmer Environmental, Palmer Environmental** attached.

As part of permitting an Aquatic Effects Monitoring Program (AEMP) will be submitted describing the monitoring that will be completed in relation to all aspects of the Project including selenium concentrations and their species.

Telkwa Mining believes the responses provided above and in **Appendix 14: Tenas Coal Mine Information Request # 498, 500-504, and 520 - Expert Advice Regarding Fish and Fish Habitat Within the Project Area, Palmer Environmental, Palmer Environmental**, address the requirements set forth in IR **Theme 3**.

THEME 6: OTHER ITT TABLE COMMENTS

FOLLOWUP COMMENTS

FOLLOW UP 306 ITT TABLE

Due to the high consequence and likelihood of selenium speciation occurring as a result of reducing conditions commonly observed in lentic waters these processes should be included in the modelling. In addition, in order to have informative data to base impacts to the receiving environment on a water sampling node should be created a maximum of 100 meters downstream of the proposed discharge location. Currently, it appears that WQS06 is the nearest downstream node at approximately 4.3 km from the proposed discharge (refer to comment 319) [EA Information Requirement].

RESPONSE FOLLOW UP 306 ITT TABLE

Telkwa Mining acknowledges the comment and after discussion with EMLI in 2023 and QPs, the model cannot include the required modelling included in the model as it is difficult to predict with any degree of confidence what species of selenium produced and what concentrations might be present. It was agreed at the last meeting with the water sub-working group that this modelling would no longer be required.

Telkwa Mining has added a new prediction node labelled EA1 at point approximately 100 m from the discharge point into Goathorn Creek for the Project. As the selenium concentration in the Final EAC Project Case (2024) is below the BC WQGs no adverse effect is expected as the value in this guideline is protective for all selenium species as there is no distinction provided in the guidelines in terms of selenium species. The requirement of additional selenium and selenium species monitoring in the existing environment and during the Construction and Operation Phases can be made a condition of the EAC Certificate.

FOLLOWUP COMMENTS

FOLLOW UP 307 ITT TABLE

Due to the potential for impacts to aquatic biota and resident fish populations, these impacts should be considered in a local context [EA Information Requirement].

LETTER IR 307 AND FOLLOW UP 307 ITT TABLE

Consider the impacts of exceeded BC water quality guidelines (WQGs), particularly to aquatic biota and resident fish populations, at a local scale rather than regional scale.

RESPONSE FOLLOW UP 307 ITT TABLE

Please find the response for this ITT in the attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK**.

Telkwa Mining has implemented an additional mitigation use a pipeline to transport discharge from the Tenas Control Pond to Goathorn Creek in the Construction, Operation and Decommissioning and Reclamation Phases and will only use the existing channel once end of pipe parameter concentrations will not cause effects to fish and fish habitat in this channel.

In summary Telkwa Mining had SRK revise the effects assessment for the Surface Water Valued Component based on the Local Study Area versus the Regional Study Area and still found there were no significant adverse effects due to the Project on the Surface Water Valued Component.

FOLLOWUP COMMENTS

FOLLOW UP 310 ITT TABLE

It sounds like this stream will no longer provide any significant ecological function. This is an issue under the federal Fisheries Act and may need attention from MLWRS and/or DFO.

RESPONSE FOLLOW UP 310 ITT TABLE

The stream currently does not have flow for most of the year and only in major storm events and for a brief period in freshet is there any water flows present in this ephemeral channel, as its catchment is extremely limited under background/baseline conditions. Based on the background/baseline site assessment completed for fish and fish habitat as part of the EAC Application this tributary does not provide viable fish habitat according to QPs. The photo **(Figure 2-8 below)** below illustrates this stream during the October 2023 rainy season with no signs of water by the leaf debris left in the channel.

Figure 2-8: Tributary to Goathorn Creek During the October 2023 Rainy Season

FOLLOWUP COMMENTS

FOLLOW UP 319 ITT TABLE

Thank you for your response. It appears as though the closest downstream prediction node from the discharge location is WQS06, located approximately 4.3 km from the point of discharge. It would be useful to have a prediction node closer to the point of discharge, perhaps 100 meters downstream of confluence of unnamed tributary to Goathorn Creek and Goathorn Creek [EA Information Requirement].

RESPONSE FOLLOW UP 319 ITT TABLE

Telkwa Mining has added a new prediction node labeled EA1 at the point approximately 100 m from the discharge point into Goathorn Creek for the from the ephemeral tributary.

FOLLOWUP COMMENTS

FOLLOW UP 350 ITT TABLE

It appears that Water Quality Guidelines for selenium, nitrite, and sulphate (and dissolved cadmium in Four Creek) will be exceeded in approximately 4 or more kilometres of Four Creek, and 5 or more kilometres of Tenas Creek for up to half of the year (Nov-Apr) for more than ten years of the mine life. This is significant in magnitude, geographic extent, frequency, and duration. [Comment]

FOLLOW UP 350 ITT TABLE

Response for Comment 351 applies to this Round 1 Comment, however, Comment 351 remains unresolved, and that Round 1 Response does not address frequency and duration effects characteristics.

FOLLOW UP 351 ITT TABLE

I remain in disagreement with the scale at which effects to Valued Components are being assessed and, because of that, the residual effects characterization. TCL has changed this specific assessment metric to stream length, however, they still assess affects at the RSA scale. The fish, invertebrates and other VCs in Tenas and Four Creeks are predicted to be subject to potential impacts from multiple water quality constituents in more than 4 kilometres of creek (over 20 and 25% of the entire stream length per Attachment 351-1) during half of each year for 10 years of mine life. This is not low residual effects at the scale of the individual stream (most appropriate), or even at the scale of the entire Tenas Creek watershed (the LSA, more appropriate than the RSA).

RESPONSE FOLOW UP 351/350 ITT TABLE

Please find attached **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK**, for a signed and stamped response.

Telkwa Mining has implemented an additional mitigation use a pipeline to transport discharge from the Tenas Control Pond to Goathorn Creek in the Construction, Operation and Decommissioning and Reclamation Phases and will only use the existing channel once end of pipe parameter concentrations will not cause effects to fish and fish habitat in this channel.

In summary Telkwa Mining had SRK revise the effects assessment for the Surface Water Valued Component based on the Local Study Area versus the Regional Study Area and still found there were no significant adverse effects due to the Project on the Surface Water Valued Component.

FOLLOWUP COMMENTS

352 ITT TABLE

This section of App4.3-A indicated that total selenium exceedances are expected in both winter and summer months. The characterization of residual effects in 4.3 Surface Water Quality chapter contradicts this. Clearly indicate when total selenium will be exceeded. [EA Information Requirement]

FOLLOW UP RESPONSE 352 ITT TABLE

The Final EAC Project Case (2024) Model results in the downstream node in Four Creek (WQS03DS) show no exceedances of the WQG for selenium during any period. The maximum Final EAC Project Case (2024) maximum mean monthly modelled concentration through this period is 0.00081 mg/L.

Similarly, the Final EAC Project Case (2024) Model results for the downstream node of Tenas Creek (WQS04), show no exceedances of the WQG for selenium during any period. The maximum mean monthly modelled concentration through this period is 0.00015 mg/L for the Final EAC Project Case (2024).

FOLLOWUP COMMENTS

385/387 ITT TABLE

Table 5.2-1 provides the screening of water quality parameters to determine COPCs for wildlife, and ECCC notes that maximum modelled mean monthly values were used. ECCC recommends using a more conservative water quality statistic (e.g., maximum concentrations) to determine COPC values that would not be protective of acute effects during sensitive life stages for wildlife (e.g., amphibian egg and tadpole development).

385/387 ITT TABLE

Comment provided by Provincial ENV Reviewer: TCL's previous response is that a mean value is a maximum value ("the maximum modelled mean monthly value means the maximum concentration that is predicted."). I would ask them to have a QP confirm whether any single discrete sample is predicted to exceed an acute BC Water Quality Guideline for the protection of the most sensitive use/value (wildlife or avian in this case).

RESPONSE 385/387 ITT TABLE

Please see **Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK**.

FOLLOWUP COMMENTS

FOLLOW UP 388 ITT TABLE

Provincial Reviewer Response: Adequately addressed. Aquatic receptors are expected to be more sensitive to aluminum than avian spp or wildlife (ENV 2021. Reformat of 1988 Aluminum Water Quality Guidelines). Despite this, I would recommend they include aluminum in their residual effects characterizations.

RESPONSE FOLLOW UP 388 ITT TABLE

Aluminum was not carried forward into a residual effects characterization as Aluminum concentrations with the Project are within the natural variability of background/baseline conditions. This is demonstrated by the Telkwa River having exceedances of Aluminum under background/baseline conditions while upstream prediction nodes do not have exceedances from the Project for Aluminum. If monitoring indicates that Aluminum is trending above WQGs in

Goathorn, Four, and/or Tenas Creeks, Telkwa Mining will implement a water treatment strategy for this parameter. **Table 2-16** below summarizes the Aluminum results for selected prediction node.

Table 2-16: Water Quality Results (Maximum Monthly Mean) for Aluminum at Relevant Prediction Nodes for Updated EAC Project Case (2024)

Location Creek	Parameter (total)	BC WQG (2024) (mg/L)	EAC Project Case (August 2022) (mg/L)	Updated / Final EAC Project Case (2024) (mg/L)	Comments
WQSOEA1 Goathorn Creek	Aluminium	0.27	N/A	0.099	Upstream of WQS06 and WQS05 P50 background/baseline 0.034 P95 background/baseline is 0.66
WQSO5 Goathorn Creek	Aluminium	0.27	0.17	0.0089	Upstream of WQS09
WQS03_DS Four Creek	Aluminium	0.69	0.25	0.15	Upstream of WQSEA1 P50 background/baseline is 0.081 P95 background/baseline is 1.1
WQS04 Tenas Creek	Aluminium	0.35	0.10	0.068	Upstream of WQS05 P50 background/baseline is 0.047 P95 background/baseline is 1.7
WQSO9 Telkwa River	Aluminium	0.19	0.26	0.267 due to background/baseline conditions	P50 background/baseline is 0.12 * P95 background/baseline is 1.5
WQS011 Bulkley River Upstream	Aluminium	0.18	0.14	0.11	Downstream of Rail Loadout P50 background/baseline is 0.088 P95 background/baseline is 1.2
WQS012 Bulkley River Downstream	Aluminium	0.18	0.16	0.15	Downstream of confluence with the Telkwa River P50 background/baseline is 0.088 P95 background/baseline is 1.2

Notes: %=percent; BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligram per litre; WQG=water quality guidelines.
Red text indicates exceedances of WQGs.

FOLLOWUP COMMENTS

FOLLOW UP 389 ITT TABLE

Not adequately addressed. TCL's response is to argue why SPOs are appropriate thresholds for screening COPCs. ENV (and apparently ECCC) disagrees and believes unapproved SPOs are inappropriate to use in an EA process. Using WQGs to screen COPCs, we would screen, at the least, Aluminum, Cobalt, and Sulphate as parameters for further effects assessment and characterization, including for wildlife, avian and aquatic receptors.

RESPONSE FOLLOW UP 389 ITT TABLE

Table 2-17 (Table 5.2-1 from EAC Application) was revised based on the most stringent WQG available for fresh water/wildlife/avian and the Final EAC Project Case (2024) using the format of Table 5.2-1 from the EAC application. Please note Table 5.2-2 did not appear in the EAC Application.

Based on **Table 2-17** below no parameters were identified as Parameter of Interest in the receiving environment beyond Cobalt which as short-term exceedance (four years) of the WQGs. This parameter was also identified as POC in the BAT analysis provided in **Appendix 11: Tenas Project Best Achievable Technology Assessment Updated, SRK**. Based on this analysis no further mitigations are recommended beyond the best management practices and technologies already employed by the Project.

Table 2-17: (Table 5.2-1 in EAC application) Water Quality (Maximum Monthly Mean) Results for the Final EAC Project Case (2024) in Post Closure versus Relevant Guidelines

Parameter	Units	Final EAC Project Case (2024) (mg/L)	Location of Greatest Parameter Concentration	BC AWQG or BC WWQG (Aquatic, Livestock, or Wildlife)*, if none exist use CCME (mg/L)	Guideline Source	Exceedance Factor WQG (Final EAC Project Case (2024)) Maximum Modelled Result/Guideline
Aluminum (t)	mg/L	0.15	Four Creek, WQS03_DS	0.69	BC AWQG	0.22
Arsenic (t)	mg/L	0.0011	Four Creek, WQS03_DS	0.005	BC AWQG	0.22
Beryllium (t)	mg/L	0.00011	Four Creek, WQS03_DS	0.00013	BC WWQG	0.85
Boron (t)	mg/L	0.023	Four Creek, WQS03_DS	1.2	BC AWQG	0.020
Cadmium (d)	mg/L	0.000012	Four Creek, WQS03_DS	0.00023	BC AWQG	0.050
Chloride (t)	mg/L	0.47	Four Creek, WQS03_DS	150	BC AWQG	0.0030
Chromium (VI) (t)	mg/L	0.00074	Four Creek, WQS03_DS	0.001	BC WWQG	0.74
Cobalt (d)	mg/L	0.00063	Four Creek, WQS03_DS	0.00056	BC AWQG	1.1
Copper (d)	mg/L	0.0019	Four Creek, WQS03_DS	0.0047	BC AWQG	0.40
Fluoride (t)	mg/L	0.11	Four Creek, WQS03_DS	1.4	BC AWQG	0.080
Iron (d)	mg/L	0.12	Telkwa River, WQS09	0.35	BC AWQG (acute)	0.34
Lead (t)	mg/L	0.000060	Four Creek, WQS03_DS	0.0061	BC AWQG	0.0001
Manganese (t)	mg/L	0.012	Four Creek, WQS03_DS	1.1	BC AWQG	0.010
Mercury (t)	mg/L	0.0000038	Four Creek, WQS03_DS	0.000020	BC AWQG	0.19
Molybdenum (t)	mg/L	0.0012	Four Creek, WQS03_DS	0.034	BC AWQG (ruminant)	0.035
Nickel (d)	mg/L	0.0012	Four Creek, WQS03_DS	0.0047	BC WWQG	0.26
Nitrate (t)	mg/L	0.43	Four Creek, WQS03_DS	3.0	BC AWQG	0.14
Nitrite (t)	mg/L	0.0090	Four Creek, WQS03_DS	0.02	BC AWQG	0.45

Parameter	Units	Final EAC Project Case (2024) (mg/L)	Location of Greatest Parameter Concentration	BC AWQG or BC WWQG (Aquatic, Livestock, or Wildlife)*, if none exist use CCME (mg/L)	Guideline Source	Exceedance Factor WQG (Final EAC Project Case (2024)) Maximum Modelled Result/Guideline
Selenium (t)	mg/L	0.00081	Four Creek, WQS03_DS	0.002	BC AWQG	0.41
Silver (t)	mg/L	0.0000050	Four Creek, WQS03_DS	0.0015	BC AWQG	0.00
Strontium (t)	mg/L	0.33	Four Creek, WQS03_DS	2.5	ECCC FEQG for Aquatic Life	0.13
Sulfate (t)	mg/L	33	Four Creek, WQS03_DS	309	BC AWQG	0.11
Thallium (t)	mg/L	0.000013	Four Creek, WQS03_DS	0.0008	BC AWQG	0.016
Uranium (t)	mg/L	0.00025	Four Creek, WQS03_DS	0.0085	BC AWQG	0.030
Zinc (d)	mg/L	0.0025	Four Creek, WQS03_DS	0.014	BC AWQG	0.18

Notes: * = Wildlife and Aquatic guidelines were selected as there no plans on using the water from the Project for Irrigation Purposes.

* = WQG for stream with highest modelled concentration

BC=British Columbia; EAC=Environmental Assessment Certificate; mg/L=milligram per litre; WQG=water quality guidelines

Red text indicates exceedances of WQGs.

Telkwa Mining believes the details above and provided in attached appendices address the requirements set forth in IR **Theme 6**.

THEME 7: EMLI GEOSCIENCE CLARIFICATIONS

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

EMLI does not support the application of the concept that an entire zone can be designated potentially acid generating (PAG) or non-PAG based on an average weighed NPR. Application of an average weighed NPR implies that a portion of the material from that unit will become acid generating at some point in the future. Although the overall drainage from that storage area may be pH-neutral due to mixing with the non-PAG portion of the unit or non-PAG material from another unit, the current Management Plan does not address blending and the current source terms do not account for a blended non-PAG / PAG rock piles or covers that are exposed to allow advanced stage weathering and acidic hot-spots within the pile. Additional information should therefore be presented by the proponent to support this approach.

RESPONSE IR LETTER OVERVIEW

Telkwa Mining assumes the concern outlined in the statement above from EMLI is with *non-PAG* zones as the statement has no bearing on the PAG zones as the entire zone is submerged underwater as stated in the EAC Application section 1 even if portions of these zones are potentially *non-PAG* unless operational verification sampling provides evidence that portions of these zones could be managed as *non-PAG* based on operational NPR cut-off values and that they are also large enough to efficiently separate with the equipment available.

Telkwa Mining has identified that, even though an entire zone might be classified as *non-PAG* based on a comparison of its bulk composition to an NPR cut off of 2.0, that there might be a component of PAG rock both within the overall aerial extent of the zone and within the vertical thickness of the zone that may have to be managed appropriately to ensure ARD does not occur from separable PAG materials not being placed underwater. The source term for *non-PAG* material placement has assumed that appropriate segregation and mixing/blending has occurred within the vertical thickness during the mining process that a non-PAG landform (NPR > or equal to 2.0) is established for storage piles, embankments, and buttresses. If operational verification testing is conducted on PAG zones the same methodology will be used as what is used for *non-PAG* zones to identify any potential separable *non-PAG* material within PAG zones.

The following zone polygons can be identified as *non-PAG* using an NPR cutoff of 2.0 AP to 1.0 NP and their bulk geochemical properties:

- Overburden (Zone 0);
- Portions of Zone 1;
- Portions of Zone 4; and,
- Portions of Zone 8 (not mined as part of the EA Open Pit).

Table 2-18 summarizes the zone classification for materials at the Tenas Deposit based on their bulk geochemical properties.

Table 2-18: Material Zone Classification Based on NPR of 2.0

Material Zone Name	ARD Assignment in Mine Plan and EAC Application Based on an NPR of 2.0	Stratigraphic Location	Average Zone Weighted NPR
Zone 0 / Overburden	*non-PAG*	Till and overburden – topography to bedrock	17.5
Zone 1	*non-PAG* with potentially separable PAG zones	Bedrock surface to top of Seam e (minus Zone 1a)	3.1
Zone 1a	PAG	Select area above Seam e to bottom of Seam e	0.7
Zone 2 & 3	PAG	Bottom of Seam e to bottom of Seam c	0.8
Zone 4	*non-PAG* with potentially separable PAG zones	Bottom of Seam c to top of Seam b	2.6
Zone 5	PAG	Top of Seam b to top of Seam 1U	1.2
Zone 55	PAG	Top of Seam 1U to bottom of Seam 1L	1.9
Zone 6	PAG	Bottom of Seam 1L to bottom of Seam 1Lc	1.8
Zone 7**	PAG	Below Seam 1Lc to the bottom of Seam 1Ld	1.7
Zone 8**	*non-PAG* with potentially separable PAG zones	Below Seam 1Ld	5.0

** **Notes:** Zones 7 and 8 are not currently recovered within EA open pit design; (1) As understood all zones even bulk non-PAG zones contain some PAG material and in some cases these PAG materials could be large enough to segregate out during the mining process.

ARD=acid rock drainage; NPR=neutralization potential ratio; PAG=potentially acid generating

Figure 2-9 through **Figure 2-15** below illustrate the distribution of the average overall exploration drillhole weighted NPR values for rock zones mined within the EA Open Pit with polygons illustrated using an NPR cut-off of 2.0 with green exploration drillhole polygons being classified as *non-PAG* and red exploration drillhole polygons being classified as PAG.

Please note the **entirety** of Zones 1a, 2/3, 5, 55, and 6 were planned to be placed underwater in the EAC application and will continue to be planned to be placed underwater until verification testing is completed on blastholes demonstrate that *non-PAG* regions of a suitable size and thickness is present using an NPR cut off criteria of 2.0.

Please note this is for illustration purposes only as verification testing will be based on blastholes which will be completed on a much tighter spacing and be completed for every bench mined versus the entire length of an exploration drillhole.

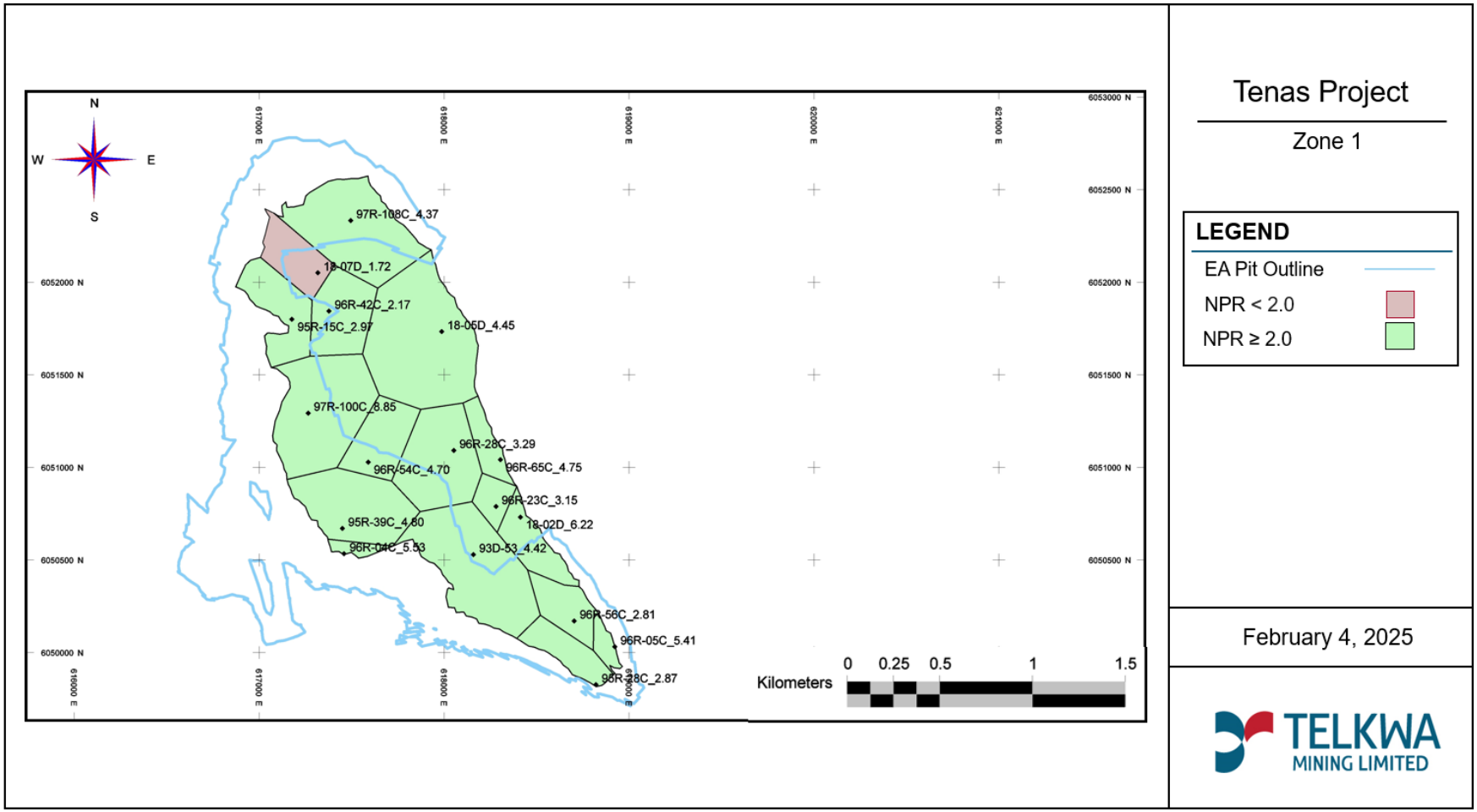

Figure 2-9: Zone 1 PAG and *non-PAG* Polygons Classified Against an NPR Cut-Off of 2.0, with Zones in Red Being Submerged Underwater in the EAC Application

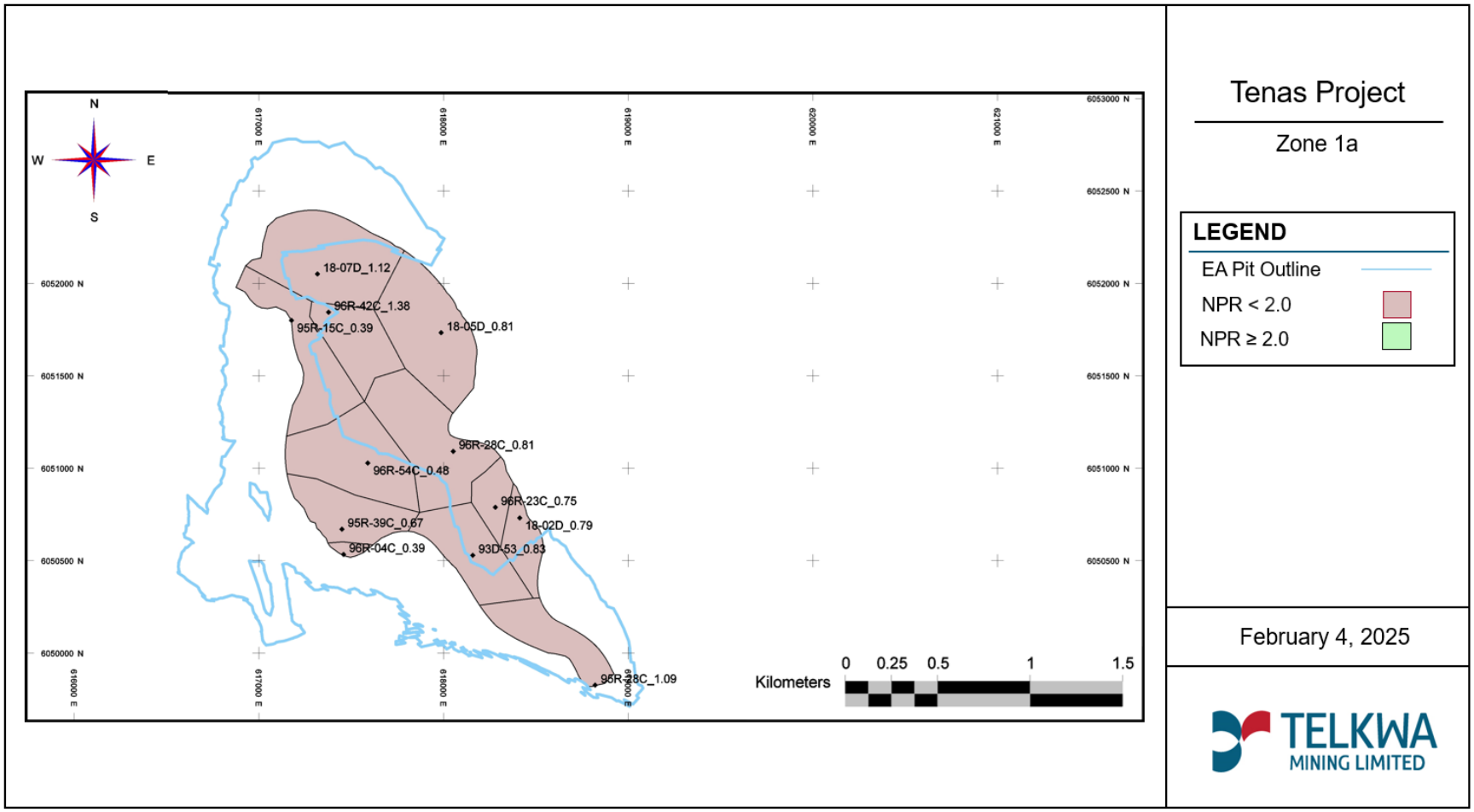

Figure 2-10: Zone 1a PAG and *non-PAG* Polygons Classified Against an NPR Cut-Off of 2.0, Entire Zone Treated as PAG in EAC Application and Submerged Underwater

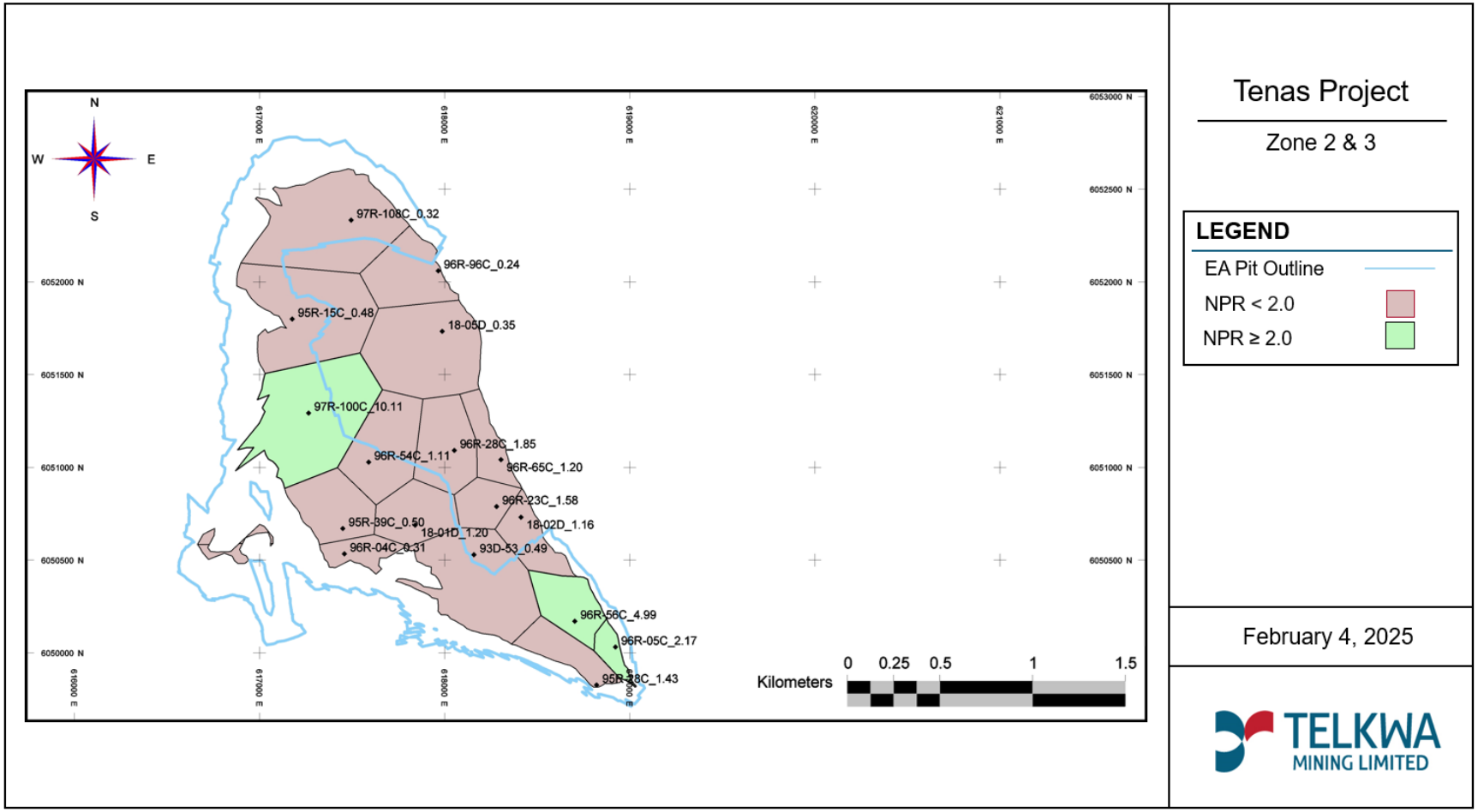

Figure 2-11: Zone 2/3 PAG and *non-PAG* Polygons Classified Against an NPR Cut-Off of 2.0, Entire Zone Treated as PAG in EAC Application and Submerged Underwater

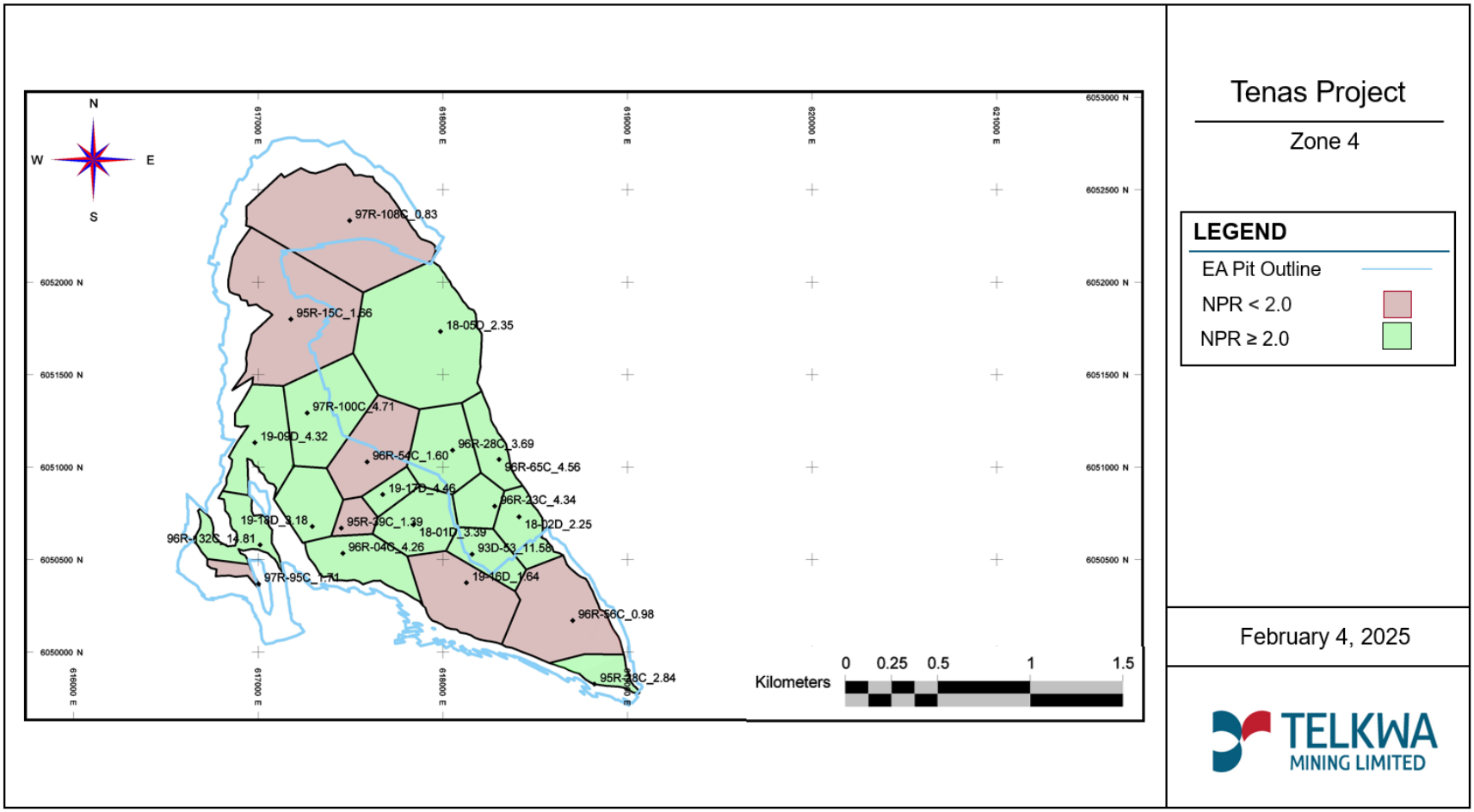

Figure 2-12: Zone 4 PAG and *non-PAG* Polygons Classified Against an NPR Cut-Off of 2.0, Red Polygons Submerged Underwater in the EAC Application

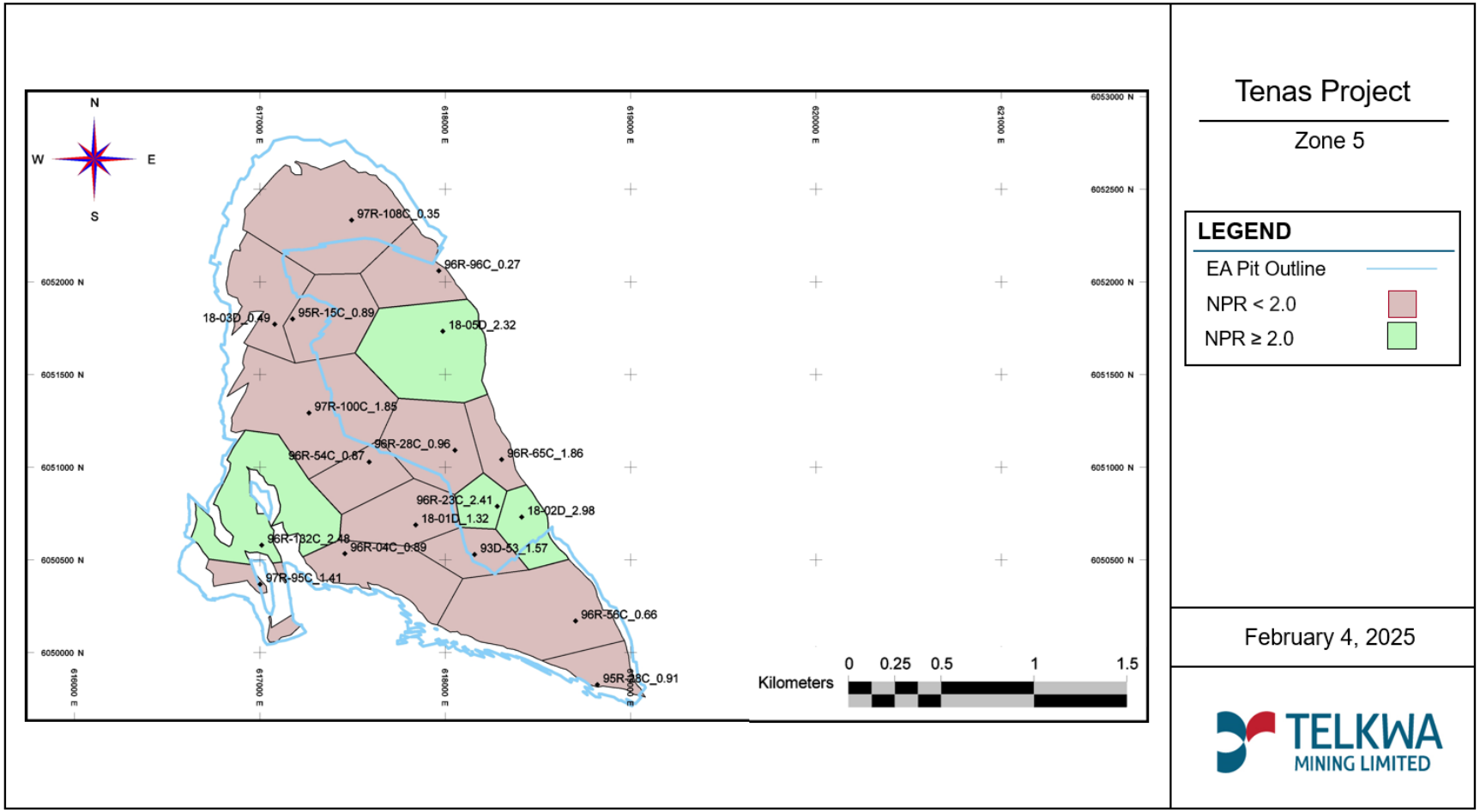

Figure 2-13: Zone 5 PAG and *non-PAG* Polygons Classified Against an NPR Cut-Off of 2.0, Entire Zone Treated as PAG in EAC Application and Submerged Underwater

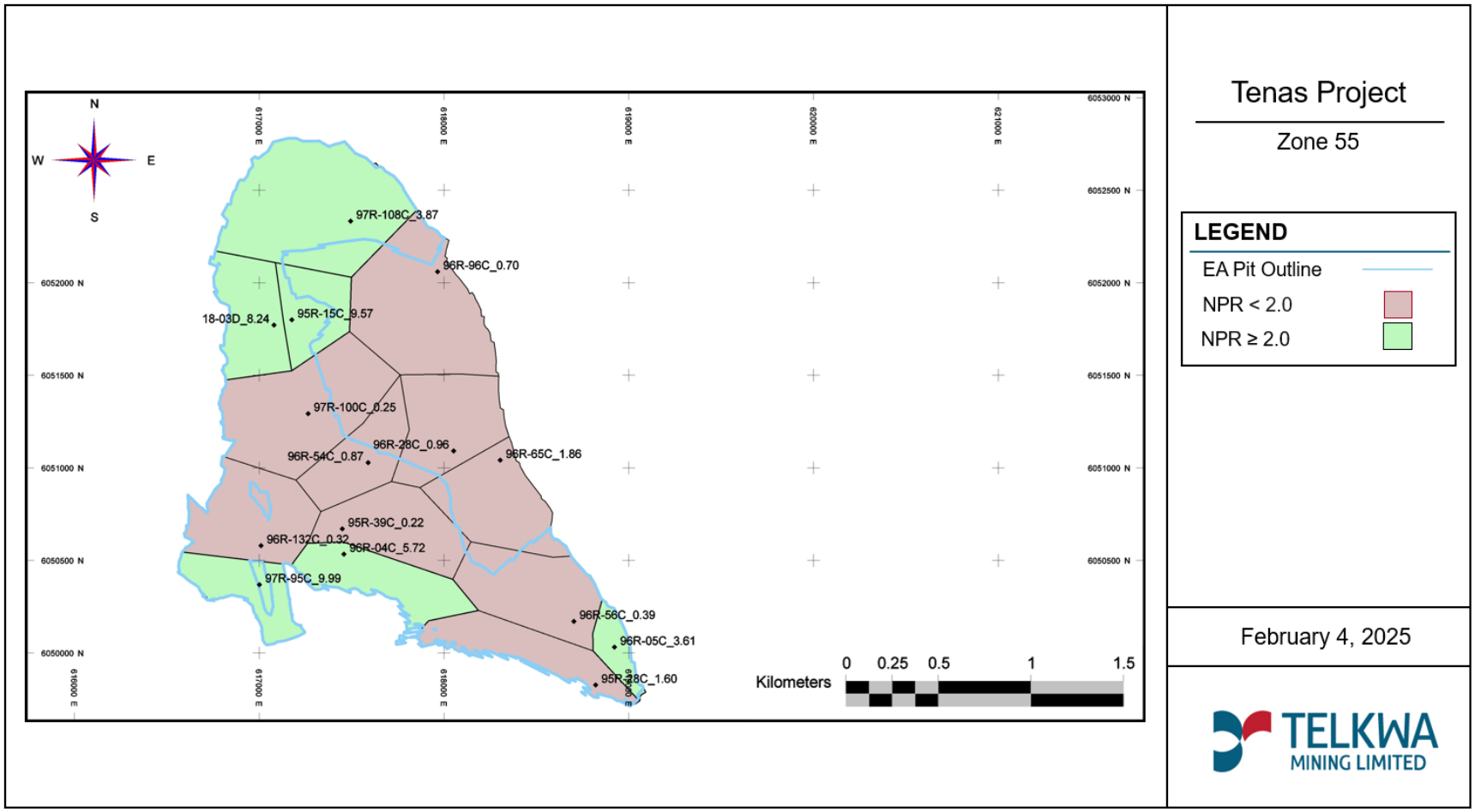

Figure 2-14: Zone 55 PAG and *non-PAG* Polygons Classified Against an NPR Cut-Off of 2.0, Entire Zone Treated as PAG in EAC Application and Submerged Underwater

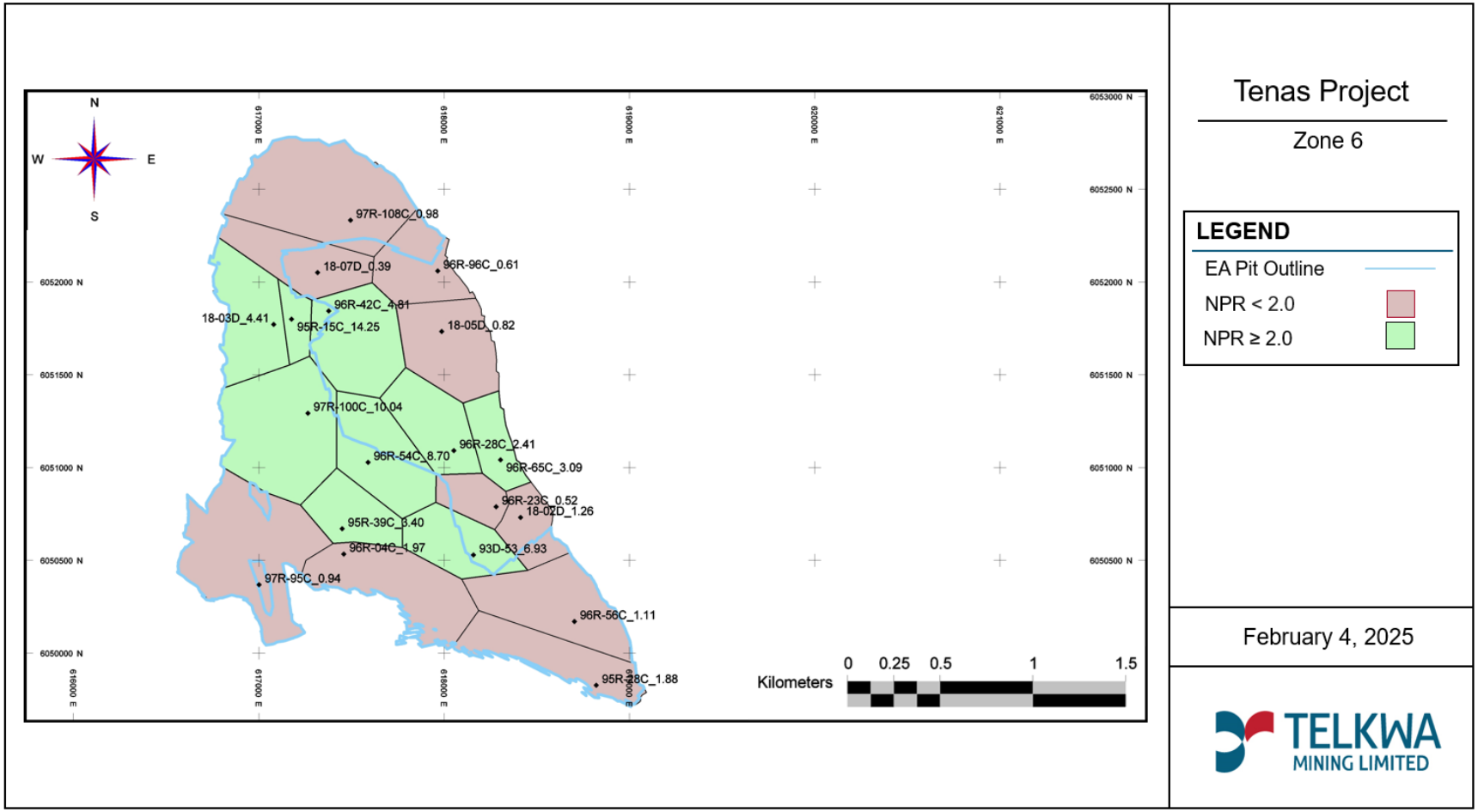

Figure 2-15: Zone 6 PAG and *non-PAG* Polygons Classified Against an NPR Cut-Off of 2.0, Entire Zone Treated as PAG in EAC Application and Submerged Underwater

As illustrated by the figures above, Zone 1 is the only zone that is almost entirely *non-PAG* on an aerial basis with only one exploration drillhole having an NPR less than 2.0 on an aerial extent (1.80) and Zone 1a is all PAG with no exploration drillholes having an NPR greater than or equal 2.0. Zones 7, and 8 have not been provided as there are no plans for mining of either of these zones and neither zone forms part of the EA Open Pit walls. Zones 1, 2/3, 4, 5, 55, and 6 have exploration drillholes that are both *non-PAG* and PAG based on the geochemical data collected using an NPR cutoff of 2.0. However, in the EAC application submission **all of zones 1a, 2/3, 55, 5, and 6 material** were classified as PAG and assumed to be placed underwater into the management ponds to be conservative for planning purposes while Zones 1, and 4 were demarcated into *non-PAG* and PAG polygons for the EAC Application based on the individual exploration drillhole NPR values on an aerial basis, distribution of material within the vertical column of exploration drillholes, and their locations respective to economic coal seams.

Note that these NPR values are only used for planning purposes and regulatory applications such as the EAC Application as the actual segregation of PAG from *non-PAG* will be based on field sampling and testing of blastholes with material being designated as PAG using a cutoff of an NPR 2.0 during the Construction and Operation Phases. The spacing of the blastholes will be on a much tighter spacing than exploration drilling can ever practically achieve.

Appendix 15: Tenas Project, Mine Material Management based on an NPR Cut-Off of 2.0, 1.80, 1.60, and 1.20, Telkwa Mining provides how Telkwa Mining would manage the various material zones would be managed if blasthole verification testing confirmed the exploration drillhole data and an NPR cut-off of 2.0 was used, or the EAC Application Methodology was used to classify PAG from *non-PAG* material. As demonstrated by **Table 2-19,** even when using an NPR value 2.0, a drillhole (exploration and/or blasthole) with a bulk property that would classify the entire drillhole polygon as *non-PAG* (NPR greater than 2.0) may have portions within the vertical length of a drillhole that may get placed underwater due to PAG intervals being present that can effectively be segregated (**Table 2-19**). **Table 2-19** indicates segregation is possible based on the drillhole interval NPR values.

Furthermore, some minor PAG units within an overall *non-PAG* drillhole polygon will become blended vertically within a polygon through the mining and blasting process into the surrounding *non-PAG* material so that the entire drillhole polygon can be considered *non-PAG* if these PAG zones are too small to be separated as illustrated by **Table 2-20**.

Finally, some geochemical zones in the EAC application that were classified as PAG might have polygons that could be managed as *non-PAG* during the Construction and Operation Phases. **Table 2-21** shows a Zone 6 exploration drillhole with a bulk NPR greater than 4.0 for this drillhole which could clearly be managed as *non-PAG* if confirmed by blasthole confirmation testing.

Table 2-19: Mining Plan for Zone 1 with a Bulk NPR of 3.29 for Drillhole T96R-28C

Hole-ID	Sample Depth and Thickness (m)			ABA Zones	Mine Plan Inputs				BULK ZONE NPR	EAC Application Plan	Mining Plan at NPR of 2.00
	From	To	Thickness		Sulfide	AP	NP	NPR			
T96R-28C	12.50	14.32	1.82	1	0.53	16.59	22.3	1.34		Place underwater	Place underwater
T96R-28C	14.32	14.68	0.36	1	0.71	22.12	9.73	0.44			
T96R-28C	14.68	15.08	0.4	1	3.79	118.57	47.42	0.40			
T96R-28C	15.08	17.07	1.99	1	0.79	24.7	23.2	0.94			
T96R-28C	17.07	17.86	0.79	1	1.48	46.31	19.6	0.42			
T96R-28C	17.86	18.40	0.54	1	1.02	32.03	7.04	0.22			
T96R-28C	18.40	19.66	1.26	1	1.10	34.36	21.4	0.62			
T96R-28C	19.66	20.11	0.45	1	0.26	8.1	29.5	3.62	3.29	non-PAG	non-PAG
T96R-28C	20.11	20.99	0.88	1	0.10	3	49	15.45		non-PAG	non-PAG
T96R-28C	20.99	26.93	5.93	1	0.23	7.3	36.7	5.05		non-PAG	non-PAG
T96R-28C	26.92	35.09	8.17	1	0.61	19.2	42.9	2.24		non-PAG	non-PAG
T96R-28C	35.09	35.93	0.84	1	0.31	10	416	43.38		non-PAG	non-PAG
T96R-28C	35.93	45.03	9.10	1	0.42	13.1	43.8	3.35		non-PAG	non-PAG
T96R-28C	45.03	47.83	2.80	1	0.24	7.6	43.8	5.80		non-PAG	non-PAG
T96R-28C	47.83	55.72	7.89	1	0.12	4	114	30.21		non-PAG	non-PAG
T96R-28C	55.72	63.86	8.14	1	0.27	8.4	44.7	5.31		non-PAG	non-PAG

Table 2-20: Mining Plan for Zone 6 with a Bulk NPR of 2.97 for Drillhole T96R-15C

Hole-ID	Sample Depth and Thickness (m)			ABA Zones	Mine Plan Inputs				BULK ZONE NPR	EAC Application Plan	Mining Plan at NPR of 2.00
	From	To	Thickness		Sulfide	AP	NP	NPR			
T95R-15C	6.50	7.62	1.12	1	0.129884	4.1	26.8	6.60		non-PAG	non-PAG
T95R-15C	7.62	7.92	0.30	1	-0.0183676	-1	473.6892	-825.26		non-PAG	non-PAG
T95R-15C	7.92	9.90	1.98	1	0.1802336	5.6	25.0	4.44		non-PAG	non-PAG
T95R-15C	9.90	11.34	1.44	1	0.2007464	6.3	48.3	7.70		non-PAG	non-PAG
T95R-15C	11.34	13.04	1.70	1	0.2016788	6.3	25.9	4.11		non-PAG	non-PAG
T95R-15C	13.04	14.18	1.14	1	0.2473664	7.7	22.3	2.88		non-PAG	non-PAG
T95R-15C	14.18	15.43	1.25	1	0.3452684	10.8	28.6	2.65		non-PAG	non-PAG
T95R-15C	15.43	17.05	1.62	1	0.2688116	8.4	25.0	2.97		non-PAG	non-PAG
T95R-15C	17.05	19.57	2.52	1	0.4711424	14.7	28.6	1.94	**2.97**	Blend into surrounding units	Blend into surrounding units
T95R-15C	19.57	21.51	1.94	1	0.7881584	24.6	51.9	2.11		non-PAG	non-PAG
T95R-15C	21.51	24.15	2.64	1	0.922424	28.8	30.4	1.05		Blend into surrounding units	Blend into surrounding units
T95R-15C	24.15	25.96	1.81	1	0.6016784	18.8	72.6	3.86		non-PAG	non-PAG
T95R-15C	25.96	27.30	1.34	1	0.5858276	18.3	32.2	1.76		Blend into surrounding units	Blend into surrounding units

Table 2-21: Mining Plan for Zone 6 with a Bulk NPR of 4.41 for Drillhole T18-03D

Hole-ID	Sample Depth and Thickness (m)			ABA Zones	Mine Plan Inputs				BULK ZONE NPR	EAC Application Plan	Mining Plan at NPR of 2.00
	From	To	Thickness		Sulfide	AP	NP	NPR			
T18-03D	17.500	17.650	0.15	6 Coal Cleaning					4.41	Place underwater	Place underwater
T18-03D	17.650	18.6	0.95	6	1.1	35.31	33.8	0.96			Blend into surrounding units
T18-03D	18.6	19.4	0.8	6	0.1	4.2	12.5	2.96			non-PAG
T18-03D	19.4	19.6	0.2	6	0.4	12.8	26.0	2.03			non-PAG
T18-03D	19.6	20.5	0.9	6	0.1	2.2	15.5	7.09			non-PAG
T18-03D	20.5	22.25	1.75	6	0	2	37	23.87			non-PAG
T18-03D	22.25	23.16	0.91	6	0	1	55	87.20			non-PAG
T18-03D	23.16	23.56	0.4	6	0	2	51	32.51			non-PAG
T18-03D	23.56	25	1.44	6	0	1	94	74.80			non-PAG
T18-03D	25	26.12	1.12	6	0	2	77	49.15			non-PAG
T18-03D	26.12	28	1.88	6	0.4	13.8	27.8	2.02			non-PAG
T18-03D	28	29.06	1.06	6	0.5	14.4	70.3	4.89			non-PAG
T18-03D	29.06	30	0.94	6	0.3	8.8	34.3	3.92			non-PAG
T18-03D	30	32.25	2.25	6	0.3	10.6	18.8	1.77			Blend into surrounding units
T18-03D	32.25	32.65	0.4	6	1.48	46.25	6.0	0.13			

As the material zones mined with excavators/shovels will occur in approximately 12-m benches and a ML/ARD verification process will be conducted in advance of mining, any potential PAG or *non-PAG* material will be identified at a bench scale (12 m) as the sample interval recovered will be based on the planned mining horizon for the rock units within a blasthole. If sampling identifies separable PAG units within a mining horizon that require active management that can be mined efficiently with an excavator/shovel they will be managed as per the procedure provided as follows:

- For any separable PAG rock within blasthole polygons (defined as 2 times the burden and spacing distances) identified with an NPR less than 2.0 will need to be placed underwater within an average of 6 months and no longer than 12 months to mitigate the generation of ARD;
- Rock resulting from coal cleaning will be treated as PAG even if surrounding materials is *non-PAG* due to the inclusion of coaly materials into the rock;
- Rock materials will be treated as *non-PAG* if verification testing shows an NPR greater than or equal to 2.0 within blasthole polygons (defined as 2 times the burden and spacing distances);
- For overburden, surface soils, processed rock, rock construction materials, and non-rock construction materials will be treated as PAG if their NPR is less than 2.0, and verification testing will need to be done for these materials if they are to be treated as *non-PAG* as per the **ML/ARD Management Plan (ML/ARDMP; S13.0-C12)**; and,
- If verification testing is not completed, rock and processed rock will be treated as PAG.

Operational sampling committed to under the **ML/ARD Management Plan (ML/ARDMP; S13.0-C12)** provides sufficient data for final decision making on material segregation and placement as it has the necessary density and sample frequency needed to provide the certainty required for the protection of water quality and downstream environmental integrity.

Furthermore, at least one confirmation sample will be taken for each blast pattern which will be sourced from the reserve samples kept from the blasthole samples from the blast pattern. This sample confirmation requirement applies if only one type of geochemical material is consistently present for the entire blast being mined (i.e., all PAG or *non-PAG*). If more than one material type is identified based on the NPR cut off of 2.0 within an individual blast pattern a confirmation sample will be taken from each identified geochemical material which will be identified by material type, geochemical classification, zone, bench, lift number, blasthole, and blast pattern identifiers.

Lastly, random quarterly *non-PAG* rock pile samples will be taken from active *non-PAG* rock lifts in areas where rock has been placed during the last quarter. The number of samples will be based on an approximate 200 by 200-m grid pattern and taking a sample on every node of this grid. The

same criteria will be used as for operational blasthole verification testing with material having an NPR less than 2.0 being designated as PAG, while materials with an NPR greater than 2.0 being designated as *non-PAG*. If PAG material is identified by these grid points additional sampling will be conducted on approximately 25-m offset concentric circles from this location until a *non-PAG* sample is measured as illustrated by **Figure 2-16** below.

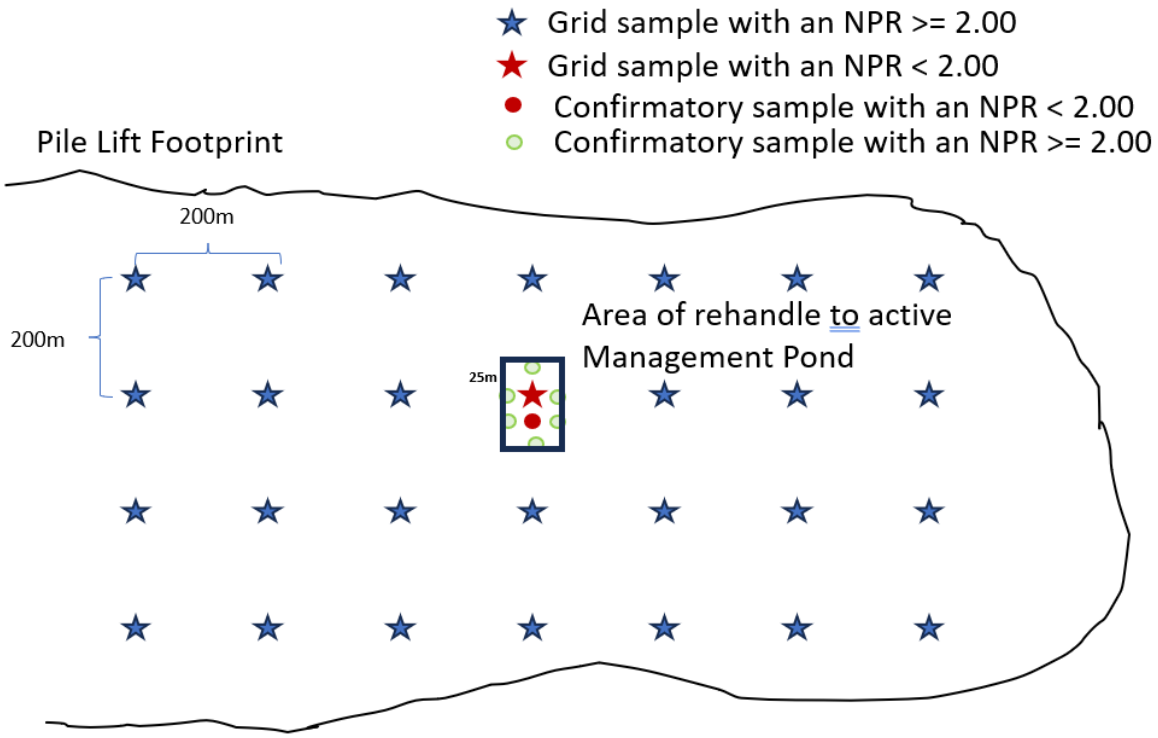

Figure 2-16: *Non-PAG* Pile Lift Material Confirmation Testing

Once the *non-PAG* rock pile lift area is defined by confirmatory testing and a bulk NPR and sulfur % has been calculated based on the sample testing completed; the following actions will be taken:

- If the bulk NPR for the sample is less than 2.0 an investigation will be completed, including a survey of the material's location and review of material that was placed there via the site electronic tracking system.
- Then a risk assessment will be conducted to determine if this this material will be rehandled and placed underwater in one of the active management ponds.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

The current sampling frequency does not provide adequate information to define or refine PAG volume estimates beyond what they have specified in the ML/ARD Management Plan. Monitoring the geochemical characterization of ore, waste, and overburden must be based on proper sampling frequency representative of the proportional volume of sampled materials.

LETTER IR 136 AND 136 ITT TABLE

Indicate what additional sampling and characterization studies are planned to meet BC ML/ARD Guidelines. For instance, Zone 4 is underrepresented in the static test database.

2 Available from: https://www2.gov.bc.ca/gov/content/industry/mineral-exploration-mining/permitting/ml-ard

RESPONSE LETTER IR 136 AND 136 ITT TABLE

SRK has provided responses to this geoscience IR in **Appendix 16: Telkwa Coal Tenas Project Environmental Assessment Application – Responses to 2022 Supplemental Geochemistry Information Requests from the Ministry of Energy, Mines and Low Carbon Innovation, SRK**.

FOLLOWUP COMMENTS

OVERVIEW IR LETTER

The metal leaching/acid rock drainage (ML/ARD) Management Plan in Section 6.4 specifies that all materials excavated from zones 1a and 2/3 will be managed as potentially acid generating (PAG). Material from zones 5, 55, and 6 were characterized as non-PAG but will be initially classified and managed as PAG unless testing can demonstrate otherwise. To facilitate the shorter turnaround times that are required to make operational decisions for placement of blasted rock, rejects, and other materials, the results of the geochemical characterization are used to develop operational proxies for determining NP and AP in an onsite laboratory that will be equipped with a Leco furnace. Section 6.1.3 of the ML/ARD Management Plan specifies an NPR of 1.2 is proposed to classify PAG mine rock at the Project. Clarifications and justifications on the ML ARD management plan and use of NPR 1.2 and 2 criteria as cutoff for verification and planning purposes should be provided.

IR LETTER 140, 142, 143, 146 and 148 AND 140a ITT TABLE

The ML/ARD Management Plan Section 6.4 specifies that all materials excavated from zones 1a and 2/3 will be managed as PAG. Material from zones 5, 55, and 6 were characterized as non-PAG but will be initially classified and managed as PAG unless testing can demonstrate otherwise. To facilitate the shorter turnaround times that are required to make operational decisions for placement of blasted rock, rejects, and other materials, the results of the geochemical characterization are used to develop operational proxies for determining NP and AP in an onsite laboratory that will be equipped with a Leco furnace. Section 6.1.3 of the ML/ARD Management Plan specifies an average weighted NPR of 1.2 is proposed to classify PAG mine rock at the Project.

1. *Provide clarifications and justifications for the proposed ML ARD management plan and use of weighed average NPR 1.2 and 2 criteria as cutoff for verification and planning purposes.*

RESPONSE 140a ITT TABLE

SRK has provided a response to this geoscience IR in **Appendix 16: Telkwa Coal Tenas Project Environmental Assessment Application – Responses to 2022 Supplemental Geochemistry Information Requests from the Ministry of Energy, Mines and Low Carbon Innovation, SRK.**

Telkwa Mining contracted SRK to provide a scientifically defensible NPR criterion for segregating *non-PAG* material from PAG material for the planning/regulatory and operational verification phases based on site-specific data for the Tenas Deposit and best practices provided in the MEND (2009) prediction manual for drainage chemistry from sulphidic geologic materials.

SRK determined that a site-specific NPR cut off criteria of 1.20 for this deposit was appropriate to characterize blasthole rock as PAG (NPR less than 1.2) or *non-PAG* (NPR greater than or equal to 1.2). However, Telkwa Mining has elected to use a more conservative NPR criterion of 2.0 as a cut off versus the site-specific value of 1.20 to identify exploration drillhole and blasthole rock as PAG and non-PAG. This criterion was selected to ensure that Telkwa Mining will not classify PAG rock as *non-PAG rock*. This criterion will be reviewed as additional information is gathered for the permitting application at which point if the data supports it, Telkwa Mining will apply to revise the proposed NPR criterion.

The following provides a clear definition for the NPR cut off criterion used for the Tenas Project.

Planning, Regulatory, and Operational Stages

For mine planning processes, regulatory submissions such as the EAC application and operational verification testing, an NPR cut off criteria of 2.0 will be used to segregate *non-PAG* from PAG in exploration drillhole and/or blasthole. All rock with an NPR value less than 2.0 will be designated as PAG while rock having an NPR >= 2.0 will be classified as *non-PAG* based on verification testing specified in the ML/ARD management plan attached in **Appendix 17: Metal Leaching/Acid Rock Drainage Management Plan, SRK**.

Non-rock materials such as surface soils, overburden, processed coal, processed rock, and run-of-mine coal were characterized as PAG or *non-PAG* also using a cut-off of 2.0.

The justification to use an NPR cutoff of 2.0 for the planning, regulatory submission and operational stages for rock and non-rock materials is based on other deposits in BC, and an understanding of the site-specific geochemical information for this Project. The NPR criterion of 2.0 is also supported by the static geochemical testing results which showed that positive correlation of calcium and magnesium to the modified-NP indicating carbonate minerals are available to neutralize acid production (SRK 2024b).In addition, as noted above, kinetic testing results (SRK 2024b) indicate that an NPR of 1.2 is sufficient to identify rock as PAG or *non-PAG*. Selection of an operational NPR greater than the site-specific value is therefore suitable for identifying rock as PAG or *non-PAG*.

FOLLOWUP COMMENTS

IR LETTER 140, 142, 146 and 140a ITT TABLE

2. *Clarify what NPR criterion of 1.2 or 2 will be applied to manage waste material from zones 5, 55, and 6 and define them as non-PAG or PAG.*

RESPONSE 140a ITT TABLE

An NPR criterion of 2 will be applied to manage rock material from all zones including zones 5, 55 and 6.

SRK has provided a response to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

148 ITT TABLE

Please provide an updated management plan that addresses comments discussed in comments EMLI 140, 142, 143, and 146

IR LETTER 140, 142, 146 and 148 AND 140a ITT TABLE

3. *Based on responses to comments EMLI 140, 142, 143, and 146 indicate if updates to the proposed Metal Leaching (ML) Acid Rock Drainage (ARD) management plan are needed to address blending of material.*

RESPONSE 140a ITT TABLE

No blending beyond what is provided through the normal mining process is planned for this Project.

The ML/ARDMP has been updated to reflect the proposed change in NPR criterion and is attached in **Appendix 17: Metal Leaching/Acid Rock Drainage Management Plan, SRK**.

SRK has provided a response to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

The ability to maintain a consistent water cover and to coordinate staged flooding and PAG placement was not demonstrated within the WLBM inputs or through contingencies in the waste management plan or mine plan.

168 ITT TABLE

The model assumes that all rock will be submerged underwater within 6 to 12 months. Please provide the contingencies in the waste management plan or mine plan to ensure maintenance of a consistent water cover and to coordinate staged flooding and PAG placement.

IR LETTER 140, 142, 146 and 148 AND 140a ITT TABLE

4. *Provide contingencies in the waste management plan or mine plan to maintain a consistent water cover and to coordinate staged flooding and PAG placement.*

RESPONSE 140a ITT TABLE

SRK has provided a response to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

LETTER IR 140, 142, 143, 146, and 145, AND 140b ITT TABLE

To address overestimation of available NP, please specify the best-fit linear regression of the data in Figure 8 and do not fix the line through the origin. A review of Figure 8 of Appendix 1.0-M that illustrates the relationship between TIC-Fe Corrected and Modified NP also indicates that the Modified NP may on occasion overestimate available NP and as a result, revising the NPR criterion to the minimum NPR cut-off value of 1.2 may result in PAG rock being managed as Non-PAG mine rock.

a) *Provide a greater range of percentile values in Table 2-4 and provide discussion of how spatially extensive a full PAG interval would be encountered for each zone in the pit.*

Regulatory Clarification provided via email from Morgan Dyas on February 9th, 2024

The request to "provide a discussion of how spatially extensive a full PAG interval would be encountered for each zone in the pit" is based on the implications stemming from the statement in Appendix 1.0 M (SRK, 2022) that a unit is NPAG based on an average NPR > 1.2. The characterization results indicate that the Tenas Project geologic units contain both PAG and NPAG strata. For example, more than 10 of the 20 boreholes that intersected Unit 5 have NPR < 1.2, thus over ½ of the strata in this unit is PAG. By stating that overall a unit is NPAG implies that the mixing and blending associated with the standard mining procedures of a unit will prevent localized ARD from forming within a waste rock pile. To prevent localized ARD, published blending studies (Andrina, 2009; Mehling, 1998) indicate that blended quantities greater than 1:1 are required. This could not be achieved for Unit 5 without active management and may be difficult for units such as Unit 6 or Unit 7 that have median NPR of 1.7 and 1.6, respectively.

An understanding of the spatial distribution of PAG and NPAG within a stratigraphic unit would be required to allow effective blending to occur. The request to provide the spatial distribution of PAG strata was to determine if there is currently enough data to support that units designated as NPAG could actually be handled and placed as NPAG. Handling the entire zone for units 1a, 2/3, 5,55 and 6 as PAG and placing them in permanent flooded storage the average thickness and aerial map extent of each unit within the pit limits is adequate. However, if another type of PAG management is considered, more detailed characterization and identification of NPAG zones would be requested.

Information required for units 1 and 4 where NPAG is proposed to be segregated from PAG provide a map with average thickness and extent of the PAG and NPAG zones within the pit limits and show data points that were used to define the zones. This information would be helpful to inform additional characterization that may be required to allow segregation decisions to be made during permitting and/or operations.

Reference:

Andrina, J., 2009. Physical and Geochemical Behaviour of Mine Rock Stockpiles in High Rainfall Environments. A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in the Faculty of Graduate Studies (Mining Engineering), the University of British Columbia.

Mehling, P. 1998. BLENDING AND LAYERING WASTE ROCK TO DELAY, MITIGATE OR PREVENT ACID ROCK DRAINAGE AND METAL LEACHING: A CASE STUDY REVIEW MEND Project 2.37.1 April 1998.

RESPONSE 140b ITT TABLE

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

To clarify, SRK (2022) does not state that zones whose bulk properties are *non-PAG* will be mined as *non-PAG*. SRK (2022) states that all zones contain both PAG and *non-PAG* zones. The classification on the bulk properties was completed to provide an estimate of the *non-PAG* and

PAG quantities for the purpose of mine planning. As described in the ML/ARD Management Plan, verification will be conducted for *non-PAG* zones and separable PAG intervals in *non-PAG* zones will be segregated and submerged in the management ponds, in the same manner as rock from zones that were characterized as PAG based on their bulk quantities.

Telkwa Mining has stated that no blending is occurring for *non-PAG* units on a horizontal aerial basis to achieve a higher NPR, rather *non-PAG* areas will not be placed underwater while PAG areas will be placed underwater. The only blending that will occur is within the vertical horizon of a mining bench of 12 meters which is expected to occur from drilling/blasting and mining activities within the dig face.

Figure 2-17 shows how Zone 5 would be segregated if verification testing agreed with the exploration drillhole polygons and an NPR cut-off of 2.0 was used with blocks in green being treated as *non-PAG* while blocks in red and yellow are treated as PAG. The above methodology follows a very similar and proven process used in metal mines to designate ore from mine rock, with this Project is using it to designate PAG from *non-PAG* rock. However, in the EAC Application the entire Zone 5 was classified as PAG and placed underwater. The same exercise could be completed using a different NPR criterion value if Telkwa Mining were successful in amending the NPR value of 2.0 being used in the EAC application.

Zones 5 and 6 are both entirely placed underwater in the EAC application so there is currently no segregation of polygons above an NPR of 2 versus below 2 so the statement above is not applicable to the EAC application. As stated earlier, Zones 7 and 8 are not mined within the EA open pit so the reference to Zone 7 above is not relevant to this application, however it would be subject to the same verification testing as other zones if it were to be encountered and to be treated as non-PAG.

Figure 2-18 and **Figure 2-19** illustrate how zones 1, and 4 were split into PAG and *non-PAG* zones for the EAC application using a cut off of 2.0. Polygons coloured in red and yellow were treated as PAG while polygons colored green were treated as *non-PAG*.

The methodology proposed is like that used to define ore and non-ore at a metal mine based on the blastholes and blending is currently not planned to occur.

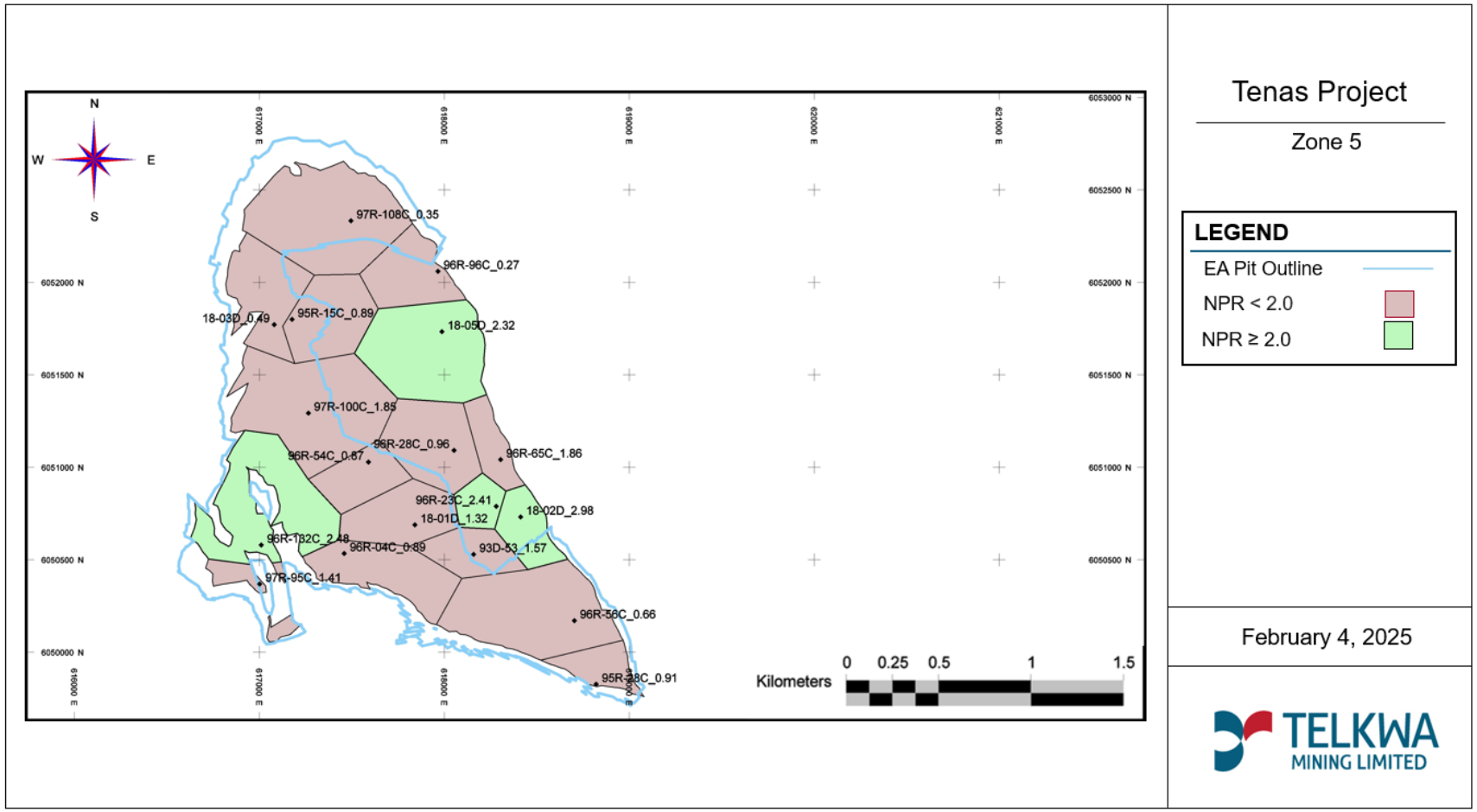

Figure 2-17: Zone 5 Classification Based on Using an NPR Cutoff of 2.0 with Red Polygons Being Classified as PAG and Green Polygons Being Treated as *non-PAG*

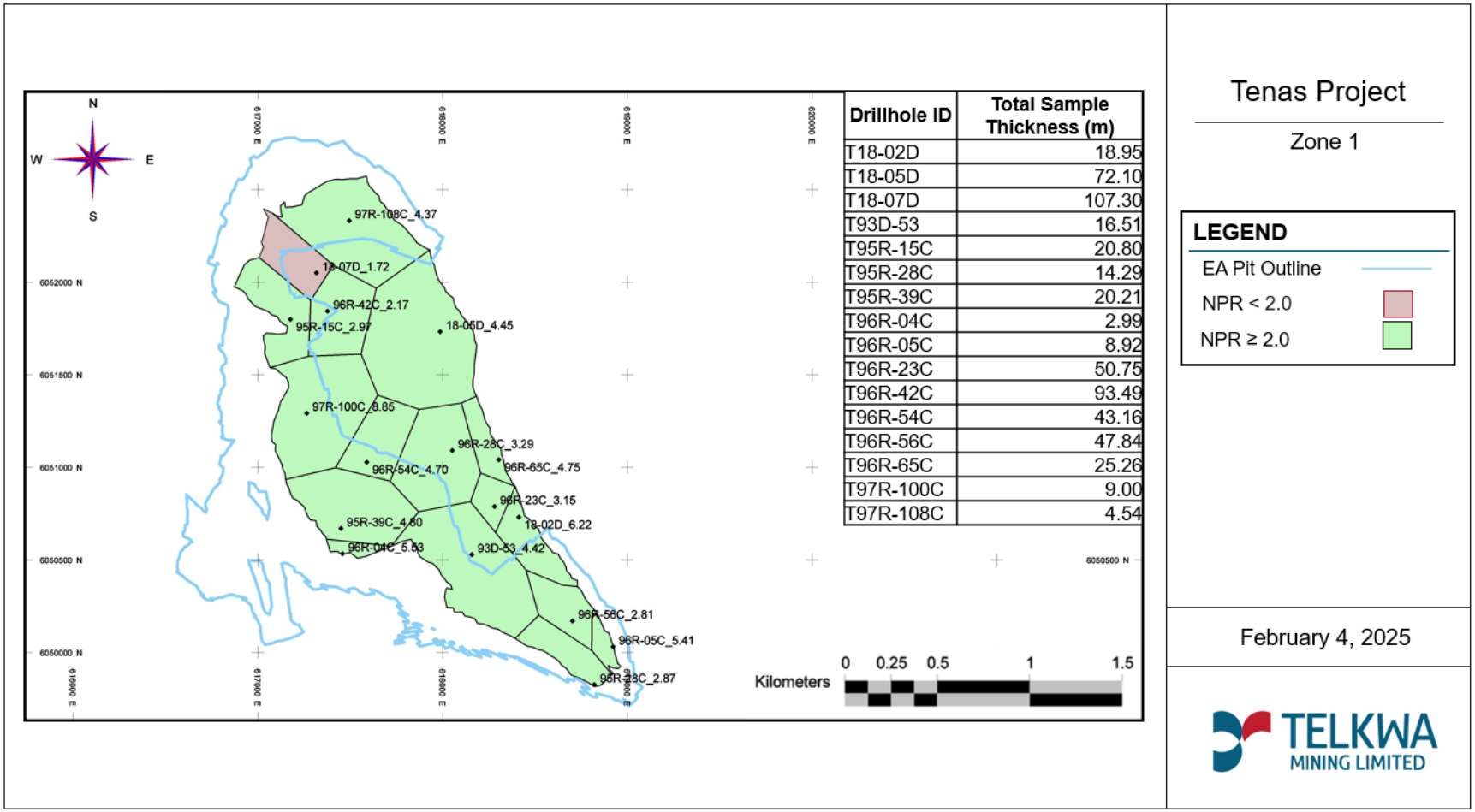

Figure 2-18: Zone 1 PAG and non-PAG Polygons Classified Against an NPR Cut-Off of 2.0, with Zones in Red Being Submerged Underwater in the EAC Application

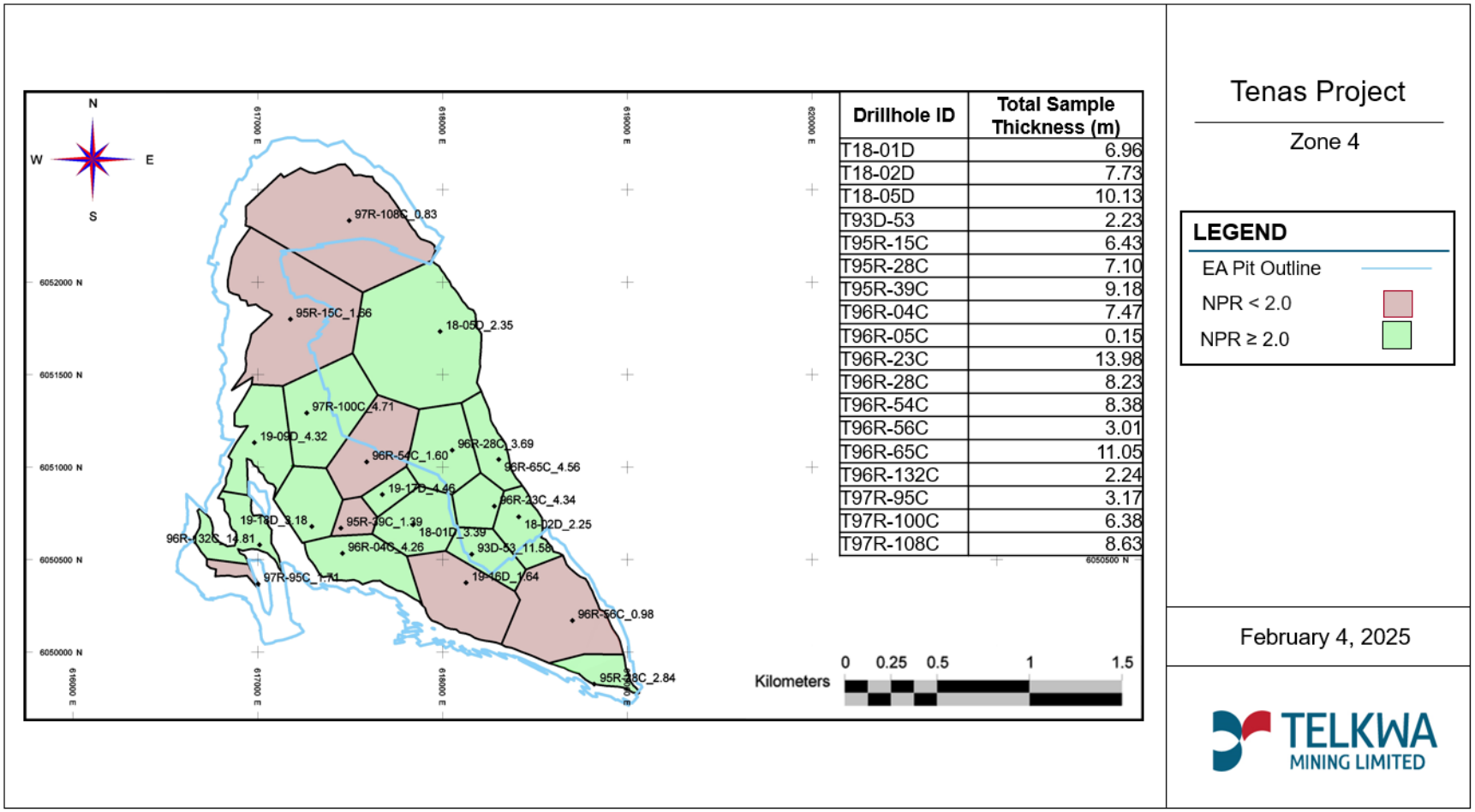

Figure 2-19: Zone 4 PAG and non-PAG Polygons Classified Against an NPR Cut-Off of 2.0, Red Polygons Submerged Underwater in the EAC Application

Table 2-22 below summarizes the zone distribution and volumes within the EA Open Pit.

Table 2-22: Summary of Zone Thicknesses, Extents, and Volumes with the EA Open Pit

Zone	Average Thickness (m)	Aerial Extent (m^2)	Volume (kbcm)
0 *non-PAG*	8.1	2,650	21.409
1 PAG	12.1	115	0.538
1 *non-PAG*	18.1	1,200	21.501
1a PAG	1.8	1,250	2.197
2/3 PAG	9.2	1,350	12.427
4 PAG	7.4	600	4.948
4 *non-PAG*	7.0	1,000	7.205
5 PAG	3.8	1,940	7.380
55 PAG	1.2	1,725	2.110
6 PAG	5.2	1,815	2.228
PAG Rock	**Variable**	**Variable**	**31,828**
Non-PAG Rock	**Variable**	**Variable**	**28.706**
Non-PAG Overburden	8.1	2,650	21.409

FOLLOWUP COMMENTS

142 ITT Table

Carbonate molar ratio (CMR) is a critical assessment because it has implications on estimates for the time to onset of ARD, the volume of PAG rock that requires management and the design of the ARD management facilities at site. As noted in the TCL response, the flattening of the CMR vs. sulphate trend shown on Figure 14 represents the minimum NPR cut-off as the CMR evaluation does not account for other factors that need to be accounted for when assigning NPR criteria such as NP availability and other factors as outlined in MEND 2009 ARD Prediction Manual. It is the opinion of the reviewer that assigning a NPR cutoff criteria solely based on the CMR and not taking into account other factors that may affect the on-set of ARD, such as available NP, is not supported by the presented data and contributing factors at a mine scale. This comment is related to Comment #140 #143, and #146.

RESPONSE 142 ITT TABLE

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

FOLLOW UP 143 ITT TABLE

EMLI understands that the average weighted NPR of 1.2 did not account for other factors that may affect the onset of ARD, such as blended PAG and non-PAG strata in an unsaturated embankment or pile. EMLI understands that the NPR cutoff of NPR = 1.2 did not account for other factors that may affect the onset of ARD, such as available NP. The proponent should therefore provide an extended evaluation of these other factors if they wish to apply for an average

weighted NPR less than 2.0. Until this demonstration is done the Proponent should use a uniform approach based on NPR criterion of 2 to designate zoning of material as PAG or non-PAG and ensure their ML ARD management plan is updated accordingly.

OVERVIEW IR LETTER

The geochemical characterization report defines non-PAG material based on weighed NPR of 1.2. If the application of a weighted average NPR of 1.2 to define non-PAG and PAG zones is not conservative, it may impact the quantity of PAG waste rock to manage and configuration of the project during the life of mine. Additional information should therefore be presented by the proponent to demonstrate the conservativeness of this approach.

- *EMLI understands that the neutralization potential ratio (NPR) cutoff of NPR = 1.2 did not account for other factors that may affect the on-set of acid rock drainage (ARD), such as available NP blended PAG and non-PAG strata in an unsaturated embankment or pile. An evaluation of these other factors with an average weighted NPR less than 2.0 was not provided.*

LETTER IR 143 AND 143 ITT TABLE

EMLI understands that the weighted NPR cutoff of NPR = 1.2 to define non-PAG zones 5, 55, and 6. This did not account for other factors that may affect the on-set of ARD, such as available NP blended PAG and non-PAG strata in an unsaturated embankment or pile.

1. *Provide an extended evaluation of these other factors if an average weighted NPR less than 2.0 is applied.*
2. *Provide a demonstration of the conservativeness of application of an average weighted NPR of 1.2*

RESPONSE 143 ITT TABLE

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

The metal leaching potential of overburden may not be driven by the same processes as sulphidic mine rock ARD and as a result, basic static testing [e.g., acid base accounting (ABA) and metal content] alone may not quantify the risk associated with overburden. The proposed geochemical characterization and monitoring program must also include testing methods to assess the metal leaching potential.

LETTER IR 145 AND 145 ITT TABLE

Conduct a geochemical characterization and monitoring program using methods to assess the ML potential.

a) Specify what additional methods will be employed as part of the geochemical characterization and monitoring program to characterize the metal/contaminant leaching potential at the expected pH of the material on the mine site.

b) b) Evaluate the metal/contaminant leaching potential and duration at the expected pH from the samples already collected to characterize the overburden.

RESPOSNE 145 ITT TABLE

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

Follow up to 146 ITT Table

Please propose a more conservative development of the Tenas mine rock NP designation and the ARD criterion of NP/AP = 1.2 based on responses to comments EMLI 140, 142 and 143.

LETTER IR 140, 142, 143, 146, and 145, AND 140b ITT TABLE

a) *Propose a more conservative development of the Tenas mine rock NP designation and the ARD criterion of NP/AP = 1.2.*

EMLI Clarification provided on April 18, 2024

The EMLI request is requesting the proponent to determine a more conservative approach to define PAG strata for the Tenas Project. The request is based on the individual IRs provided in the Round 2 EMLI Geoscience IRs 140, 142, 143 and 146. The request may be fulfilled by revising the approach to calculate available NP and/or revising the NP/AP criterion for PAG strata. It may be best summarized by point 3 of IR 143 outlined below.

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

Telkwa Mining contracted SRK to provide a scientifically defensible NPR criterion for segregating *non-PAG* material from PAG material for the planning/regulatory and operational verification phases based on site-specific data for the Tenas Deposit and best practices provided in the MEND (2009) prediction manual for drainage chemistry from sulphidic geologic materials.

SRK determined that a site-specific NPR cut off criteria of 1.20 for this deposit was appropriate to characterize blasthole rock as PAG (NPR less than 1.2) or *non-PAG* (NPR greater than or equal to 1.2). However, Telkwa Mining has elected to use a more conservative NPR criterion of 2.0 as a cut off versus the site-specific value of 1.20 to identify exploration drillhole and blasthole rock as PAG and *non-PAG*. This criterion was selected to ensure that Telkwa Mining will not classify PAG rock as *non-PAG* rock. This criterion will be reviewed as additional information is gathered for the permitting application at which point if the data supports it, Telkwa Mining will apply to revise the proposed NPR criterion.

The following provides a clear definition for the NPR cut off criterion used for the Tenas Project.

Planning, Regulatory, and Operational Stages

For mine planning processes, regulatory submissions such as the EAC application and operational verification testing, an NPR cut off criteria of 2.0 will be used to segregate *non-PAG* from PAG in exploration drillhole and/or blasthole. All rock with an NPR value less than 2.0 will be designated as PAG while rock having an NPR >= 2.0 will be classified as *non-PAG* based on verification testing specified in the ML/ARD management plan attached in **Appendix 17: Metal Leaching/Acid Rock Drainage Management Plan, SRK**.

Non-rock materials such as surface soils, overburden, processed coal, processed rock, and run-of-mine coal were characterized as PAG or *non-PAG* also using a cut-off of 2.0.

FOLLOWUP COMMENTS

FOLLOWUP COMMENTS LETTER IR 153 AND 153 ITT TABLE

EMLI understands that precipitation of these mineral phases, and the predicted concentrations, will be validated through operational water quality monitoring.

1. *Specify how the minerals or other attenuation processes identified through speciation modelling will be confirmed by mineralogical or geochemical characterization of the material.*

RESPONSE 153 ITT TABLE THEME #1

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

LETTER IR 153 AND 153 ITT TABLE

2. *Describe the field or laboratory studies that will be conducted to validate these assumptions (e.g., field barrel program).*

RESPONSE 153 ITT TABLE THEME #2

Telkwa Mining initiated a field barrel program in October of 2019 and includes a discussion of the available results up to October 2023 which is four years of data. The report is provided in **Appendix 3: Geochemical Field Barrel Results Interpretation, SRK**. Key findings of this program are:

- After four plus years of testing only one barrel has gone acid using material from the drill program.
- Source terms for some parameters were updated in the Final EAC Project Case (2024) to reflect what the monitoring has shown to date.

Telkwa Mining will continue monitoring the barrel samples for the foreseeable future with SRK providing a follow up analysis every 2 to 3 years.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

Additional sensitivities are needed to refine the water quality modelling predictions:

- *Exposed PAG rock in the management pond during a period of early closure;*
- *PAG rock exposures on pit wall;*
- *Upper-case prediction that is representative of challenging blasting conditions that could lead to higher nitrogen loading to blasted rock.*

LETTER IR 154, 157, AND 161 AND 154a ITT TABLE

1. *Prepare a sensitivity within the WLBM to evaluate how a 4-meter thickness of PAG rock left exposed in a management pond during a period of early closure would affect water quality.*
2. *Provide a sensitivity in the water quality model to allow PAG exposures on pit wall to understand how exposure of PAG may affect downstream water quality.*
3. *Develop an upper-case prediction that is representative of challenging blasting conditions that could lead to higher nitrogen loading to blasted rock.*

RESPONSE LETTER IR 154, 157, AND 161 AND 154a ITT TABLE

SRK has provided responses to this geoscience IR in **Tenas Project – Water and Load Balance Modeling Report (Updated 2025), SRK**.

FOLLOWUP COMMENTS

LETTER IR 154, 164 AND 154, 164 ITT TABLE

1. *Clarify what loading rates were used for developing mine rock source terms, including differences in Table 2-6 and Attachment 2 and Table A-4.*
2. *Provide annual non-PAG material quantities required to construct the embankments and the location of where this material will be sourced.*

RESPONSE LETTER IR 154, 164, AND 154, 164 ITT TABLE

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

EMLI understands that the App 13.5 reports that calcite precipitation is likely to occur in seepage from mine site facilities and in site water management ponds in varying degrees during operations, closure, and post-closure. However, predictions indicate that calcite precipitation is not expected to occur downstream of the proposed project footprint based on current observations and baseline concentrations. Additional information should be provided on:

- *The demonstration that calcite precipitation is not expected to occur downstream of the proposed project including all seepage and surface pathways.*
- *The mechanisms that might lead to calcite precipitation.*
- *Proposed calcite monitoring, management plan, and contingency measures to prevent or treat the onset of calcite precipitation downstream of the project discharge.*

174 LETTER IR AND ITT TABLE

EMLI understands that, based on the conclusions made in Appendix 13.5-K, calcite precipitation is likely to occur in seepage from mine site facilities and in site water management ponds in varying degrees during operations, closure, and post-closure. However, predictions indicate that calcite precipitation is not expected to occur downstream of the proposed project footprint based on current observations and baseline concentrations.

1. *What are the uncertainty and gaps around the current assessment that calcite precipitation is not expected to occur downstream of the proposed project footprint based on current observations and baseline concentrations? Please describe how the baseline observations and related conclusions relate to the projected load from the mine and propose recommendations to address these uncertainties and gaps.*
2. *Please update the calcite conceptual model provided in App 13.5K to include seepage pathways through groundwater or provide a rationale for its omission.*
3. *Provide clarifications on the mechanisms and likelihood of calcite precipitation in the immediate downstream environment including all pathways (i.e., surface and groundwater) below the end-of-pipe discharge location in Goathorn Creek.*
4. *Provide details of the calcite monitoring and management plan to prevent onset of calcite precipitation downstream of the project discharge and contingency measures to be implemented if specific triggers on the mine site are reached.*

RESPONSE 174 ITT TABLE

SRK has provided responses to this geoscience IR in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

175 ITT TABLE

EMLI is consulting with ENV on water quality monitoring and water management measures for this project. Telkwa Coal will need to propose conceptual design of management structures as part of the current application to demonstrate that the Project as proposed is capable of managing water not suitable for discharge and meeting WQGs.

176a ITT TABLE

EMLI understands that ENV's review of the surface water quality effects assessment and proposed water quality benchmarks is ongoing. EMLI notes that based on that review additional water quality mitigation for the Project may be required. Should water treatment or other mitigation measures be proposed for the Project, EMLI will review the information at that time. Telkwa Coal is encouraged to engage as soon as possible with EMLI on any proposed water treatment, especially if any passive or semi-passive technologies are proposed.

IR LETTER OVERVIEW

Additional conceptual design of alternative treatment options, mitigation measures, and management structures are needed to prevent the discharge of water that is not suitable for release to the environment.

LETTER IR 176 AND 176b ITT TABLE

1. *Provide conceptual design of alternative treatment options, mitigation measures, and management structures that can manage water not suitable for discharge and that meet BC WQGs.*

RESPONSE 176 ITT TABLE

This was previously addressed by IR **Theme 1 RESPONSE IR 175, 176b, 514, 350, 353, and 355** above.

Telkwa Mining believes the details above and the attached appendices address the requirements set forth in IR **Theme 7**.

THEME 8: EMLI GEOTECHNICAL CLARIFICATIONS

FOLLOWUP COMMENTS

IR LETTER OVERVIEW

The proponent does not identify the processed rock waste as tailings and does not identify the North, East, and West Management Ponds as tailings storage facilities (TSFs). As per the Health, Safety and Reclamation Code for Mines in British Columbia (the Code), the definition of "tailings" is: "the residue remaining from the preparation of a concentrate of minerals or coal;" and a "tailings storage facility" (TSF) is: "a facility that stores tailings." As per these definitions, the "processed rock" described in the Application is considered tailings and the North, East and West Management Ponds are TSFs.

- *TSFs have different minimum requirements than water dams in BC, including, but not limited to, minimum factors of safety, minimum design requirements for larger flood (return event and duration) and seismic events, downstream slopes, and many other requirements related to water management, performance, monitoring and surveillance, governance, etc.*

RESPONSE IR LETTER OVERVIEW

Telkwa Mining and SRK classified the management ponds as water holding ponds versus tailings storage ponds due to the following reasons:

- Embankment construction does not use tailing materials as a construction material but rather used engineered specified materials from mining activities;
- The ratio of PAG rock to processed rock (tailings) is approximately 11.25 to 1 on a volume basis so PAG rock will be the predominant material dictating performance of the materials contained within the embankment;
- Processed rock did not match definition of tailings provided by Vick; and,
- Processed rock is dewatered to less than 25% moisture prior to placement within the management ponds.

However, even though Telkwa Mining and SRK did not classify the management and control ponds as tailings storage facilities, due to the size of the management and control ponds, closeness to population centers such as the Village of Telkwa, and fish habitat Telkwa Mining/SRK utilized the guidelines for design requirements that matched the tailings pond design guidelines as these were the most conservative parameters to reference as summarized by **Table 2-23** below.

Table 2-23: Canadian Dam Association Guidelines for Design of Tailings Dams[1]

Dam Class	Annual Exceedance Probability - Floods[2]	Annual Exceedance Probability - Earthquakes	Minimum Static Factor of Safety			Downstream Slope No Steeper Than
			End of Construction	Long Term	Full or Partial Drawdown	
Low	1/3 between 1/975 and PMF	1/2,475	1.5	1.5	1.5	2H:1V
Significant	1/3 between 1/975 and PMF	1/2,475				
High	1/3 between 1/1,000 and PMF	1/2,475				
Very High	2/3 between 1/1,000 and PMF	½ between 1/2475 and 1/10,000 or MCE				
Extreme	PMF	1/10,000 or MCE				

Notes:

1. Adapted from CDA Dam Safety Guidelines, 2013. Further context and guidance provided there.
2. The Code required that a facility that stores the inflow design flood use a minimum event duration of 72 hours.

Source: BC MEMLI 2022

MCE=Maximum Credible Earthquake; PMF=probable maximum flood.

Telkwa Mining has adopted a more conservative approach to the design of the management ponds than is required for even some of the parameters for a Tailings Storage Facility (TSF).

For example, the Factor of Safety (FOS) that Telkwa Mining has put in place is 1.60 for all periods versus 1.50 provided in **Table 2-23** above and a downstream slope no steeper than 3H to 1V and an upstream slope no steeper than 2.5H to 1V versus 2H to 1V downstream requirement specified by **Table 2-23** above.

Given their proximity to the Village of Telkwa, the more stringent requirements of TSF embankments will be applied to management and control pond embankments regarding but not limited to the following parameters:

- minimum FOS;
- minimum design requirements for larger flood (return event and duration);
- seismic events;
- downstream and upstream slopes;
- water management;

- performance;
- monitoring and surveillance;
- governance;
- emergency response plan; and,
- etc.

Please find additional information on this IR provided in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOW UP COMMENTS

LETTER IR 171 AND 171 ITT TABLE

The report FINAL Tenas Project Dam Breach Assessment Report dated April 2021, by SRK (Canada) Ltd., included as Appendix 1.0-AA of the Application, has not been appropriately sealed in accordance with Engineers and Geoscientists BC requirements. Provide appropriately sealed documents, as required, including the Dam Breach Analysis included as Appendix 1.0-AA of the Application.

RESPONSE 171 ITT TABLE

Please find attached **Appendix 19: Tenas Project Dam Breach Assessment Report, SRK**.

FOLLOW UP COMMENTS

IR LETTER OVERVIEW

Completion of an alternative means of undertaking the proposed project with respect to options for tailings management that considers technology, siting, and water balance has not been demonstrated.

LETTER IR 178 AND 178 ITT TABLE

Applications must include an alternatives assessment for the Management Ponds/Tailings Storage Facilities and the alternatives assessment completed should be consistent with the Guidelines for the Assessment of Alternative for Mine Waste Disposal.

1. Provide a detailed review of tailings storage alternatives assessed to support the proposed mine plan
3. Available from: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/environmental-assessments/guidance-documents/eao-guidance-tailingsmanagement.pdf
4 Available from: https://www.canada.ca/en/environment-climate change/services/managing-pollution/publications/guidelines-alternatives-mine-waste-disposal/chapter- 1.html

RESPONSE 178 ITT TABLE THEME #1

Based on the geochemical work conducted, processed rock has been classified as PAG material and as such placement of this material underwater is the recommended management strategy for this material to prevent potential ARD in the future. This was the conclusion of **Tenas Project PAG Management Alternative Means Assessment for managing this material, SRK**, provided by SRK with the EAC Application and included again as **Appendix 20: PAG Management Alternatives Assessment, SRK** with this response.

This requirement influences all future decisions with respect to this material, which is why this assessment was completed first. In response to this IR, SRK completed an **PAG Alternative Materials Storage Assessment** using the guidelines provided by Environment and Climate Change Canada *Guidelines for the Assessment of Alternatives for Mine Waste Disposal, July 2014* which is provided in **Appendix 21: Tenas Project Potential Acid Generating Material Storage Alternatives Assessment, SRK**. Based on the guidelines a multiple-stage process was completed as follows:

1. Step 1 involved completing a screening exercise to determine potential viable location for the storage of materials.
2. Step 2 involved completing a Multiple Accounts Analysis (MAA) for the identified preferred locations and configurations to identify the preferred option going forward.
3. Step 3 involved completing a sensitivity analysis to determine if the preferred option was robust enough to remain the preferred option under several conditions.

Figure 2-20 and **Figure 2-21** below illustrate the results of the MAA and sensitivity analysis which demonstrated that the option submitted in the EAC Application was the preferred option to carry forward into detailed design during the permitting phase of the Project.

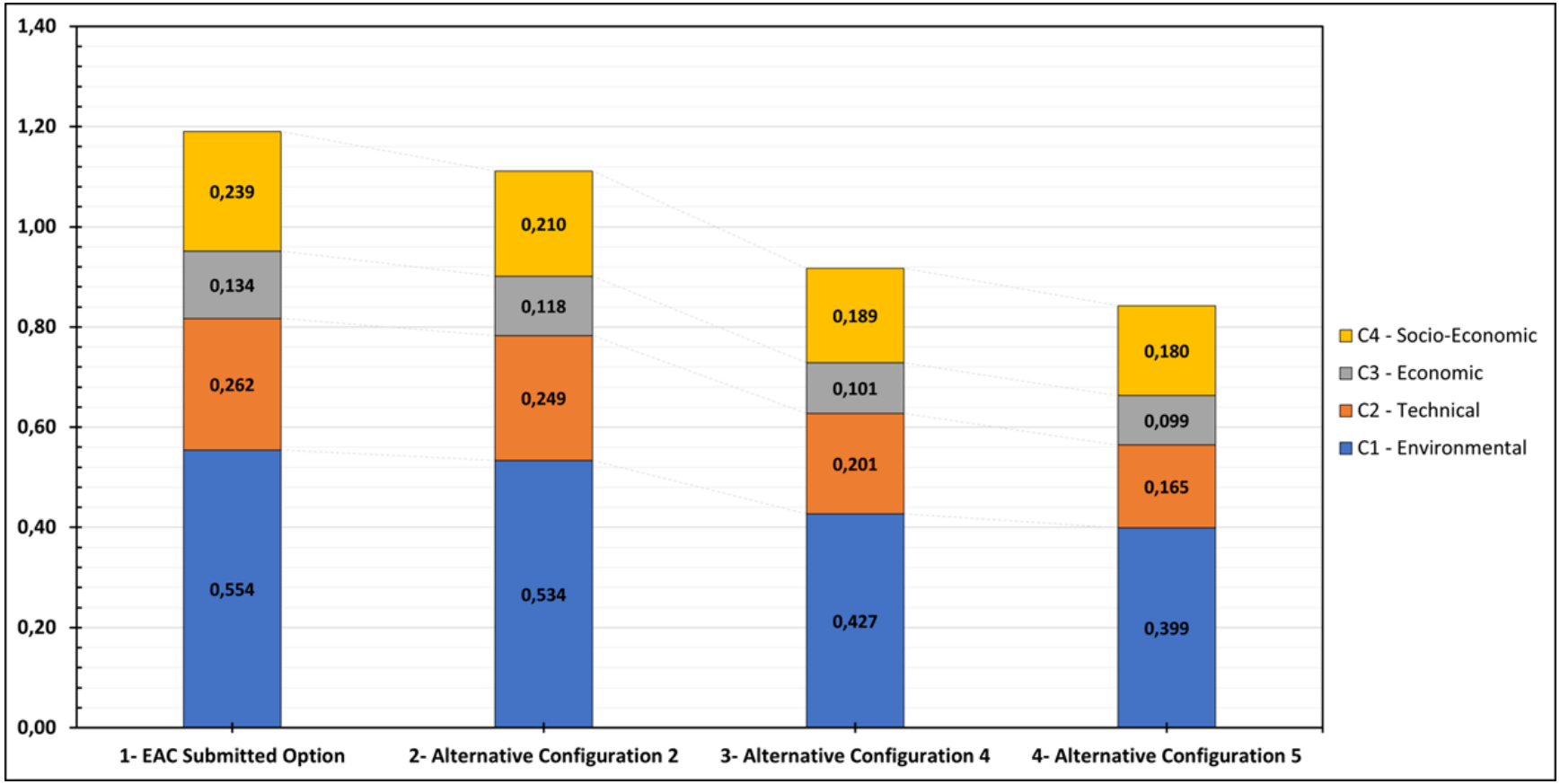

Figure 2-20: Multiple Accounts Analysis Results of the Final EAC Project Case (2024) Location versus Alternatives

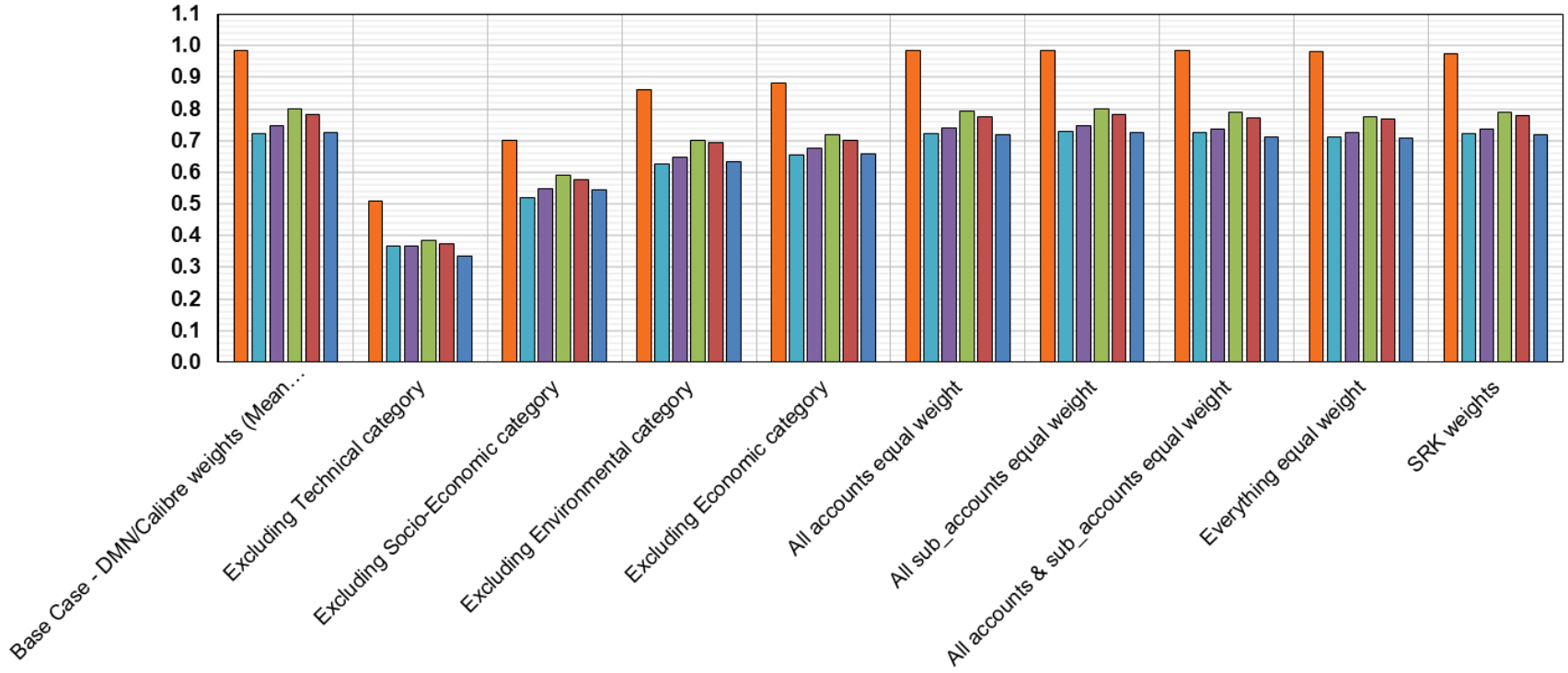

Figure 2-21: Multiple Accounts Analysis Sensitivity Results of the Final EAC Project Case (2024) Location versus Alternatives

Please find additional information on this IR provided in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

FOLLOWUP COMMENTS

OVERVIEW LETTER IR

Results of the Dam Breach Analysis (DBA) does not clearly support the selected Consequence Classification Ratings for Dams or the seismic design criteria required by the Code given that the DBA reports that over 100 people could be impacted or at risk in the event of a breach of one of more of the management pond embankments. The Consequence Classification and seismic design criteria are lower than what is anticipated from the results of the Dam Breach Analysis, which could result in use of design criteria that are not consistent with regulatory requirements or accepted industry practice.

LETTER IR 181 AND FOLLOW UP 181 ITT TABLE

1. *Provide justification for the selection of the failure scenarios considered, including descriptions of the findings of all cascading failure modes/scenarios assessed.*
2. *Provide justification for selection of a "Very High" Consequence Classification given the findings of the Dam Breach Analysis that over 100 people could be impacted or at risk in the event of potential failure or breach of one or more of the management pond embankments.*
    a. *Include the relevant TSF regulations and guidelines that support this determination.*
    b. *Indicate what evaluation of possible environmental impacts due to the release of the contents of the North, West or East Management Ponds was used as a basis for selection of Consequence Classification. The environmental impacts should be consistent with the current understanding of the project (PAG tailings, etc.) and include appropriate references to the sources of information considered.*
3. *Provide justification for selection of the TSF design flood events (Inflow Design Flood and Environmental Design Flood). Include the relevant TSF regulations and guidelines that support this design event selection.*
4. *Provide justification for selection of an earthquake with a return period of 1 in 2,475 years for the Management Ponds/TSFs stability assessment. Include the relevant TSF regulations and guidelines that support this design event selection.*

RESPONSE FOLLOW UP 181 ITT TABLE

Please find additional information on this IR provided in **Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK**.

Telkwa Mining believes the details above and provided in attached appendices address the requirements set forth in IR **Theme 8**.

3. FIRST NATION FEEDBACK

The Office of the Wet'suwet'en (OW) provided comment on these submissions on February 28, and March 12, 2025, which are summarized in

Table 3-1 below. Responses have been provided in **Appendix 22 Tenas Project Information Request Responses from Office of the Wet'suwet'en – Final, SRK**.

Telkwa Mining is expecting further input could be provided from Wet'suwet'en during their Assessment Process. Where modifications or clarifications of responses are appropriate Telkwa Mining will provide supplemental information to both the EAO and OW.

Table 3-1: February 28, March 12, and May 15, 2025, Comments from OW

Comment ID	Master ITT Comment ID (BC EAO)	OW Comment from Feb 28 or Mar 12 Letters/Report	OW Recommendations from Feb 28 or Mar 12 Letters/Report
OW-011	175, 176, 307, 350, 353, 355, 356, 514	As mentioned, a presentation from TML is welcome. However, OW has its own priorities and objectives related to protecting aquatic resources in the territory. OW is working to identify Project-related issues related to water quality, water and load balance modeling, water treatment, and hydrology.	To address this IR, the Proponent should: • Provide all the information requested in OW's forthcoming responses to TML's IR responses. • Consider forthcoming information from OW regarding how all concerns related to Project impacts on aquatic resources have been identified and characterized. • Consider forthcoming information from OW regarding whether monitoring and mitigation plans are adequate to address adverse impacts to aquatic resources. Impacts to water may also be considered in the RIA being conducted by OW. This IR will remain open until OW is satisfied with how information from the RIA and the outcomes of OW's review of TML documents and engagement with TML on this issue are incorporated into Project monitoring, mitigation, and adaptive management plans.
OW-038	350 and 351	The Proponent provides 11 mitigation options (6 single treatment options and 5 that are combinations of 3 or more of the single treatment options) and models the results. The results show options for reduction of max monthly concentrations and reduction of WQG for Four Creek and Tenas Creek. All of the viable options for reduction include a combination of multiple treatments and would result in some periods of time of reduced downstream natural streamflow.	The Proponent provides viable options for reducing concentrations of selenium, sulfate, cadmium, and nitrate/nitrite including a combination of multiple treatments. In some cases (Table 9), exceedances still occur (e.g., selenium, nitrate) at the end of pipe, even when multiple treatments are applied, particularly from the Tenas Control Pond. While the right combination of mitigation treatments will definitely improve downstream water quality, there are impacts to local streamflow and in some cases other constituents (e.g., increases in selenium). The most concerning reductions in streamflow for both Tenas and Four Creek are during late summer months (August) and winter baseflows. It doesn't appear that these reductions in streamflow have been modelled within the Water Load Balance Model to predict how the lower flows will impact downstream WQ at prediction nodes, although reduced concentrations in surface and groundwater should help, reduced water flow could end up balancing that reduction and total constituent loading may ultimately not change much. This warrants further investigation. To resolve these issues, TML must: • Provide more information on how the reduction of water flow in the Tenas and Four Creek is involved in mitigations for reducing concentrations of selenium, sulfate, cadmium, and nitrate/nitrite; • Provide data for how this reduction is incorporated into the Water Load Balance Model to predict how the lower flows will impact water quality downstream, especially during late summer months (August) and winter baseflows; • Provide more information on the proposed water mitigations, including the reliability and risks of each option associated with failure of effective treatment, in addition to the expected beneficial change and the expected consequences of each treatment option;
OW-039	350 and 351	As above, the Proponent provides 11 mitigation options and describes aspects of treatment efficiency and effectiveness for each option, including modelled water quality outcomes. The Proponent provides information on the expected beneficial change and the expected consequences of each treatment option but does not provide risks associated with failure of effective treatment.	The reliability and risks of each option are not discussed, and very little information is provided on situations where the mitigation option may be less effective/ ineffective (i.e., high, or low run off conditions, liner failure, etc.). The water treatment plan option (Control 5) appears to be one of the most effective options, particularly when combined with other options. However, the design details of the water treatment plant have not been developed (which the proponent acknowledged in the document), and the reductions in constituent concentrations are only assumed. This would require additional storage and appropriate treatment rates, along with additional energy and waste disposal costs. As water treatment, in combination with other approaches, is the most effective way of reducing exceedances from the ponds, this option should be pursued but TML must provide more information on the details of that process (including detailed operations of the treatment facility over time, energy and water use, and efficiency of treatments, etc.). TML must provide further information on alternative treatment plans and outcomes that describe how the water treatment facility would be designed, what standards would be used, the operation, and the duration.
OW-040	356	The Proponent developed a new node (WQSEA1) of water quality measures for the Water and Load Balance Model (WLBM), 100 m downstream of the confluence with the unnamed tributary for Project discharge on Goathorn Creek. The Proponent developed and ran new WLBM scenarios to review the impacts of changes in seepage rates on expected water quality and says, "Water quality results will be presented at the new node (WQSEA1), WQS06, WQS05, WQS04, and WQS03_DS with the Final EA Water and Load Balance results". We have been unable to find the aforementioned document containing the results. There were some errors in the figure from the WLBM report (Fig 2.2-2.4 of App 4.3) that showed incorrect connections of the three creeks (Four	We are unable to find the documents containing the results of this IR response, "Final EA Water and Load Balance results", or Attachment IR 356-1 as the IR response does not provide further information regarding where these documents are located. We are unable to find any documents with that name in the review materials provided to us and therefore could not review the IR. Please provide these documents, including figures for each of the requested scenarios in the IR (Tributary receiving discharge above confluence with Goathorn Creek, and Goathorn Creek below confluence with tributary receiving discharge); projected water quality from baseline through to post-closure; and updated figures from the WLBM report (Fig 2.2-2.4 of App 4.3) that showed incorrect connections of the three creeks (Four Creek, Tenas Creek, Goathorn Creek).

Comment ID	Master ITT Comment ID (BC EAO)	OW Comment from Feb 28 or Mar 12 Letters/Report	OW Recommendations from Feb 28 or Mar 12 Letters/Report
		Creek, Tenas Creek, Goathorn Creek), but the proponent claims the errors in the figure were NOT incorporated into the model and that the model correctly accounts for the mixing of streams. There are final figures presented in Attachment IR 356-1; however, we also cannot find this document as the attachment with that name at the end of App F contains no information. We are also unclear whether this is the location of the other results the authors describe (e.g., figures for each of the requested scenarios and projected WQ from baseline through to post-closure). Because we were unable to locate this document, we could not completely review the response to the IR.	
OW-041	NEW	Same comment as previous. The Proponent developed a new node (WQSEA1) of water quality measures for the Water and Load Balance Model (WLBM), 100 m downstream of the confluence with the unnamed tributary for Project discharge on Goathorn Creek. The Proponent developed and ran new WLBM scenarios to review the impacts of changes in seepage rates on expected water quality and says, “Water quality results will be presented at the new node (WQSEA1), WQS06, WQS05, WQS04, and WQS03_DS with the Final EA Water and Load Balance results”. We have been unable to find the aforementioned document containing the results. There were some errors in the figure from the WLBM report (Fig 2.2-2.4 of App 4.3) that showed incorrect connections of the three creeks (Four Creek, Tenas Creek, Goathorn Creek), but the proponent claims the errors in the figure were NOT incorporated into the model and that the model correctly accounts for the mixing of streams. There are final figures presented in Attachment IR 356-1; however, we also cannot find this document as the attachment with that name at the end of App F contains no information. We are also unclear whether this is the location of the other results the authors describe (e.g., figures for each of the requested scenarios and projected WQ from baseline through to post-closure). Because we were unable to locate this document, we could not completely review the response to the IR.	We are unable to find the documents containing the results of this IR response, “Final EA Water and Load Balance results”, or Attachment IR 356-1 as the IR response does not provide further information regarding where these documents are located. We are unable to find any documents with that name in the review materials provided to us and therefore could not review the IR. Please provide these documents, including figures for each of the requested scenarios in the IR (Tributary receiving discharge above confluence with Goathorn Creek, and Goathorn Creek below confluence with tributary receiving discharge); projected water quality from baseline through to post-closure; and updated figures from the WLBM report (Fig 2.2-2.4 of App 4.3) that showed incorrect connections of the three creeks (Four Creek, Tenas Creek, Goathorn Creek).
OW-042	NEW	The IR document says, "In summary, the background water quality inputs used in the EAC Project Case (August 2022) were monthly mean values while seasonal values are used in both the Updated and Final EAC Project Cases (2024)". However, in Appendix F, Section 4.18.2, SRK says "The EA WLBM used statistics from the full water quality baseline monitoring record, including the 50th percentile and 95th percentile for each stream. Monthly or seasonal background source terms were not used". This is relatively confusing as responses in the IR in different locations are providing different answers to the initial question. In Appendix F, they follow up by saying they generated new baseline statistics for the Final EAC Project Case (2024) based on updated data, including a new 50th percentile for the winter months and a 50th percentile for the "rest of the year" (May to October). They say the Final EA Water and Load Balance Report will include the seasonal source terms for background concentrations on the in-stream water quality conditions, so we assume this is the 50th percentile or the median. However, it is unclear if this will be presented as the main WQ prediction scenario or alternative assessment scenario(s). We were unable to locate the document referred to as Final EA Water and Load Balance Report to further review.	Reporting the use of different time scales is troublesome, especially in a region with high seasonal variability. The caching of all "open water" months into one "summer season" is not appropriate as there are very different climate and ecosystem processes influencing or influenced by spring vs summer vs fall water quality dynamics. The use of one seasonal value may be skewed by over-represented high or low values that occur during more months, and therefore not representative of periods exhibiting seasonally low or high values. Monthly values would be more appropriate to capture full seasonal variability. Please provide this information. In addition, we were unable to fully review this IR because we could not locate the referenced document "Final EA Water and Load Balance Report". Please provide this information.
OW-043	NEW	Some of the sedimentation ponds that discharge to the natural ground were not included as part of the WLBM in the EAC application (the proponent lists 6). Four of the ponds are lined with impermeable geomembrane liners or equivalent and the remaining 2 are unlined. They were not considered in the site water and load balance model when it was developed because: 1) they are geographically separate from the EA Open Pit, management and control ponds, and material storage pile water management systems, 2) they are small and manage very defined catchments with low flow rates compared to discharge from mine components through Tenas Control Pond, 3) TSS is the main POC for most of these ponds but some also include nitrogen species, 4) they are designed to produce TSS well below the BC (35 vs 50 ppm) requirement so deemed protective of aquatic environment, 5) the remaining pond doesn't discharge to the environment it gets pumped	The organization of various ponds and their connectivity, as well as the lack of data associated with each pond is an obvious source of confusion in the application. This theme arises in many comments throughout the proponent’s IR response. Discharges from sedimentation ponds (excluding Tenas Control Pond/North Management Pond and Rail Infrastructure Pond) are directed towards natural ground. The Proponent plans to convey this water along natural flow pathways to eventually reach downstream watercourses. Despite use of pumps and other structures for controlled release, there is risk of overflow and higher amounts of release during high rain events, which may increase downstream erosion potential. The Proponent must provide a clear map of the location and connectivity of each pond along with an associated table that includes all the requested information from the IR.

Comment ID	Master ITT Comment ID (BC EAO)	OW Comment from Feb 28 or Mar 12 Letters/Report	OW Recommendations from Feb 28 or Mar 12 Letters/Report
		to the Tenas Control Pond, and 6) they describe how they deal with material from the Explosive Magazine Pond.	
OW-044	NEW	The only discharge that will be directed into a stream is the Tenas Control Pond (and North Management Pond after closure). An IDZ study was prepared to evaluate discharge from Tenas Control Pond, which found that discharge would not be acutely toxic. This discharge was simulated in the Water and Load Balance Model to quantify the expected effect in streams. They do not reference the IDZ study used to evaluate discharge, so we were unable to review in the context of this IR. The Proponent ensures that when the ponds are discharging, they will be monitored on a “regular basis” (frequency not mentioned) and monthly when not discharging. Monthly monitoring proposed with various (3) "action steps" proposed to address WQ exceedances if they should occur. Some of these involve reactions to chemical parameter exceedances of BC WQG over a "period of months".	Note that an IDZ will not be considered during permitting without an adequate BAT assessment. Given that a new BAT assessment has been performed with alternative treatment options, the IDZ study would need to be redone to account for water quality differences derived from various different treatment options. The comment does not address the need to also evaluate cumulative effects around the IDZ. In addition, the proposed frequency of monitoring for exceedances is inadequate given the risk to downstream fish. These ponds will be monitored monthly to evaluate toxicity results against authorized limits for lethality of Rainbow Trout. If exceedances exist, a number of actions are proposed to reduce exceedance, but given the frequency of monitoring (monthly) and the amount of time required for implementation of the proposed actions, it is possible exceedances (and downstream negative effects) could persist for a substantial amount of time (months) before any resolution. This presents a considerable prolonged threat to fish and ecosystem health. TML must correct these discrepancies.
OW-045	520	There are no lentic (i.e., lakes or ponds) water bodies located in the near-field or far-field receiving environments of the Project.	The concern here is sedimentation and conversion of selenium species, so there may be opportunities for this in micro-lentic environments such as back channels and pool environments along the stream course, but according to the proponent in this local study and regional study region there are no lentic environments.
OW-046	176	Mitigation control scenarios are discussed and compared, including the pros and cons of expected changes in water quality. The most effective treatments for reduction of selenium and nitrate-nitrite in both control ponds are combinations of multiple mitigation strategies, many of which include the strategy of water quality treatment (listed as "mitigation control 5").There are no plans or outcomes developed that describe how the water treatment facility would be designed or operate, some of the benefits are based on assumed targets met through treatment.	However, there are no actual plans or outcomes developed that describe how the water treatment facility would be designed or operate, some of the benefits are based on assumed targets met through treatment. This is acceptable but should be fleshed out further, and it should be confirmed that these targets can actually be met if this is considered a feasible option. The Proponent is also assuming the water quality treatment would persist past the end of closure as the model shows results out to 2100. Additional information on water treatment facility is needed (design, standards, operation, and duration) and should not be assumed if this is considered as an option, in conjunction with other mitigation strategies (it is included on the list of combined best options). There are also effects on streamflow in Four and Tenas Creek, which should be explored more with the water load balance model. Goat Creek was not included in the model outputs, although this is acknowledged by the authors. Impacts on Goat Creek should be included in additional assessment of further mitigation strategies.
OW-047	154, 157, 161	The Proponent claims that the evaluation of how a 4-meter thickness of PAG left exposed in a management pond would affect water quality is not possible because of the way the pumping system is set up and that the management ponds are always built ahead of PAG placement to ensure that the PAG is below water level. We are concerned that the Proponent dismissed this request saying that under properly managed scenarios this would not be a concern. "	We are concerned that the Proponent dismissed this request saying that under properly managed scenarios this would not be a concern. However, it doesn't provide information on the effects of exposed PAG to water quality under scenarios where the management pond techniques fail, such as failure of a pond dam or failure of the pumping system to work as designed. The Proponent must provide this information and include scenarios in the water quality model for estimating impacts where management actions fail, to provide a clear picture of the downstream impacts of PAG under less-than-ideal conditions, but conditions that could possibly occur if there are situations where proper management cannot occur (failure of pumping system or pond dam, or some other instance where a 2m cover of water cannot be maintained).
OW-048	154, 157, 161	It is unclear where the information is associated with this IR. Within App D they cite a ""SRK 2024a"" (page 16) with the results of the model output using the various source terms but the reference is not included at the end of the document under ""References"". Appendix A- Water Balance Report. contains source terms but has not been updated to include a sensitivity like requested in the IR.	We were unable to review this IR responses as we were unable to find the supporting information. Please provide this information.
OW-049	174	The predictions provided in SRK (2022d) indicate that calcite is not expected to form in downstream tributaries since predicted alkalinity, calcium and magnesium concentrations are like existing conditions and there is currently no visual evidence of calcite precipitation even though surface water in these drainages is supersaturated with respect to calcite under baseline conditions. Because of this, they suggest that site-specific Saturation Indices (SI) may need to be developed once sufficient monitoring data are available. They describe how if calcite formation is identified as part of the operational monitoring program, TML will develop a mitigation plan that will be submitted to EMLI for approval. The most common calcite prevention mitigation strategy is	1. The response to the IR states that the estimated SI do not suggest calcite precipitation, but detailed discussion is not in the reference. They do not specify what additional monitoring data is required for site-specific calculation of site-specific SIs for calcite. Is TML referring to monitoring data from this post-project operations, or baseline data? It is unclear where in the referenced SRK (2022d) document they specifically address calcite, as the term “calcite” only appears once in the document. TML must update the Discharge Management Plan and provide further information on how operation and a post-closure increase in conductivity in ponds and the receiving environment will affect the SI for calcite and predictions for precipitation. 2. Higher pCO2 in groundwater will be more likely to precipitate calcite at possible groundwater seepage locations (contact with atmosphere). Some accounting for this should be included in the conceptual model.

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		addition of antiscalant to site effluent. This would be the most likely mitigation strategy should it be required. They also say there is no need to include groundwater seepage in the conceptual model as there is no reason for CO2 off-gassing to occur along groundwater pathways at the Project, and calcite is therefore not expected to precipitate in groundwater pathways.	3. Within the referenced SRK 2022d (Tenas Project Water and Load Balance Modeling Report REV1), we cannot find discussion of calcite precipitation, including mechanisms, contributing factors, predictions, etc. The response to the IR states that the estimated SI do not suggest calcite precipitation, but detailed discussion on this topic is not in the reference. According to the IR response, "predictions provided in SRK (2022d) indicate that calcite is not expected to form in downstream tributaries since predicted alkalinity, calcium and magnesium concentrations are like existing conditions". However, there are multiple examples of increases in alkalinity and magnesium (in particular) in the load model. Therefore, TML must explore conditions in terms of potential for calcite precipitation. 4. There is no plan, other than including calcite in the surface water quality monitoring program. If calcite formation is observed, then they will develop a mitigation plan. This plan will likely include mitigation using antiscalants. The proponent does not discuss this option further but should include considerations and possible impacts and interactions of the use of antiscalant for reducing calcite precipitation considering the high background conditions of aluminum in these watersheds.
OW-050	181	The statement "The effect of the rainy-day breach on aquatic habitat is low given the PMF/Q200 conditions already present" is not supported given the discharge at the mouth of Tenas Creek is estimated to be 1100 m^3/s in comparison to a PMF of 168 m^3/s, and that maximum water velocity and rate of discharge increase from a flood wave are not accounted for. However, we do agree that the risk to aquatic life for a breach of the East Dam or West Dam should be 'Very High' due to the likelihood of major long-term deterioration of critical steelhead spawning habitat. We believe that the 'Very High' classification would be more appropriate for a breach of the North or Tenas Dams as well given the likelihood of major long-term deterioration of critical steelhead spawning habitat in Tenas and Goathorn Creeks.	Given the likelihood of major long-term deterioration of critical steelhead spawning habitat in Tenas and Goathorn Creeks, a 'Very High' risk classification should be used for a breach of the North Dam or Tenas Dam.
OW-118	NEW	To help OW better assess how TML is protecting the Environmental Flow Needs, provide details on how and/or TML will manage flows to avoid high risk levels and maintain environmental flow needs (reduction of <10% of mean average by season) during operation. To help OW better assess how TML is protecting the Environmental Flow Needs, provide details on how and/or TML will manage flows to avoid high risk levels and maintain environmental flow needs (reduction of <10% of mean average by season) during operation.	Commit to appropriate planning for contaminant areas, which requires a proactive approach to mitigating contaminant leakage (rather than attempting to mitigate once problems have been identified);
OW-120	NEW	To help OW better assess how TML is protecting the Environmental Flow Needs, provide details on how and/or TML will manage flows to avoid high risk levels and maintain environmental flow needs (reduction of <10% of mean average by season) during operation. To help OW better assess how TML is protecting the Environmental Flow Needs, provide details on how and/or TML will manage flows to avoid high risk levels and maintain environmental flow needs (reduction of <10% of mean average by season) during operation.	Consider the appropriateness of water and load balance models and correct seepage migration rates and timing of peak contaminant concentrations;
OW-122	NEW	For Surface Water, Ground Water, and Aquatic Resources VCs, TML must:	Provide the cited document in Appendix D: "SRK 2024a" (page 16), which is missing from the end of the document under "References". Appendix A- Water and Load Balance Model Report.
OW-123	NEW	For Surface Water, Ground Water, and Aquatic Resources VCs, TML must:	Update the Discharge Management Plan - Calcite Precipitation document to include: • How operation and a post-closure increase in conductivity in ponds and the receiving environment affect the Saturation Indices (SI) for calcite, and predictions for precipitation; • Accounting for higher pCO2 in groundwater, which is more likely to precipitate calcite; • Further accounting for increased calcite precipitation in instances where alkalinity and magnesium in the water increase; and • A separate calcite monitoring and management plan, which considers possible impacts and interactions of the use of antiscalants for reducing calcite precipitation, considering the high background conditions of aluminum in these watersheds.
OW-124	NEW	For Surface Water, Ground Water, and Aquatic Resources VCs, TML must:	Provide additional information and figures for the Water and Load Balance Model Report that we have not been able to locate, including: • Final figures presented in "Attachment IR 356-1 as the attachment with that name at the end of App F contains no information;

Comment ID	Master ITT Comment ID (BC EAO)	OW Comment from Feb 28 or Mar 12 Letters/Report	OW Recommendations from Feb 28 or Mar 12 Letters/Report
			• Figures for each of the requested scenarios in the IR (Tributary receiving discharge above confluence with Goathorn Creek, and Goathorn Creek below confluence with tributary receiving discharge) and projected water quality from baseline through to post-closure; • Updated figures from the WLBM report (Fig 2.2-2.4 of App 4.3) that originally showed incorrect connections of the three creeks (Four Creek, Tenas Creek, Goathorn Creek); and • TML's response to the IR, labelled "Final EA Water and Load Balance results", or Attachment IR 356-1.
OW-125	NEW	For Surface Water, Ground Water, and Aquatic Resources VCs, TML must:	Use climate change predictions in the understanding of potential impacts throughout the operation and post-closure periods (e.g., changes in flow and changes in stream temperature due to changes in flow and air temperature).
OW-126	NEW	For Surface Water, Ground Water, and Aquatic Resources VCs, TML must:	Resolve outstanding technical questions regarding PAG Rock management and seepage including: • If PAG rock is to be submerged prior to the onset of ARD/ML, why would seepage tailings facilities contain the products of ARD/ML? • How much seepage is expected out of tailings facilities, both in groundwater and in surface water?

4. CLOSING

Thank you again for providing Telkwa Mining with the opportunity to respond to the Water Quality IRs from ENV and MEMLI. Telkwa Mining believes the responses provided close out the information requests that fall under Items 1 through 8. If there are any further questions or concerns, please do not hesitate to contact me.

Sincerely Yours,

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Email: dan.farmer@telkwa-mining.ca
Phone: 778-643-2843
Cell: 604-220-5703

Cc: File

5. ATTACHMENTS

BC EAO AND OFFICE OF THE WET'SWUET'EN INFORMATION REQUESTS

Appendix 1: Tenas Project, Water and Load Balance Modeling Report (Updated 2025), SRK
Appendix 2: Tenas Project, Hydrometeorological Baseline and Model Development Report (Update 2025), SRK
Appendix 3: Geochemical Field Barrel Results Interpretation – Tenas Project, SRK
Appendix 4: Updated Water Quality Model Source Terms, SRK
Appendix 5: Tenas Project - Suboxic Evaluation of Non-Acid Generating Mine Rock, Okane
Appendix 6: Tenas Project Information Request Responses Related to Surface Water Valued Component, SRK
Appendix 7: Water and Wastewater Treatment Design Report and Bionest Assurance Letter, Radloff
Appendix 8: Tenas Project, Hydrogeology Technical Report, SRK
Appendix 9: Evaluation of Acute Daphnia Magna and Rainbow Trout LC50 Toxicity Supporting Tenas Project Best Available Technology Assessment Study – Parameters of Concern: Nitrite, Iron (Total) and Iron (Dissolved)
Appendix 10: Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, SRK
Appendix 11: Tenas Project Best Achievable Technology Assessment Updated, SRK
Appendix 12: Environmental Effects Assessment - Surface Water Valued Component

Appendix 13: Tenas Project, Initial Dilution Zone Assessment, SRK
Appendix 14: Tenas Coal Mine Information Request # 498, 500-504, and 520 - Expert Advice Regarding Fish and Fish Habitat Within the Project Area, Palmer Environmental
Appendix 15: Tenas Project, Mine Material Management Based on an NPR Cut-Off of 2.0, 1.80, 1.60, and 1.20, Telkwa Mining
Appendix 16: Telkwa Coal Tenas Project Environmental Assessment Application – Responses to 2022 Supplemental Geochemistry Information Requests from the Ministry of Energy, Mines and Low Carbon Innovation, SRK
Appendix 17: Metal Leaching/Acid Rock Drainage Management Plan, SRK
Appendix 18: Tenas Project Information Request Responses Related to Geotechnical Aspects, SRK
Appendix 19: Tenas Project Dam Breach Assessment Report, SRK
Appendix 20: PAG Management Alternatives Assessment, SRK
Appendix 21: Tenas Project Potential Acid Generating Material Storage Alternatives Assessment, SRK
Appendix 22: Tenas Project Information Request Responses from Office of the Wet'suwet'en – Final, SRK

APPENDIX 1: TENAS PROJECT, WATER AND LOAD BALANCE MODELING REPORT (UPDATED 2025), SRK

APPENDIX 2: TENAS PROJECT, HYDROMETEOROLOGICAL BASELINE AND MODEL DEVELOPMENT REPORT (UPDATE 2025), SRK

APPENDIX 3: GEOCHEMICAL FIELD BARREL RESULTS INTERPRETATION – TENAS PROJECT, SRK

APPENDIX 4: UPDATED WATER QUALITY MODEL SOURCE TERMS, SRK

APPENDIX 5: TENAS PROJECT - SUBOXIC EVALUATION OF NON-ACID GENERATING MINE ROCK, OKANE

APPENDIX 6: TENAS PROJECT INFORMATION REQUEST RESPONSES RELATED TO SURFACE WATER VALUED COMPONENT, SRK

APPENDIX 7: WATER AND WASTEWATER TREATMENT DESIGN REPORT AND BIONEST ASSURANCE LETTER, RADLOFF

APPENDIX 8: TENAS PROJECT, HYDROGEOLOGY TECHNICAL REPORT, SRK

APPENDIX 9: EVALUATION OF ACUTE DAPHNIA MAGNA AND RAINBOW TROUT LC50 TOXICITY SUPPORTING TENAS PROJECT BEST AVAILABLE TECHNOLOGY ASSESSMENT STUDY – PARAMETERS OF CONCERN: NITRITE, IRON (TOTAL) AND IRON (DISSOLVED)

APPENDIX 10: EFFECT OF MITIGATION CONTROLS ON WATER QUALITY AND QUANTITY OF THE TENAS PROJECT, SRK

APPENDIX 11: TENAS PROJECT BEST ACHIEVABLE TECHNOLOGY ASSESSMENT UPDATED, SRK

APPENDIX 12: ENVIRONMENTAL EFFECTS ASSESSMENT - SURFACE WATER VALUED COMPONENT

Tenas Steelmaking Coal Project

BC EAO EAC Application – Tenas Project

Section 4.0 Environmental Effects Assessment, Chapter 3
Surface Water Valued Component

December 2025

Version 3.0

Submitted to:	BC Environmental Assessment Office
Pursuant to:	Environmental Assessment Act, S.B.C. 2002, c. 43
Submitted by:	Telkwa Mining Limited, a wholly owned subsidiary of Bathurst Resources Limited Suite 1410 – 409 Granville Street Vancouver, BC V6C 1T2

EXECUTIVE SUMMARY

This chapter addresses the potential effects of the Tenas Project (Project) on the Surface Water Valued Component (VC). The purpose of this environmental effects assessment (assessment) is to analyse the potential changes to the surface water system because of the Project.

Surface Water was selected as a VC based on feedback from community stakeholders and Indigenous groups due to its intrinsic value, not only as a pathway but as a means of influencing other resources. The Project has the potential to interact with Surface Water Quantity and Quality, which are considered as separate subcomponents for the assessment.

Baseline characterisation of the Surface Water VC within the Local Study Area (LSA) and Regional Study Area (RSA) were facilitated through monitoring programs for streamflow and water quality, and encompasses datasets from Project-specific networks, regional networks (Water Survey of Canada, Environment and Climate Change Canada, and British Columbia Ministry of Environment and Climate Change Strategy) and technical reports from previous mining and environmental studies in the area.

A water and load balance model (WLBM) was developed to generate a continuous time series of monthly flows and parameter concentrations of water quality parameters for pre-mining and post-mining conditions and throughout the life-of-mine through the Year 2100. See Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report (Updated 2025). Hydrologic components of the model were calibrated to regional and local streamflow datasets and encompassed interactions between surface water and groundwater. Streamflow was generated on a daily timestep based on precipitation and temperature datasets, which included orographic gradient adjustments developed and discussed in Appendix 4.3-B Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2025). Both precipitation and temperature had additional adjustments to account for climate change through the Year 2100.

The load balance component was based on conservation of mass, assuming a fully mixed scenario at each Prediction Node and time step. Geochemical characterisation results were included to estimate mass of constituents released per mass of rock stored in various mine waste facilities. The in-stream water quality was calculated based on mixing of Project discharge with background loading, developed based on baseline monitoring of surface and groundwater quality. Baseline monitoring data and model results were screened against water quality guidelines.

Prediction Nodes were selected to represent expected conditions in the downstream environment and were evaluated in relation to the baseline condition, which estimates streamflow and quality through the Year 2100 without influence of the proposed Project.

An additional study was completed to evaluate the hydrology in Four Creek (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development). This study incorporated a dynamic streamflow model for Four Creek, that shows that this creek is perched and not connected to the deeper groundwater system. As such open pit dewatering is not expected to drawdown water flows in Four Creek.

The residual effects for Surface Water Quantity and Surface Water Quality were developed based on the following parameters as per the methodology that has been reviewed and approved by regulatory agencies: Magnitude, Geographic Extent, Duration, Frequency, Reversibility, and Context, along with the Likelihood, Significance, and Level of Confidence. Residual effects on Surface Water Quantity were evaluated using the following indicators:

- change in mean annual discharge (MAD);
- change in seasonal flow distribution; and
- change in low and high flows.

The Project is expected to change catchment areas and summer and winter streamflow from baseline conditions in the receiving environment. Modelling results found that the residual effects on Surface Water Quantity are limited to the downstream segments of Four Creek, within the LSA. The potentially affected watercourses represent up to 3.7 percent (%) and 5.3% of the LSA in the case of change in MAD and change to seasonal flow distribution, respectively.

No affected area was identified for change to low and high flows. Based on the characterisation criteria, the Magnitude of all potential residual effects on Surface Water Quantity is **Low** or **Moderate**, and residual effects are predicted to be **Not Significant** (i.e., not expected to result in a change within the RSA that will alter its integrity beyond an acceptable level).

Residual effects on Surface Water Quality were evaluated using the following indicators:

- change in parameter concentrations; and
- change in other measurable parameters.

Modelling results showed that the only parameter which could be expected to exceed both the water quality guideline and the streams natural variability (greater than the 95th percentile from baseline records) was dissolved cobalt, in the lower segments of Four Creek for a duration of four years. The cause of the exceedance is seepage from the East Management Pond. While the dynamic streamflow model for Four Creek has shown that the majority of the creek is perched above the groundwater table (Appendix 4.3-B Tenas Project, Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development, SLR Consulting), the lower reach is not perched and may experience exceedances of the cobalt guideline, based on the WLBM results.

The catchment area contributing to the lower reach of Four Creek is therefore defined as being affected by the Project. Based on the characterisation criteria, the Magnitude of the potential residual effect on Surface Water Quality for the change in modelled parameters is Low, and residual effects are predicted to be **Not Significant** (i.e., not expected to result in a change within the RSA that will alter its integrity beyond an acceptable level).

Seepage from management ponds is expected to produce elevated levels of total dissolved solids and specific conductance relative to baseline monitoring, in Tenas and Four creeks, along with discharge from the North Management Pond into Goathorn Creek, in the Post-closure Phase. The elevated levels in Tenas and Four creeks are within 10% of the natural variability from the baseline monitoring record (i.e. within 10% of the 95th percentile value).

The levels in Goathorn Creek, however, are expected to remain above the 95th percentile value from baseline monitoring through the Post-closure Phase. The catchment area from this portion of Goathorn Creek is therefore defined as being affected by the Project. Based on the characterisation criteria, the Magnitude of the potential residual effect on Surface Water Quality for the change in other measurable water quality parameters is Low, and residual effects are predicted to be **Not Significant** (i.e., not expected to result in a change within the RSA that will alter its integrity beyond an acceptable level).

Considering the results of the environmental effects assessment, the Project effects on the Surface Water VC are predicted to be **Not Significant** (i.e., not expected to result in a change in the RSA that will alter its integrity beyond an acceptable level).

The cumulative effects assessment (CEA) included a review of potential effects on the Surface Water VC due to the Project's residual effects overlapping both spatially and temporally with the same residual effects resulting from other projects and activities. Projects included in the assessment for the cumulative effects on the Surface Water VC based on spatial and temporal interaction were proposed mining, forestry, agricultural, and urban activities.

Planned and/or current projects and activities are located outside of the Project's LSA but within the Project's RSA in the watersheds of the Telkwa and Bulkley rivers. The proposed projects are expected to occupy a small portion of either watershed, and like the Project, their residual effects on the Telkwa and Bulkley Rivers are expected to be minor. Additional mitigation measures beyond those considered in the assessment of Project-related effects are not expected to be necessary to avoid or minimize predicted cumulative effects on the Surface Water VC and its subcomponents; Surface Water Quantity; and Surface Water Quality.

Based on the available information supporting each reasonably foreseeable future project and current projects and activities, the Magnitude of the cumulative effects is expected be Low, since less than 5% of the RSA would be affected. Effects in the RSA would be expected to be of Short

Duration and Infrequent, and are predicted to be **Not Significant (**i.e., not expected to result in a change in the RSA that will alter its integrity beyond an acceptable level).

Monitoring programs will be used to gauge the performance of the Project water management system and mitigation measures against model results and regulatory commitments. When changes relative to modelling results are observed, appropriate solutions will be developed using adaptive management and applied in a timely manner.

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
AGRA	AGRA Earth and Environmental Ltd.
AIR	Application Information Requirements
AP	acid potential
AQMP	Air Quality Management Plan (S13.0-C2)
BAT	best achievable technology
BC	British Columbia
BC AWQG	British Columbia Approved Water Quality Guidelines
BC EAO	British Columbia Environmental Assessment Office
BC MECCS	British Columbia Ministry of Environment and Climate Change Strategy
BC MELP	British Columbia Ministry of Environment, Lands and Parks
BC MEM	British Columbia Ministry of Energy and Mines
BC MEMLI	British Columbia Ministry of Energy, Mines and Low Carbon Innovation
BC MFLNRO	British Columbia Ministry of Forests, Lands and Natural Resources Operations
BC MOE	British Columbia Ministry of Environment
BC WWQG	British Columbia Working Water Quality Guidelines
BMPs	best management practices
c.	Chapter
CCME	Canadian Council of Ministers of Environment
CCME WQG	Canadian Environmental Quality Guidelines, published by Canadian Council of Ministers of the Environment
CEA	Cumulative Effects Assessment
CEMP	Construction Environmental Management Plan (S13.0-C4)

Acronym/Abbreviation	Definition
CMSTHP	Chemicals and Materials, Storage, Transfer, and Handling Plan (S13.0-C3)
CPP	Coal Processing Plant
CUS	Cultural Use Study
DEM	Digital Elevation Model
DMP	Discharge Management Plan (S13.0-C5)
EA	Environmental Effects Assessment
EAA	*Environmental Assessment Act*, SBC 2002, c 43 (Government of British Columbia [GovBC] 2002)
EAC	Environmental Assessment Certificate
ECCC	Environment and Climate Change Canada
EC	electrical conductivity
EDP	Effluent Discharge Permit
EMA	*Environmental Management Act*, SBC 2003, c. 53 (Government of British Columbia [GovBC] 2003)
EMP	Explosives Management Plan (S13.0-C6)
EMS	Environmental Management System (S13.0-C1)
FEQG	Environment Canada and Climate Change Federal Environmental Quality Guidelines
FMSCP	Fuel Management and Spill Control Plan (S13.0-C7)
FSR	Forest Service Roads
GovBC	Government of British Columbia
GovCan	Government of Canada
IDZ	Initial Dilution Zone
ISO	International Standards Organization
LIDAR	Light Detection and Ranging
LSA	Local Study Area

Acronym/Abbreviation	Definition
MA/EMA	*Mines Act*, RSBC 1996, c 293, and *Environmental Management Act*, SBC 2003, c 53
MAD	mean annual discharge
Manalta	Manalta Coal Ltd.
ML/ARD	metal leaching/acid rock drainage
ML/ARDMP	Metal Leaching (ML)/Acid Rock Drainage (ARD) Management Plan (S13.0-C12)
MWMP	Minesite Water Management Plan (S13.0-C11)
NP	neutralizing potential
NPR	neutralization potential ratio
non-PAG	non-potentially acid generating
NSE	Nash-Sutcliffe Efficiency
OW	Office of the Wet'suwet'en
PAG	potentially acid generating
PAH	polycyclic aromatic hydrocarbons
PCIC	Pacific Climate Impact Consortium
Piteau	Piteau Engineering Ltd.
POC/COC	Parameters of Concern/Contaminants of Concern
POPC/COPC	Parameters of Potential Concern/Contaminants of Potential Concern
Project	Tenas Project
RCP	Reclamation and Closure Plan (S13.0-C15)
ROM	run-of-mine
ROW	right-of-way
RSA	Regional Study Area
S	Section
SC	specific conductance

Acronym/Abbreviation	Definition
SEPSCP	Surface Erosion Prevention and Sediment Control Plan (S13.0-C17)
TAC	Tenas Access Corridor
TARP	Trigger Action Response Plan
TCP	Tenas Control Pond
TDS	total dissolved solids
TK	Traditional Knowledge
TML	Telkwa Mining Limited
TSA	Timber Supply Area
TSS	total suspended solids
UTM	Universal Transverse Mercator
VC	Valued Component
WLBM	water and load balance model
WMPRE	Waste Management Plan for Refuse and Emissions (S13.0-C20)
WQG	Water Quality Guideline
WQS	Water Quality Station
WSC	Water Survey of Canada

UNITS OF MEASURE

Unit Abbreviation	Definition
%	percent
µS/cm	micro Siemens per centimetre
cm	centimetre
ha	hectare
km	kilometre
km^2	square kilometre
kV	kilovolt
$L/s/km^2$	litre per second per square kilometre
m	metre
masl	metres above sea level
mg/L	milligram per litre
mg-$CaCO_3$/L	milligrams of calcium carbonate per litre
mg-N/L	milligrams nitrate per litre
mm	millimetre
P50	50th percentile
P95	95th percentile
V	volt

1. INTRODUCTION

This chapter presents the identification and environmental effects assessment (assessment) of the potential for residual effects of the Tenas Project (Project) and the cumulative effects on the Surface Water Valued Component (VC) in a thorough, rigorous, and concise manner. For this Environmental Assessment Certificate (EAC) Application, the Surface Water VC is represented by two (2) subcomponents: Surface Water Quantity, and Surface Water Quality.

This assessment is comprised of the following steps:

- **Regulatory Context:** A description of the applicable legislation, policies, standards, and guidelines pertaining to the protection of the Surface Water VC;
- **Scope of the Assessment:** A description of the assessment scope including issues scoping, rationale for the selection of the Surface Water VC, subcomponents and indicators, and definition of the assessment boundaries;
- **Existing Conditions:** A description of the baseline studies undertaken for the Project, other relevant information, and descriptions of the Surface Water VC within the defined spatial boundaries;
- **Assessment of Project-related Effects:** A description of the potential interactions between the Project and the Surface Water VC, potential effects, proposed mitigation measures, an evaluation of potential residual effects that remain following implementation of the proposed mitigation measures, and an assessment of the significance of these potential residual effects;
- **Cumulative Effects Assessment (CEA):** A description of the residual effects of the Project in combination with the residual effects of past, present, and reasonably foreseeable future projects, and activities, (if/where necessary) the development of additional mitigation measures to eliminate, reduce, or control cumulative effects and an assessment of the cumulative effects on the Surface Water VC and their significance; and
- **Follow-up Strategy:** A presentation of monitoring programs to verify assessment predictions and evaluate mitigation effectiveness, and a discussion of adaptive management program(s) to be implemented to address any unexpected Project effects on the Surface Water VC.

2. REGULATORY CONTEXT

The Tenas Project Application Information Requirements (AIR) for the Project, approved by the British Columbia Environmental Assessment Office (BC EAO) in 2022, outlines the requirements of the Surface Water VC assessment to meet both requirements under the *Environmental Assessment Act*, SBC 2002, c 43 (Government of British Columbia [GovBC] 2002) (EAA).

Water use for the Project is subject to the provincial *Water Sustainability Act*, SBC 2014, c 15 (GovBC 2014) via a license for the use of surface and/or groundwater. The Project is expected to be subject to the federal *Fisheries Act*, RSC, c. F-14 (Government of Canada [GovCan] 1985b) and through the future *Coal Mining Effluent Regulations* which are currently in development (GovCan 2021), as well as the provincial *Environmental Management Act*, SBC 2003, c. 53 (GovBC 2003) (EMA); via a Waste Discharge Authorization (permit).

In the British Columbia (BC) provincial jurisdiction, limits for discharge of treated or excess water to the environment may be specified in an Effluent Discharge Permit (EDP) issued by the British Columbia Ministry of Environment and Climate Change Strategy (BC MECCS) under the provincial EMA, in addition to established surface Water Quality Guidelines (WQG) for receiving environments. In advance of an EDP, the long-term average BC Approved Water Quality Guidelines or BC AWQG (BC MECCS 2019) and the British Columbia Working Water Quality Guidelines (BC WWQG) (BC MECCS 2021) for freshwater aquatic life were applied for the evaluation of results from the load balance. The Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CCME WQG) (CCME 2014) were applied for parameters for which there is no BC AWQG or BC WWQG established, where appropriate. For the comparison of the modelled discharge water quality after active water treatment to the final EA Project Case, the British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary. Water Quality Guideline Series, WQG-20. (British Columbia Ministry of Water, Land, and Resource Stewardship 2025) was used.

The proposed *Coal Mining Effluent Regulations* (GovCan 2021) are expected to specify end-of-pipe limits for total suspended solids (TSS), nitrate, and selenium for new and existing coal mines. In advance of the regulations, Project-specific end-of-pipe limits have been proposed to meet the in-stream WQG in the receiving environment.

Table 2-1 presents a summary of relevant provincial and federal statutory guidance documents and policies related to potential Project-related effects on the Surface Water VC.

Table 2-1: Surface Water Legislation, Regulation, Policy, Standards, and Guidelines

Name	Year	Description
British Columbia Field Sampling Manual (British Columbia Ministry of Environment [BC MOE] 2013a)	2013	Provides standard protocols for sampling quality control and assurance, procedures, and equipment that must be followed by permit holders for environmental monitoring and sample collection. Part E Water and Wastewater Sampling, Ambient Freshwater and Effluent Sampling provide specific details for water sampling, including location and frequency.
British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary. Water Quality Guideline Series, WQG-20 (British Columbia Ministry of Water, Land, and Resource Stewardship 2025)	2025	Water quality guidelines are defined as the maximum or minimum physical, chemical, or biological characteristics of water, biota, or sediment that are predicted to be protective of specific water values and are applicable province wide. The guidelines are intended to provide science-based policy direction to prevent detrimental effects on the health of aquatic ecosystems and terrestrial species under specified environmental conditions. This summary specifically establishes criteria for the protection of freshwater and marine aquatic life, wildlife, and agricultural uses including livestock watering and irrigation.
British Columbia Water Quality Guidelines (Approved and Working) (British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2019, 2021)	2019, 2021	Water quality criteria are defined as maximum or minimum physical, chemical, or biological characteristics of water, biota, or sediment; and are applicable province wide. The guidelines are intended to prevent detrimental effects on water quality or aquatic life, under specified environmental conditions. Guidelines for drinking water supply and wildlife water supply.
Water Sustainability Act, SBC 2014, c. 15 (GovBC 2014)	2014	Regulates water rights and use in the province. Changes in and about a stream may be made only with an approval under section 11 of the Act and section 4 of the *Water Sustainability Regulation*, BC Reg 36/2016 (GovBC 2016), or through a notification, where applicable. The Act also provides special protection for designated sensitive streams in British Columbia (BC).

Name	Year	Description
Canada Water Act, RSC 1985, c. C-11 (Government of Canada [GovCan] 1985a)	1985	Management of the water resources including research and the planning and implementation of programs relating to the conservation, development, and utilization of water resources.
Canadian Council of Ministers of Environment (CCME) Water Quality Guidelines (CCME 2014)	2014	Environmental quality guidelines are intended to protect, sustain, and enhance the quality of the Canadian environment. Each authority determines the degree to which it will adopt CCME recommendations and guidelines should not be regarded as blanket values for national environmental quality; users of guidelines consider local conditions and other supporting information during the implementation. Science-based site-specific criteria, guidelines and objectives or standards may differ from the Canadian guidelines.
Environmental Management Act SBC 2003, c. 53 (GovBC 2003) (EMA)	2003	Prohibits pollution of the environment and requires authorization to introduce waste into the environment or "prescribed" industry, trade, businesses, Operations, and activities
Fisheries Act, RSC 1985, c. F-14 (GovCan 1985b)	1985	The Act prohibits causing serious harm to fish that are part of or support a commercial, recreational, or Aboriginal fishery (section 35); makes provisions for flow and passage (section 20 and 21); provides a framework for regulatory decision-making (section 6 and 6.1).
Guidelines for Metal Leaching and Acid Rock Drainage in British Columbia (Price et al. 1998)	1998	Describes generic requirements and outlines common errors, omissions, and constraints. Assist mines in the development of comprehensive proposals that include the necessary documentation and consideration of risk for sound environmental management.
Manual of British Columbia Hydrometric Standards (British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2018)	2018	Defines a set of standards with detailed procedures for acquiring water quantity data, assessing the data, and qualifying and quantifying data grades.
Mines Act, RSBC 1996, c. 293 (GovBC 1996b)	1996	The Act and the associated Health, Safety and Reclamation Code for Mines in British Columbia (British Columbia Ministry of Energy, Mines and

Name	Year	Description
		Low Carbon Innovation [BC MEMLI] 2021) (Code) requires that mines have programs for the environmental protection of watercourses throughout mine life, including plans for prediction and prevention of metal leaching and acid rock drainage, and prevention of erosion and sediment release. Watercourses are required to be reclaimed, and the Ministry has the authority to require monitoring and/or remediation programs to protect watercourses and water quality.
Policy for Metal Leaching and Acid Rock Drainage at Mine Sites in British Columbia (British Columbia Ministry of Energy and Mines [BC MEM] and British Columbia Ministry of Environment, Lands and Parks [BC MELP])	1998	Outlines the process for determining the potential for metal leaching and acid rock drainage, and measures to prevent or reduce its occurrence to satisfy conditions of the *Mines Act*, RSBC 1996, c. 293 (GovBC 1996b).
Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators (BC MOE 2012)	2012	Outline and define the baseline study requirements and information considerations necessary to propose a mineral development project in BC. Covers information requirements for surficial hydrology, water quality (physical and chemical parameters), aquatic sediments, tissue residues and aquatic life.
Water Protection Act, RSBC 1996, c. 484 (GovBC 1996c)	1996	Under the Act the ownership of water is vested in the Crown; the Act provides statutes governing the allocation of water licenses and controls the use of freshwater in the BC. The Act also includes environmental protection for waters flowing in a stream, lake, or other surface water body.

The following sources were reviewed for applicability, but were determined to not contain the most recent/relevant information:

- *Canadian Environmental Protection Act*, S.C. 1999 (GovCan 1999); and
- British Columbia Environmental Laboratory Manual (British Columbia Ministry of Environment [BC MOE] 2020).

3. SCOPE OF THE ASSESSMENT

The assessment of Surface Water VC, including the assessment of Project-related effects and cumulative effects, was conducted according to the methods set out in the approved Section (S) 3.0 Assessment Methodology of this EAC Application. The assessment boundaries specific to the Surface Water VC are provided in 3.2.4 Assessment Boundaries and the characterisation criteria specific to the Surface Water VC are provided at the start of 5.4 Residual Effects and Significance of Residual Effects.

This subsection outlines the scope of the assessment, including the rationale for the inclusion of Surface Water as a VC along with its subcomponents, the selection of indicators, and the definition of spatial and temporal boundaries. This assessment is organized into two (2) subcomponents: Surface Water Quantity, and Surface Water Quality (3.2.2 Subcomponents).

The assessment focuses on characterising Project-related interactions on surface water systems, in terms of Water Quantity and Water Quality at the local and regional level, supported by site-specific data and modelling. The assessment was informed by baseline studies and monitoring campaigns, as well as water and load balance modelling of expected Project conditions. The assessment was conducted according to the methods set out in S3.0 Assessment Methodology of the EAC Application. The scope was defined through the AIR as well as input from Indigenous groups, the public and government agencies through working groups and comment solicitation. The scope was developed by identifying indicators, spatial and temporal boundaries, and assessment cases to identify potential interactions between the Project and the VC, along with residual and cumulative effects.

3.1 ISSUES SCOPING

Telkwa Mining Limited (TML) has undertaken an engagement and consultation process to support the scoping of issues for the Project. Refer to S11.0 Wet'suwet'en Rights and Interests Assessment and S12.0 Public Consultation of this EAC Application for details on the consultation program). The consultation and engagement process has included technical working groups established with Indigenous groups and government departments, community meetings, one-on-one and small group meetings, regarding key themes of interest and discussion of candidate VCs to represent the themes of interest.

3.2 RATIONALE FOR SELECTION OF SURFACE WATER VALUED COMPONENT

The Surface Water VC and associated subcomponents were selected during the pre-Application phase of the Project following the VC selection process set out in 3. Scope of the Assessment and using the methodology provided in the Guideline for Selection of Valued Components and

Assessment of Potential Effects (BC EAO 2013). The goal was to focus on relevant issues, concerns, and components of the natural and human environment that may be affected by the Project.

Surface water is a key component of the environment that was considered in the assessment for the Project, as it is linked to fish and aquatic habitat, as well as terrestrial resources and health, and human health. Both Surface Water Quantity, and Surface Water Quality were evaluated as part of the Surface Water VC.

To inform the assessment of the effects of the Project on the Surface Water VC, five (5) watercourses were considered:

1. Tenas Creek;
2. Four Creek;
3. Goathorn Creek;
4. Telkwa River; and
5. Bulkley River.

These watercourses were selected for their proximity to Project infrastructure and the potential for Project interactions. Modelling incorporated the various Prediction Nodes along each watercourse which were specifically selected to capture the Project effects.

The Tenas Access Corridor (TAC) will cross Helps Creek and its tributaries. The potential effects on Helps Creek and its tributaries are limited to road dust and are expected to be isolated and limited. For this reason, Helps Creek and its tributaries has not been evaluated for the purpose of the assessment as it relates to the Surface Water VC.

3.2.1 Valued Component

Surface Water was identified as a VC based on feedback from the Office of the Wet'suwet'en (OW), regulatory agencies, and other community stakeholders due to its intrinsic value, not only as a pathway but as a means of influencing other resources. The Project will require that non-contact and/or contact water be diverted away from streams and discharged at controlled locations outside of the natural flow pathways for these streams, which may affect stream water quantity. Storage of water in reservoirs or excavation of open pits will affect the natural groundwater regime, which could also affect streamflow. Exposed material from open pit mining and material placement has the potential to alter the water quality of streams both directly by overland flow and/or indirectly via groundwater.

Surface water is dependent on and/or supports (i.e., is input to) the assessment of several VCs:

- **Dependent on:**
  - **Atmospheric Environment VC (S4.0-C1)** – Atmospheric environment interacts with surface water through dust deposition and in distinguishing precipitation between rainfall and snowfall;
  - **Terrain and Soils VC (S1.0-C2)** – Terrain and soils interact with surface water by contributing to landscape form and function which influences infiltration and runoff rates; and
  - **Groundwater VC (S4.0-C4)** – Groundwater interacts with surface water by contributing to site drainage and discharge, moisture regimes, and water chemistry.

- **Supporting:**
  - **Aquatic Resources VC (S4.0-C5)** – Surface water contributes to ecosystem form and function that support aquatic resources (e.g., habitat area, flow characteristics, suitable water quality);
  - **Fish and Fish Habitat VC (S4.0-C6)** – Surface water contributes to ecosystem form and function that support fish and fish habitat (e.g., habitat area, flow characteristics, suitable water quality);
  - **Vegetation VC (S4.0-C3)** – Surface water interacts with vegetation by contributing to site drainage and discharge and moisture regimes, which influence the persistence of vegetation, ecosystems, and wetlands;
  - **Wildlife VC (S4.0-C8)** – Surface water is consumed by wildlife and is part of the exposure pathway from environment to wildlife;
  - **Avian Species VC (S4.0-C9)** – Surface water provides habitat for feeding, reproduction, rearing, and/or cover for avian species;
  - **Land and Resource Use VC (S6.0-C4)** – Surface water provides resource values such as recreation, fishing, and transportation; and
  - **Human Health VC (S8.0-C1)** – Surface water can be consumed or in direct contact with humans and is part of the exposure pathway from environment to humans.

3.2.2 Subcomponents

During the VC scoping exercise two (2) subcomponents were selected to focus the Surface Water VC assessment on key themes of interest identified through consultation and engagement, and reviews of other information. The subcomponents of the Surface Water VC are:

- Surface Water Quantity: The Project will require that water be diverted away from streams and discharged at controlled locations outside of the natural flow pathways,

which may affect stream water quantity. Storage of water in reservoirs or excavation of pits will affect the natural groundwater regime, which could also affect streamflow; and

- Surface Water Quality: Exposed rock from open pit mining and waste placement has the potential to alter the water quality of streams.

Subcomponents and linkages are summarized in Table 3.2-1.

Table 3.2-1: Summary of Rationale for Selection of Surface Water Valued Component and Subcomponents and Their Linkages

Subcomponent	Rational for Inclusion	Source of Information	VC Linkages	
Surface Water Quantity	The Project has the potential to affect surface water quantity which could affect fish and fish habitat, aquatic resources, vegetation, land and resource use and wildlife.	• Issues scoping • Government agency • Traditional Knowledge	Dependent on: • Atmospheric Environment • Terrain and Soils • Groundwater	Supporting: • Aquatic Resources • Fish and Fish Habitat • Wildlife • Vegetation • Avian Species • Land and Resource Use • Human Health
Surface Water Quality	The Project has the potential to affect surface water quality which could affect fish and fish habitat, aquatic resources, human health, wildlife, vegetation, and avian species.			

Notes: Project=Tenas Project; VC=Valued Component

3.2.3 Indicators

Indicators are quantitative or qualitative measures used to describe existing VC and/or VC subcomponents' conditions and trends, and to evaluate potential Project effects and cumulative effects on the VC.

The Surface Water VC assessment follows the structure indicated in the Project AIR (BC EAO 2022) and uses the indicators listed in Table 3.2-2.

Table 3.2-2: Indicators of Surface Water Valued Component

Indicator	Rationale for Selection
Surface Water Quantity	
Change in Mean Annual Discharge (MAD)	The Tenas Project (Project) has the potential to change the MAD of streams.
Change in seasonal flow distribution	The Project has the potential to change the flow distribution throughout the year (i.e., monthly average streamflow).
Change in low flows and high flows	The Project has the potential to change the magnitude of low flows and high flows.
Surface Water Quality	
Change in modelled parameter concentrations	The Project may result in a change in parameter concentrations based on model results. Total and dissolved elements, anion/nutrients and hardness are measured based on concentrations.
Change in other measurable water quality parameters.	The Project may result in other water quality parameters beyond those modelled, including a change in stream temperature, pH, and alkalinity, turbidity, and total suspended solids (TSS), specific conductance (SC) and total dissolved solids (TDS), and polycyclic aromatic hydrocarbons (PAHs), relative to baseline conditions.

3.2.3.1 Water Quality Guidelines

The assessment for the Surface Water VC used published WQGs for screening purposes to identify potential parameters of potential concern (POPC) and parameters of concern (POC). The WQGs used for screening included the following sources and were used in the following order:

1. British Columbia Ambient Water Quality Approved Guidelines, specifically for freshwater aquatic life (BC AWQGs) (BC MECCS 2019);
2. British Columbia Ambient Water Quality Working Guidelines, specifically for freshwater aquatic life (BC WWQGs) (BC MECCS 2021);
3. Canadian Environmental Quality Guidelines, published by Canadian Council of Ministers of the Environment (CCME WQGs) (CCME 2014, 2022); and
4. Environment and Climate Change Canada (ECCC) Federal Environmental Quality Guidelines (FEQGs) (ECCC 2021).

Some parameters required that the guideline be calculated using baseline water quality, including the pH, hardness, and dissolved organic carbon concentration. Where this was required, baseline median statistics for each stream were used to define the stream specific guideline (refer to 4.2.4 Surface Water Quality Baseline Conditions).

Long-term average water quality guidelines for the protection of freshwater aquatic life as described above are herein referred to as the Guidelines, are summarized in Table 3.2-3 for each selected watercourse.

Table 3.2-3: Long-term (30-day average) Water Quality Guidelines for Freshwater Aquatic Life in Receiving Environments

Parameter	Units	Water Quality Guideline by Stream (mg/L)				
		Tenas Creek	Four Creek	Goathorn Creek	Telkwa River	Bulkley River
Total Suspended Solids	mg/L	35	35	35	35	35
Chloride	mg/L	150	150	150	150	150
Fluoride	mg/L	1.22	1.37	1.19	1.0	0.84
Ammonia, total*	mg-N/L	1.3	1.0	1.6	1.7	1.6
Nitrate	mg-N/L	3	3	3	3	3
Nitrite*	mg-N/L	0.02	0.02	0.02	0.02	0.02
Sulphate*	mg/L	218	309	218	218	128
Aluminum, total*	mg/L	0.35	0.69	0.27	0.19	0.18
Antimony, total	mg/L	0.074	0.074	0.074	0.074	0.074
Arsenic, total	mg/L	0.005	0.005	0.005	0.005	0.005
Barium, total	mg/L	1	1	1	1	1
Beryllium, total	mg/L	0.00013	0.00013	0.00013	0.00013	0.00013
Boron, total	mg/L	1.2	1.2	1.2	1.2	1.2
Cadmium, dissolved*	mg/L	0.00017	0.00023	0.00016	0.00011	0.00009
Chromium (Cr VI), total	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025

Parameter	Units	Water Quality Guideline by Stream (mg/L)				
		Tenas Creek	Four Creek	Goathorn Creek	Telkwa River	Bulkley River
Cobalt, dissolved	mg/L	0.00045	0.00056	0.00045	0.00039	0.00039
Copper, dissolved*	mg/L	0.0026	0.0047	0.0013	0.0008	0.0011
Iron, total	mg/L	1	1	1	1	1
Iron, dissolved	mg/L	0.35	0.35	0.35	0.35	0.35
Lead, dissolved*	mg/L	0.0031	0.0061	0.0026	0.0022	0.0022
Manganese, total*	mg/L	0.94	1.09	0.91	0.79	0.73
Mercury, total**	mg/L	0.00002	0.00002	0.00002	0.00002	0.00002
Molybdenum, total	mg/L	0.034	0.034	0.034	0.034	0.034
Nickel, dissolved*	mg/L	0.003	0.005	0.002	0.001	0.001
Selenium, total	mg/L	0.002	0.002	0.002	0.002	0.002
Strontium, dissolved	Mg/L	2.5	2.5	2.5	2.5	2.5
Silver, total*	mg/L	0.00005	0.0015	0.00005	0.00005	0.00005
Thallium, total	mg/L	0.00003	0.00003	0.00003	0.00003	0.00003
Uranium, total	mg/L	0.0085	0.0085	0.0085	0.0085	0.0085
Zinc, dissolved*	mg/L	0.0071	0.0139	0.0074	0.0042	0.0039

Notes: mg/L=milligram per litre; mg-N/L=milligram of nitrogen as nitrate or nitrite or ammonia per litre

*Guidelines (BC MECCS 2019, 2021, CCME 2014) determined by baseline receiving water quality, presented in Table 4.2-6 to account for hardness and other parameters which modify the guidelines for site specific conditions.

**Assuming methyl mercury is ≤ 0.5% of total mercury. The guideline for total mercury is dependent on the methyl mercury concentrations of the receiving environment, which is not measured in the baseline data. The mid-range guideline was selected, which assumes a concentration of MeHg that is 1% of total mercury. Since the lowest limit is below the detection limit of the baseline monitoring data.

3.2.4 Assessment Boundaries

This subsection identifies the spatial and temporal boundaries established for the assessment of the Surface Water VC. These boundaries were delineated to encompass the area within, and times during which, the Project is expected to interact with the Surface Water VC.

3.2.4.1 Spatial Boundaries

Three (3) spatial boundaries were delineated for the Surface Water VC assessment: the Project Area, the Local Study Area (LSA) and the Regional Study Area (RSA) (Table 3.2-4 and Figure 3.2-1).

The Project Area covers 18.6 square kilometres (km^2) and refers to the maximum area within which the Project will be constructed and operated, including the Minesite and access routes. The Project Area is described in detail in S3.0-Chapter (C) 1-3 Assessment of Boundaries. The Project Area is a conservative spatial estimate of the area of direct Project effects on the Surface Water VC to inform this assessment.

The Surface Water LSA is defined as the area where direct discharges occur to watercourses within the vicinity of the Minesite (e.g., Tenas Creek, Four Creek, and Goathorn Creek) to the edge of the mixing zone in the Telkwa River, and the Bulkley River downstream of the Rail Loadout. The LSA is 208.3 km^2 in area and incorporates the Project Area.

The Surface Water RSA was confirmed through modelling and extends approximately 2 kilometres (km) downstream of the Bulkley River confluence with the Telkwa River which captures Water Quality Station (WQS) monitoring location WQS12. The RSA is 1,430 km^2 in area and includes the Telkwa River catchment area to be consistent with other VC boundaries. The RSA continues upstream of the confluence of the Telkwa River to the Bulkley River at Quick Water Survey of Canada (WSC) station (08EE004), which captures conditions upstream of the Rail Infrastructure Area. The Bulkley River catchment area upstream of the WSC station Bulkley River at Quick was not included as part of the RSA. This decision was based on the relative difference between the size of the Bulkley River catchment area (approximately 7,340 km^2 at the Bulkley River at Quick WSC hydrometric station) relative to the Project Area.

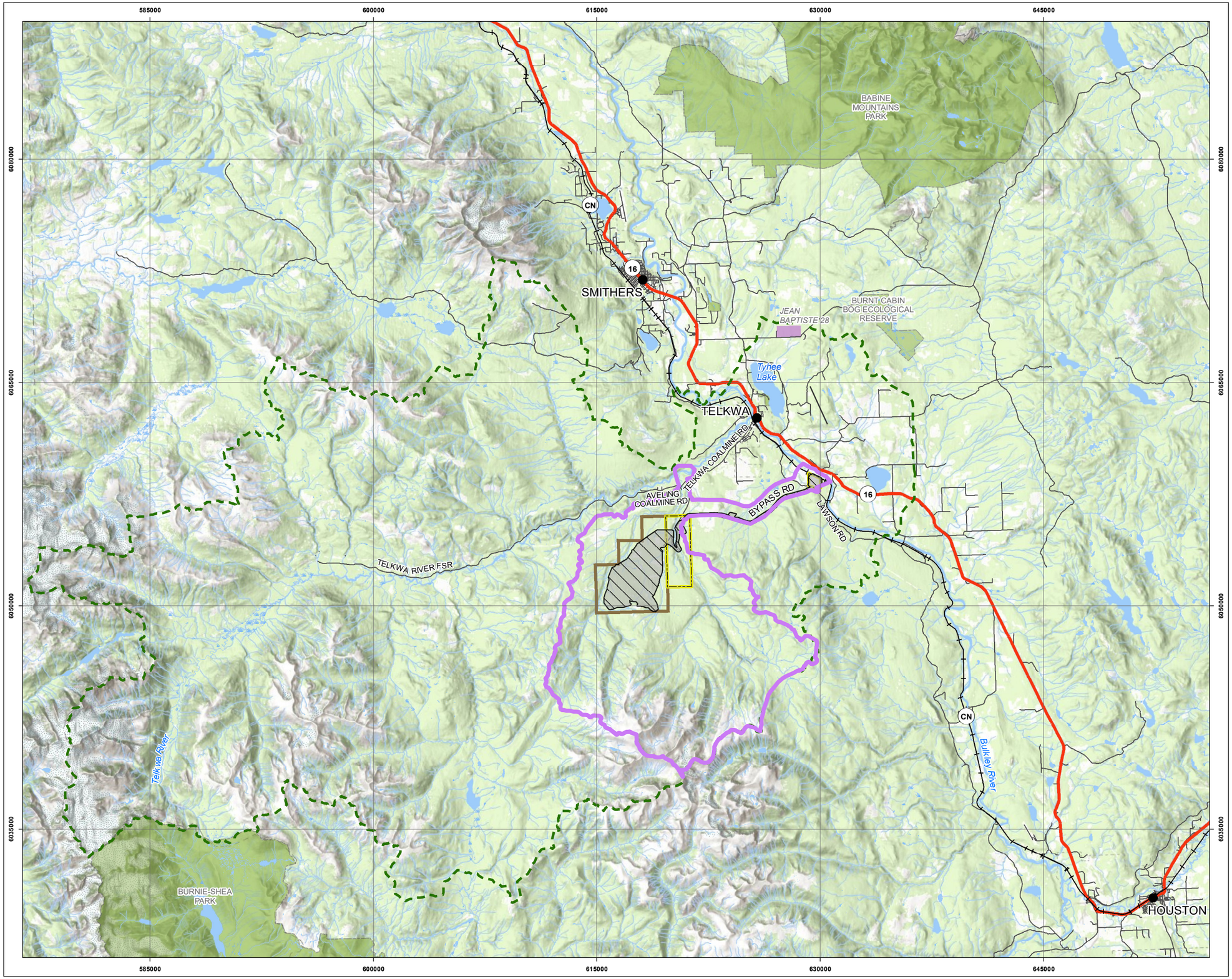
The spatial boundaries delineated for the Surface Water VC are described in Table 3.2-4 and shown in Figure 3.2-1.

Table 3.2-4: Spatial Boundary Definitions for Surface Water Valued Component

Spatial Boundary	Description of Study Area
Project Area	Maximum disturbance area within which the Tenas Project (Project) will be constructed and operated
Local Study Area (LSA)	A 208.3 square kilometre (km^2) area delineated by the watersheds of the Tenas Creek, and Goathorn Creek, including the Project Area.
Regional Study Area (RSA)	A 1,430 km^2 area defined based on the Telkwa River watershed and in the tributaries to the Bulkley River crossed by the Tenas Access Corridor (TAC).

Tenas Project

Local and Regional Study Areas for Surface Water Valued Component



Legend

- City/Town
- Rail Line
- Highway
- Road
- Discharge Path
- Watercourse
- LSA Boundary
- RSA Boundary
- Wetland
- Waterbody
- Park or Protected Area
- First Nation Reserve
- Tenas Coal Licenses
- Telkwa Coal Limited Private Property

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Area: Allegiance Coal, April 21, 2021
- Basedata: Government of British Columbia
- Basemap: World Topo Base

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TELKWA COAL LIMITED

srk consulting

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3.2.4.2 Temporal Boundaries

The assessment includes analyses for the Construction, Operation, Decommissioning and Reclamation, and Post-closure phases of the Project, as described in S1.0 Overview of Project Proponent Description of the EAC Application. The relevant time periods used for the Surface Water assessment are presented in Table 3.2-5.

The modelling to inform the assessment for surface water extends to the Year 2100, which is the current projection extent of global climate change models. Monitoring through the Post-closure Phase is not anticipated to be required through the Year 2100; however, model results in terms of potential effects are presented for this period.

Table 3.2-5: Temporal Boundaries for the Tenas Project

Phase	Year	Duration (years)	Description of Activities
Construction	-0.5 to 0	1.5	Site clearing, soil salvage, open pit development, building construction, service and haul road development, Rail Infrastructure construction, bridge construction and development of onsite utilities and services. Development of mine rock, and overburden storage piles, stockpiling of reclamation material such as soil, overburden, and other materials suitable for reclamation. Development of water management systems and management ponds for storage of potentially acid generating (PAG) materials.
Operation	1 to 21	21	Development of the open pit through drilling, blasting, loading, and hauling functions. Development of mine rock, and overburden storage piles, stockpiling of reclamation material such as soil, overburden, and other materials suitable for reclamation. Development of water management systems and management ponds for PAG storage. Conducting coal processing, stockpiling of raw coal prior to processing, and stockpiling of processed coal prior to shipping. Progressive reclamation will be accomplished during operation including, where available, reclamation activities such as sloping, topsoil placement and revegetation.

Phase	Year	Duration (years)	Description of Activities
Decommissioning and Reclamation	22 to 25	4	Tear-down of infrastructure onsite plus reclamation activities, including sloping of storage piles, backfill materials, and placement of reclamation materials including growth media, overburden and non-PAG rock for management pond covers and revegetating surfaces that are planned to be reclaimed.
Post-closure	26 to 50	10	Active: This involves the filling of the open pit with water, monitoring of vegetation growth and water quality for both groundwater and surface water and wildlife. Control and sedimentation ponds may still be needed for settling of total suspended solid levels. The management ponds are left as dry land reclamation except for portions that will be left as open water.
		15	Passive: This stage is when the control and sedimentation ponds are no longer required for settling of total suspended solid (TSS) levels and the management ponds are left as dry land reclamation except for portions that will be left as open water. Telkwa Mining Limited (TML) is now simply monitoring the site.

3.2.4.3 Administrative Boundaries

No administrative boundaries are relevant to the Surface Water VC assessment.

3.2.4.4 Technical Boundaries

No technical boundaries were identified to the Surface Water VC assessment.

4. EXISTING CONDITIONS

The information in this subsection establishes the context for the assessment of effects of the Project on the Surface Water VC, including regulatory context, Traditional Knowledge (TK), and baseline studies undertaken for the Project.

4.1 BACKGROUND INFORMATION AND STUDIES

This subsection describes the contribution of TK to the description of the existing conditions, the availability of existing information, and the studies conducted for the Project.

4.1.1 Traditional Knowledge

The Surface Water LSA and RSA are within the Wet'suwet'en Traditional Territory. TK for the Project was obtained through a review of publicly available information as well as the Cultural Use Study (CUS). The CUS is Appendix 7.1-B of 7.0 Heritage Effects Assessment of the EAC Application and presents a completed baseline inventory of cultural hereditary resources pertaining to the Wet'suwet'en communities by examining pre-existing cultural, social, historic, and economic data. Telkwa Mining understands that the OW is completing their Assessment Process. Telkwa Mining is committed to continuing to work with the OW throughout Project development to appropriately integrate the OW's information and ongoing participation in the Tenas Project. Where additional responses are appropriate, Telkwa Mining will provide supplemental information to both the BC EAO and the OW.

Water is important to the Wet'suwet'en culture and history. Physical environment features can be understood within the context of TK by recognizing the connection between the environment and the types and settings of Indigenous cultural values. The health of watersheds and waterways is just as important to Wet'suwet'en culture as the health of dry land. Both land and water are integral to the feast system, which in turn is integral to the Wet'suwet'en culture and collective identify. Given their preference for salmon, some culturally important waterways in the RSA are the Bulkley and Telkwa rivers.

The importance of surface water to the Wet'suwet'en culture, and its links to other environmental components (e.g., fish and fish habitat), supported its selection as a VC and informed the effects assessment. This includes the identification of potential residual effects, the development of mitigation measures proposed, the characterisation of the predicted residual effects, and the determination of significance of those residual effects on the Surface Water VC (i.e., TK was considered throughout the assessment).

4.1.2 Scientific and Other Information

The following information was consulted to support the assessment:

- Regional streamflow datasets:
- Telkwa River Below Tsai Creek, Station 08EE020 (WSC 2020);
- Bulkley River at Quick, Station 08EE004 (WSC 2020);
- Bulkley River Near Smithers, Station 08EE005 (WSC 2020);
- Goathorn Creek near Telkwa, Station 08EE008 (WSC 2020);
- Digital Elevation Model (DEM) from a Light Detection and Ranging (LIDAR) survey conducted in August 2017 on behalf of TML;
- Climate data (ECCC 2020):
- ECCC meteorological stations, namely Smithers A (Climate Identifier 1076638) and Smithers Airport Auto (Climate Identifier 1077501);
- Automated Snow Weather Station network operated by the BC MECCS, BC Hydro, and others, namely Tsai Creek (Station Identified 4B17P);
- ERA-5 Reanalysis data from European Centre for Medium-Range Weather Forecast, providing gridded climate data from 1980 to present;
- PRISM Reanalysis data from the Pacific Climate Impact Consortium (PCIC), providing gridded climate data from 1950 to 2007;
- Technical reports reviewed in support of the Project Surface Water conditions include:
- Davidson Project Meteorology and Hydrology Baseline report 2006-2008 (Rescan Environmental Services Ltd 2009);
- Application for Environmental Assessment Certificate (Blue Pearl Mining Inc. 2008);
- Drinking Water Source Quality Monitoring 2002-03; Bulkley Valley Surface Water Sources: Smithers Lakes, Kirby Lake, Chicago Creek, Bulkley River, Tobaggan Creek, and Thompson Creek (BC MECCS 2006);
- Telkwa Coal Project 1999 Baseline Surface Flow and Water Quality Final Data Report (AGRA Earth and Environmental Ltd. [AGRA] 2000);
- Telkwa Coal Mine Surface Water Monitoring Program 1998 (AGRA 1999);
- Report to Stephen Day: BC Research Selenium Results (Frontier 1999);
- Water Management for the Telkwa Coal Project (Piteau Engineering Ltd. [Piteau] 1998);
- Final Project Report Specifications for Manalta Coal Ltd.'s Proposed Telkwa Coal Project (Telkwa Coal Project Committee 1997);
- Telkwa Coal Project: Application for a Project Approval Certificate – Volumes I-V (Manalta Coal Ltd. [Manalta] 1997);

- Summary of Fisheries, Aquatic Habitat and Water Quality Information for the Telkwa Project Area: A Literature Review (SRK Consulting (Canada) Inc. [SRK] 1996);
- Baseline Data, Surface Water and Groundwater, Telkwa Coal Project (Piteau 1994);
- Suspended Sediment: Telkwa River Watershed (Beaudry, P.G., J.W. Schwab and D. September 1991);
- Water Quality Summaries for Eight Rivers in the Skeena River Drainage, 1983 – 1987: the Bulkley, Upper Bulkley, Morice, Telkwa, Kispiox, Skeena, Lakelse, and Kitimat Rivers (Wilkes, B., and R. Lloyd 1990);
- Ambient Water Quality Objectives for the Bulkley River Basin: Overview Report. B.C. Ministry of Environment (Nijman 1986a);
- Ambient Water Quality Objectives for the Bulkley River Basin: Technical Appendix. B.C. Ministry of Environment (Nijman 1986b);
- Skeena-Nass Area Bulkley River Basin Water Quality Assessment and Objectives (BC MOE 1986);
- Water Quality Investigation: Telkwa Coal Project (MacLaren 1985); and
- Telkwa Project: Stage I Application (Crows Nest Resources 1983).

4.1.3 Baseline Studies

Baseline studies were completed between 1997 and 1999 in support of the former Manalta Coal Project and were reinitiated in 2017 through 2020 for the Project. Further baseline work for Tenas and Four Creeks is ongoing, and data was added for the years of 2021 and 2022 for this report. Methods to characterize surface water conditions are summarized as follows:

- local hydrometric station installation and manual discharge measurements; and
- annual water quality monitoring programs.

Table 4.1-1 lists the relevant field programs related to the Surface Water VC. Additional descriptions of the available data are summarized in Appendix 4.1-C Tenas Project 2017 to 2019 Baseline Report of the EAC Application.

Table 4.1-1: Summary of Desktop and Field Studies Related to the Surface Water Valued Component

Study Name	Study Purpose, Duration, and Spatial Boundaries
Tenas Project 2022 and 2023 Baseline Data (ERM 2025)	• For stations within Four, Goathorn, and Tenas Creeks • Summary of hydrometric station installations, continuous water level readings, manual streamflow measurements, development of rating curves, and resultant continuous streamflow time series • Summary of surface water quality monitoring data

Study Name	Study Purpose, Duration, and Spatial Boundaries
	• Summary of local meteorological data • Developed in support of the Tenas Project (Project) effects assessment
Tenas Project 2017-2019 Baseline Report	• Summary of hydrometric station installations, continuous water level readings, manual streamflow measurements, development of rating curves, and resultant continuous streamflow time series • Summary of surface water quality monitoring data • Summary of local meteorological data • Developed in support of the Tenas Project (Project) effects assessment. • Presented in Appendix 4.1-C Tenas Project 2017 to 2019 Baseline Report of S4.0-C1 Atmospheric Environment Valued Component of the EAC Application,
(ERM 2020)	• Water quality, water level and streamflow monitoring in support of the Telkwa Coal Project: Application for Project Approval Certificate by Manalta Coal Ltd (Manalta) (1997). Water quality measured in Telkwa River, Tenas Creek, Bulkley River, Goathorn Creek and Four Creek • Continuous water level measurements collected in Four Creek in 1997 (October to November) and in 1998 (June to November). Converted to streamflow in support of 1999 baseline studies (AGRA 1999)
Telkwa Coal Project 1999 Baseline Surface Flow and Water Quality Final Data Report	• Summary of water monitoring data, including water levels, streamflow, and water quality, in support of Telkwa Coal Project Application for Project Approval Certificate by Manalta • Data within the LSA and RSA
AGRA Earth & Environmental [AGRA 2000)	• Prepared for Manalta. Summary of surface water quality measurements in Telkwa River, Bulkley River and Goathorn Creek, in addition to the meteorological data collection at the local weather station

Additional documents supporting the Surface Water VC assessment that are provided in the EAC Application include:

- Tenas Project – Water and Load Balance Modeling Report (Updated 2025) (Appendix 4.3-A);
- Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2025) (Appendix 4.3-B);
- Tenas Project Water Management Design Technical Report (Appendix 1.0-F of the EAC Application);

- Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development (Appendix 4.3-C);
- Minesite Water Management Plan (S13.0-C11) (MWMP);
- Tenas Project Supplemental Geochemical Characterisation (Appendix 1.0-M of the EAC Application);
- Groundwater Technical Report for the Tenas Coal Project, Telkwa (Appendix 1.0-U of the EAC Application); and
- Description of Proposed Project in S1.0 Overview of Project Proponent Description of the EAC Application.

4.1.3.1 Surface Water Quantity Methods

Surface water quantity was characterised through the installation of local hydrometric stations along with compilation of data from regional stations. Figure 4.1-1 presents the four (4) local hydrometric stations and their associated catchment areas in relation to the regional stations.

Local hydrometric monitoring stations were set up at Tenas Creek, Four Creek, Goathorn Creek, and Telkwa River. At each station, pressure transducers were installed as deep in the channel as possible to allow for continuous monitoring of water levels for ranges of flows. Pressure transducers continuously recorded the water level at a 10-minute interval. Manual flow measurements were completed during each site visit during the 2017 to 2022 monitoring period to obtain a range of measured discharges under various conditions.

To provide a continuous record of the discharge at hydrometric monitoring sites, empirical relationships between measured stage and discharge (i.e., rating curves) were developed (as per International Standards Organization [ISO] 2010). Once the rating curve was established for a monitoring site, continuous stage data were converted into continuous discharge data by applying the rating curve equation to the recorded stage values. Data were then presented as discharge hydrographs.

Annual hydrographs, presented as mean daily discharge, were generated for each hydrometric monitoring station. To develop hydrologic indices, including mean annual runoff, seasonal runoff distribution and peak and low flow conditions, each local hydrometric station was extended to develop long-term synthetic streamflow records. The regression approach selected to develop regressions between measured, Project hydrometric records and regional analogues was chosen based on:

- the simplicity of the regression;
- the Nash-Sutcliffe Efficiency (NSE) between the estimated flows and the measured flows for the period of overlap; and

- the ability of the regression to approximate both high and low flows based on flow duration curves.

The regressions were then used to generate synthetic flow records for each Project hydrometric station using the long-term, regional records from WSC as a foundation. The time series generated from the developed regression equations for each hydrometric station were compared to the measured unit discharges at each station, and hydrologic indices were prepared.

Table 4.1-2 summarizes the hydrometric stations installed for the most recent baseline data collection. Rating curves and continuous discharge were developed for each hydrometric station by ERM (2020). Additional details on the instrumentation and rating curve development are summarized in the Tenas Project 2017-2019 Baseline Report (Appendix 4.1-C of the EAC Application). The Tenas-Hydro station was relocated approximately 200 metres (m) upstream in 2018 after a flood event eroded the channel bank and rendered the former monitoring location unsuitable for anchoring instrumentation. Additional monitoring, rating curve development and analysis for 2019 hydrometric data were completed by ERM.

The Four-Hydro station was installed in April 2020 and a rating curve was developed. Monitoring of other local hydrometric stations in 2020 was not completed due to access restrictions during the COVID-19 pandemic. Two additional monitoring stations were established on Four Creek (Four Hydro 2 and Four Hydro 3) in 2021 to evaluate flow continuity along the creek. In 2021 and 2022, monitoring continued at Four-Hydro and Tenas-Hydro, strengthening the characterization of these two streams.

Table 4.1-2: Project Specific Hydrometric Monitoring Network

Hydrometric Station	Location	Easting[4]	Northing[4]	Drainage Area (km^2)	Median Elevation (masl)	Period of Operation
Tenas-Hydro[1]	Tenas Creek	616914	6053490	47.6	1181	May 2017-October 2022
Tenas-Hydro B[2]				46.8		
Four-Hydro[3]	Four Creek	620101	6054128	11.0	985	April 2020 – October 2022
Four Hydro 2[5]	Four Creek	619344	6052005	5.5	1029	Sept 2021 – October 2022
Four Hydro 3[5]	Four Creek	619248	6049944	2.8	1140	Sept 2021 – October 2022

Hydrometric Station	Location	Easting[4]	Northing[4]	Drainage Area (km^2)	Median Elevation (masl)	Period of Operation
Goathorn-Hydro[1]	Goathorn Creek	621100	6057441	123.5	1243	May 2017-November 2019
Telkwa-Hydro[1]	Telkwa River	617940	6057866	54.65	1243	May 2017-November 2019

Notes: km^2=square kilometre; masl=metres above sea level
1. Goathorn-Hydro, Telkwa-Hydro and Tenas-Hydro stations were installed May 2017, collecting continuous water level data through the open-water season. Rating curves were established through manual measurements in 2017 through 2019, and continuous streamflow records developed accordingly. Instrumentation was not re-installed in 2020.
2. Tenas-Hydro station relocated in 2018 approximately 200 m downstream from original location, renamed Tenas-Hydro B.
3. Four-Hydro station was installed April 2020 (ERM) with continuous water level data collected through October 2020 and winter spot flows in November, December 2020, and February 2021. Rating curve established through manual measurements 2020 only.
4. Northing and Easting based on UTM Zone 9N, datum WGS84.
5. Four Hydro 2 and Four Hydro 3 records consist of spot flow measurements only.

The WSC is the national authority responsible for the collection, interpretation, and dissemination of standardized water resource data in Canada. Stations within the same BC hydrological zone were evaluated and additional selection criteria were subsequently applied.

Figure 4.1-1 illustrates the four (4) regional WSC stations selected based on proximity to the Project hydrometric stations, as well as for having similar flow regimes, whereby the Goathorn Creek near Telkwa station (08EE008) is at the same location as Goathorn-Hydro. These stations have more than 10 years of data and catchment areas ranging between 125 km^2 to 8,940 km^2. Table 4.1-3 summarizes the metadata for these stations and the length of published historical record that were used in the Project baseline characterization.

Table 4.1-3: Regional Hydrometric Monitoring Network

Station ID	Station Name	Easting[2]	Northing[2]	Drainage Area (km^2)	Period of Operation	
					First Year	Last Year
08EE0081	Goathorn Creek near Telkwa	621100	6057441	125	1960	2021
08EE0201	Telkwa River below Tsai Creek	596710	6052132	367	1975	2018
08EE0041	Bulkley River at Quick	635022	6054566	7340	1930	2018

Station ID	Station Name	Easting[2]	Northing[2]	Drainage Area (km^2)	Period of Operation	
					First Year	Last Year
08EE0051	Bulkley River near Smithers	620206	-6070667	8940	1945	2018

Notes: km^2 = square kilometres
1. Streamflow records downloaded from WSC databases (WSG 2020) and consist of daily average flows along with annual peak instantaneous flows.
2. Northing and Easting based on UTM Zone 9N, datum WGS84.

Tenas Project

Monitoring Map for Baseline Characterisation of Surface Water Quantity

Legend

- City/Town
- Project Hydrometric Stations
- Regional Hydrometric Stations (WSC)
- Rail Line
- Highway
- Road
- Discharge Path
- Watercourse
- Project Hydrometric Station Watersheds
- Wetland
- Waterbody
- Park or Protected Area
- First Nation Reserve
- Tenas Coal Licenses
- Telkwa Coal Limited Private Property

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Area: Allegiance Coal, April 21, 2021
- Basedata: Government of British Columbia
- Basemap: World Topo Base

N

1:250,000

0 2 4 6 8 10

Kilometres

NAD 1983 UTM Zone 9N

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TELKWA COAL LIMITED

srk consulting

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4.1.3.2 Surface Water Quality Methods

Water quality samples were collected from streams within the LSA and RSA in support of the Project, including Tenas Creek, Four Creek, Goathorn Creek, Telkwa River, and Bulkley River. Samples were also collected at Helps Creek, located east of the Project, as it is crossed by the TAC. Samples were analyzed by ALS Environmental Laboratories. Table 4.1-4 presents the station information and rationale. Data collection occurred from 2017 to 2023, predominantly in the open water season. Sample locations are shown in Figure 8.1-1 of Appendix 4.1-C of the EAC Application.

Table 4.1-4: Surface Water Quality Baseline Sites, Tenas Project, 2017 to 2019

Site	Waterbody	Water Quality		Location and Rationale
		Easting[1]	Northing[1]	
WQS01	Tenas Creek	615171	6050438	Upstream reference for proposed Project infrastructure
WQS02	Tenas Creek	616914	6053490	Near-field downstream of deposits and proposed Project infrastructure
WQS04	Tenas Creek	620499	6057020	Mid-field downstream of deposits and proposed Project infrastructure
WQS04B	Tenas Creek	620676	6057950	Mid-field downstream of deposits and proposed Project infrastructure
E242646	Tenas Creek	-	-	Unknown point in Tenas Creek (EMS UTM not in stream)
WQS03	Four Creek	619235	6049989	Upstream reference for proposed Project infrastructure
WQS20	Four Creek	619344	6052005	Upstream of proposed clean water diversion into Four Creek
WQS03-DS	Four Creek	620101	6054128	Downstream of proposed Project infrastructure, potentially influenced by historical workings
WQS15	Goathorn Creek	620942	6047172	Far upstream site sampled once. Sampled at the request of the Office of the Wet'suwet'en
WQS14	Goathorn Creek	620476	6047262	Far upstream site sampled once. Sampled at the request of the Office of the Wet'suwet'en (OW)

Site	Waterbody	Water Quality		Location and Rationale
		Easting[1]	Northing[1]	
WQS13	Goathorn Creek	621664	6051778	Upstream reference site on Goathorn Creek. Upstream of historical workings
WQS06-US	Goathorn Creek	620587	6053711	Upstream of WQS06 and the confluence with Four Creek. Potentially influenced by historical workings
WQS06	Goathorn Creek	621100	6057441	Downstream of Project discharge, above the confluence with Tenas Creek
E242647	Goathorn Creek	-	-	Unknown point on Goathorn Creek (EMS UTM not in stream); description states that it is above the confluence with Tenas Creek
WQS05	Goathorn Creek	620615	6058133	Mid-field downstream of the confluence with Tenas Creek
WQS16	Helps Creek	625906	6055851	Upstream of proposed Tenas Bypass Road
WQS17	Helps Creek	625801	6055979	Upstream of proposed Tenas Bypass Road
WQS08	Telkwa River	617964	6057860	Upstream reference; above the confluence with Goathorn Creek
WQS09	Telkwa River	621394	6058998	Mid-field downstream of the confluence with Goathorn Creek
WQS10	Telkwa River	624269	6061725	Far-field downstream before the confluence with the Bulkley River
400187	Telkwa River	625481	6062592	At the mouth of the Telkwa River at Village of Telkwa
WQS11-US	Bulkley River	630472	6056723	Upstream reference for the proposed Rail Infrastructure
WQS11	Bulkley River	629601	6059221	Near-field downstream of the proposed Rail Infrastructure

Site	Waterbody	Water Quality		Location and Rationale
		Easting[1]	Northing[1]	
E246125	Bulkley River	625477	6062748	Immediately downstream of the Telkwa River confluence, at water intake for Telkwa
WQS12	Bulkley River	625021	6063831	Mid-field downstream of the proposed rail loadout and confluence with the Telkwa River
400434	Bulkley River	618410	6074024	Far-field downstream of the Project; downstream of Smithers and upstream of Smithers sewage discharge
400435	Bulkley River	617870	6074979	Far-field downstream of the Project; downstream of Smithers and downstream of Smithers sewage discharge

Notes: EMS=environmental monitoring system; Project=Tenas Project; UTM=Universal Transverse Mercator; WQS=Water Quality Station
1. Northing and Easting based on UTM Zone 9N, datum WGS84.

Water-quality parameters were compared to their respective BC MECCS and CCME water quality guidelines for the protection of freshwater aquatic life.

4.2 Description of Existing Conditions

This subsection describes the existing (or baseline) surface water conditions in the context of the LSA and RSA. Details on surface water data, as well as data location maps and analyses, are provided in the attached Appendix 4.3-B Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2025).

4.2.1 Surface Water in the Context of the Regional Study Area

The Project is located within the Telkwa River Watershed, a tributary of the Bulkley River and the Skeena River, which discharges into the Pacific Ocean, approximately 180 km west of the Project. The Project is situated between Goathorn Creek to the east, along with its tributary, Four Creek, and Tenas Creek to the west and north. Tenas Creek joins Goathorn Creek north of the Project, which in turn flows into the Telkwa River. The Telkwa River flows northwest approximately 6 km from the confluence with Goathorn Creek before discharging into the Bulkley River (Figure 4.1-1).

The streamflow regime is nival (snowmelt-dominated) with the majority of runoff occurring in the spring and early summer due to melting winter snowpack. Following the snowmelt-driven high flow, there is typically a period of low flow throughout the late summer and early fall when inputs from snow have diminished. Throughout the fall period, short duration high intensity rain events may produce substantial high flow events with naturally elevated concentrations of suspended particles. Annual low flows occur during the winter months when air temperatures remain below freezing and snow that falls is typically stored in the snowpack until spring. During the winter low flow period, most streams retain baseflow from groundwater discharge. Some streams in the region have glacial inputs, but this is less prominent in the Project Area, as most of the substantial glacier coverage is west of the Project in the upper Telkwa River Watershed.

The RSA includes the Telkwa River catchment and a portion of the Bulkley River catchment between the Rail Infrastructure and downstream of the Telkwa River confluence. The RSA is characterised by mountainous terrain (i.e., Telkwa range and Bulkley range) with peak elevations ranging between 2,300 and 2,500 metres above sea level (masl) and elevations at Telkwa of about 500 masl.

The Telkwa River has a catchment area of approximately 1,000 km^2 upstream of the confluence with Goathorn Creek, which contributes an additional catchment of 200 km^2 below the confluence. The Telkwa River catchment increases to nearly 1,200 km^2 at the confluence with the Bulkley River, and the Bulkley River catchment upstream of the Telkwa River is close to 7,400 km^2.

Tenas Creek encompasses 35 percent (%) of the Goathorn Creek's catchment area, and approximately 6% of the Telkwa River's catchment at its confluence with the Bulkley River. Four Creek encompasses an even smaller portion of these catchments, representing 6% and 1% of the total Goathorn Creek and Telkwa River catchments, respectively. Four Creek was further characterized in a field study conducted in 2024 (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development) and was determined to be a perched system with limited connectivity to the underlying aquifers.

Streams in the RSA exhibit naturally elevated concentrations of iron, copper and aluminum based on baseline monitoring data (ERM 2020). The Telkwa River and Bulkley River have historically exceeded the water quality guideline for total and dissolved aluminum, total iron, and total copper. Goathorn Creek and Tenas Creek have historically exceeded the water quality guideline for total and dissolved aluminum, total iron, and total copper, while Four Creek data exhibited exceedances for dissolved and total aluminum and dissolved and total iron.

4.2.2 Past and Current Human Activities

Within the RSA, small-scale underground and surface mining began in 1918 and continued sporadically until 1985, resulting in the recovery of over 400,000 tonnes of coal, about 3.6 km north and northwest of the Project. Currently, human activities within the LSA include mining

exploration and forestry. Agriculture and forestry are concentrated in the area surrounding the village of Telkwa and along roads, trails, and rail tracks within the RSA.

Historic forest fires and forestry activities are expected to have had a temporary influence on sediment loads in the streams and may have resulted in increased flows by reducing infiltration losses to the soils. Similarly, small-scale quarry Operations would be expected to have increased sediment load or the occurrence of elevated metals in the nearby receiving water quality.

4.2.3 Surface Water Quantity Baseline Conditions

To inform the assessment of the Project effects on the Surface Water VC, representative drainages were selected: Tenas Creek; Four Creek; Goathorn Creek; Telkwa River; and Bulkley River. Helps Creek and some of its tributaries will be crossed by the TAC however the potential effects on Surface Water Quantity and Quality are expected to be negligible. This is based on the use of clear span bridges, best management practices (BMPs) for road construction in and around surface water streams and the use of surficial materials and approved gravel sources for the construction and maintenance of structures. For this reason, Helps Creek has not been evaluated for the purpose of the assessment as it relates to the Surface Water VC.

The following subsections summarize the characteristics of each stream, including data source and quality, typical hydrologic indices (Table 4.2-1) and commentary on the methodology for record extension with regional datasets. Detailed discussion of station quality and modelling are presented in Appendix 4.3-B Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2025).

Table 4.2-1: Summary of Hydrologic Indices for Local Hydrometric Stations in the Regional Study Area from 2017–2022

Hydrometric Station (stream)	Year	Total Annual Runoff (mm)	Peak Annual Unit Flow (L/s/km^2)	June-September Unit Low Flow (L/s/km^2)	
			Daily	Seven-day	Daily
Tenas-Hydro B (Tenas Creek)	2017	382	121	3.2	2.5
	2018	410	181	2.3	2.1
	2019	319	55	3.2	2.9
	2020	319	56	2.8	2.6
	2021	334	83	2.1	1.9
	2022	350	114	1.6	1.5

Hydrometric Station (stream)	Year	Total Annual Runoff (mm)	Peak Annual Unit Flow (L/s/km^2)	June-September Unit Low Flow (L/s/km^2)	
			Daily	Seven-day	Daily
Four-Hydro[1] (Four Creek)	2020	41	9.0	0.33	0.30
	2021	46	15.5	0.23	0.20
	2022	57	24.2	0.16	0.15
Goathorn-Hydro (Goathorn Creek)	2017	412	132	7.1	6.8
	2018	423	127	7.5	7.4
	2019	422	54	6.1	5.7
	2020	404	57	5.8	5.5
	2021	405	83	4.6	4.2
	2022	?	?	?	?
Telkwa-Hydro (Telkwa River)	2017	974	371	12.6	9.4
	2018	862	234	4.7	4.2
	2019	860	164	13.0	7.7
Bulkley River at Quick[2] (Bulkley River)	2017	664	95.0	13.9	13.5
	2018	536	110.2	6.3	6.0
	2019	511	55.7	10.8	10.1

Notes: L/s/km^2=litres per second per square kilometre; mm=millimetre
Results are based on the gap-filled records developed for each creek using WSC records.
1. Tenas-Hydro B, Four-Hydro and Goathorn-Hydro datasets were updated in 2023 to extend through 2022, based on extension with Goathorn Creek WSC station (08EE008) and additional local monitoring.
2. Bulkley River data based on WSC 08EE004 Bulkley River at Quick. Data are presented for 2017 through 2019 for purpose of comparison to local hydrometric records.

4.2.3.1 Tenas Creek

Tenas Creek is a 20 km long tributary of Goathorn Creek and a portion of the stream flows past the western and northern extents of the Project Area.

Streamflow in Tenas Creek was characterised by data collected by the Tenas-Hydro station (renamed Tenas-Hydro B from 2018 onwards after being moved approximately 200 m upstream). Monitoring of Tenas-Hydro consists of open-water season continuous water level

measurements, collected in 2017, 2018, 2019 and 2022, which are converted to streamflow based on a rating curve established from manual flow measurements. Winter flows are estimated based on regression with WSC stations and available manual measurements.

The Tenas watershed ranges from 2,000 masl at its upper-most extent to 670 masl at the confluence with Goathorn Creek. The catchment area at Tenas-Hydro is 47.6 km^2, while the catchment area at the confluence with Goathorn Creek is approximately 70 km^2.

The Tenas-Hydro record was extended using regression analysis with Goathorn Creek near Telkwa WSC station (08EE008), resulting in a continuous flow record from 1960 through 2022. The regression model provided similar monthly and annual discharges as those measured at Tenas-Hydro but was found to overestimate higher exceedance probability flows (i.e., low flows).

The mean annual runoff for Tenas Creek was calculated to be 357 millimetres (mm), with a typical peak runoff occurring in May and June. This mean runoff depth is within the range of the runoff rates measured at the Tenas-Hydro station between 2017 and 2022. The unit peak flows in Tenas Creek are higher than the unit peak flows at Goathorn Creek for a given return period, which can be attributed to its steeper terrain and shorter response time. Baseflow rates to Tenas Creek are lower per unit area than Goathorn Creek, with lowest flows occurring over the winter months between December and March.

4.2.3.2 Four Creek

Four Creek is a tributary to Goathorn Creeks and is approximately 7 km long, flowing along a portion of the eastern edges of the Project Area. The upper reaches of Four Creek provide fish habitat.

The Four Creek watershed ranges from 1,300 masl at its headwaters to 700 masl at the confluence with Goathorn Creek. The watershed area at Four-Hydro is 11 km^2, which is located near the confluence with Goathorn Creek.

Streamflow in Four Creek was characterised by the Four-Hydro hydrometric station, installed in April 2020, and removed in October 2022. Two additional stations were also installed in Four Creek, Four Hydro 2, and Four Hydro 3, capturing the variation in flow from upstream to downstream. The Four-Hydro station record was regressed against the Goathorn Creek near Telkwa WSC station (08EE008), using ranked regressions, resulting in a continuous flow record from 1960 through 2022. The regression model provided similar mean flows as the Four-Hydro hydrometric station but underestimated low and high flows. Despite this discrepancy, the regression provided valuable insight that the unit flows at Four Creek are smaller than the other creeks (Tenas and Goathorn).

The mean annual runoff for Four Creek was calculated to be 54 mm based on the extended record using WSC 08EE008, with a typical peak runoff occurring in May and June coinciding with spring

freshet. This mean runoff depth is within the range of values measured during the monitoring period at the Four-Hydro station between 2020 and 2022. The unit runoff and peak flows in Four Creek are lower than the same values calculated at Tenas and Goathorn Creek, which justified additional analysis on Four Creek.

A groundwater interaction model was also developed for the Four Creek watershed to assess groundwater circulation in the till-dominated overburden layer and understand the role of shallow groundwater flow pathways. This analysis examined groundwater levels from nearby monitoring wells, and a streamflow and conductivity survey along the channel length (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development).

This study found that groundwater from the underlying overburden and bedrock aquifers is not supporting the baseflow in the stream. In addition, Four Creek was determined to be a losing stream, with a downward vertical gradient from the upper surficial deposits (interflow) and the deep overburden and bedrock units. Shallow interflow plays a key role in the watershed's hydrology. This subsurface flow, which is above the water table, occurs when water infiltrates the thin surficial layer of till and moves laterally through the shallow groundwater system before entering the channel network. Interflow is the key driver of low flows and baseflows in Four Creek, which is the portion of streamflow that remains during dry periods.

Monitoring results from 1997 and 1998 (AGRA 1999) were reviewed, which showed that Four Creek presented a similar hydrological response as Goathorn Creek throughout the available overlapping records at that time.

4.2.3.3 Goathorn Creek

Goathorn Creek is a 20 km long tributary of Telkwa River that flows along the eastern and northern edges of the Project Area. Goathorn Creek is a moderately wide, extensively braided creek. The TAC will cross the Goathorn Creek downstream of the confluence with Four Creek and upstream of the confluence with Tenas Creek.

Streamflow in Goathorn Creek is characterised by the Goathorn-Hydro station, which is located close to the WSC station on Goathorn Creek near Telkwa (08EE008). Monitoring of Goathorn-Hydro consists of open-water season continuous water level measurements in 2017, 2018 and 2019, which are converted to streamflow based on a rating curve established from manual flow measurements. Winter flows are estimated based on regression with WSC stations and available manual measurements.

The Goathorn watershed ranges from 2,000 masl at its upper-most extents to 570 masl at the confluence with Telkwa River. The catchment area at Goathorn-Hydro is 123.5 km^2, while the catchment area at the confluence with Telkwa River is approximately 195 km^2.

The Goathorn-Hydro record was extended using scaled flows from the Goathorn Creek near the Telkwa WSC station (08EE008), resulting in a continuous flow record from 1960 through 2022. The regression model provided similar monthly and annual discharges to those measured at Goathorn-Hydro.

The mean annual runoff for Goathorn Creek was calculated to be 438 mm based on the extended record using WSC 08EE008, with a typical peak runoff occurring in May and June coinciding with spring freshet. Baseflow rates to Goathorn Creek are lower per unit area than Telkwa River, with the lowest flows occurring over the winter months between December and March.

4.2.3.4 Telkwa River

Telkwa River is a major watercourse, with a length of approximately 60 km and a watershed that encompasses glacier-capped mountains to the west. Where Goathorn Creek meets the Telkwa River, north of the Project, the slope of the river is approximately 1% with a floodplain width of approximately 500 m. The Telkwa River meets the Bulkley River in the Village of Telkwa, approximately six (6) km downstream of the confluence with Goathorn Creek.

Streamflow in Telkwa River was characterised by the Telkwa-Hydro station, located 2.6 km upstream of the confluence with Goathorn Creek and 22 km downstream of the WSC station Telkwa River below Tsai Creek (08EE020). Monitoring at Telkwa-Hydro consists of open-water season continuous water level measurements in 2017, 2018 and 2019, which were converted to streamflow based on a rating curve established from manual flow measurements. Winter flows were estimated based on regression with WSC stations and available manual measurements.

The Telkwa Watershed ranges from 2,100 masl at its upper-most extents to 500 masl at the confluence with Telkwa River. The watershed area at Telkwa-Hydro is 997 km^2, while the watershed area at the confluence with Bulkley River is approximately 1,200 km^2.

The Telkwa-Hydro record was extended using regression analysis with Telkwa River below Tsai Creek WSC station (08EE020), resulting in a continuous flow record from 1975 through 2020. The regression model provided similar monthly and annual discharges as those measured at Telkwa-Hydro, with slight underestimation in 2017 but comparable results for 2018 and 2019.

The mean annual runoff for Telkwa River was calculated to be 911 mm based on the extended record using WSC 08EE020, with a typical peak runoff occurring in May and June. The unit peak flows in Telkwa River are like Goathorn Creek, and greater than Bulkley River, for a given return period. Baseflow rates to the Telkwa River are higher per unit area than its tributaries, with lowest flows occurring over the winter months between December and March.

4.2.3.5 Bulkley River

Bulkley River is a major watercourse, with a length of approximately 267 km and draining a total of 12,400 km^2 towards the Skeena River. The Bulkley River flows through the communities of Quick, Telkwa and Smithers, from south to north, and eventually discharges to the Skeena River near Hazelton.

Streamflow in the Bulkley River is characterised by two (2) WSC stations, Bulkley River at Quick (08EE004) and Bulkley River near Smithers (08EE005), located upstream and downstream of the confluence with the Telkwa River, respectively. Gaps in station 08EE005 exist from 1952 through 2008. For this reason, the baseline characterisation relied more on the 08EE004 records.

The Bulkley River Watershed ranges from 2,200 masl at its upper-most extents to 480 masl at the Town of Smithers. The watershed area at 08EE004 is 7,340 km^2.

The mean annual runoff for the Bulkley River was calculated to be 583 mm based on the WSC 08EE004 record, with a typical peak runoff occurring in May and June. The unit peak flows in the Bulkley River are lower than the Telkwa River or the smaller tributaries, for a given return period. Baseflow rates to the Bulkley River are higher per unit area than the smaller tributaries of Goathorn, Tenas or Four Creek, but lower than baseflows expected in the Telkwa River.

Baseline Surface Water Quantity summaries are presented for each stream based on regional and local hydrometric datasets. Results include the monthly runoff rates at representative regional monitoring stations (Figure 4.2-1), monthly runoff distributions from the local hydrometric stations (Figure 4.2-2), modelled unit runoff rates (Table 4.2-2), modelled unit seven (7)-day low flows (Table 4.2-3) and modelled unit peak flows (Table 4.2-4).

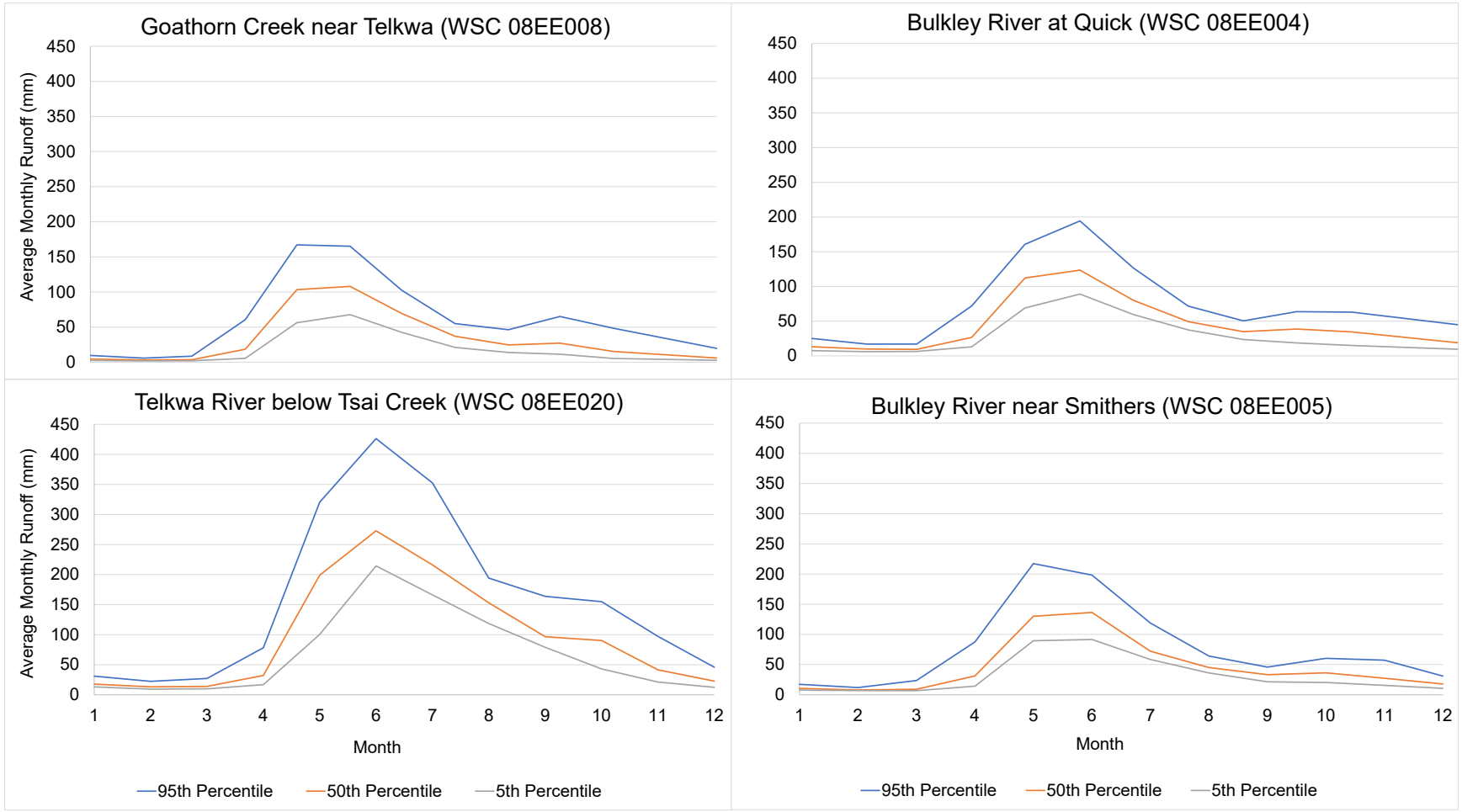


Figure 4.2-1: Monthly Runoff Rates (millimetre [mm]) at Representative Regional Monitoring Stations for Various Percentile Flow Conditions, including 5th (Grey), 50th (Orange), and 95th (Blue) Monthly Runoff Percentiles

Figure 4.2-2: Monthly Runoff Distribution for Local Hydrometric Stations Based on Measured Data from 2017 to 2022, Including Tenas-Hydro (Grey), Goathorn-Hydro (Blue), Telkwa-Hydro (Orange), and Four-Hydro (Yellow)

Table 4.2-2: Modelled Monthly Average Runoff Depth (mm) for Tenas Project Watercourses

Watercourse	Unit Runoff Depth (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Tenas Creek[1]	4.2	3.1	4.0	28.8	110	107	35.7	16.8	12.8	13.8	14.8	6.4	357
Four Creek[2]	0.2	0.1	0.2	3.2	17.1	16.2	7.7	2.8	2.1	2.5	1.2	0.3	54
Goathorn Creek[3]	5.0	3.7	4.9	31.5	111	107	64.6	32.9	25.6	27.7	16.9	7.6	438
Telkwa River[4]	18.4	13.8	15.8	49.2	219	223	125	71.0	54.5	67.7	32.9	21.0	911
Bulkley River[5]	13.7	10.2	12.0	39.2	125	128	81.5	46.7	34.0	39.4	34.2	18.8	583

Notes: mm=millimetre

Table 4.2-3: Modelled Seven (7)-Day Unit Low Flows (L/s/km^2) for Tenas Project Watercourse

Watercourse	7-Day Unit Low Flow (L/s/km^2) Recurrence (Years)					
	2	5	10	20	50	100
Tenas Creek[1]	0.87	0.63	0.52	0.45	0.37	0.32
Four Creek[2,6]	0.03	0.02	0.01	0.01	0.01	0.00
Goathorn Creek[3]	1.04	0.77	0.63	0.54	0.45	0.40
Telkwa River[4]	4.4	3.8	3.5	3.3	3.0	2.9
Bulkley River[5]	3.1	2.4	2.1	1.8	1.6	1.5

Notes: L/s/km^2=litres per second per square kilometre

Table 4.2-4: Modelled Annual Unit Peak Flows (L/s/km^2) for Tenas Project Watercourses

Watercourse	Unit Peak Flow (L/s/km^2) Recurrence (Years)					
	2	5	10	20	50	100
Tenas Creek[1]	96	137	171	208	264	311
Four Creek[2,6]	21	34	46	59	79	97

Watercourse	Unit Peak Flow (L/s/km^2) Recurrence (Years)					
	2	5	10	20	50	100
Goathorn Creek[3]	98	140	172	205	248	280
Telkwa River[4]	105	144	178	216	278	336
Bulkley River[5]	91	111	122	130	140	147

Notes: L/s/km^2=litres per second per square kilometre
All results are based on extended records from 1990 to 2022.
1. Tenas Creek results calculated based on regression with Tenas-Hydro with Goathorn Creek near Telkwa (WSC 08EE008)
2. Four Creek results calculated based on regression Four-Hydro and Goathorn Creek near Telkwa (WSC 08EE008)
3. Goathorn Creek results calculated based on regression with Goathorn-Hydro with Goathorn Creek near Telkwa (WSC 8EE008)
4. Telkwa River results calculated based on regression of Telkwa-Hydro with Telkwa River below Tsai Creek (WSC 08EE020)
5. Bulkley River results calculated based on Bulkley River at Quick (WSC 08EE004)

4.2.4 Surface Water Quality Baseline Conditions

Table 4.2-5 presents the number of measurements collected within each watercourse selected to inform the assessment, over the sampling campaign in 2017 through 2019. Percentiles were developed from year-round monitoring data and from two seasonal periods, including a winter period, encompassing data from November to March, and a summer period, encompassing data from April to October. The 50th and 95th percentile water quality results from the available datasets in each stream were calculated on an annual basis and for each seasonal period. Resulting baseline statistics are presented alongside the associated water quality guidelines for each stream, in Table 4.2-6, Table 4.2-7, Table 4.2-8, Table 4.2-9, and Table 4.2-10 for Four Creek, Goathorn Creek, Tenas Creek, Telkwa River and Bulkley River, respectively.

Furthermore, five (5) measurements over a 30-day timeframe were also completed as per regulatory guidelines for most of the watercourses in the Project Area with only Four Creek being missed. TML is currently completing these measurements for Four Creek and will be provided during the EA process. Note that only parameters with an associated guideline, as described in 3.2.3.1 Water Quality Guidelines, are presented in the summary tables. Complete baseline data compilation can be found in Appendix 4.1-C Tenas Project 2017 to 2019 Baseline Report of S4.0-C1 Atmospheric Environment VC of the EAC Application.

In processing the receiving water quality data, values presented as less than the method detection limit were assumed to be equal to the method detection limit to be conservative. Where reporting parameters were different between historical and current baseline data sets, but where the same species was measured, the data were combined into a single parameter (done for: fluoride, sulfate, ammonia, nitrate, and nitrite).

Table 4.2-5: Number of Samples Collected Throughout Surface Water Quality Baseline Sampling Program, 2017 to 2019, 2021, and 2022

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017												
Four Creek	-	-	-	-	1	1	1	1	1	1	1	1
Tenas Creek	-	-	-	-	4	3	3	3	3	4	4	4
Goathorn Creek	-	-	-	-	2	2	2	2	2	3	3	3
Telkwa River	-	-	-	-	4	4	4	4	4	3	3	3
Bulkley River	-	-	-	-	2	2	2	2	3	2	3	3
2018												
Four Creek	1	1	1	1	2	2	2	2	2	2	2	2
Tenas Creek	4	5	3	4	7	8	4	4	3	10	3	4
Goathorn Creek	3	2	2	3	5	6	3	4	6	9	6	4
Telkwa River	3	3	5	3	5	9	4	3	4	9	3	3
Bulkley River	-	-	1	1	4	7	3	3	4	11	3	4
2019												
Four Creek	2	2	2	2	-	-	-	-	-	2	2	-
Tenas Creek	3	3	3	3	-	-	-	3	-	-	3	-
Goathorn Creek	5	5	5	4	-	-	-	2	-	3	3	-
Telkwa River	4	4	3	2	-	-	-	2	-	-	2	-
Bulkley River	3	3	4	3	-	-	-	2	-	-	4	-
2021												
Four Creek	-	-	-	-	-	-	-	-	-	6	-	-
Tenas Creek	-	-	-	-	-	-	-	-	-	2	-	-
Goathorn Creek	-	-	-	-	-	-	-	-	-	-	-	-

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Telkwa River	-	-	-	-	-	-	-	-	-	-	-	-
Bulkley River	-	-	-	-	-	-	-	-	-	-	-	-
Four Creek	-	-	-	-	-	-	-	-	-	6	-	-
2022												
Four Creek	3	-	-	6	2	12	-	-	6	8	-	-
Tenas Creek	1	-	-	2	-	2	-	-	-	2	-	-
Goathorn Creek	-	-	-	-	-	-	-	-	-	-	-	-
Telkwa River	-	-	-	-	-	-	-	-	-	-	-	-
Bulkley River	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
1. Four Creek numbers include data collected from stations WQS03, WQS03-DS, WQS18.
2. Tenas Creek numbers include data collected from stations WQS02, WQS01, WQS04B, WQS04.
3. Goathorn Creek numbers include data collected from stations WQS05, WQS06, WQS06-US, WQS07, WQS13, WQS14, WQS15
4. Telkwa River numbers include data collected from stations WQS08, WQS09, WQS10
5. Bulkley River numbers include data collected from stations WQS11, WQS11-US and WQS12

Table 4.2-6: Surface Water Quality Summary Statistics for Four Creek, 2017 to 2022 (milligrams per litre [mg/L]) where Parameters Exceeding the Water Quality Guidelines are Highlighted in Pink

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Total Dissolved Solids	mg/L	150	160	150	270	210	56	n/a
Conductivity	µS/cm	230	270	240	420	340	56	n/a
pH		8.2	8.3	8.3	8.4	8.5	56	n/a
Total Suspended Solids	mg/L	6.9	1.5	3	26	20	56	35
Hardness	mg-$CaCO_3$/L	110	130	120	200	170	58	n/a
Ammonia, total	mg-N/L	0.0042	0.0025	0.0025	0.01	0.011	39	1.0
Chloride	mg/L	0.4	0.25	0.25	0.54	0.5	58	150
Fluoride	mg/L	0.055	0.060	0.054	0.076	0.068	58	1.37
Nitrate	mg-N/L	0.050	0.066	0.014	0.160	0.170	58	3
Nitrite	mg-N/L	0.00078	0.0005	0.0005	0.0011	0.001	58	0.02
Sulfate	mg/L	8.8	2.4	2.3	43	26	58	309
Aluminum, total	mg/L	0.23	0.058	0.099	0.94	1.1	58	0.69
Aluminum, dissolved	mg/L	0.097	0.018	0.03	0.44	0.35	58	n/a
Antimony, total	mg/L	0.00007	0.00005	0.00005	0.00013	0.00010	58	0.074

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Arsenic, total	mg/L	0.00063	0.00064	0.00069	0.00110	0.00092	58	0.005
Barium, total	mg/L	0.081	0.093	0.070	0.110	0.140	58	1
Beryllium, total	mg/L	0.00007	0.00005	0.00005	0.00010	0.00010	58	0.00013
Boron, total	mg/L	0.012	0.014	0.01	0.02	0.018	58	1.2
Cadmium, total	mg/L	0.000007	0.000005	0.000006	0.000013	0.000018	58	n/a
Cadmium, dissolved	mg/L	0.000005	0.000003	0.000005	0.000011	0.000010	58	0.00023
Calcium, total	mg/L	24	27	25	42	34	58	n/a
Chromium, total	mg/L	0.00047	0.00022	0.00050	0.00120	0.00140	58	0.0025
Cobalt, dissolved	mg/L	0.00008	0.00005	0.00008	0.00014	0.00012	58	0.00056
Copper, dissolved	mg/L	0.0016	0.0011	0.0013	0.0030	0.0033	58	0.0047
Iron, total	mg/L	0.21	0.058	0.095	0.96	0.74	58	1
Iron, dissolved	mg/L	0.078	0.015	0.015	0.36	0.34	58	0.35
Lead, dissolved	mg/L	0.00004	0.00003	0.00003	0.00007	0.00007	58	0.0061
Magnesium, total	mg/L	13	15	14	21	19	58	n/a
Manganese, total	mg/L	0.0046	0.0016	0.0024	0.017	0.016	58	1.089
Mercury, total	mg/L	0.0000055	0.0000025	0.0000050	0.0000150	0.0000120	58	0.00002
Molybdenum, total	mg/L	0.00022	0.00025	0.00021	0.00040	0.00039	58	0.034

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Nickel, dissolved	mg/L	0.00055	0.00038	0.00050	0.00120	0.00099	58	0.0047
Selenium, total	mg/L	0.000051	0.000025	0.000051	0.000085	0.000095	58	0.002
Strontium, dissolved	mg/L	0.15	0.19	0.16	0.23	0.25	58	2.5
Silver, total	mg/L	0.000008	0.000005	0.000005	0.000018	0.000021	58	0.0015
Thallium, total	mg/L	0.000007	0.000005	0.000005	0.000011	0.000010	58	0.00003
Uranium, total	mg/L	0.000120	0.000110	0.000078	0.000300	0.000260	58	0.0085
Zinc, dissolved	mg/L	0.0012	0.0010	0.0010	0.0017	0.0027	58	0.014

Notes: µS/cm=microSiemens per centimetre; mg-$CaCO_3$/L=milligrams of calcium carbonate per litre; mg-N/L=milligrams nitrate per litre; mg/L=milligrams per litre; P50=50th percentile; P95=95th percentile

1. List includes all parameters with an associated guideline value. Complete list of baseline water quality statistics presented in ERM 2020 and SRK 2021b.

Table 4.2-7: Surface Water Quality Summary Statistics for Goathorn Creek, 2017 to 2022 (milligrams per litre [mg/L]) where Parameters Exceeding the Water Quality Guidelines are Highlighted in Pink

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Total Dissolved Solids	mg/L	110	120	100	160	120	94	n/a
Conductivity	µS/cm	160	190	150	220	180	117	n/a
pH		7.9	8	7.9	8.2	8.1	117	n/a
Total Suspended Solids	mg/L	4.9	1.5	1.5	10	20	94	35
Hardness	mg-$CaCO_3$/L	74	89	66	110	82	123	n/a
Ammonia, total	mg-N/L	0.0035	0.0025	0.0025	0.0067	0.007	114	1.6
Chloride	mg/L	0.33	0.25	0.25	0.5	0.5	124	150
Fluoride	mg/L	0.033	0.038	0.031	0.045	0.038	110	1.2
Nitrate	mg-N/L	0.064	0.110	0.043	0.170	0.084	112	3
Nitrite	mg-N/L	0.0007	0.0005	0.0005	0.0020	0.0020	112	0.02
Sulfate	mg/L	26	27	26	38	38	124	218
Aluminum, total	mg/L	0.16	0.018	0.047	0.55	0.66	123	0.27
Aluminum, dissolved	mg/L	0.028	0.0049	0.011	0.091	0.12	109	n/a
Antimony, total	mg/L	0.00007	0.00005	0.00008	0.00011	0.00014	123	0.074

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Arsenic, total	mg/L	0.00025	0.00017	0.00020	0.00047	0.00069	123	0.005
Barium, total	mg/L	0.059	0.065	0.058	0.073	0.069	123	1
Beryllium, total	mg/L	0.00005	0.00005	0.00005	0.00010	0.00010	123	0.00013
Boron, total	mg/L	0.0094	0.005	0.005	0.013	0.05	123	1.2
Cadmium, total	mg/L	0.000013	0.000006	0.000012	0.000010	0.000050	123	n/a
Cadmium, dissolved	mg/L	0.000011	0.000004	0.000010	0.000010	0.000037	109	0.00016
Calcium, total	mg/L	23	27	21	32	26	122	n/a
Chromium, total	mg/L	0.00028	0.00017	0.00020	0.00070	0.00084	123	0.0025
Cobalt, dissolved	mg/L	0.00006	0.00005	0.00005	0.00010	0.00010	109	0.00045
Copper, dissolved	mg/L	0.0016	0.0010	0.0013	0.0041	0.0034	109	0.0013
Iron, total	mg/L	0.18	0.017	0.048	0.6	0.79	123	1
Iron, dissolved	mg/L	0.034	0.015	0.015	0.12	0.11	110	0.35
Lead, dissolved	mg/L	0.00003	0.00003	0.00003	0.00005	0.00005	109	0.0026
Magnesium, total	mg/L	4.1	5.5	3.5	6.9	4.9	122	n/a
Manganese, total	mg/L	0.0078	0.0026	0.0046	0.019	0.033	123	0.91
Mercury, total	mg/L	0.0000030	0.0000025	0.0000025	0.0000050	0.0000069	98	0.00002
Molybdenum, total	mg/L	0.00066	0.00046	0.00049	0.00057	0.00064	123	0.034

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Nickel, dissolved	mg/L	0.00029	0.00025	0.00025	0.00060	0.00050	109	0.0022
Selenium, total	mg/L	0.000100	0.000084	0.000084	0.000200	0.000200	123	0.002
Strontium, dissolved	mg/L	0.083	0.100	0.075	0.130	0.095	109	2.5
Silver, total	mg/L	0.000007	0.000005	0.000005	0.000020	0.000020	123	0.00005
Thallium, total	mg/L	0.000005	0.000005	0.000005	0.000010	0.000010	123	0.00003
Uranium, total	mg/L	0.000065	0.000090	0.000052	0.000160	0.000075	123	0.0085
Zinc, dissolved	mg/L	0.0012	0.0010	0.0015	0.0015	0.0026	109	0.0074

Notes: µS/cm=microSiemens per centimetre; mg-$CaCO_3$/L=milligrams of calcium carbonate per litre; mg-N/L=milligrams nitrate per litre; mg/L=milligrams per litre; P50=50th percentile; P95=95th percentile

1. List includes all parameters with an associated guideline value. Complete list of baseline water quality statistics presented in ERM 2020 and SRK 2021b.

Table 4.2-8: Surface Water Quality Summary Statistics for Tenas Creek, 2017 to 2022 (milligrams per litre [mg/L]) where Parameters Exceeding the Water Quality Guidelines are Highlighted in Pink

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Total Dissolved Solids	mg/L	100	110	93	150	120	66	n/a
Conductivity	µS/cm	160	190	140	230	190	89	n/a
pH		8.1	8.1	8.1	8.3	8.3	89	n/a
Total Suspended Solids	mg/L	6.6	1.5	1.5	7.2	44	66	35
Hardness	mg-$CaCO_3$/L	75	96	69	110	97	95	n/a
Ammonia, total	mg-N/L	0.004	0.0025	0.0025	0.008	0.0071	89	1.3
Chloride	mg/L	0.34	0.25	0.25	0.5	0.6	95	150
Fluoride	mg/L	0.034	0.039	0.030	0.056	0.037	82	1.2
Nitrate	mg-N/L	0.024	0.049	0.003	0.091	0.038	84	3
Nitrite	mg-N/L	0.0013	0.0005	0.0005	0.0020	0.0020	84	0.02
Sulfate	mg/L	3.3	4.6	2.5	8.6	4.1	95	218
Aluminum, total	mg/L	0.27	0.035	0.053	0.52	1.9	95	0.35
Aluminum, dissolved	mg/L	0.032	0.0095	0.013	0.13	0.14	83	n/a
Antimony, total	mg/L	0.00013	0.00008	0.00015	0.00012	0.00024	95	0.074

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Arsenic, total	mg/L	0.00049	0.00038	0.00050	0.00060	0.00092	95	0.005
Barium, total	mg/L	0.035	0.038	0.033	0.045	0.045	95	1
Beryllium, total	mg/L	0.00005	0.00005	0.00005	0.00010	0.00005	95	0.00013
Boron, total	mg/L	0.017	0.018	0.013	0.033	0.05	95	1.2
Cadmium, total	mg/L	0.000006	0.000003	0.000005	0.000011	0.000021	95	n/a
Cadmium, dissolved	mg/L	0.000003	0.000003	0.000003	0.000006	0.000005	83	0.00017
Calcium, total	mg/L	23	29	21	33	29	92	n/a
Chromium, total	mg/L	0.00052	0.00035	0.00032	0.00081	0.00200	95	0.0025
Cobalt, dissolved	mg/L	0.00006	0.00005	0.00005	0.00012	0.00010	83	0.00045
Copper, dissolved	mg/L	0.0012	0.0009	0.0010	0.0039	0.0024	83	0.0026
Iron, total	mg/L	0.23	0.038	0.045	0.6	1.5	95	1
Iron, dissolved	mg/L	0.035	0.015	0.015	0.15	0.13	84	0.35
Lead, dissolved	mg/L	0.00003	0.00003	0.00003	0.00005	0.00005	83	0.0031
Magnesium, total	mg/L	4.5	5.7	4	6.9	5.6	92	n/a
Manganese, total	mg/L	0.011	0.0029	0.0051	0.02	0.058	95	0.935
Mercury, total	mg/L	0.0000036	0.0000025	0.0000025	0.0000050	0.0000087	71	0.00002
Molybdenum, total	mg/L	0.00013	0.00015	0.00011	0.00022	0.00019	95	0.034

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Nickel, dissolved	mg/L	0.00027	0.00025	0.00025	0.00060	0.00039	83	0.0025
Selenium, total	mg/L	0.000069	0.000053	0.000040	0.000230	0.000200	95	0.002
Strontium, dissolved	mg/L	0.11	0.13	0.098	0.15	0.13	83	2.5
Silver, total	mg/L	0.000008	0.000005	0.000005	0.000020	0.000020	95	0.00005
Thallium, total	mg/L	0.000005	0.000005	0.000005	0.000010	0.000012	95	0.00003
Uranium, total	mg/L	0.000130	0.000220	0.000098	0.000270	0.000160	95	0.0085
Zinc, dissolved	mg/L	0.0010	0.0010	0.0006	0.0015	0.0015	83	0.0071

Notes: mg/L=milligrams per litre; P50=50th percentile; P95=95th percentile

1. List includes all parameters with an associated guideline value. Complete list of baseline water quality statistics presented in ERM 2020 and SRK 2021b.

Table 4.2-9: Surface Water Quality Summary Statistics for Telkwa River, 2017 to 2022 (milligrams per litre [mg/L]) where Parameters Exceeding the Water Quality Guidelines are Highlighted in Pink

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Total Dissolved Solids	mg/L	66	81	58	91	77	90	n/a
Conductivity	µS/cm	93	120	70	140	110	157	n/a
pH		7.8	7.9	7.7	8.1	8	155	n/a
Total Suspended Solids	mg/L	8.9	1.5	5.5	15	42	90	35
Hardness	mg-$CaCO_3$/L	43	58	33	71	51	126	n/a
Ammonia, total	mg-N/L	0.0045	0.005	0.0025	0.0087	0.0097	154	1.7
Chloride	mg/L	0.32	0.25	0.25	0.5	0.5	127	150
Fluoride	mg/L	0.029	0.035	0.026	0.040	0.032	113	0.99
Nitrate	mg-N/L	0.028	0.059	0.009	0.084	0.040	118	3
Nitrite	mg-N/L	0.00098	0.00050	0.00050	0.00200	0.00500	118	0.02
Sulfate	mg/L	5.7	6.8	5.1	7.7	9.3	126	218
Aluminum, total	mg/L	0.34	0.036	0.25	0.34	1.8	120	0.19
Aluminum, dissolved	mg/L	0.034	0.0063	0.031	0.045	0.09	111	n/a
Antimony, total	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	120	0.074

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Arsenic, total	mg/L	0.00026	0.00022	0.00023	0.00042	0.00058	120	0.005
Barium, total	mg/L	0.041	0.042	0.039	0.046	0.053	120	1
Beryllium, total	mg/L	0.00005	0.00005	0.00005	0.00005	0.00005	120	0.00013
Boron, total	mg/L	0.0095	0.005	0.005	0.05	0.05	120	1.2
Cadmium, total	mg/L	0.000014	0.000006	0.000013	0.000011	0.000049	120	n/a
Cadmium, dissolved	mg/L	0.000006	0.000003	0.000007	0.000007	0.000010	111	0.00011
Calcium, total	mg/L	14	18	11	20	16	119	n/a
Chromium, total	mg/L	0.00033	0.00018	0.00021	0.00054	0.00110	120	0.0025
Cobalt, dissolved	mg/L	0.000052	0.00005	0.00005	0.000055	0.000073	111	0.00039
Copper, dissolved	mg/L	0.00072	0.00052	0.00067	0.0011	0.0017	111	0.0008
Iron, total	mg/L	0.45	0.23	0.31	0.71	1.7	120	1
Iron, dissolved	mg/L	0.11	0.14	0.069	0.29	0.24	112	0.35
Lead, dissolved	mg/L	0.00004	0.00003	0.00003	0.00003	0.00010	111	0.0022
Magnesium, total	mg/L	2.3	3	1.8	3.8	2.8	119	n/a
Manganese, total	mg/L	0.025	0.012	0.021	0.032	0.082	120	0.790
Mercury, total	mg/L	0.0000032	0.0000025	0.0000025	0.0000035	0.0000110	98	0.00002
Molybdenum, total	mg/L	0.00052	0.00046	0.00057	0.00057	0.00073	120	0.034

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Nickel, dissolved	mg/L	0.00024	0.00025	0.00025	0.00028	0.00025	111	0.0013
Selenium, total	mg/L	0.000089	0.000084	0.000079	0.000200	0.000200	120	0.002
Strontium, dissolved	mg/L	0.065	0.083	0.052	0.094	0.08	111	2.5
Silver, total	mg/L	0.0000081	0.0000050	0.0000050	0.0000200	0.0000200	120	0.00005
Thallium, total	mg/L	0.0000047	0.0000050	0.0000050	0.0000050	0.0000050	120	0.00003
Uranium, total	mg/L	0.000058	0.000067	0.000054	0.000091	0.000074	120	0.0085
Zinc, dissolved	mg/L	0.001	0.001	0.0015	0.0016	0.0015	111	0.0042

Notes: µS/cm=microSiemens per centimetre; mg-$CaCO_3$/L=milligrams of calcium carbonate per litre; mg-N/L=milligrams nitrate per litre; mg/L=milligrams per litre; P50=50th percentile; P95=95th percentile

1. List includes all parameters with an associated guideline value. Complete list of baseline water quality statistics presented in ERM 2020 and SRK 2021b.

Table 4.2-10: Surface Water Quality Summary Statistics for Bulkley River, 2017 to 2022 (milligrams per litre [mg/L]) where Parameters Exceeding the Water Quality Guidelines are Highlighted in Pink

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Total Dissolved Solids	mg/L	49	53	47	76	57	73	n/a
Conductivity	µS/cm	63	76	56	93	76	108	n/a
pH		7.7	7.7	7.7	7.8	7.8	135	n/a
Total Suspended Solids	mg/L	11	1.5	3.5	11	56	73	35
Hardness	mg-$CaCO_3$/L	29	34	27	48	35	93	n/a
Ammonia, total	mg-N/L	0.0055	0.0025	0.005	0.017	0.015	147	1.6
Chloride	mg/L	0.42	0.51	0.25	1.3	0.77	85	150
Fluoride	mg/L	0.023	0.027	0.022	0.043	0.031	79	0.84
Nitrate	mg-N/L	0.022	0.038	0.013	0.057	0.031	94	3
Nitrite	mg-N/L	0.0025	0.0005	0.002	0.0011	0.005	153	0.02
Sulfate	mg/L	4.2	4.6	4	5	5	83	128
Aluminum, total	mg/L	0.28	0.047	0.11	0.54	1.3	85	0.18
Aluminum, dissolved	mg/L	0.061	0.0087	0.015	0.1	0.23	77	n/a
Antimony, total	mg/L	0.00007	0.00005	0.00005	0.00010	0.00012	85	0.074

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Arsenic, total	mg/L	0.00030	0.00020	0.00021	0.00053	0.00070	85	0.005
Barium, total	mg/L	0.027	0.025	0.026	0.034	0.035	85	1
Beryllium, total	mg/L	0.00006	0.00005	0.00005	0.00010	0.00010	85	0.00013
Boron, total	mg/L	0.0072	0.005	0.005	0.01	0.012	82	1.2
Cadmium, total	mg/L	0.000008	0.000004	0.000007	0.000011	0.000023	85	n/a
Cadmium, dissolved	mg/L	0.000004	0.000003	0.000003	0.000006	0.000007	77	0.000085
Calcium, total	mg/L	9.5	11	8.6	14	11	91	n/a
Chromium, total	mg/L	0.00038	0.00018	0.00020	0.00073	0.00130	85	0.0025
Cobalt, dissolved	mg/L	0.000072	0.00005	0.00005	0.0001	0.0001	77	0.00039
Copper, dissolved	mg/L	0.0008	0.0006	0.0006	0.0015	0.0022	79	0.0011
Iron, total	mg/L	0.33	0.092	0.15	0.58	1.4	88	1
Iron, dissolved	mg/L	0.077	0.04	0.015	0.16	0.15	79	0.35
Lead, dissolved	mg/L	0.00004	0.00003	0.00003	0.00005	0.00005	77	0.0022
Magnesium, total	mg/L	1.5	1.7	1.3	2.5	2	91	n/a
Manganese, total	mg/L	0.02	0.011	0.012	0.029	0.061	85	0.7326
Mercury, total	mg/L	0.0000031	0.0000025	0.0000025	0.0000050	0.0000062	77	0.00002
Molybdenum, total	mg/L	0.00038	0.00036	0.00039	0.00041	0.00056	85	0.034

Parameter[1]	Units	Receiving Water Quality						
		Average	P50 (Winter)	P50 (Summer)	P95 (Winter)	P95 (Summer)	Count	WQG
Nickel, dissolved	mg/L	0.00055	0.00025	0.00025	0.00050	0.00130	79	0.001
Selenium, total	mg/L	0.000046	0.000025	0.000025	0.000061	0.000200	85	0.002
Strontium, dissolved	mg/L	0.043	0.05	0.039	0.061	0.05	77	2.5
Silver, total	mg/L	0.0000072	0.0000050	0.0000050	0.0000100	0.0000200	85	0.00005
Thallium, total	mg/L	0.0000072	0.0000050	0.0000050	0.0000100	0.0000140	85	0.00003
Uranium, total	mg/L	0.000039	0.000035	0.000034	0.000065	0.000082	85	0.0085
Zinc, dissolved	mg/L	0.0011	0.0005	0.001	0.0015	0.0048	79	0.0039

Notes: µS/cm=microSiemens per centimetre; mg-$CaCO_3$/L=milligrams of calcium carbonate per litre; mg-N/L=milligrams nitrate per litre; mg/L=milligrams per litre; P50=50th percentile; P95=95th percentile

1. List includes all parameters with an associated guideline value. Complete list of baseline water quality statistics presented in ERM 2020 and SRK 2021b.

Watercourses monitored during baseline studies within the RSA have historically had elevated concentrations of total suspended solids, total aluminum, dissolved copper, total and dissolved iron, dissolved nickel, and dissolved zinc, relative to the WQGs.

- The 95th percentile summer results in Tenas Creek, Telkwa River and Bulkley River exceeded the TSS WQG.
- The 50th percentile summer result in Telkwa River and 95th percentile winter and summer results in Four Creek, Goathorn Creek, Tenas Creek, Telkwa River, and Bulkley River exceeded the total aluminum WQG. The average sample in Telkwa River and Bulkley River also exceeded the total aluminum WQG.
- The 95th percentile winter and summer results in Goathorn Creek, Telkwa River and Bulkley River, along with the 95th percentile winter results in Tenas Creek, exceeded the dissolved copper WQG. The average sample in Goathorn Creek also exceeded the dissolved copper WQG.
- The 95th percentile summer result in Tenas Creek, Telkwa River and Bulkley River exceeded the total iron WQG.
- The 95th percentile winter result in Four Creek exceeded the dissolved iron WQG.
- The 95th percentile summer result in Bulkley River exceeded the dissolved nickel WQG.
- The 95th percentile summer result in Bulkley River exceeded the dissolved zinc WQG.

5. ASSESSMENT OF PROJECT-RELATED EFFECTS

A water and load balance model (WLBM) was developed to evaluate the change between pre-mining conditions and post-mining conditions in surface water to inform the assessment. Inputs to the model include groundwater modelling results, historical and modelled climate and hydrology datasets, performance and Operations of mining elements, water management infrastructure, catchment areas, geochemical source terms and baseline water quality data. The model is intended to provide expected and reasonable worst-case conditions before, during and after mining is complete and includes sensitivity analyses to understand the range of expected conditions. Where applicable, model results were calibrated using baseline information. Modelling methods, assumptions and detailed results are presented in Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report (Updated 2025). Results are summarized in terms of effects during the Construction, Operation, Decommissioning and Reclamation, and Post-closure phases.

An additional hydrologic assessment and water balance model was prepared to support the assessment in Four Creek, which has a more complex and dynamic streamflow response linked to shallow interflow. These results are presented in Appendix 4.3-C Four Creek Watershed Groundwater Surface Water Interaction Investigation and Water Balance Model Development Report.

The assessment of Project-related effects was characterized using the Four Creek dynamic streamflow model for Four Creek and using the WLBM for all other surface water areas.

Modelled Prediction Nodes were selected within each stream in the receiving environment to characterise potential Project-related effects. Results of the modelling for the Prediction Nodes were used to determine the location, extent, and timing of change in Surface Water Quantity and Surface Water Quality subcomponents based on thresholds selected for each indicator, as described in Table 5-1. The catchment area reporting to Prediction Nodes that were classified as affected by the Project were compared with the total catchment area available within the LSA and the RSA. This was to determine if the Project's effect on the Surface Water VC compromised the sustainability or its contributions to ecological function or other water uses (agriculture, drinking water, recreation, wildlife) at the local and regional level.

Table 5-1: Definition of Affected Areas by Surface Water Valued Component Indicators

Indicator	Definition of Affected Area
Surface Water Quantity	
Change in Mean Annual Discharge (MAD)	Catchment area for Prediction Nodes where modelling results show an increase of more than 30 percent (%) or reduction of more than 10% to pre-mining MAD in any year.
Change in seasonal flow distribution	Catchment area for Prediction Nodes where modelling results show an increase of more than 30% or reduction of more than 10% to pre-mining monthly average discharge in any year.
Change in low flows and high flows	Catchment area for Prediction Nodes where modelling results show a reduction of more than 10% to pre-mining low flows (7Q10) or increase of more than 30% to pre-mining high flows (100-year wet).
Surface Water Quality	
Change in parameter concentrations	Catchment area for Prediction Nodes where modelling results show an exceedance of water quality guidelines for any parameter while also exceeding the 95th percentile from baseline monitoring data.
Change in other measurable water quality parameters.	Catchment area for Prediction Nodes where modelling results show an exceedance of guideline for any parameter while also exceeding the 95th percentile from baseline monitoring data.

The water quantity thresholds were selected based on the Environmental Flow Needs Policy (British Columbia Ministry of Forests, Lands and Natural Resources Operations [BC MFLNRO] and British Columbia Ministry of Environment [BC MOE] 2016) and environmental risk management framework, which uses a 10% reduction or withdrawal from streamflow as an indicator of stream sensitivity for fish habitat. Water quality thresholds are based on the guidelines, while accounting for natural variability each stream could be expected to experience based on baseline monitoring (95th percentile). Several assessment cases were selected to understand the range of potential effects from the Project throughout the life of the mine. Cases incorporate variability in hydrologic conditions, groundwater conditions and geochemical source terms.

The assessment described in this report describes the Project Case, which incorporates Project design mitigation measures and expected inputs for geochemical source terms and average hydrology. The results were used to inform the assessment of the Project effects on the Surface Water VC at the RSA level. Alternative assessment cases are discussed in Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report (Updated 2025).

This subsection presents:

- identification of potential Project-related interactions with the Surface Water VC;
- description of potential Project-related effects on the Surface Water VC;
- identification of mitigation measures; and
- characteristics of Project residual effects and determination of Significance on the Surface Water VC.

5.1 Potential Project-Related Interactions

This subsection focuses the assessment on those Project components and activities expected to interact with the Surface Water VC and may cause a potential effect on surface water, in terms of both quantity and quality. The potential interactions were identified based on professional experience with other mining projects in BC and through multi-disciplinary consultation with consultants working on behalf of TML. Interactions are defined as either No Interaction, or Interaction, as outlined in Table 5.1-1.

Table 5.1-1: Potential for the Interaction Between Surface Water Valued Component or Subcomponent and the Tenas Project

Term	Definition
No Interaction	Tenas Project (Project) activity will not interact with the Surface Water Valued Component (VC); no effect is expected; no further consideration is warranted.
Interaction	Interaction between the Project activity and the Surface Water VC may have a substantive influence on the short- or long-term integrity of the VC (i.e., measurable, or detectable using the identified indicator). The potential effect(s) of the interaction is considered further in the effects assessment.

The evaluation of the interaction matrix (Table 5.1-2) led to identification of potential interactions between Project components or activities and Surface Water VC subcomponents, which are those that warrant further assessment as they have potential to result in residual effects or to be of greater concern to Indigenous groups, government, or the public. Where an interaction is possible, the anticipated potential effect(s) is identified and carried forward in the assessment (5.2 Potential Project-related Effects).

Where no interaction between the Project and a subcomponent is anticipated, the interaction is not considered further in the assessment for one (1) or both of the following reasons:

- They are known to have no or negligible effects (i.e., not expected to have an influence on the integrity of surface water; effect would not be measurable or detectable using the indicators identified for the Surface Water VC); or
- They are already well regulated and/or managed under another regulatory process.

Table 5.1-2: Interactions Between Surface Water Valued Component and the Tenas Project

Project Activities	Surface Water Subcomponent	
	Surface Water Quantity	Surface Water Quality
Construction		
Transportation of equipment, materials, and personnel	X	X
Site clearing (surveying, clearing, grubbing, soil salvaging)	X	X
Construction of Surface Water Management Infrastructure, including channels and ponds (sedimentation, control, management, storage)	X	X
Construction of Bypass Road and quarries from the Minesite to the Rail Infrastructure	X	X
Improvements to existing private road and Forest Service Roads	X	X
Construction of haul roads and service roads within the Minesite		X
Construction of the permanent Goathorn Bridge Crossing over Goathorn Creek	X	X
Construction of the Coal Processing Plant	X	X
Construction of fuel and lubricant storage facilities and distribution network		X
Construction of administration buildings (first aid, maintenance, mine dry, warehouse, laboratory, parking, and vehicle wash facilities)		
Construction of a 25 kilovolt (kV) power line and a 600-volt (V) substation adjacent to the Coal Processing Plant		X
Construction of Rail Infrastructure including Rail Loop and Loadout connecting to the existing main Canadian National Railway line	X	X

Project Activities	Surface Water Subcomponent	
	Surface Water Quantity	Surface Water Quality
Installation of water supply wells, storage, and distribution system		
Construction of the water discharge infrastructure		X
Construction of storage piles for overburden, rock separated from coal in Coal Processing Plant, and stockpiles for topsoil and vegetation management	X	X
Construction of material handling systems for Minesite, including run-of-mine coal, processed coal, process rock conveyors, and stockpiles	X	X
Construction of solid waste management systems including recycling and composting facilities		
Construction of Explosives Magazine (storage building)	X	X
Employment and labour		
Operation		
Mining the open pit (soil salvaging, drilling, and blasting, excavation of material, dewatering, loading, hauling, unloading)	X	X
Operation of Surface Water Management Infrastructure including channels and ponds (sedimentation, control, management, storage)	X	X
Maintain and use Bypass Road and quarries from the Minesite to the Rail Infrastructure		
Maintain improved private and Forest Service Roads		
Maintain haul roads within the Minesite, including service roads		
Maintain permanent bridge over Goathorn Creek		

Project Activities	Surface Water Subcomponent	
	Surface Water Quantity	Surface Water Quality
Operate Coal Preparation Plant		
Maintain fuel and lubricant storage facilities		
Maintain administration buildings (first aid, maintenance, mine dry, warehouse, laboratory, and vehicle wash facilities)		
Maintain 25 kV power line and a 600 V substation adjacent to the Coal Processing Plant		
Transportation of equipment, materials, and personnel		
Maintain and use Rail Infrastructure including Rail Loop and Loadout connecting to the existing main Canadian National Railway line		X
Operate water supply wells, storage, and distribution system	X	
Operate the water discharge infrastructure	X	X
Maintain storage piles for overburden, rock separated from coal in Coal Processing Plant, and stockpiles for topsoil and vegetation management	X	X
Operate material handling systems for Minesite, including run-of-mine coal, processed coal, process rock conveyors, and stockpiles	X	X
Operate solid waste management systems including recycling and composting facilities		X
Maintain Explosives Magazine (storage facilities)		
Progressive reclamation		
Employment and labour		

Project Activities	Surface Water Subcomponent	
	Surface Water Quantity	Surface Water Quality
Decommissioning and Reclamation		
Dismantle and remove mining equipment and facilities (including powerline, Rail Infrastructure)		X
Transportation of equipment, materials, and personnel		
Reclamation and closure activities at Minesite	X	X
Reclamation and closure of Bypass Road and haul roads, including quarries	X	X
Reclamation and closure of permanent bridge over Goathorn Creek		
Reclamation and closure of powerlines		
Reclamation and closure of Rail Infrastructure	X	X
Implement post-mining systems and monitoring	X	X
Employment and labour		
Post-closure		
Maintain post-mining systems and ongoing monitoring	X	X
Transportation of equipment, materials, and personnel		
Employment and labour		

Notes:

Interaction (X): Interaction between the Project activity and the VC may have a substantive influence on the short- or long-term integrity of the VC (i.e., measurable, or detectable using the identified indicator). The potential effect(s) of the interaction is considered further in the effects assessment.

No interaction (Blank): Project activity will not interact with the VC; no adverse effect is expected; no further consideration is warranted.

5.2 POTENTIAL PROJECT-RELATED EFFECTS

This subsection considers the potential Project-related effects on the Surface Water VC arising from potential interactions identified in Table 5.1-2, and in relation to the indicators listed in Table 3.2-2. Mitigation measures for each potential effect are described in 5.3.

5.2.1 Surface Water Quantity Subcomponent

Surface water runoff is collected within the Project footprint to meet various water needs and discharged into the receiving environment when excess water is accumulated. The following sections summarize the potential Project-related effects on Surface Water Quantity in terms of the assessment indicators.

5.2.1.1 Change in Mean Annual Discharge

Changes to the streams' catchment areas throughout the life of the Project has the potential to affect the MAD. Where catchment areas are reduced or increased over baseline conditions, a similar change in MAD is expected.

5.2.1.2 Change in Seasonal Flow Distribution

Runoff generated within the Project footprint will be discharged, as needed, to Goathorn Creek. The Project will include several ponds and other changes to land use, which will affect the rate of precipitation losses, including evaporation and infiltration rates, and increasing the rate of runoff in relation to a natural, vegetated catchment. Runoff more than water demand will be discharged from the Project into a tributary to Goathorn Creek, which is expected to affect the seasonal distribution of flows in Goathorn relative to natural conditions.

Changes to the water table have the potential to alter streamflow. The water table will be reduced in proximity to the open pit, which is expected to influence groundwater recharge rates in Tenas Creek and Goathorn Creek. Since Four Creek was found to be a losing stream with a perched water table that is not connected to the underlying groundwater system, the effect of the drawdown in the water table from mining is not expected to negatively impact discharge in Four Creek.

The management ponds are expected to increase the water table levels, which would result in a net gain to groundwater recharge further downstream in Four, Tenas and Goathorn creeks. Both changes affect the shape of the annual hydrograph in relation to baseline conditions.

5.2.1.3 Change in Low Flows and High Flows

The water table is expected to fluctuate throughout the life of the mine, based on open pit mining and mounding of water in raised management ponds. This change is expected to have an effect (i.e., change in flows) that is expected to be most prominent during low flow conditions in Tenas Creek. Since Four Creek was found to be a losing stream with a perched water table that is not connected to the underlying groundwater system, the effect of the drawdown in the water table from mining is not expected to negatively impact discharge in Four Creek.

Where catchment areas are expected to increase relative to baseline conditions, such as in select reaches within Four Creek and in Goathorn Creek downstream of the Project discharge, the Project may influence high flows. These changes are expected to be similar in magnitude as the increase in catchment relative to baseline conditions.

5.2.2 Surface Water Quality Subcomponent

Surface Water Quality has the potential to be affected because of mining Operations. The primary pathways for effects on water quality include seepage from water storage facilities and direct discharge to surface water streams, as well as minor pathways related to inadvertent spills or leaks of hydrocarbons.

5.2.2.1 Change in Modelled Parameter Concentrations

Water in contact with previously buried rock, whether non-potentially acid generating (non-PAG) or potentially-acid generating (PAG), may result in release of naturally occurring metals, including selenium, cadmium, sulphate, and aluminum, through metal leaching and/or acid rock drainage (ML/ARD).

Recently blasted rock from active mining may also contain residual compounds from incomplete detonation of explosives materials, resulting in elevated levels of nitrite, nitrate, and ammonia. These blasting residuals can also be released through water in contact with blasted rock.

As a result, water captured within the Project footprints that may be in contact with mine rock may produce elevated concentrations of metals and other water quality parameters.

Project discharge is expected to occur because of surplus runoff and precipitation within storage facilities such as the management, sedimentation ponds and will be directed to Goathorn Creek or Tenas Creek via the Tenas Control Pond. Discharge will occur throughout Construction, Operation, Decommissioning and Reclamation, as well as Post-closure Phases. During Construction, Operation, Decommissioning and Reclamation, and part of the Post-closure Phase, discharge will be through the Tenas Control Pond, while in the later part of the Post-closure Phase discharge will be from the North Management Pond.

Seepage from the Project may occur because of increased head in the water table versus baseline conditions. The timing of seepage being observed in the downstream environment is tied to soil characteristics, which suggest that the effect will not be immediate, but will occur primarily near the end of Operation Phase, and during the Post-closure Phase. Seepage effects are not expected to be observed during the Construction Phase.

Effects are evaluated in relation to the in-stream water quality guidelines (3.2.3.1).

5.2.2.2 Change in Other Measurable Water Quality Parameters

Any disturbance to natural ground may result in an increase in suspended sediment (i.e., TSS) and total dissolved solids (TDS) which in turn may increase turbidity and electrical conductivity (EC). Elevated concentrations of metals in water storage facilities may also change the conductivity of the water.

Unexpected, incidental spills or leaks due to operating machinery could result in elevated concentrations of hydrocarbons.

No changes are expected for polycyclic aromatic hydrocarbons (PAHs) from baseline conditions so the effect from PAHs was not carried forward into the assessment stage, however PAHs will be included as a monitored parameter as part of the Minesite Water Monitoring Program (Appendix 13.11-E of the MWMP).

5.2.3 Summary of Potential Project-related Effects

5.2.3.1 Construction Phase

The following bullet points summarize potential Project-related effects on the Surface Water VC during the Construction Phase, including effects on both Water Quantity and Water Quality subcomponents:

- Removal of vegetation and topsoil during land clearing has the potential to result in increased erosion rates, resulting in sediment migration to downstream creeks and rivers (i.e., change in water quality parameters);
- Changes to site drainage patterns, resulting in reduction or increases to pre-mining catchment areas, have the potential to reduce or enhance streamflow (i.e., change in MAD, seasonal distribution, low flows, and high flows); and
- Construction of Project facilities has the potential to result in accidental spills/leaks or release of sediment to the downstream creeks and rivers (i.e., change in water quality parameters, change in other measurable parameters).

5.2.3.2 Operation Phase

The following bullet points summarize potential Project-related effects on the Surface Water VC during the Operation, and Decommissioning and Reclamation phases, including effects on both Water Quantity and Water Quality subcomponents:

- As the Project footprint expands over-time, streamflow in both Tenas and Four creeks is expected to decrease in relation to the reduced catchment area (i.e., change in mean annual discharge, low flows, and high flows);
- Open pit mining is anticipated to result in a drawdown of the groundwater table, which could influence the baseflow contributions in the adjacent creeks and rivers (i.e., change in low flows);
- Water in contact with blasted rock during open pit mining has the potential to mobilize blasting residuals including nitrate, nitrite, and ammonia, which could influence water quality (i.e., change in modelled water quality parameters);
- Management ponds and the Tenas Control Pond are anticipated to increase the water table level, which could increase the baseflow contributions in the adjacent creeks and rivers (i.e., change in low flows);
- Exposure of mine waste to oxygen has the potential to produce ML/ARD, resulting in potential degradation of water quality in the downstream creeks and rivers. ML/ARD has the potential to travel in both subsurface flows through groundwater pathways and in surface water via direct discharge from Project infrastructure (i.e., change in modelled water quality parameters, change in other measurable parameters);
- Use of road crossings (i.e., vehicle traffic) has the potential to release dust and sediment into creeks and rivers (i.e., change in modelled water quality parameters, change in other measurable parameters);
- Operation of the Coal Processing Plant (CPP) and other industrial activities have the potential to release contaminants, into downstream creeks and rivers (i.e., change in modelled water quality parameters, change in other measurable parameters); and
- Water storage facilities, including the larger management ponds and the Tenas Control Pond, as well as smaller sedimentation ponds, have the potential to breach, resulting in uncontrolled discharge of water and mine waste to the environment (i.e., change in modelled water quality parameters, high flows).

5.2.3.3 Post-closure Phase

The following bullet points summarize potential Project-related effects on the Surface Water VC during the Post-closure phase, including effects on both Water Quantity and Water Quality subcomponents:

- Dewatering of the Tenas Control Pond to the tributary of Goathorn Creek has the potential to result in increased erosion and elevated concentrations of water quality parameters (i.e., change in high flows and modelled water quality parameters, change in other measurable parameters);
- Release of ML/ARD may contribute to water quality exceedances in downstream creeks and rivers (i.e., change in modelled water quality parameters, change in other measurable parameters);
- Flooding of the open pit in development of pit lakes may reduce Project discharge for approximately 12 years (i.e., change in MAD, seasonal flow distribution); and
- Permanent changes to site drainage may reduce streamflow in Four Creek and Tenas Creek (i.e., change in MAD, seasonal flow distribution, low flows, and high flows).

5.3 MITIGATION MEASURES

This subsection describes the mitigation measures that have been considered within the Project design and mitigations to alleviate potential Project-related effects (changes in MAD, seasonal flow distribution, low flows, high flows, etc.) in all Project phases. These mitigations include practical means or measures taken to avoid or reduce potential effects of the Project on the Surface Water VC. Mitigation measures include applicable standards, guidelines and BMPs supported by guidance documents and are based on proven, accepted mitigation used on other similar projects in BC.

TML has incorporated several mitigation measures in the Project's design and/or operational procedures to reduce the magnitude, duration, and extent of effects due to the Project. These Project mitigation measures are outlined in S1.0 Overview of Project Proponent Description of the EAC Application and include Project design aspects such as site selection, selection of best available technology (BAT) to-date for Project infrastructure and mining equipment, and a commitment to progressive reclamation. Project mitigation measures that are relevant to minimizing potential Project-related effects on the Surface Water VC are described in 5.3.1 to 5.3.10 below. As not all effects can be addressed through design, additional mitigation measures specific to the Surface Water VC and tailored to Project features are described in 5.3.11 and 5.3.12.

Several environmental management plans will define the standard operating procedures, the BMPs, the adherence to existing environmental regulations, and the use of appropriate design criteria. Environmental management plans will define the purpose and objectives, scope, the BMPs, the adherence to existing environmental regulations, Minesite employee roles and responsibilities, and the use of appropriate design criteria. Project Operations are governed by an overarching Environmental Management System (S13.0-C1) (EMS) of the EAC Application, of

which all management plans are a part. The following is a list of the management plans (S13.0 Management Plans) with potential linkages to the Surface Water VC:

- EMS;
- Air Quality Management Plan (S13.0-C2) (AQMP);
- Chemicals and Materials, Storage, Transfer, and Handling Plan (S13.0-C3) (CMSTHP);
- Construction Environmental Management Plan (S13.0-C4) (CEMP);
- Discharge Management Plan (S13.0-C5) (DMP);
- Explosives Management Plan (S13.0-C6) (EMP);
- Fuel Management and Spill Control Plan (S13.0-C7) (FMSCP);
- MWMP;
- ML/ARD Management Plan (S13.0-C12) (ML/ARDMP);
- Reclamation and Closure Plan (S13.0-C15) (RCP);
- Surface Erosion Prevention and Sediment Control Plan (S13.0-C17) (SEPSCP); and
- Waste Management Plan for Refuse and Emissions (S13.0-C20) (WMPRE).

The management plans provide further direction on sequencing, monitoring and adaptive management, and the mitigation measures outlined in each plan are expected to be timely and effective following implementation.

Mitigation measures are commitments that Telkwa Mining has applied through mine design and to the operating principals through the life cycle of the Project. All mitigation measures for the Surface Water VC are described in detail in the following subsections and summarized in Table 5.3-1.

5.3.1 Avoid Sensitive Environments

The Project has been designed to:

- avoid known wetlands and sensitive ecosystems (such as riparian areas); and
- avoid activities within watercourses.

5.3.2 Limit Project Footprint and Project Area

To limit the Project footprint and Project Area the Project has been designed to:

- Cluster Project components, including the open pit, stockpiles for run-of-mine (ROM) coal, processed coal, and processed rock, CPP, management ponds, and ancillary facilities such as the Maintenance Facility and Administration Building;

- Align linear Project features (such as powerlines, roads, water distribution) into a common right-of-way (ROW);
- Place Project features within existing or planned Project component footprints to limit the clearing of vegetation and the salvage of reclamation materials (surface soil, woody debris, and overburden). For example, the Minesite buildings will be built in areas previously cleared by forestry activity;
- Place reclamation material (surface soil and woody debris) stockpiles within development areas such as the open pit and haul roads to avoid disturbance, while overburden is directly placed on Project components for future reclamation activities;
- Limit the TAC to a single lane width for long distances and utilize existing Forest Service Roads (FSRs) or private roads where appropriate;
- Backfill approximately 50% of non-coal material back into the open pit; and
- Place processed rock from the CPP within the management ponds versus a separate permanent pile to avoid any potential ARD from this material and reduce the Project Footprint.

5.3.3 Reclamation Measures

The following reclamation measures have been incorporated into the mine design:

- Use progressive reclamation techniques to limit the amount of disturbance at any given time by sequencing the open pit and stockpiles to the extent feasible, backfilling of open pit where possible, directly reclamation materials, and placing excavated materials on previously disturbed areas;
- Salvage reclamation materials (surface soil, woody debris, and overburden), for later use in accordance with the RCP;
- Vegetate all temporary surface soil and overburden stockpiles to minimize the potential for erosion and sediment generation, to prevent subsequent potential effects on water quality, and to prevent losses of surface soils;
- Implement progressive reclamation on embankments, buttresses, backfills, TAC cut and fill slopes, and other Project components, where possible to minimize fugitive dust emissions and reduce erosion and sediment generation;
- PAG material deposited in the management ponds will be flooded to prevent acid mine drainage but will also be covered with an engineered cover consisting of non-PAG rock, overburden, and surface soils to allow for terrestrial revegetation; and
- Majority of open pit features (e.g., highwalls and footwalls) are covered/resurfaced/recontoured with non-PAG rock and overburden.

5.3.4 Management of Metal Leaching/Acid Rock Drainage

The following mitigation measures apply to preventing potential ARD:

- Identify and segregate PAG material while mining the open pit, and place PAG material in management ponds and submerge PAG material under a minimum of one (1) m of water within an average of six (6) months after excavation but no longer than 12 months and under at least two (2) m of water once the management pond has met its PAG material storage requirements (North Management Pond is completed first, followed by the East Management Pond and finally the West Management Pond) to prevent potential ARD and subsequent effects on surface water quality;
- Place approximately a one (1) to two (2) m layer of non-PAG rock on top of the submerged PAG material below the active water level of the respective management pond, followed by approximately one (1) to three (3) m layer of overburden to create a dry landform above water, followed by an approximately 30 centimetre (cm) layer of reclamation materials (surface soil) to reduce evaporative losses from the management ponds and provide a landscape more similar to pre-Project development;
- No PAG material will be used in construction of any external piles, pads, roads, embankments, buttresses, or for backfilling the open pit, to prevent potential ARD and subsequent effects on surface water quality;
- Open pit walls will be covered by non-PAG material to limit oxygen and water ingress into the open pit walls and provide a neutralizing effect on the open pit wall material below;
- Some of the open pit walls will be flooded with water to further reduce the likelihood of ARD from the covered open pit walls;
- Establish a material geochemical testing program for future Project exploration drillholes and Operation Phase blast holes as part of the blasting program to verify PAG versus non-PAG materials. Maintain a PAG geological model while the open pit is being mined to reflect any changes observed;
- Maintain a database of geochemical testing results and material placement to avoid the incorrect placement of PAG material and potential ARD with subsequent effects on surface water quality;
- Establish a material tracking system to document the location and type of material being excavated and hauled to avoid misplacement of material and/or remediate any misplacement that may occur;
- Controlled open pit wall blasting will be conducted on both the highwall and footwall to limit the amount of damage to the open pit wall to minimize the potential for particle size reduction and provide pathways for water and oxygen to enter the open walls prior to them being covered;

- Majority of material near the open pit footwall will not be blasted again to minimize the potential of water and oxygen accessing this material; and
- Progressive reclamation will be undertaken to reduce the infiltration of water and oxygen into the open pit walls by placing non-PAG rock and overburden on the open pit walls once mining is completed for an open pit wall section in question and people operating equipment have moved at least 100 m away from proposed backfilling operation. Furthermore, this non-PAG material is expected to provide a permanent high neutralization potential (NP) water source to prevent ARD generation from PAG material present in the open pit walls.

The following mitigation measures apply for minimizing potential metal leaching (ML):

- Progressive reclamation will be undertaken to reduce the infiltration of water and oxygen into the non-PAG backfills, buttresses, and embankments;
- Non-PAG rock will be covered with overburden as much as material constraints allow to reduce the infiltration of water and oxygen;
- Place some non-PAG rock into management ponds that are characterized as PAG because of the mine planning process using a neutralization potential ratio (NPR) value of 2NP (neutralizing potential):1AP (acid potential [AP]) to classify non-PAG material from PAG material versus the geochemistry NPR value of 1.2NP:1AP used for classifying non-PAG material from PAG material; and
- In the Post-closure Phase, approximately half of non-PAG material will be flooded with water in the open pit to prevent oxygen ingress and further oxidization of this material resulting in a reduction of ML once this occurs.

5.3.5 Transport Measures

The following mitigation measures refer to transport measures:

- Build, maintain, and use the TAC for hauling processed coal to the Rail Infrastructure for the duration of all Project phases after the Construction Phase to minimize traffic on existing, residential roads;
- Build, maintain, and use the TAC for transport of personnel, goods, and services for the duration of all Project phases after the Construction Phase to minimize traffic on existing, residential roads;
- Repair and/or replace and/or upgrade existing FSRs or private roads that will be used as part of the TAC;
- Repair and replace new and existing culverts as required for all Project related transport corridors including the TAC;

- Design and build a permanent clear span bridge over Goathorn Creek and Helps Creek and its tributaries to provide vehicular access to the Project that will be controlled by TML;
- Use buses and/or vans for employees and contractors as much as practical to reduce the risk of traffic incidents, and to reduce noise and fugitive dust emissions generated by the Project. Bussing options to Witset and/or Houston to be provided (if requested and based on sufficient employees in these locations) to facilitate potential employees accessing employment opportunities with the Project;
- Use dust supressing agents on the rail cars to reduce fugitive dust emissions;
- Cover super B-train trucks when hauling processed coal from CPP to Rail Infrastructure to reduce fugitive dust emissions from trucks;
- Use water and chemical agents on the TAC to reduce fugitive dust emissions, where and when appropriate; and
- Use water and chemical agents, as required, on processed coal and ROM coal stockpiles to reduce fugitive dust emissions resulting from storage and handling.

5.3.6 Blasting Measures

The following mitigation measures apply to blasting:

- Use best management stemming techniques (e.g., type of material, size consistency, loading method, and thickness) that will minimize effects of noise and fugitive dust from blast patterns and assist in the complete detonation of drill holes to reduce the introduction of nitrogen species into the surrounding rock per the EMP;
- Correctly time blast to minimize effects of noise, vibration, and fugitive dust from blast patterns;
- Keep blast patterns small to minimize effects of noise, vibration, and fugitive dust and to reduce the time that patterns need to sleep or wait until they are blasted which reduces the introduction of nitrogen species into the surrounding rock;
- Monitor actual blast results and implement improvements as required as per the adaptive management process to reduce effects of noise, vibration, fugitive dust and reduce the introduction of nitrogen species into the surrounding rock;
- Incorporate the use of liners for all blastholes if the hole conditions allow for the installation of liners; and
- Use electronic detonators to minimize effects of noise, vibration, and fugitive dust from blast patterns and manage misfires to reduce the introduction of nitrogen species into the surrounding environment.

5.3.7 Seepage Management Measures

Mitigation measures associated with seepage management:

- Use overburden bentonite liners for management ponds to reduce the amount of groundwater seepage and potential effects on surface and groundwater quality;
- Use liners in the Tenas Control Pond, Wastewater Storage Pond, Soil Treatment Facility, Potable Water Storage Pond, and sedimentation pond at the CPP site to minimize the risk of seepage to groundwater and potential effects on surface water and groundwater quality;
- Monitor seepage, groundwater, and surface water levels, and quality/quantity downstream and upstream of the Project as per the monitoring programs set up in the MWMP; and
- Establish trigger levels that require the implementation of contingency mitigations measures described in the DMP to protect surface water and groundwater quality and maintain minimum flow levels downstream of the Project.

5.3.8 Water Capture Measures

The designs of the management ponds, sedimentation ponds, collection and diversion channels, and all other water management structures are documented in S1.0-1.22 Management Ponds (Tailings Storage Facility) and Control Pond Aspects, Appendix 1.0-G Tenas Project Water Management Technical Design Report of the EAC Application, and the MWMP. The following mitigation measures apply to water capture:

- Construct diversion channels, where practical, to prevent non-contact water from entering the Project Area and remain as non-contact water;
- Sedimentation and control ponds will have sufficient storage capacity to allow fine sediments to settle out for 1 in 10-year storm events and will be designed to structurally withstand a 1 in 200-year storm event; TSS and/or turbidity will be monitored prior to release;
- Establish flocculent addition systems for sedimentation and/or control ponds that will discharge directly to surface waters to provide additional sedimentation control to reduce potential effects on surface water quality;
- If monitoring indicates, construct wetlands within or downstream of sedimentation and/or control ponds to reduce potential effects on surface water quality;
- Include a control structure on the outflow from the C02 diversion channel south of the East Management Pond to control high flow events discharging into the upstream portion of Four Creek by enabling overflow to the East Management Pond directly in the

Post-closure Phase or to a channel going into the Tenas Control Pond in the Operation, and Decommissioning and Reclamation phases;

- Maintain sufficient capacity in the Tenas Control Pond to store up to a 1 in 10-year storm event and to control discharge;
- Monitor and control water discharges from Tenas Control Pond to a tributary of Goathorn Creek based on downstream water flow rates and water quality to meet in-stream guidelines and flow requirements during the Operation, and Decommissioning and Reclamation phases; and
- Develop the open pit in a manner that will allow it to collect water in the Decommissioning and Reclamation, Post-closure Phases to provide additional sedimentation control.

5.3.9 Project Use of Water

The following mitigation measures apply to water use:

- Maximize the use of contact water for Project water needs (i.e., use contact water for process water for the CPP and equipment washbays before withdrawing additional water from streams);
- Incorporate a contingency water supply from of 2.5 % of Goathorn Creek's mean annual monthly flow which was part of the assessment (effect is included in the flow rate of Goathorn Creek downstream of intake location) but this contingency is not incorporated into water cover simulations or the overall Project water balance;
- Use dewatered fine processed rock in the CPP to reduce Project water consumption;
- Direct water from the Maintenance Facility to the CPP to reduce Project water consumption;
- Use process water from the Tenas Control Pond, management ponds, and CPP sedimentation pond for the CPP to limit water consumption;
- Design of the CPP allows for the introduction of additional equipment to be installed within 18 months to further reduce water consumption in the Operation Phase if required;
- Use process water from the Tenas Control Pond for toilets in the Minesite Administration Building to reduce potable water consumption; and
- Construct engineered covers for the management ponds in the Operation, and Decommissioning and Reclamation, and Post-closure phases to limit the consumption of water through evaporation losses.

5.3.10 Water Quality Monitoring and Reporting Measures

The following refer to surface water quality and monitoring measures:

- Provide results of water quality sampling and quantity monitoring per the MWMP via the BC MECCS website, as was completed for baseline sampling activities, in addition to annual reporting required as part of regulatory permits. Annual reports regarding *Mines Act*, RSBC 1996, c. 293, and *Environmental Management Act*, SBC 2003, c. 53 (MA/EMA) permits will be sent to Indigenous groups and the public based on final permit conditions.

5.3.11 Erosion and Sediment Control

- Sediment and erosion control measures will be implemented in accordance with the SEPSCP and CEMP; and
- Areas prone to instability and areas in proximity to water bodies and drainages will be further reinforced/stabilized via construction of abutments and permanent erosion controls, if specified. Hydrological connectivity will be maintained by providing unobstructed passage of water in existing drainage channels through fill materials (i.e., using free-span bridges or culverts at water crossings) in accordance with the MWMP.

5.3.12 Hazardous Materials and Refueling

- Hydrocarbon storage and refueling stations will be located at least 30 m from waterbodies and on level ground. Double-walled hydrocarbon (fuel, glycol, and lubricant) tanks will be used at most locations in addition to other spill controls for any single-walled hydrocarbon (fuel, glycol. and lubricant) tanks. In the absence of double-walled tanks, secondary containment must be used;
- Spill prevention and response measures will be implemented during vehicle and equipment travel/Operations in accordance with the FMSCP and any hazardous materials management in accordance with the FMSCP as well;
- The Project, including along the TAC and Rail Infrastructure, will have spill kits strategically located around site and on TML and contractor vehicles to allow an immediate response to fuel spills, oil leaks, hydraulic line ruptures, and accidental spills of hazardous materials. Re-fueling and lubrication of equipment will not be conducted within 30 m of a watercourse and, where stationary equipment cannot be relocated beyond 30 m of a watercourse, it will be situated in a designated area that has been bermed and lined with a semi-impermeable barrier of sufficient size to provide secondary containment for liquids stored;
- Vehicles and equipment will be clean and free of leaks prior to working in proximity to a watercourse and checked routinely.

5.3.13 Summary of Mitigation Measures

Table 5.3-1 summarizes the mitigation measures that are designed and will be implemented to avoid, reduce, or limit the potential effects on the Surface Water VC.

Table 5.3-1: Summary of Potential Effects and Mitigation Measures for Surface Water Valued Component

Potential Effect	Contributing Activities within the Project Phases (C, O, D, P)	Proposed Mitigation Measure	Applicable VC Subcomponent	Residual Effect (Yes/No)
Change in Mean Annual Discharge	All activities (C, O, D, P)	• Avoid sensitive environments • Limit Project footprint and Project Area • Reclamation measures (refer to RCP) • Management of ML/ARD • Water capture measures	Surface Water Quantity	Yes
Change in Seasonal Flow Distribution	All activities (C, O, D, P)	• Limit Project footprint and Project Area • Transport measures • Water capture measures • Project use of water • Seepage management measures	Surface Water Quantity	Yes
Change in Low Flows and High Flows	All activities (O, D, P)	• Water capture measures • Project use of water • Seepage management measures	Surface Water Quantity	Yes
Change in Modelled Parameter Concentrations	All activities (C, O, D, P)	• Avoid sensitive environments • Limit Project footprint and Project Area • Reclamation measures (refer to RCP) • Management of ML/ARD • Blasting measures (refer to EMP) • Water capture measures • Erosion and sediment control (refer to SEPSCP, CEMP, and MWMP) • Hazardous material and refueling (refer to FMSCP)	Surface Water Quality	Yes

Potential Effect	Contributing Activities within the Project Phases (C, O, D, P)	Proposed Mitigation Measure	Applicable VC Subcomponent	Residual Effect (Yes/No)
		• Water quality monitoring and reporting measures • Incorporation of pilot In-situ Active Gravel Bed Reactors in the Coal Processing Plant and Rail Infrastructure Sedimentation Ponds		
Change in Other Measurable Water Quality Parameters	All activities (C, O, D, P)	• Transport measures • Management of ML/ARD • Erosion and sediment control (refer to SEPSCP, CEMP, and MWMP) • Hazardous material and refueling (refer to FMSCP)	Surface Water Quality	Yes

Note: C, O, D, P represent Project Phases: (C)onstruction, (O)peration, (D)ecomissioning and Reclamation, (P)ost-closure

FMSCP=Fuel Management and Spill Control Plan (S13.0-C7); ML/ARD=metal leaching/acid rock drainage; (S13.0-C12); MWMP=Minesite Water Management Plan (S13.0-C11); RCP=Reclamation and Closure Plan (S13.0-C15); SEPSCP=Surface Erosion Protection and Sediment Control Plan (S13.0-C17); VC=Valued Component

See Table 5.1-2 for list of applicable activities for each listed Project phase, unless otherwise noted in this table.

5.4 Residual Effects and Significance of Residual Effects

This subsection describes anticipated residual effects of the Project on the Surface Water VC. Residual effects are effects that remain after the implementation of all mitigation measures and management strategies and are the expected effects of the Project on the Surface Water VC.

The approach to assessing residual Project effects on the Water Quality VC follows the methodology outlined in S3.0 Assessment Methodology of the EAC Application. The Significance of residual effects on the Surface Water VC, including changes to Water Quantity and Water Quality subcomponents, are presented, along with the Likelihood of each effect and the Level of Confidence associated with the determination of Significance. Determination of Significance for residual effects on the Surface Water VC is based on consideration of the residual effects characteristics and environmental context at the RSA level.

5.4.1 Description of Evaluation Criteria

5.4.1.1 Residual Effects Characteristics

Residual effects on the Surface Water VC subcomponents, Water Quantity and Water Quality, have been characterised in terms of Magnitude, Geographical Extent, Frequency, Duration, Reversibility, and Context and are presented on Table 5.4-1 and Table 5.4-2, respectively. The definitions for what qualifies as an affected area for each indicator were provided in Table 5-1 and summarized in the Magnitude definitions for each subcomponent.

Table 5.4-1: Effect Characteristics Considered When Determining the Significance of Residual Effects on the Surface Water Quantity Subcomponent

Residual Effect Characteristic	Definition	Indicator	Rating
Magnitude	Change in streamflow because of Project Interactions, relative to pre-mining conditions	Change in mean annual discharge (MAD)	Low: Affected area, where MAD is expected to be reduced by more than 10% or increased by more than 30%, is less than 5% of LSA. Moderate: Affected area is 5% or more but less than 20% of LSA. High: Affected area is 20% or more of LSA.
		Change in seasonal flow distribution	Low: Affected area, where monthly average streamflow is expected to be reduced by more than 10% or

Residual Effect Characteristic	Definition	Indicator	Rating
			increased by more than 30%, is less than 5% of LSA. Moderate: Affected area is 5% or more but less than 20% of LSA. High: Affected area is 20% or more of LSA.
		Change in low flows and high flows	Low: Affected area, where 7Q10 or high flows are expected to be reduced by more than 10% or increased by more than 30%, is less than 5% of LSA. Moderate: Affected area is 5% or more but less than 20% of LSA. High: Affected area is 20% or more of LSA.
Geographic Extent	Spatial scale over which the change is expected to occur.	All	Local: Affected area is within the LSA. Regional: Affected area extends beyond the LSA but is confined within the RSA. Beyond Regional: Affected area extends beyond the RSA.
Duration	Length of time, in years, over which the change is expected	All	Short-term: Effect lasts less than 1.5 years (Construction Phase). Medium-term: Effect lasts 1.5 years or more and less than 25 years (encompassing operation, reclamation, closure periods). Long-term: Effect extends beyond the Post-closure period.
Frequency	How frequently the change is expected over Base Case assessment	All	Infrequent: Effect occurs in sporadic intervals (i.e., under maximum conditions but not under average conditions). Frequent: Effect occurs on a regular basis (i.e., on a monthly average basis).

Residual Effect Characteristic	Definition	Indicator	Rating
			Continuous: Effect occurs year-round under average conditions.
Reversibility	Whether or not the change can be reversed once the activity causing the residual effect ceases.	All	Fully Reversible: Effect occurs in construction and Operations only. Partially Reversible: Effect occurs in the initial closure period but does not persist in steady state (through to the Year 2100). Irreversible: Effect occurs in steady-state conditions (through to the Year 2100).
Context	The extent to which surface water has been affected by past and present environmental and socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience).	All	Low: Receiving environment has high resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the ecosystem, and/or a lack of historic and ongoing anthropogenic or natural disturbance. Moderate: Receiving environment has a neutral resilience to imposed stresses and expected to be able to respond and adapt to the effect. High: Receiving environment has weak resilience to stress or ecological change. This resilience can be a result of the ecological characteristics of the ecosystem, and/or a high level of historic or ongoing anthropogenic or natural disturbance.

Notes: %=percent; LSA=Local Study Area; Project=Tenas Project; RSA=Regional Study Area; VC=Valued Component

Table 5.4-2: Effect Characteristics Considered When Determining the Significance of Residual Effects on the Surface Water Quality Subcomponent

Residual Effect Characteristic	Definition	Indicator	Rating
Magnitude	Increase of parameter concentrations compared to baseline conditions and water quality guideline[1]	Change in parameter concentrations	Low: Affected area, where water quality concentrations are expected to exceed water quality guidelines as well as the 95th percentile from baseline monitoring, is less than 5% of LSA. Moderate: Affected area is 5% or more but less than 20% of LSA. High: Affected area is 20% or more of LSA.
	Increase of parameter concentrations compared to baseline conditions	Change in other measurable parameters	Low: Affected area, where water quality concentrations are expected to exceed the 95th percentile from baseline monitoring, is less than 5% of LSA. Moderate: Affected area is 5% or more but less than 20% of LSA. High: Affected area is 20% or more of LSA.
Geographic Extent	Spatial scale over which the change is expected to occur.	All	Local: Affected area is within the LSA. Regional: Affected area extends beyond the LSA but is confined within the RSA. Beyond Regional: Affected area extends beyond the RSA.
Duration	Length of time, in years, for which the parameter exceeds the water quality guideline in any given month (winter or summer).	All	Short-term: Effect lasts less than 1.5 years (Construction Phase). Medium-term: Effect lasts 1.5 years or more and less than 25 years (encompassing

Residual Effect Characteristic	Definition	Indicator	Rating
			operation, reclamation, closure periods). Long-term: Effect extends beyond the Post-closure Phase.
Frequency	How frequently modelled water quality is expected to exceed the water quality guideline, based on winter months (November through April) or summer months (May through October)	All	Infrequent: Effect occurs in sporadic intervals (i.e., under maximum conditions for winter or summer but not under average conditions). Frequent: Effect occurs on a regular basis (i.e., on a monthly average basis for winter or summer). Continuous: Effect occurs year-round under average conditions (winter and summer).
Reversibility	Whether or not the change can be reversed once the activity causing the residual effect ceases.	All	Fully Reversible: Effect occurs in construction and Operations only. Partially Reversible: Effect occurs in the initial closure period but does not persist in steady state (through the Year 2100). Irreversible: Effect occurs in steady-state conditions (through the Year 2100).
Context	The extent to which surface water has been affected by past and present environmental and socio-economic processes and conditions, its potential sensitivity to the Project-related residual effect, and its ability to recover from that effect (i.e., resilience)	All	Low: Receiving environment has a high resilience to imposed stresses and is expected to respond and adapt to the effect. Moderate: Receiving environment has a neutral resilience to imposed stresses and is expected to be able to respond and adapt to the effect. High: Receiving environment has a low resilience to imposed

Residual Effect Characteristic	Definition	Indicator	Rating
			stresses and is not expected to easily respond and adapt to the effect.

Notes: %=percent; LSA=Local Study Area; Project=Tenas Project; RSA=Regional Study Area; VC=Valued Component

1. The applicable water quality guidelines for each parameter are presented in Section 3.2.3.1.

5.4.1.2 Likelihood

Likelihood refers to the probability of the predicted residual effect occurring, including consideration of the potential that the mitigation will be successful. The probabilities are based on qualitative judgment and collective understanding of the hydrologic system within the profession.

- **Likely** Moderate-to-High probability of an effect; or
- **Unlikely** Low probability of an effect.

5.4.1.3 Significance Definition

The characterisation of residual effects is based on the review of existing conditions (see 4), the assessment of Project-related effects (5.2), other relevant scientific information, and the professional judgement of the assessment team. All residual effects (independent of their Significance rating) are carried forward to the CEA.

The Significance of the residual effect is rated as **Significant** or **Not Significant** and is defined as follows:

- **Significant**: An effect that results in a change in the Surface Water VC within the LSA that will alter its integrity beyond an acceptable level, defined as High Magnitude effects, Local or greater in Extent, with a Long-term Duration; or
- **Not Significant**: An effect that does not meet the definition of **Significant**.

Confidence is a measure of how well residual effects are understood and the quality of the input data. It considers the scientific certainty relative to the quantification and/or qualification of the effect, including the quality and or quantity of data and the understanding of effect mechanisms, as well as professional judgment based on prior experience in predicting effects and the effectiveness of mitigation measures.

A Low Level of Confidence is assigned to effects predictions with little or no empirical site-specific data, whereas a Moderate Level of Confidence is assigned to predictions that are based on site-

specific data sources such as predictive model outputs and published literature. A High Level of Confidence is assigned to predictions that have direct, site-specific quantitative data to support the predictions.

Based on these criteria, it was determined that an additional risk analysis was not required.

5.4.2 Surface Water Quantity Subcomponent

Model results from the WLBM (Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report [Updated 2025]) and the Four Creek dynamic streamflow model (Appendix 4.3-C Four Creek Watershed Groundwater Surface Water Interaction Investigation and Water Balance Model Development Report) were used to inform the assessment of effects for Surface Water Quantity in terms of the thresholds for each indicator, as defined in Table 5-1. The following sections summarize the affected areas for each Surface Water Quantity indicator.

5.4.2.1 Change in Mean Annual Discharge

Changes to natural streams' catchment areas throughout the life of the Project has the potential to influence MAD. Where catchment areas are expected to be reduced or increased over pre-mining conditions, a similar change in MAD is expected.

The maximum change in pre-mining catchment area is experienced at the end of mining, resulting in an expected reduction to total catchment area of 5.0 km^2 and 4.1 km^2 in the Tenas Creek and Four Creek watersheds, respectively. A proposed diversion channel along the southern extent of the East Management Pond is also expected to increase the catchment area in portions of Four Creek. As a result, Four Creek is expected to experience the largest change in catchment area relative to baseline total catchment conditions, including portions with a net increase and portions with a net decrease in MAD.

Modelling results from the Four Creek dynamic streamflow model (Appendix 4.3-C Four Creek Watershed Groundwater Surface Water Interaction Investigation and Water Balance Model Development Report, SLR Consulting) show monthly streamflow in Four Creek increasing by up to 12% during Operations and reducing by up to 7% in the closure and Post-closure phase. Based on these results, Four Creek would not be characterized as being affected by the Project. Modelling results from the WLBM (Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report [Updated 2025]) show changes in Four Creek with respect to pre-mining conditions. The WLBM shows that Four Creek, directly downstream of the East Management Pond diversion channel, could experience an increase to MAD by up 50% over pre-mining conditions during Operations. In the closure and Post-closure phase, the impact of the surface diversion is reduced, and the maximum increase to MAD is 35%. Further downstream, Four Creek is expected to have reduction in streamflow, by up to 25% in Operations and 20% in closure and Post-closure. These effects are driven by changes to the catchment area of Four Creek due to

Project infrastructure. Based on the threshold criteria defined in Table 5-1, the WLBM suggests that Four Creek is expected to be affected by the Project in terms of change in MAD.

Modelling results from the WLBM (Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report [Updated 2025]) show that the expected reduction in Tenas Creek's catchment area from Project footprint could result in up to 8% reduction to MAD over pre-mining conditions during Operations. In the Post-closure phase, the maximum reduction in MAD in Tenas Creek relative to pre-mining conditions is 6%. The Project influence on Goathorn Creek results in less than 2% reduction in MAD over pre-mining conditions, during Operations and Post-closure, and up to 3% increase in MAD over pre-mining conditions during Operations. Change in MAD in Telkwa River and Bulkley River is predicted to be minimal (i.e., less than 1% reduction to pre-mining conditions during all phases). Based on the thresholds for affected areas, Tenas Creek, Goathorn Creek, Telkwa River and Bulkley River are not expected to be affected by the Project in terms of change in MAD.

Based on this assessment, the Project is expected to affect MAD in the lower reaches of Four Creek, which encompasses a catchment area equal to 7.6 km^2.

5.4.2.1.1 Residual Effects Characteristics

The WLBM shows that portions of Four Creek are expected to have an increase in streamflow greater than 30% in Operations and Post-closure. Similarly, portions are expected to have a decrease in streamflow greater than 10% in Operations and Post-closure. Based on these results, the area affected by the Project in terms of change to MAD was estimated to be 7.6 km^2. This represents 69% of the Project, 3.7% of the LSA and 0.5% of the RSA.

The dynamic streamflow model of Four Creek, however, shows that the change to MAD should be lower, with results that are less than the thresholds in Table 5-1. This model is expected to more accurately reflect the streamflow regime of Four Creek; however, it simplifies some of the Project interactions.

The WLBM results were used for the purpose of evaluating the ratings for the effects characteristics to change in MAD, since they are more conservative in this case. The ratings for the residual effects characteristics for MAD are presented in the summary table (Table 5.4-3).

Table 5.4-3: Summary of Effect Characteristics Ratings for the Change in Mean Annual Discharge

Residual Effects Characteristic	Rating	Rationale for Rating
Magnitude	Low	Based on the thresholds identified in Table 5-1 and WLBM results, the affected catchment area for MAD is localized to the Four Creek catchment only and is less than 5% of the total LSA.
Geographic Extent	Local	The affected area is located within the LSA and does not extend into the RSA.
Duration	Long-term	The effect is persistent through the Post-closure phase.
Frequency	Continuous	The effect occurs year-round under average conditions.
Reversibility	Irreversible	The effect is expected to continue throughout the Post-closure phase.
Context	Moderate	Annual discharge fluctuates regularly based on variations in snowpack and rainfall. The receiving environment is expected to have some resilience to changes in MAD that are expected from the Project.

Notes: %=percent; LSA=Local Study Area; MAD=mean annual discharge; Project=Tenas Project; RSA=Regional Study Area; WLBM = water and load balance model

5.4.2.1.2 Likelihood

Changes to MAD are driven by the change in catchment area to Four Creek due to Project infrastructure. While one set of model results indicates that Four Creek would not be impacted by the Project (based on the threshold values for MAD outlined in Table 5-1), the WLBM does show an effect, which accounts for greater variability in the temporal changes to Four Creek's catchment area. Therefore, the likelihood of the effect to MAD is Likely for this segment of the creek.

5.4.2.1.3 Significance Determination

The residual effect of change on MAD because of the Project is not expected to result in a change that will alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 5% is affected). The effect is therefore predicted to be **Not Significant**.

The Level of Confidence of this prediction is Moderate. The modelling used to inform the assessment incorporates site-specific data in Four Creek but has inherent sources of error, as does the mapping of groundwater and surface water catchments.

5.4.2.2 Change in Seasonal Flow Distribution

Seasonal flow distribution was evaluated based on the change in monthly streamflow under Project Case conditions in relation to pre-mining conditions. Like the MAD results, changes to catchment areas in the streams adjacent to the Project will result in a corresponding change to monthly flows. The other driver of changes to seasonal flow distribution is the impact of the open pit and Management Ponds on the groundwater table, which contributes to winter and summer baseflows.

Appendix 4.3-C Four Creek Watershed Groundwater Surface Water Interaction Investigation and Water Balance Model Development Report presented the change in monthly flow to Four Creek during Operations and Post-closure. The effect is most prominent in the open water season (May through October), with an expected increase in monthly streamflow of up to 13% relative to pre-mining conditions due to the additional area routed into Four Creek from the diversion channel around the East Management Pond. Over the winter months, the change relative to pre-mining conditions is expected to be 7% during Operations. In Post-closure, diversions around the open pit result in a reduction of the Four Creek catchment area, with an overall decrease to monthly discharge in Four Creek for all months except July and September. The change relative to pre-mining conditions in Post-closure ranges from +1% in September to -7% in April.

Since Four Creek was determined to have a perched groundwater condition, there is no expected effect from open pit mining and the drawdown of the water table on Four Creek. Based on the thresholds defined for seasonal flow distribution in Table 5-1, which present a threshold of 30% for flow increases and 10% for reductions, Four Creek's seasonal flow distribution is not expected to be affected by the Project.

Modelling results from the WLBM (Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report [Updated 2025]) show changes in Four Creek with respect to pre-mining conditions. The WLBM shows that Four Creek, directly downstream of the East Management Pond diversion channel, could experience an increase to spring and summer month streamflow by up 50% over pre-mining conditions during Operations. In the closure and Post-closure phase, the impact of the surface diversion is reduced, and the maximum increase to monthly streamflow is 35%. Further downstream, Four Creek is expected to have reduction in monthly streamflow, by up to 25% in Operations and 20% in closure and Post-closure. These effects are driven by changes to the catchment area of Four Creek due to Project infrastructure.

The WLBM also shows changes to Four Creek winter baseflows from Project interaction with the groundwater table, however this model does not account for the fact that Four Creek is a perched system, and therefore the change to winter baseflows is not expected to be as accurate as the dynamic streamflow model (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development). Based on the threshold criteria defined in Table 5-1, the WLBM suggests that Four Creek is expected to be affected by

the Project in terms of change to seasonal flow distribution, due to changes to its catchment area relative to pre-mining conditions.

While the dynamic streamflow modelling approach for Four Creek is expected to be more accurate (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development), the WLBM results (Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report [Updated 2025]) were used for the purpose of the residual effects characterization of seasonal flow distribution in Four Creek.

Monthly streamflow in Tenas Creek is expected to be reduced by up to 11% during low flow periods (April and August) in the Operation Phase because of open pit groundwater drawdown and catchment area reductions. This change is not expected to occur throughout the entire Operation Phase, however, and is countered by the increase in seepage from the management ponds. Monthly streamflow in sections of Tenas Creek is expected to decrease by up to 3% over pre-mining conditions by the end of Operations and throughout the Post-closure period. Based on the thresholds in Table 5-1, Tenas Creek's seasonal flow distribution is not expected to be affected by the Project.

Monthly streamflow in upstream sections of Goathorn Creek are expected to be reduced by up to 8% over pre-mining conditions during low flow periods in Operations. Monthly streamflow downstream of the Project discharge in Goathorn Creek may increase by up to 6% in the Operation Phase and 11% during the Post-closure phase. The increase presented in modelling results is expected to be controlled by pump Operations and a Trigger Action Response Plan (TARP) for the Tenas Control Pond, which are not incorporated into the model. Based on these expected mitigation measures and modelling results, and the thresholds in Table 5-1, Goathorn Creek is not expected to be affected by the Project in terms of seasonal flow distribution.

The Project may reduce monthly streamflow in the Telkwa River downstream of Goathorn Creek by less than 2% over pre-mining conditions during Operations and increase monthly streamflow by up to 1% over pre-mining conditions during the Post-closure Phase. Changes reflect the change in water capture upstream and changes to groundwater baseflow. The expected change from the Project to Bulkley River monthly streamflow are minimal (less than 0.1% over pre-mining conditions). Both rivers are therefore not expected to be affected by the Project in terms of seasonal flow distribution.

Based on these findings, the total affected area in terms of change in seasonal flow distribution is limited to segments of Four Creek, where changes to the catchment area influence the monthly streamflow. The affected area is 10.9 km^2. The effect is not observed in the dynamic streamflow modelling of Four Creek; however, it is being carried forward from the WLBM.

5.4.2.2.1 Residual Effects Characteristics

The WLBM shows that portions of Four Creek are expected to have changes in seasonal flow distribution that exceed the thresholds presented in Table 5-1. The affected area, according to the WLBM, is 10.9 km^2, which represents 5.3% of the LSA and 0.8% of the RSA. According to the dynamic streamflow model of Four Creek, the creek would not be affected by the Project, however the more conservative outcome has been carried forward into the residual effects characterization (Table 5.4-4).

Table 5.4-4: Summary of Effect Characteristics Ratings for the Changes in Seasonal Flow Distribution

Residual Effects Characteristic	Rating	Rationale for Rating
Magnitude	Moderate	Based on the thresholds identified in Table 5-1 and WLBM results, the affected catchment area for seasonal flow distribution is localized to the Four Creek catchment only and is greater than 5% but less than 20% of the total LSA.
Geographic Extent	Local	The affected area is located within the LSA and does not extend into the RSA.
Duration	Long-term	The effect is persistent through the Post-closure phase.
Frequency	Continuous	The effect occurs year-round under average conditions.
Reversibility	Irreversible	The effect is expected to continue throughout the Post-closure Phase.
Context	Moderate	Monthly discharge fluctuates regularly based on variations in snowpack and rainfall. The receiving environment is expected to have some resilience to changes in seasonal flow distribution that are expected from the Project.

Notes: %=percent; LSA=Local Study Area; Project=Tenas Project; RSA=Regional Study Area

5.4.2.2.2 Likelihood

Changes to seasonal flow distribution are driven by the change in catchment area to Four Creek due to Project infrastructure. While one set of model results indicates that Four Creek would not be impacted by the Project, the WLBM does show an effect, which accounts for greater variability in the temporal changes to Four Creek's catchment area. Therefore, the likelihood of the effect to seasonal flow distribution is Likely for this segment of the creek.

5.4.2.2.3 Significance Determination

The residual effect of change to seasonal flow distribution because of the Project is not expected to result in a change that will alter its integrity within the Surface Water LSA to an unacceptable level (i.e., between 5% and 20% is affected, indicating a Moderate magnitude). The effect is therefore predicted to be **Not Significant**.

The Level of Confidence of this prediction is Moderate. The modelling used to inform the assessment incorporates site-specific data in Four Creek but has inherent sources of error, as does the mapping of groundwater and surface water catchments.

5.4.2.3 Change in Low and High Flows

The relative change in high flows is driven by the relative change in stream catchment area. Stream sections which are expected to experience a reduction in catchment area and MAD because of the Project will also likely experience a net reduction in high flows.

Stream sections which are expected to see an increase in catchment area from the Project include a portion of Four Creek, downstream of the East Management Pond diversion channel discharge. A control structure has been designed to limit the discharge into Four Creek from the diversion under extreme flood conditions (i.e., high flows), as described in Appendix 1.0-l SRK Water Management Technical Report and the MWMP. This structure and its operations have not been considered in the modelling. Based on this structure and its design intent of controlling high flow discharge, changes in high flows in Four Creek are expected to be mitigated.

Project discharge from the Tenas Control Pond in the Operation Phase and North Management Pond in the Post-closure Phase may also increase high flow conditions in Goathorn Creek. This condition was assessed using the model with three (3) consecutive 10-year wet precipitation years based on the synthetic historical record to estimate Project discharge rates (Alternative Assessment Case 4 in Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report [Updated 2025]). The results show a potential increase in streamflow over pre-mining conditions of up to 13% during spring freshet. The Tenas Control Pond will be operated to provide additional attenuation up to the 1 in 10-year flood event, reducing the peak discharges into the Goathorn tributary and downstream Goathorn Creek. This strategy has not been incorporated into the model but is expected to reduce the expected change in streamflow in Goathorn Creek during high flow events. Based on this structure and its design intent of controlling high flow discharge, changes in high flows in Goathorn Creek are expected to be mitigated.

Further downstream in the Telkwa River and Bulkley River, the change in streamflow relative to pre-mining conditions is minimal under the repeated wet year condition modelled.

Based on the controls that have been designed as part of the Project to limit high flow discharge, including the diversion structure around the East Management Pond and the surge capacity in the Tenas Control Pond, the change in high flows from the Project are expected to be minimal. No area is expected to be affected for change in high flows.

Change in low flow conditions in the receiving environment are discussed in terms of winter baseflows (i.e., average annual low flow conditions) in the seasonal flow distribution characterization. These changes are a result of the Project's influence on groundwater baseflows and reduction in catchment area from the Project footprint. Modelling also considered a low-flow scenario using the 7Q10 flow rates in the receiving environment. Results show that low flows are expected to be reduced over pre-mining conditions by the same percentage as monthly average baseflow, where Tenas Creek and Goathorn Creek could expect up to 7% and 2% reduction over pre-mining conditions in low flow, respectively, in sections downgradient of the open pit. These changes are expected during Operations and are reduced in Post-closure when the pit lake is formed. This assessment in the WLBM also found reductions in Four Creek low flows, however this did not account for Four Creek being a perched system, as was found in the dynamic Four Creek streamflow model (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development). Based on the dynamic modelling results, winter low flows in Four Creek could be reduced by up to 6%.

Based on the model results, the total affected area in terms of change in low flows was determined to be 0 km^2 which corresponds to no effect.

5.4.2.3.1 Residual Effects Characteristics

Since no area was determined to be affected in terms of change in low and high flows, the ratings for the residual effects characteristics are presented as not applicable in the summary table, presented in Table 5.4-5.

Table 5.4-5: Summary of Effect Characteristics Ratings for the Changes to Low and High Flows

Residual Effects Characteristic	Rating	Rationale for Rating
Magnitude	N/A	High flows are expected to be reduced over baseline conditions for all streams which will experience a reduction in catchment area. Control structures will limit the increase to high flows and as a result, no area is expected to be affected in terms of change in high flows. Change in low flows is expected but the magnitude will be below the thresholds. The combined affected area for change in high and low flows from the Project is 0 km^2, which represents 0% of the LSA.

Residual Effects Characteristic	Rating	Rationale for Rating
Geographic Extent	N/A	No affected area
Duration	N/A	No affected duration
Frequency	N/A	No affected frequency
Reversibility	N/A	No effect expected to continue throughout the Post-closure Phase.
Context	N/A	Both low and high flow events are infrequent, by definition, and experience variability in magnitude naturally. Changes from the Project would have been experienced historically from agriculture, forestry, and other land uses in the LSA and RSA.

Notes: %=percent; km^2=square kilometres; LSA=Local Study Area; N/A: not applicable; Project=Tenas Project; RSA=Regional Study Area

5.4.2.3.2 Likelihood

There is no expected residual effect to streamflow distribution. The likelihood of this finding is Likely.

5.4.2.3.3 Significance Determination

The change in high and low flows because of the Project is not expected to alter Surface Water Quantity integrity within the RSA to an unacceptable level. Since no effect was determined, the effect is predicted to be **Not Significant**.

The Level of Confidence of this prediction is Moderate. The modelling used to inform the assessment incorporates site-specific data but has inherent sources of error, as does the mapping of groundwater and surface water catchments.

5.4.3 Surface Water Quality Subcomponent

Model results from the WLBM (Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report [Updated 2025]) were used to inform the assessment of effects for Surface Water Quality in terms of the thresholds for each indicator, as defined in Table 5-1. Findings from the dynamic streamflow model of Four Creek (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development) were used to support the interpretation of WLBM results with respect to Four Creek. The expected case conditions and results from the Initial Dilution Zone (IDZ) model were also used to quantify effects in Goathorn Creek immediately downstream of the Project discharge (Appendix 4.3-D Tenas Project – Initial

Dilution Zone Assessment). The following sections summarize the affected areas for each Surface Water Quality indicator.

5.4.3.1 Change in Modelled Parameter Concentrations

Changes in stream water quality in terms of modelled parameter concentrations were evaluated in relation to guideline values, as well as in context with streams' natural variability observed through baseline monitoring. Model results present monthly average and maximum concentrations in winter (November through April) and summer (May to October) to capture seasonal variability related to both the Project and baseline concentrations. The modelling did not consider the potential for attenuation of loading through groundwater pathways, which is expected, and which would reduce the amount of change in some parameter concentrations. The modelling results for stream water quality are therefore considered to be conservative.

Modelling results show potential exceedances of water quality guidelines and the stream's natural variability (95th percentile from baseline records) for only dissolved cobalt. Results are consistently below the guideline values, where applicable. The following general observations can be made for the source and trend in change in water quality parameter concentrations:

- Higher concentrations of parameters for which the source is mining (e.g. sulfate, cobalt, selenium, nitrate) occur more frequently during the winter months from discharge to the receiving environment(s) during periods of low flow, and therefore low dilution / assimilation capacity;
- An increase in parameters for which the source is mining are driven by seepage from the management ponds and occur in segments along Tenas Creek and Four Creek located downstream of the West, North and East Management Ponds. Predictions in Four Creek do not account for Four Creek being a perched system, which would prevent seepage from Management Ponds reaching the stream and was determined to be a likely condition in the dynamic streamflow model (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development). Note that attenuation of selenium, dissolved cadmium, and nitrite are expected in the management ponds and through the groundwater pathway, but this mechanism has not been modelled;
- The stream concentrations are expected to peak after approximately 25 years, reflecting the delay in seepage migration (SRK 2021b);
- The dissolved cobalt exceedance found in Four Creek is expected to occur in the Post-closure Phase only and only for a period of four years. Exceedances of guidelines are not expected during the Project's Operation Phase. Only stream segments located downstream of Project activities are expected to experience changes to water quality during the Operation Phase;

- Increase to Goathorn Creek water quality parameter concentrations from the Project occur from Project discharge during Operations and typically are only a single month. The only WQG exceedance recorded in Goathorn Creek is dissolved copper and its source is mainly from background loading. The Project contribution to the load is less than 1% during the exceedance months;
- Model results for total aluminum and dissolved copper in the Telkwa River show exceedances of the water quality guideline. Like Goathorn Creek, the source of both parameters is the background loading, with the Project's contribution less than 0.1%; and
- The IDZ model (Appendix 4.3-D Tenas Project – Initial Dilution Zone Assessment) shows that dissolved copper is expected to exceed the water quality guideline in Goathorn Creek after the confluence with the unnamed stream that receives discharge downstream of Tenas Control Pond. After this length, the concentrations were shown to be less than the guideline. This is driven by the baseline concentration of dissolved copper, which already exceeds the water quality guideline.

Table 5.4-6 summarizes the occurrence and magnitude of guideline exceedances in the receiving environment. Detailed modelling results are described in Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report (Updated 2025).

The only parameter that modelling shows may exceed the guideline is dissolved cobalt, in Four Creek. This exceedance is a result of groundwater seepage from the management ponds. However, the dynamic streamflow model for Four Creek (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development) found that Four Creek is expected to be a perched system, which would remove the mechanism for management pond seepage to reach the stream. Based on this understanding, the affected area in Four Creek due to exceedances from the WLBM of the dissolved cobalt guideline, is expected to be zero. However the more conservative result from the WLBM was carried forward into the residual effects characterization, which results in an affected area of 5.7 km^2.

All other exceedances are driven by elevated concentrations in the baseline monitoring records and are therefore not considered to be an effect from the Project.

Table 5.4-6: Surface Water Quality Affected Areas Based on Change in Modelled Parameter Concentration

Stream	Parameters with Exceedances of Guidelines	Comments on Exceedance	Affected Area Justification	Affected Area (km^2)	Affected Areas as a Percentage of the LSA	Affected Area as a Percentage of the RSA
Four Creek	Dissolved Cobalt	Guideline is expected to be exceeded by up to 1.1 times the value during the winter months in the Post-closure Phase only in sections of the creek downstream of the East Management Pond. The model result also exceeds the 95th percentile concentration from baseline monitoring. The exceedance event occurs for four years the Post-closure Phase. Long-term modelling results (i.e. Year 2100) are below the guideline. The cause of the exceedance is seepage from the management pond. Dynamic streamflow modelling of Four Creek suggests that the stream is perched, and that groundwater seepage from the Project would not interact with the stream, and as a result no exceedances related to Cobalt is expected however this mechanism is not incorporated into the WLBM.	Loading mechanism is expected to be removed based on perched system in Four Creek.	5.7	2.7%	0.4%
Goathorn Creek	Dissolved Copper	The guideline is expected to be exceeded by up to 1.5 times the value during summer and winter months in the Construction, Operation, and Post-closure phases in sections of the creek downstream of the Tenas Control Pond. Long-term modelling results (i.e. Year 2100) remain above the guideline in summer and in winter.	Exceedances of guideline are less than the 95th percentile baseline concentration	0	0	0

Stream	Parameters with Exceedances of Guidelines	Comments on Exceedance	Affected Area Justification	Affected Area (km^2)	Affected Areas as a Percentage of the LSA	Affected Area as a Percentage of the RSA
		The 50th percentile baseline concentrations in summer also exceed the guideline. All model results are below the 95th percentile baseline concentrations. The Project contributes less than 1% of the total load found in the Creek.				
Telkwa River	Dissolved Copper	The model result is equal to the guideline for one month of the simulation during the Operations Phase. Long-term modelling results (i.e. Year 2100) remain below the guideline. The model result is consistently below the 95th percentile baseline concentration in summer and winter. The Project contributes less than 0.1% of the total load found in the Creek.	Exceedances of guideline are less than the 95th percentile baseline concentration	0	0	0
Telkwa River	Total Aluminum	The guideline is expected to be exceeded by up to 2.0 times the value during summer months in the Construction, Operation, and Post-closure phases in sections of the River downstream of the Tenas Control Pond. Long-term modelling results (i.e. Year 2100) remain above the guideline in summer but are less than the guideline in winter.	Exceedances of guideline are less than the 95th percentile baseline concentration	0	0	0

Stream	Parameters with Exceedances of Guidelines	Comments on Exceedance	Affected Area Justification	Affected Area (km^2)	Affected Areas as a Percentage of the LSA	Affected Area as a Percentage of the RSA
		The 50th percentile baseline concentrations in summer also exceed the guideline. All model results are below the 95th percentile baseline concentrations. The Project contributes less than 0.1% of the total load found in the Creek.				
Total Affected Area: The dynamic streamflow model determined the affected area would be zero in Four Creek. The affected area from the WLBM, which does not incorporate the perched groundwater mechanisms, is 5.7 km^2, limited to Four Creek. This more conservative value was carried forward into the residual effects characterization.				5.7	2.7%	0.4%

Note: % = percent; km^2=square kilometre; LSA=Local Study Area; RSA=Regional Study Area

Based on findings in the WLBM (Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report (Updated 2025)), IDZ assessment (Appendix 4.3-D Tenas Project – Initial Dilution Zone Assessment), the affected area due to change in modelled parameter concentrations from the Project is 5.7 km^2, which represents the lower segment of Four Creek. The dynamic streamflow model of Four Creek (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development) accounted for the perched groundwater system in Four Creek and determined that Four Creek would not be affected. The more conservative result was carried forward into the residual effects characterization.

5.4.3.1.1 Residual Effect Characteristics

The summary of the residual effects characterisation for the change in modelled parameter concentrations due to the Project is presented in Table 5.4-7.

Table 5.4-7: Summary of Effect Characteristics Ratings for the Change in Modelled Parameter Concentrations

Residual Effects Characteristic	Rating	Rationale for Rating
Magnitude	Low	The affected catchment area for surface water modelled parameter concentrations is 5.7 km^2, which is less than 5% of the LSA.
Geographic Extent	Local	The affected catchment area for surface water modelled parameter concentrations is located in the LSA.
Duration	Medium-term	The effect is expected to occur for four years in the Post-closure Phase.
Frequency	Infrequent	The effect is expected to occur in winter months only for a finite period of years and is not expected to occur on a regular basis through the Post-closure Phase.
Reversibility	Partially reversible	The effect occurs in Post-closure Phase but does not persist in steady-state conditions.
Context	Low	Surface water is a valued resource in the region, but it has experienced historic and ongoing effects from agriculture, forestry, mining, and other land uses in the RSA.

Notes: %=percent; LSA=Local Study Area; N/A: not applicable; RSA=Regional Study Area

5.4.3.1.2 Likelihood

The residual effect of change in surface water modelled parameter concentration is Unlikely based on the findings of the dynamic streamflow model of Four Creek (Appendix 4.3-C Four Creek Watershed: Groundwater Surface Water Interaction Investigation and Water Balance Model Development).

5.4.3.1.3 Significance Determination

The residual effect of change in surface water modelled parameter concentrations because of the Project is not expected to result in a change that will alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 5% is affected). The effect is predicted to be **Not Significant**.

The Level of Confidence of this prediction is Moderate. The modelling used to inform the assessment incorporates site-specific data, however inherent sources of error based on characterisation of streamflow and geochemical source terms do exist.

5.4.3.2 Change in Other Measurable Water Quality Parameters

Changes in other measurable water quality parameters were evaluated in relation to each streams' natural variability observed through baseline monitoring, including the Telkwa and Bulkley rivers and Tenas, Four, and Goathorn creeks. Effects for other measurable water quality parameters were evaluated using relationships to modelled parameters, where possible, or conservative assumptions based on available information. Parameters include stream temperature, pH and alkalinity, turbidity and total suspended solids (TSS), specific conductance (SC) and TDS, and polycyclic aromatic hydrocarbons (PAHs).

Results show potential increases over the natural variability experienced in Goathorn, Tenas, and Four creeks (i.e. greater than 95th percentile from baseline records) for TDS and SC. In Tenas and Four creeks, the increase over the 95th percentile baseline value is less than 10%. In Goathorn Creek, there are several years in Post-closure where the winter concentrations are expected to be greater than the 95th percentile value, by approximately 30%. The change relative to baseline in the long-term results, however, are within 10% of the 95th percentile value for Goathorn Creek. Other measurable parameters are expected to remain within the streams' natural variability (i.e. below the 95th percentile from baseline records).

The Project is not expected to change levels of PAHs due to mitigation measures including spill response plans, and the relative distance from activities from the water bodies.

TDS is a measure of the dissolved constituents in water. The most common source of TDS in undisturbed streams is from weathering of sedimentary rocks and erosion. Groundwater usually has higher levels of TDS than surface water. Conductivity is a measure of water's ability to carry

an electrical charge. This is related directly to the concentration of ions in the water, and therefore the TDS.

The following general observations can be made from modelling results about the source and trend in change in other measurable water quality parameter concentrations:

- TDS and SC levels are expected to increase above natural levels in the Post-closure Phase only because of seepage from the management ponds, in Tenas, and Four creeks, and due to discharge from the North Management Pond into Goathorn Creek;
- Elevated levels of TDS and SC are expected in segments of Goathorn Creek, Tenas Creek, and Four Creek downstream of the West, North, and East Management ponds. Levels are expected to be within the stream's natural variability in Telkwa River and Bulkley River;
- Higher levels of TDS and SC than historically observed are expected during the winter months because of seepage discharge to the receiving environment(s) during periods of low flow, and therefore, low dilution/assimilation capacity;
- TDS and SC levels are expected to peak approximately 25 years after the peak concentrations are expected in each management pond, reflecting the delay in seepage migration. The period of elevated TDS and SC parameters varies based on the magnitude of modelled results in relation to the historical values; and
- Long-term TDS and SC results (average Post-closure Phase results through the Year 2100 are within 10% of the natural variability in Four Creek, Tenas Creek, and Goathorn Creek.

Table 5.4-8 summarizes the expected occurrence and predicted levels for TDS and SC in the receiving environment relative to each stream's natural levels. Results also present the affected area in context with the LSA and RSA. Based on the definition of an affected area for these parameters, the only creek with TDS and SC levels greater than 10% above the natural variability (i.e. 95th percentile of baseline record) is Goathorn Creek. Detailed modelling results are described in Appendix 4.3-A Tenas Project Water and Load Balance Modeling Report (Updated 2025).

Table 5.4-8: Surface Water Quality Affected Areas Based on Change in Other Measurable Water Quality Parameters

Stream	Parameters with Exceedances of Natural Variability	Comments on Exceedance	Affected Area [km^2]	Affected Areas as a percentage of the LSA	Affected Area as a percentage of the RSA
Goathorn Creek	Total Dissolved Solids	Model results are expected to be greater than the 95th percentile TDS concentration from baseline data, increasing by approximately 30% during the winter months through the Post-closure Phase only in sections of the creek downstream of the management ponds. Long-term average modelling results (i.e., Year 2100) are expected to remain above the stream's natural variability, by up to 1.1 times (10% greater than 95th percentile).	6.7	3.2%	0.5%
	Conductivity	Model results are expected to be greater than the 95th percentile SC concentration from baseline data, increasing by more than 30% during the winter months through the Post-closure Phase only in sections of the creek downstream of the management ponds. Long-term average modelling results (i.e., Year 2100) are expected to remain above the stream's natural variability, by up to 1.1 times (10% greater than 95th percentile).			
Total Affected Area			**6.7**	**3.2%**	**0.5%**

Notes: %=percent; TDS=Total Dissolved Solids; SC=specific conductance; km^2=square kilometre; LSA=Local Study Area; RSA=Regional Study Area

In total, the Project is expected to affect other measurable water quality parameters over a catchment area that is equal to 3.2% of the area in the LSA and 0.5% of the area in the RSA. The affected area includes the downstream segments of Goathorn Creek. The affected area is only expected in the Post-closure Phase, after seepage from management ponds and discharge from the North Management Pond reaches the downstream segments of the creek.

5.4.3.2.1 Residual Effect Characteristics

The summary of the residual effects characterisation for the change in other measurable water quality parameters due to the Project is presented in Table 5.4-9.

Additional monitoring is anticipated to characterize the benthic community structure of Goathorn Creek. This dataset will be used to support establishing a site-specific water quality guideline for SC at the Project, using the new water quality guidance for SC (currently in development). This is expected to show that the elevated SC and TDS levels in Goathorn Creek from the modelling work will not have a residual effect on the environment. For this reason, the context of this effect is expected to be Low.

Table 5.4-9: Summary of Effect Characteristics Ratings for the Change in Other Measurable Water Quality Parameters

Residual Effects Characteristic	Rating	Rationale for Rating
Magnitude	Low	The affected catchment area is less than 5% of the LSA.
Geographic Extent	Local	The affected catchment area resides within Goathorn Creek catchment only, which are part of the LSA.
Duration	Long-term	The effect Duration is Long-Term since it occurs throughout the Post-closure period.
Frequency	Frequent	The effect is expected to occur on a regular basis (i.e. monthly average winter long-term conditions).
Reversibility	Irreversible	The effect is expected to occur under steady-state winter conditions (i.e. through Year 2100).
Context	Low	Natural processes such as erosion can result in elevated levels of both TDS and SC. Surface Water is a valued resource in the region, but it has experienced historic and ongoing effects from agriculture, forestry, mining, and other land uses in the RSA.

Notes: %=percent; EC=electrical conductivity; LSA=Local Study Area; RSA=Regional Study Area; TDS=Total Dissolved Solids

5.4.3.2.2 Likelihood

The residual effect of change in Surface Water Quality other measurable parameters is Likely. Disturbance of ground and mining are expected to increase both TDS and SC levels over baseline conditions in localized areas around the Project footprint.

5.4.3.2.3 Significance Determination

The residual effect of change in Surface Water Quality of other measurable parameters because of the Project is not expected to result in a change that will alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 5% is affected); the effect is predicted to be of Low Magnitude, Local Extent, and Long-term Duration. Therefore, the effect is predicted to be **Not Significant**.

The Level of Confidence of this prediction is Moderate. The modelling used to inform the assessment incorporates site-specific data but has inherent sources of error based on characterisation of streamflow and geochemical source terms.

5.5 Summary of Project-related Residual Effects and Significance

The following potential effects of the Project were identified as residual effects on the Surface Water VC subcomponents through the assessment process:

- Surface Water Quantity:
  - change in MAD;
  - change in seasonal flow distribution; and
  - change in high and low flows.
- Surface Water Quality:
  - change in modelled parameter concentrations; and
  - change in other measurable water quality parameters.

The residual effect characteristics for each subcomponent are summarized in Table 5.5-1. The residual effects of the Project on Surface Water Quantity and Surface Water Quality were predicted to be **Not Significant**. Considering this, the Project effects are not expected to alter the integrity of the Surface Water VC within the LSA beyond an acceptable level (i.e., remain within acceptable ranges); and are predicted to be **Not Significant**. Residual effects were carried forward into the CEA.

Table 5.5-1: Summary of Residual Adverse Effects on the Surface Water Valued Component

Residual Adverse Effects	Contributing Activities within the Project Phases (C, O, D, P)	Proposed Mitigation Measures	Subcomponent	Residual Effects Characterisation								
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance	Level of Confidence
Change in Mean Annual Discharge (MAD)	All activities (C, O, D, P)	• Limit Project footprint and Project Area • Reclamation measures (refer to **RCP**) • Water capture measures	Surface Water Quantity	L	LSA	LT	C	IR	M	L	NS	M
Change in Seasonal Flow Distribution	All activities (O, D, P)	• Seepage management measures • Water capture measures	Surface Water Quantity	M	LSA	LT	C	IR	M	L	NS	M
Change in Low and High Flows	All activities (O, D, P)	• Water capture measures • Seepage management measures	Surface Water Quantity	N/A	N/A	N/A	N/A	N/A	N/A	L	NS	M
Change in Modelled Parameter Concentrations	All activities (C, O, D, P)	• Erosion and sediment control (refer to **SEPSCP**,	Surface Water Quality	L	LSA	MT	IF	PR	L	L	NS	M

Residual Adverse Effects	Contributing Activities within the Project Phases (C, O, D, P)	Proposed Mitigation Measures	Subcomponent	Residual Effects Characterisation								
				Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance	Level of Confidence
		CEMP, and **MWMP**) • Management of ML/ARD • Blasting measures • Water capture measures • Reclamation measures (refer to **RCP**)										
Change in other measurable water quality parameters	All activities (C, O, D, P)	• Management of ML/ARD • Transport measures • Erosion and sediment control (refer to **SEPSCP**, **CEMP**, and **MWMP**) • Hazardous material and refueling (refer to **FMSCP**)	Surface Water Quality	L	LSA	LT	F	IR	L	L	NS	M

Notes: C, O, D, P represent Project Phases: (C)onstruction, (O)peration, (D)ecomissioning and Reclamation, (P)ost-closure

FMSCP=Fuel Management and Spill Control Plan (S13.0-C7); ML/ARD=metal leaching/acid rock drainage; MWMP=Minesite Water Management Plan (S13.0-C11); N/A=not applicable; RCP=Reclamation and Closure Plan (S13.0-C15); SEPSCP=Surface Erosion Protection and Sediment Control Plan (S13.0-C17)

Magnitude: Low (L), Moderate (M), High (H)
Geographic Extent: Local (LSA), Regional (RSA), beyond Regional (beyond RSA)
Duration: Short-term (ST), Medium-term (MT), Long-term (LT)
Frequency: Infrequent (IF), Frequent (FF), Continuous (CF)
Reversibility: Fully reversible (FR), Partially reversible (PR), Irreversible (IR)
Context: Low (L), Moderate (M), High (H)
Likelihood: Unlikely (UL), Likely (L)
Significance: Not-Significant (NS), Significant (S)
Level of Confidence: High (H), Moderate (M), or Low (L)

See Table 5.1-2 for list of applicable activities for each listed Project phase, unless otherwise noted in this table.

6. CUMULATIVE EFFECTS ASSESSMENT

Cumulative effects are the overall effects on a VC due to the Project's residual effects overlapping both spatially and temporally with the residual effects resulting from other projects and activities. This subsection presents an assessment of the cumulative effects on the Surface Water VC. The approach to determining cumulative effects is described in S3.0-C1-6 Cumulative Effects Assessment of the EAC Application.

The environmental effects of past and existing projects and activities are captured in the baseline conditions (i.e., existing environment; 4. Existing Conditions). Thus, the likelihood of cumulative effects due to ongoing and reasonably foreseeable future projects and activities is the focus of this CEA.

As described in 3.2.3.1, the spatial boundary of the CEA for the Surface Water VC is defined as the Surface Water RSA. Projects and activities that are outside of the Surface Water RSA but had potential effects that are expected to extend into the Surface Water RSA were also considered. The temporal boundaries within which cumulative effects were considered include past, present, and reasonably foreseeable future activities inclusive of the life of the Project including Construction, Operation, Decommissioning and Reclamation, and Post-closure phases (3.2.4.2).

Baseline conditions represent past and present projects and activities, including existing disturbance. All Projects and activities listed in the Project and Activity Inclusion List in S3.0 Assessment Methodology of the EAC Application that are not listed in Table 6.1-1 are not considered in the Surface Water CEA as the residual effects of these developments are not anticipated to overlap temporally with the residual effects of the Project and are not in proximity to the Surface Water RSA.

6.1 POTENTIAL CUMULATIVE EFFECTS

Cumulative effects resulting from ongoing and future projects are the focus of this CEA. Future projects and activities with overlapping residual effects on Surface Water are outlined in Table 6.1-1, followed by text that provides supporting rationale.

As outlined in 5.2, the following Project-related residual effects were considered for their potential to interact cumulatively with residual effects of reasonably foreseeable projects and activities identified within, or extending into the Surface Water RSA:

- Surface Water Quantity subcomponent:
  - change in mean annual discharge;
  - change in seasonal flow distribution; and

- change in high and low flows.

➢ Surface Water Quality subcomponent:

- change in modelled parameter concentrations; and
- change in other measurable water quality parameters.

Table 6.1-1: Projects Included in the Assessment of the Surface Water Valued Component Based on Spatial and Temporal Interaction

Project/Activity Name	Interacts with Project-related Effects on the VC as a Past, Present or Future Project/Activity	
	Past and Present	Future
Big Onion Project	Yes	Yes
Bulbous Toe	No	Yes
Maple Leaf Cannabis Production Facility	No	Yes
Forestry Activities	Yes	Yes
Telkwa to Smithers Bike Trail	No	Yes
Prince George to Terrace Capacitors Project	No	Yes
Recreation Activities	Yes	Yes
Agricultural Activities	Yes	Yes
Urban Activities	Yes	Yes

Notes: Project=Tenas Project; VC=Valued Component

Spatial information is not available for some future projects and most activities. The following projects and activities are expected to have residual effects on the Surface Water VC subcomponents, within or extending into the Surface Water RSA (Figure 6.1-1).

➢ Big Onion Project: The property consists of nine (9) contiguous mineral claims comprising a total area of 3,206 hectares (ha). Exploration occurred from 2006 to 2009. The development and potential Operations of the Big Onion Project have the potential to interact cumulatively with the Project residual effects and result in increased potential for change in mean annual discharge, change in seasonal flow distribution, change in low and high flows, and change in modelled parameter concentrations and other water quality parameters, including increased sediment, dust deposition and trace metals. The mine will be required to undergo environmental assessments and meet permit conditions to restrict and control discharge and effects on surface water, and water quality in the

receiving environment is expected to be maintained below water quality guidelines or other approved limits;

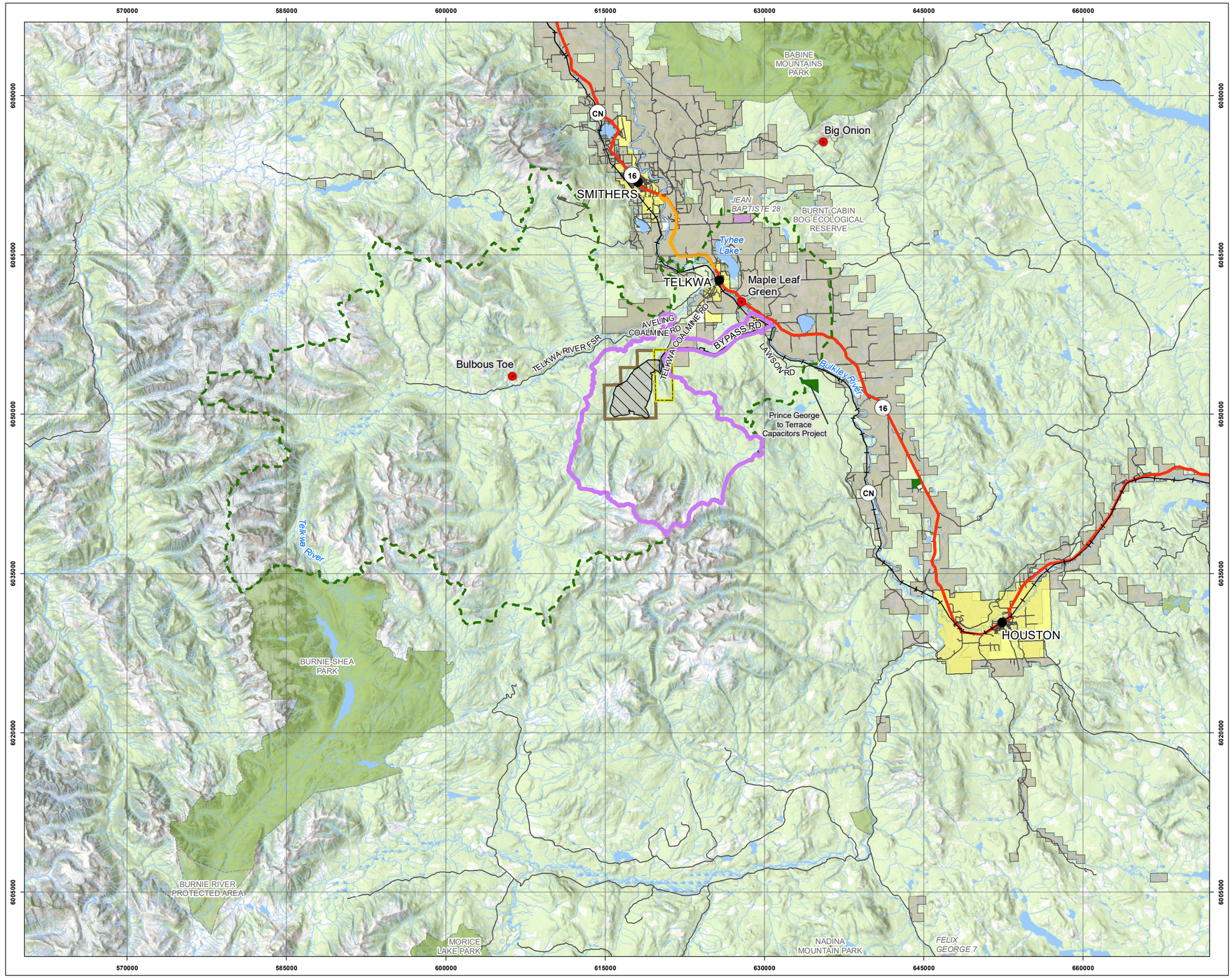
- Bulbous Toe: This slow-moving landslide has a major transmission line traversing it, and as a result one (1) of the towers requires periodic maintenance. The access crosses through a portion of the Surface Water RSA as does the tower and expected maintenance area. Maintenance activities and vehicle traffic periodically travelling through the Surface Water RSA have the potential to result in adverse residual effects on the Surface Water VC that act cumulatively with the Project residual effects through the introduction and/or proliferation of sediment, dust deposition, and trace metals deposition into watercourses within the Surface Water RSA;
- Maple Leaf Cannabis Production Facility: Maple Leaf has leased over 15 ha of land and is constructing a 0.25 ha cannabis production facility in Telkwa, BC. Construction activities and agricultural activities have the potential to result in residual effects that interact cumulatively with the Project residual effects and result in increased potential for change in seasonal flow distribution, change in high flows, and change in modelled parameters through the change in land use and increase in runoff and use of herbicides within the Surface Water RSA;
- Forestry Activities: The Surface Water RSA is located within the Bulkley Timber Supply Area (TSA). Scattered parcels of forest within the Surface Water RSA are expected to be harvested over the life of the Project. Once harvested, the areas are expected to be reforested, resulting in temporary potential effects on Surface Water Quantity and Surface Water Quality subcomponents. Future forestry activities are expected to be conducted with consideration of provincial regulatory requirements, including control of sediment migration, and mitigating change in streamflow. These forestry activities are expected to contribute to change in seasonal flow distribution and change in high flows, as well as change in modelled parameters and other measurable water quality parameters directly through change in land use and infiltration or runoff rates, and increased vehicle and equipment traffic that can result in the introduction of sediment, dust deposition, and trace metals deposition into watercourses of the Surface Water RSA;
- Telkwa to Smithers Bike Trail: This project has been routed predominantly along the Highway 16 ROW, adjacent to the Bulkley River, where historic disturbance during highway construction and maintenance has occurred. Construction of the bike trail is anticipated to result in limited clearing and grubbing as well as increased vehicle and equipment traffic within the Surface Water RSA. These effects have the potential to act cumulatively with the residual effects of the Project, resulting in a potential change in seasonal flow distribution, high flows, and modelled parameters to watercourses within the Surface Water RSA;
- Prince George to Terrace Capacitors Project: The project involves constructing three new capacitor stations to increase capacity along the 450-km, 500-kilovolt (kV) transmission

line that runs between Prince George and northern BC. One (1) of the proposed capacitor stations (3H) is located within the southeast portion of the Surface Water RSA and includes an access road. Construction and operation of this capacitor station is expected to contribute to increased vehicle and equipment traffic within the Surface Water RSA. These activities have the potential to result in residual effects that can interact cumulatively with the Project residual effects, and result in increased potential for introduction and/or proliferation of sediment, dust deposition, and trace metals deposition into watercourses within the Surface Water RSA;

- Recreational Activities: Ongoing use of existing recreational trails and watercourses within the Surface Water RSA may result in residual effects that contribute cumulatively with the residual effects of the Project by resulting in change in water quality parameters;
- Agricultural Activities: Agricultural land uses (e.g., cultivation, tame pasture/hay) are present within the Surface Water RSA. The current areal extent of agricultural activity within the Surface Water RSA is not expected to change. However, ongoing agricultural activities (e.g., cultivation, seeding, herbicide use) may result in the change in seasonal flow distribution, change in high flows, and change in modelled parameters and other measurable water quality parameters through the translocation of herbicides from surface water and sediment release within the Surface Water RSA; and
- Urban Development: The municipality of Telkwa is located within the Surface Water RSA. Urban development projects, such as road maintenance and construction, municipal works, and industrial construction, have the potential to result in residual effects that interact cumulatively with the Project residual effects and result in potential change in mean annual discharge, seasonal flow distribution, low and high flows, and modelled parameters as well as other measurable water quality parameters. These changes are expected to be on a short timescale during construction activities, however long-term increased runoff rates are typically expected after urban development through the change in land use, as well as increased levels of sediment and dust within the Surface Water RSA.

Tenas Project

Surface Water Cumulative Effects Assessment Project Inclusion List



Legend

- Project
- City/Town
- Rail Line
- Highway
- Road
- Watercourse
- LSA Boundary
- RSA Boundary
- PGTC BCHydro Capacitor Lots
- Telkwa to Smithers Bike Trail
- Wetland
- Waterbody
- Park or Protected Area
- First Nation Reserve
- Municipal Area
- General Private Property
- Tenas Coal Licenses
- Telkwa Coal Limited Private Property
- Project Area

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Area: Allegiance Coal, April 21, 2021
- Basedata: Government of British Columbia
- Basemap: World Topo Base

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6.2 Additional Mitigation Measures

Additional mitigation measures to those considered in the assessment of Project-related effects (see 5.3) are not considered to be necessary to avoid or minimize the predicted cumulative effects on the Surface Water VC and its subcomponents. It is assumed that the current and future projects and activities have appropriate environmental protection measures in place as required by laws and regulations to limit their potential effects within acceptable levels. However, if required, there are several further mitigations that could be incorporated sequentially into the Project dependent on actual monitoring values reflecting mitigations as they are included and still indicating that cobalt exceeds in the Post-closure Phase are listed below:

- Place PAG material into saturated conditions faster than the six (6)-month average proposed for the Project to decrease the amount of parameters flushed from this material **which is expected to** improve water quality for both non-point and point source effluents and subsequently for the receiving environment;
- Increase the thickness on the bentonitic liner to reduce seepage volumes from management ponds to reduce non-point source loads to surrounding creeks in low flow winter conditions **which is expected to** improve water quality for both non-point source effluents and subsequently for the receiving environment;
- Cover non-PAG material with engineered covers during the Operation Phase until the Decommissioning and Reclamation Phase when this material is covered with overburden and reclamation materials to reduce infiltration volumes **which is expected to** improve water quality for both non-point and point source effluents and subsequently for the receiving environment;
- Incorporate attenuation from saturated backfills that are being constructed in the management ponds and groundwater pathways which again will reduce several parameters such as selenium **which is expected to** improve water quality for both non-point and point source effluents and subsequently for the receiving environment;
- Allow more non-contact water to flow into the Project to assist with maintaining water covers and further reduce parameter concentrations **which is expected to** improve water quality for both non-point and point source effluents and subsequently for the receiving environment;
- Construct In-situ Active Gravel Biochemical Reactors for pumped open pit water and seepage from non-PAG buttresses and dams in the management ponds prior to discharge **which is expected to** improve water quality for both non-point and point source effluents and subsequently for the receiving environment if monitoring of parameters indicate that WQGs will be exceeded in the future;
- Implement active and semi-passive flocculant and coagulant systems in the Tenas Control Pond and Rail Infrastructure Sedimentation Pond prior to discharge to lower expected TSS

levels from a maximum of 35 mg/L to 5 mg/L which is expected to improve water quality for both non-point and point source effluents and subsequently for the receiving environment specifically for total parameter concentrations such as Iron, and Aluminium; and

- Construct approved active water treatment system of Reverse Osmosis with an Anaerobic Bioreactor and Lime High Density Sludge that are currently in operation or approved for use in the province of BC for treating water released from the Tenas Control Pond during the Operation Phase. Runoff and seepage from non-PAG rock areas, including buttresses and dams, would also be collected, and pumped for water treatment. **This is expected to** reduce the concentration of some parameters such as nitrate and selenium which is expected to improve water quality for both non-point and point source effluents and subsequently for the receiving environment.

These mitigation measures have been modelled in the WLBM, and results are described in detail in Appendix 4.3-E Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project. For reference, the modelled discharge water quality after active water treatment compared to the final EA Project Case is summarized in Table 6.2-1. The results indicate there is a change in the modelled water quality with active treatment. However, like in the final EA Project Case, there is only one exceedance in the receiving environment (prediction node WQSEA1 in Figure 6.2-1) of dissolved copper.

Table 6.2-1: Modelled Discharge Water Quality After Active Water Treatment Compared to the Final EA Project Case

Parameter	Units	WQG	Background Goathorn P50	Background Goathorn P95	Final EAC Project Case (2024)				Active treatment (RO+MBBR+HDS)			
					End of Pipe discharge from the TCP (max summer Ops)	In pipeline from TCP to Goathorn Creek (max summer ops)	WQSEA1 (100m downstream of pipeline discharge) - (max summer Ops)	WQS06 (before confluence to Tenas Creek)	End of Pipe discharge from the TCP (max summer Ops)	In pipeline from TCP to Goathorn Creek (max summer ops)	WQSEA1 (100m downstream of pipeline discharge) - (max summer Ops)	WQS06 (before confluence to Tenas Creek) - (max summer Ops)
Nitrate	**mg/L**	3	0.043	0.084	4.3	4.3	0.17	0.17	0.5	0.5	0.090	0.095
Nitrite	**mg/L**	0.02	0.0005	0.002	0.099	0.099	0.0034	0.0034	0.01	0.01	0.0020	0.0021
Sulfate	**mg/L**	218	25	38	410	410	39	41	200	200	42	45
Aluminum, total	**mg/L**	0.270189	0.034	0.66	0.39	0.39	0.063	0.065	0.05	0.05	0.063	0.065
Cobalt, dissolved	**mg/L**	0.00045	0.00005	0.0001	0.0029	0.0029	0.00018	0.00019	0.0029	0.0029	0.00028	0.00030
Copper, dissolved	**mg/L**	0.0013	0.0011	0.0036	0.0015	0.0015	0.0016	0.0016	0.0001	0.0001	0.0016	0.0016
Iron, total	**mg/L**	1	0.04	0.7	1.5	1.5	0.14	0.14	0.05	0.05	0.24	0.26
Molybdenum, total	**mg-N/L**	0.034	0.00048	0.00062	0.036	0.036	0.0017	0.0017	0.037	0.037	0.0019	0.0020
Nickel, dissolved	**mg/L**	0.0022	0.00025	0.0006	0.006	0.006	0.00051	0.00054	0.005	0.005	0.00062	0.00066
Selenium, total	**mg/L**	0.002	0.000084	0.0002	0.022	0.022	0.00074	0.00078	0.001	0.001	0.00018	0.00019
Thallium, total	**mg/L**	0.00003	0.000005	0.00001	0.00005	0.00005	0.0000079	0.0000082	0.00005	0.00005	0.000014	0.000015
Zinc, dissolved	**mg/L**	0.007405	0.0013	0.0021	0.0088	0.0088	0.002	0.0021	0.0088	0.0088	0.0021	0.0022

Notes:

mg/L = milligrams per litre; mg-N/L = milligrams of nitrogen per liter

Coloured box = exceeds British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary. Water Quality Guideline Series, WQG-20. (British Columbia Ministry of Water, Land, and Resource Stewardship 2025).

The Active treatment case may have higher concentrations in the environment because discharge was set at 12,000m^3/d vs 10,000m^3/d in the base case.

Some of the POCs are not treated by the Active treatment plant as the effluent target for the treatment is higher than the modelled concentrations in the Tenas Control Pond (TCP).

615000 620000 625000 630000 635000

6065000 6060000 6055000 6050000

WQS12
CN
16
Bulkley River
WQS11
WQS09
WQS05
WQS06
Helps Creek
WQS04
WQS22
Telkwa River
WQSEA1
WQS03DS
WQS06US
WQS02
Tenas Creek
WQS20
WQS21
WQS13
WQS01
WQS03
Four Creek
Goathorn Creek

Tenas Project

Receiving Environment Prediction Nodes Map

Legend

- Surface Water Monitoring Station
- Highway
- Rail Line
- Wetland
- Watercourse
- Waterbody

Mine Features

- Bypass Road
- Proposed Pit Haul Road
- Backfill
- Core Footprint
- Pit Lake
- Plant and Maintenance Area
- Pond
- Rock Cover

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Features: Allegiance Coal, 2020
- Basedata: Government of British Columbia
- Basemap: World Topo Base

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6.3 Cumulative Effects and Characterisation of Significance by Subcomponent

The interactions between the predicted Project residual effects and the residual effects of other projects and activities (Table 6.1-1) were reviewed to predict the cumulative effects on the Surface Water VC and associated subcomponents.

Cumulative effects on the Surface Water VC and subcomponents have been characterised and assessed in terms of Magnitude, Geographical Extent, Duration, Frequency, Reversibility, Context, Likelihood, Significance, and Level of Confidence of effect. Characterisation criteria and significance definitions for this CEA are consistent with those presented in 5.4.

Due to limited information on location and quantified effects on water quality and quantity of other projects and activities, particularly those in the reasonably foreseeable future, cumulative effects were evaluated qualitatively.

6.3.1 Surface Water Quantity Subcomponent

The interactions between the predicted Project residual effects and the residual effects of past, current, and reasonably foreseeable projects, and activities (Table 6.1-1) were reviewed to determine potential cumulative effects on the Surface Water Quantity subcomponent.

Residual effects on the Surface Water Quantity subcomponent resulting from the Project relative to the baseline conditions were identified and assessed as **Not Significant** in 5.4.2. Residual effects resulting from past, current, and reasonably foreseeable future projects and activities may act cumulatively with the residual effects of the Project on Surface Water Quantity in the RSA through change in MAD, change in seasonal flow distribution and change in low and high flows.

6.3.1.1 Change in Mean Annual Discharge

Project-related changes in MAD have the potential to interact with potential changes resulting from forestry, agriculture, urban development, and other mining projects, as listed in Table 6.1-1. All future projects are located outside of the LSA but within the RSA in the watersheds of the Telkwa and Bulkley rivers. The Project-related changes to MAD in Telkwa River and Bulkley River are expected to be minor. None of the proposed projects identified are expected to occupy a sizable portion of either watershed, and future projects will be subject to the regulatory process and their permit conditions, which are expected to minimize effects on downstream watercourses.

Natural disturbances, such as forest fires and landslides, have the potential to affect the MAD by temporarily reducing infiltration and increasing runoff rates to adjacent watercourses. These effects would be expected to occur in isolated areas over relatively short-durations, and the catchment would be expected to re-establish natural conditions within a period of years.

Historic forestry and agricultural activities would also be expected to affect the MAD in streams by reducing canopy losses and increasing runoff rates. Forestry activities are temporary and occupy specific parcels of land at a time, subject to the allowable annual cut determined by the Chief Forester based on the *Forest Act*, RSBC, c. 157 (GovBC 1996a). This determination is based on the consideration of the composition of the forest and rate of growth in the area, as well as the short- and long-term implications to the province. The magnitude of change in catchment area because of forestry relative to the total Telkwa or Bulkley watersheds is expected to be small. Agricultural and/or mining activities may have a more permanent change in land use, however, the coverage and associated effect is expected to be small relative to the total Telkwa or Bulkley watersheds.

Based on this qualitative summary, the Magnitude of the cumulative effect from change in MAD is expected to be Low, with the expectation that less than 5% of the LSA would be affected. Geographical Extent is Regional since the projects, and the effects, are located within the RSA. The Duration is predicted to be Long-Term, due to long-term change in catchment areas from the agricultural or mining activities. The Frequency of the effect is expected to be Continuous since the change is expected to occur year-round. The Reversibility of the effect is expected to be Partially Reversible since it is not expected to continue beyond the Year 2100. The Context of the effect is expected to be Moderate, considering that these projects/activities have been ongoing in the past and the streams have high resilience to small-scale changes in land use. The Likelihood of an effect is Likely, based on the expected change in catchments from the projects and activities.

The cumulative effect on Surface Water Quantity is predicted to be **Not Significant**, as the change is not expected to alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 5% of LSA is affected); the effect is predicted to be of Low Magnitude, Regional Extent, and Long-term Duration. This prediction was deemed to have a Moderate Level of Confidence, based on the qualitative assessment.

6.3.1.2 Change in Seasonal Flow Distribution

Project-related changes to seasonal flow distribution have the potential to interact with potential changes resulting from forestry, agriculture, urban development, and other mining projects, as listed in Table 6.1-1. The Project is expected to both increase and decrease monthly streamflow in sections of Four Creek, Tenas Creek and Goathorn Creek. These streams are within the LSA, and historical, current, or future activities are not anticipated in the LSA.

Activities and future projects are in the RSA within the Telkwa and Bulkley watersheds. The Project-related changes to seasonal flow distribution in Telkwa River and Bulkley River are expected to be minor. None of the proposed projects identified are expected to occupy a sizable portion of either watershed, and all future projects will be subject to the regulatory process and their permit conditions, which are expected to minimize effects on the watercourses. Localized changes to groundwater recharge may occur as infiltration rates are reduced around active forestry or agricultural land parcels. Similarly, active water storage in planned mining areas may change the timing and magnitude of spring freshet and the low flow during the summer months.

Natural disturbances, including forest fires and landslides, have historically altered the storage and runoff rates from specific areas, however, these effects are expected to be temporary and small in comparison to the total catchment areas of the Telkwa River and Bulkley River.

Based on the qualitative assessment, the Magnitude of the cumulative effect on seasonal flow distribution is Moderate, as greater than 5% but less than 20% of the LSA is expected to be altered from past, current, and future projects in combination with the Project effects. Geographical Extent is expected to be Regional since activities and their effects are located within the RSA. The Duration of the effect is Long-term since the changes in land use from planned projects are expected to continue through the Post-closure Phase. The Frequency is expected to be Continuous since changes to streamflow could be expected in both winter and summer periods. The Reversibility of the effect is expected to be Partially Reversible since it is not expected to continue beyond the Year 2100. The Context of the effect is expected to be Moderate, considering that these projects/activities have been ongoing in the past and the streams have high resilience to small-scale changes in land use. The Likelihood of an effect is Likely.

The cumulative effect on Surface Water Quantity is predicted to be **Not Significant**, as the change is not expected to alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 20% is affected). The effect is predicted to be of Moderate Magnitude, Regional Extent, and Long-term Duration. This prediction was deemed to have a Moderate Level of Confidence, based on the qualitative assessment.

6.3.1.3 Change in Low and High Flows

Project-related changes in low and high flows have the potential to interact with changes resulting from forestry, agriculture, urban development, and other mining projects, as listed in Table 6.1-1. The Project is expected to both increase and decrease low flows in Tenas Creek and Four Creek based on interactions with the groundwater table, as well as increase high flows in some segments of Four Creek. These streams are within the LSA, and historical, current, or future activities are not anticipated in the LSA.

Current activities and future projects are in the RSA within the Telkwa and Bulkley watersheds. The Project-related changes to low and high flows in Telkwa River and Bulkley River are expected

to be minor. None of the proposed projects identified are expected to occupy a sizable portion of either watershed, and all future projects will also be subject to the regulatory process and their permit conditions, which are expected to minimize effects on downstream watercourses. Local changes to groundwater recharge may occur as infiltration rates are reduced around active forestry or agricultural land parcels, resulting in low flows, while reduced forest canopy and removal of vegetation for agriculture may increase high flows. Mining activities could lower or raise the groundwater table, resulting in localized changes to low flow conditions.

Natural disturbances, including forest fires and landslides, have historically altered the storage and runoff rates from specific areas, however, these effects are expected to be temporary and small in comparison to the total catchment areas of the Telkwa River and Bulkley River.

Based on the qualitative assessment, the Magnitude of the cumulative effect on low and high flows is Low, as less than 5% of the RSA is expected to be altered from past, current, and future projects in combination with the Project effects. Geographical Extent is expected to be Regional since proposed activities are located within the RSA. The Duration of the potential effect is Long-term, since agricultural and other mining activities may change portions of the landscape through the Post-closure Phase. The Frequency of the effect is expected to be Infrequent, since low flow and high flow events are rare by nature. The Reversibility of the effect is expected to be Partially Reversible since the effect is not expected to continue beyond the Year 2100. The Context of the effect is expected to be Moderate, considering that these projects and/or activities have been ongoing in the past and the streams have high resilience to small-scale changes in land use. The Likelihood of an effect is Unlikely, considering that engineering controls will be in-place to limit change in high and low flows, and these events are rare by nature.

The cumulative effect on Surface Water Quantity is predicted to be **Not Significant**, as the change is not expected to alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 1% of RSA is affected); the effect is predicted to be of Low Magnitude, Regional Extent, and Long-term Duration. This prediction was deemed to have a Moderate Level of Confidence, based on the qualitative assessment.

6.3.1.4 Summary of Cumulative Effects to Surface Water Quantity Subcomponent

Table 6.3-1 presents a summary of the cumulative assessment for Surface Water Quantity.

Table 6.3-1: Summary of Cumulative Effects on Surface Water Quantity Subcomponent

Cumulative Effects	Contributing Activities within the Project Phases (C, O, D, P)	Cumulative Effects Characterisation								
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance	Level of Confidence
Change in Mean Annual Discharge	• Existing activities including agriculture, forestry, harvesting and recreation (C, O, D, P). • Reasonably foreseeable developments within the Surface Water RSA as outlined in Table 6.1-1 (C, O, D, P). • Project-related activities that could interact with the above activities, as outlined in Table 5.5-1.	L	R	LT	C	PR	M	L	NS	M
Change in Seasonal Flow Distribution		M	R	LT	C	PR	M	L	NS	M
Change in Low and High Flows		L	R	LT	IF	PR	M	UL	NS	M

Notes: C, O, D, P represent Project Phases: (C)onstruction, (O)peration, (D)ecomissioning and Reclamation, (P)ost-closure

Project=Tenas Project

Magnitude: Low (L), Moderate (M), High (H)
Geographic Extent: Local (LSA), Regional (RSA), Beyond Regional (beyond RSA)
Duration: Short-term (ST), Medium-term (MT), Long-term (LT)
Frequency: Infrequent (IF), Frequent (FF), Continuous (CF)
Reversibility: Fully reversible (FR), Partially reversible (PR), Irreversible (IR)
Context: Low (L), Moderate (M), High (H)
Likelihood: Unlikely (UL), Likely (L)
Significance: Not-Significant (NS), Significant (S)
Level of Confidence: High (H), Moderate (M), Low (L)

See Table 5.1-2 for list of applicable activities for each listed Project phase, unless otherwise noted in this table. Includes all existing and reasonably foreseeable projects as outlined in Table 6.1-1.

6.3.2 Surface Water Quality Subcomponent

The interactions between the predicted Project residual effects and the residual effects of past, current, and reasonably foreseeable projects, and activities (Table 6.1-1) were reviewed to predict the cumulative effects on the Surface Water Quality subcomponent.

Residual effects on the Surface Water Quality subcomponent resulting from the Project relative to the baseline conditions were identified and assessed as **Not Significant** in Table 5.5-1. Residual effects resulting from past, current, and reasonably foreseeable projects and activities may act cumulatively with the residual effects of the Project on the Surface Water Quality subcomponent in the RSA through change in modelled parameter concentrations and change in other measurable water quality parameters.

6.3.2.1 Change in Modelled Parameter Concentrations

Project-related changes to modelled parameter concentrations have the potential to interact with potential changes resulting from forestry, agriculture, urban development, and other mining projects, as listed in Table 6.1-1. Future projects are located outside the LSA but within the Telkwa and Bulkley watersheds. The Project-related changes to parameter concentrations in the Telkwa River and Bulkley River are expected to be minor. None of the proposed projects identified are expected to occupy a sizable portion of either watershed, and future projects will be subject to the regulatory process and their permit conditions, which are expected to minimize effects on the watercourses and meet water quality guidelines or appropriately selected site-specific objectives.

Natural disturbances, such as forest fires and landslides, have the potential to affect modelled parameter concentrations by temporarily increasing sediment and nutrient loads in adjacent watercourses. These effects would be expected to occur in isolated areas over relatively short-durations, and the catchment would be expected to re-establish natural conditions within a period of years.

Historic forestry and agricultural activities would also be expected to affect modelled parameter concentrations in streams with increased total suspended solids concentrations in the case of forestry and increased nutrients associated with pesticides and other products for agriculture. Forestry activities are temporary and occupy specific parcels of land at a time, subject to the allowable annual cut determined by the Chief Forester based on the *Forest Act*, RSBC, c. 157 (GovBC 1996a). Agricultural activities may have a longer lasting change in downstream water quality; however, the amount of agricultural area and the associated effect is also expected to be small relative to the total Telkwa and Bulkley watersheds. Mitigation measures would be

expected to be incorporated in agricultural practices to control release of nutrients or other chemicals.

Other mining activities have the potential to increase the metals concentrations, as well as blasting residuals including ammonia, nitrate, and nitrite. Effluent discharge from future mining projects would be subject to permit conditions and independent effects assessments, which would be expected to limit discharge to within the water quality guidelines and incorporate mitigation measures as needed. The Big Onion Project could discharge higher concentrations of metals and nutrients into a tributary of Bulkley River, which has the potential to result in a cumulative effect with the Project's discharge. However, the change relative to baseline is expected to minimal, due to the large watershed of the Bulkley River.

Based on this qualitative summary, the Magnitude of the cumulative effect from change in modelled parameter concentrations are expected to be Low, as it is expected that less than 5% of the LSA would be affected. Geographical Extent is Regional since planned activities are within the RSA. The Duration of the potential effect is Short-term, since any potential change in water quality parameters above water quality guidelines would only be expected for a period of years before additional mitigation measures are implemented. The Frequency of the effect is expected to be Infrequent since the change is not expected to occur year-round. The Reversibility of the effect is expected to be Partially Reversible since the effect is not expected to continue beyond the Year 2100. The Context of the effect is expected to be Moderate, considering that these activities have been ongoing in the past and the streams have high resilience to small-scale changes in land use and parameter concentrations. The Likelihood of an effect is Unlikely since modelling does not account for attenuation of loads through groundwater pathways.

The cumulative effect from change in modelled parameter concentrations is predicted to be **Not Significant**, as the change is not expected to alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 5% of LSA is affected); the effect is predicted to be of Low Magnitude, Regional Extent, and Short-term Duration. This prediction was deemed to have a Moderate Level of Confidence, based on the qualitative assessment.

6.3.2.2 Change in Other Measurable Water Quality Parameters

Project-related changes in other measurable water quality parameters have the potential to interact with potential changes resulting from forestry, agriculture, urban development, and other mining projects, as listed in Table 6.1-1. Future projects are located outside the LSA but within the Telkwa and Bulkley watersheds. The Project-related changes to other measurable water quality parameters in the Telkwa River and Bulkley River are expected to be minor. The identified future projects are expected to occupy a small portion of the RSA, and future projects will be subject to the regulatory process and their permit conditions, which are expected to minimize effects on the watercourses and minimize changes relative to baseline conditions.

Natural disturbances, such as forest fires and landslides, have the potential to affect other water quality parameters by temporarily increasing TSS, TDS, and conductivity in adjacent watercourses. These effects would be expected to occur in isolated areas over relatively short-durations, and the catchment would be expected to re-establish natural conditions within a period of years.

Historic forestry and agricultural activities would also be expected to affect TSS, TDS concentrations and EC levels in streams. Erosion rates can increase after forestry activities, increasing TDS and associated EC levels. Agricultural runoff can also increase TSS, TDS and SC levels. Forestry activities are temporary and occupy specific parcels of land at a time, subject to the allowable annual cut determined by the chief forester based on the *Forest Act*, RSBC, c. 157 (GovBC 1996a). Agricultural activities may have a longer lasting change in downstream water quality than forestry activities, however, the amount of agricultural area and the associated effect is expected to be small relative to the total Telkwa and Bulkley watersheds. Mitigation measures would be expected to be incorporated in agricultural practices to control release of sediment particles that could increase TDS and EC levels.

Other mining activities have the potential to increase the TDS concentrations, as well as conductivity or pH. Effluent discharge from future mining projects would be subject to permit conditions and independent effects assessments, which would be expected to limit discharge to within the receiving environment's natural variability and incorporate mitigation measures as needed. The Big Onion Project could discharge higher TDS concentrations and conductivity levels into a tributary of the Bulkley River, which has the potential to result in a cumulative effect with the Project's discharge. However, the change relative to baseline is expected to be minimal, due to the large watershed of the Bulkley River.

Based on this qualitative summary, the Magnitude of the cumulative effect from change in other measurable water quality parameters are expected to be Low, as it is expected that less than 5% of the LSA would be affected. Geographical Extent is Regional since planned activities are within the RSA. The Duration of the potential effect is Short-term, since any potential change in other measurable water quality parameters above the baseline would only be expected for a period of years before additional mitigation measures are implemented. The Frequency of the effect is expected to be Infrequent since the change is not expected to occur year-round. The Reversibility of the effect is expected to be Partially Reversible since the effect is not expected to continue beyond the Year 2100.

The Context of the effect is expected to be Low, considering that these activities have been ongoing in the past and the streams have high resilience to small-scale changes in land use and parameter levels. The Likelihood of an effect is Unlikely, due to the small scale of the projects in relation to the natural watersheds of the Bulkley River and Telkwa River.

The cumulative effect of change in other measurable water quality parameters is predicted to be **Not Significant**, as the change is not expected to alter its integrity within the Surface Water LSA to an unacceptable level (i.e., less than 5% of LSA is affected); the effect is predicted to be of Low Magnitude, Regional Extent, and Short-term Duration. This prediction was deemed to have a Moderate Level of Confidence, based on the qualitative assessment.

6.3.2.3 Summary of Cumulative Effects to Surface Water Quality Subcomponent

Table 6.3-2 presents a summary of the CEA for the Surface Water Quality subcomponent.

Table 6.3-2: Summary of Cumulative Effects for Surface Water Quality Subcomponent

Cumulative Effects	Contributing Activities within the Project Phases (C, O, D, P)	Cumulative Effects Characterisation								
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance	Level of Confidence
Change in Modelled Parameter Concentrations	• Existing activities including agriculture, forestry, harvesting and recreation (C, O, D, P). • Reasonably foreseeable developments within the Surface Water RSA as outlined in Table 6.1-1 (C, O, D, P). • Project-related activities that could interact with the above activities, as	L	R	ST	IF	PR	M	UL	NS	M
Change in Other Measurable Water Quality Parameters		L	R	ST	IF	PR	L	UL	NS	M

Cumulative Effects	Contributing Activities within the Project Phases (C, O, D, P)	Cumulative Effects Characterisation								
		Magnitude	Geographic Extent	Duration	Frequency	Reversibility	Context	Likelihood	Significance	Level of Confidence
	outlined in Table 5.5-1.									

Notes: C, O, D, P represent Project Phases: (C)onstruction, (O)peration, (D)ecomissioning and Reclamation, (P)ost-closure Project=Tenas Project

Magnitude: Low (L), Moderate (M), High (H)
Geographic Extent: Local (LSA), Regional (RSA), Beyond Regional (beyond RSA)
Duration: Short-term (ST), Medium-term (MT), Long-term (LT)
Frequency: Infrequent (IF), Frequent (FF), Continuous (CF)
Reversibility: Fully reversible (FR), Partially reversible (PR), Irreversible (IR)
Context: Low (L), Moderate (M), High (H)
Likelihood: Unlikely (UL), Likely (L)
Significance: Not-Significant (NS), Significant (S)
Level of Confidence: High (H), Moderate (M), Low (L)
See Table 5.1-2 for list of applicable activities for each listed Project phase, unless otherwise noted in this table. Includes all existing and reasonably foreseeable projects as outlined in Table 6.1-1.

6.4 SUMMARY OF CUMULATIVE EFFECTS ASSESSMENT

The following Project-related residual effects of the Project on the Surface Water VC were carried forward to the CEA:

- Surface Water Quantity subcomponent:
  - change in MAD;
  - change in seasonal flow distribution; and
  - change in high and low flows.
- Surface Water Quality subcomponent:
  - change in modelled parameter concentrations; and
  - change in other measurable water quality parameters.

As detailed in Section 6.3, the residual effects of the Project, in conjunction with the comparable residual effects from past, present, and reasonably foreseeable future projects are not expected

to alter the integrity of the Surface Water Quantity or Surface Water Quality subcomponents. Future forestry, agricultural or mining activities are expected to have the greatest contribution to cumulative effects on the Surface Water VC, however, this is expected to be mitigated with the implementation of regulatory guidance and requirements in their permit conditions.

Considering this, the cumulative effects are not expected to alter the integrity of the Surface Water VC within the Surface Water RSA beyond an acceptable level (i.e., it remains sustainable and is available to contribute to ecological function); and are predicted to be **Not Significant** (Table 6.4-1).

Table 6.4-1: Summary of Cumulative Effects on Surface Water Subcomponents

VC Subcomponent	Potential Cumulative Effect	Contributing Activities within the Project Phases (C, O, D, P)	Cumulative Effect (Yes/No)	Significant (Yes/No)
Surface Water Quantity	• Change in Mean Annual Discharge • Change in Seasonal Flow Distribution • Change in Low and High Flows	Forestry, mining, agricultural activities (C, O, D, P)	Yes	No
Surface Water Quality	• Change in Modelled Parameter Concentrations • Change in Other Measurable Water Quality Parameters		Yes	No

Notes: C, O, D, P represent Project phases: (C)onstruction, (O)peration, (D)ecomissioning and Reclamation, (P)ost-closure)

Project=Tenas Project

See Table 5.1-2 for list of applicable activities for each listed Project phase, unless otherwise noted in this table. Includes all existing and reasonably foreseeable projects as outlined in Table 6.1-1.

7. SUMMARY OF EFFECTS ASSESSMENT FOR SURFACE WATER VALUED COMPONENT

The following potential effects of the Project on the Surface Water VC subcomponents are predicted to occur due to the Project:

- Surface Water Quantity subcomponent:
  - change in MAD;
  - change in seasonal flow distribution; and
  - change in high and low flows.
- Surface Water Quality subcomponent:
  - change in modelled parameter concentrations; and
  - change in other measurable water quality parameters.

Mitigation measures employed during all Project phases are expected to avoid, minimize, or rehabilitate onsite the potential Project effects on the Surface Water VC; however, these effects are not anticipated to be fully mitigated, and residual effects are anticipated.

The Project-related residual effects on the Surface Water VC subcomponents were predicted to be **Not Significant**. Project-related residual effects were carried forward into the CEA and were assessed in relation to their overlap in time and space with the comparable residual effects of other projects and activities within the Surface Water RSA. Future forest, mining or agricultural activities are expected to have the greatest contribution to cumulative effects on the Surface Water VC, however, this is expected to be mitigated with the implementation of regulatory guidance and requirements in their permit conditions. Considering this, the cumulative effects are not expected to alter the integrity of the Surface Water VC within the Surface Water LSA or RSA beyond an acceptable level. As such, the cumulative effects on the Surface Water VC are predicted to be **Not Significant**.

8. FOLLOW-UP STRATEGY

TML has developed mitigation measures that have been incorporated in the Project's design and/or operational procedures. These Project mitigation measures are outlined in S1.0 Overview of Project Proponent Description of the EAC Application and include Project design aspects such as site selection, selection of BAT to-date for Project infrastructure and mining equipment, and a commitment to progressive reclamation.

Moreover, as described in 5.3 Mitigation Measures, Telkwa Mining has developed management plans that will be used to manage environmental issues, including surface water. The DMP provides details pertaining to the operational plans for discharges to surface water for the Project. The DMP contains information on expected discharge water quality limits, surface water discharge rates, discharge locations, emergency procedures for discharge system upsets, and contingency plans.

Along with the DMP, a comprehensive monitoring program, found in the MWMP will be used to gauge the performance of the Project's water management system and mitigation measures against model results and regulatory commitments. This MWMP contains monitoring plans for Project phases, including Post-closure. When changes are observed, solutions will be developed using adaptive management to determine the appropriate response. The following monitoring types are recommended:

- Environmental monitoring in Tenas, Four and Goathorn creeks, including water quality and streamflow, to detect alterations in receiving environment from baseline datasets;
- Water quality sampling in Project ponds and in the downstream environment, including monitoring wells, to characterise migration of seepage and ensure end-of-pipe limits and instream water quality guidelines are not exceeded;
- Survey Project pond water levels to maintain minimum freeboard requirements in preparation for emergency flood events;
- Monitor performance of soil covers over management ponds as they are subsequently covered as part of progressive reclamation in terms of erosion, and runoff rates;
- Monitor discharge rates from the control structure on the diversion channel south of the East Management Pond to verify high flow events are being discharged towards the management pond and not resulting in erosion in Four Creek;
- Monitor water cover depth over management ponds to ensure PAG material is submerged; and
- Monitor parameters of potential concern and parameters of concern related to aquatic life, terrestrial vegetation, wildlife and people and land uses.

Monitoring of Parameters of Potential Concern/Contaminants of Potential Concern (POPC/COPC) and Parameters of Concern/Contaminants of Concern (POC/COC) identified for aquatic life, wildlife, terrestrial vegetation, human health, and land uses will be conducted for soils, vegetation, sediment, and surface and groundwater.

Results of monitoring programs will be used to refine model predictions. Detailed surface water monitoring plans for all Project phases are provided in Appendix 13.11-E Minesite Water Monitoring Program of the MWMP. Appendix 4.3-A Tenas Project – Water and Load Balance Modeling Report (Updated 2025), results will be used to evaluate if additional follow-up programs or interventions are required. Based on modelling results, no follow-up programs are expected at this time.

8.1 TRIGGER ACTION RESPONSE PLAN

Given the potential effects on streams due to the development of this Project on stream flows, water quality in streams and water quality in management and control ponds (end-of-pipe) a Trigger Action Response Plan (TARP) will be developed and implemented during the permitting process for:

- changes in streamflow relative to baseline conditions;
- water quality within management ponds and the Tenas Control Pond prior to discharge so that regulatory limits are not exceeded in the receiving environment after the application of an IDZ if required. Monitoring results will be compared against model results to verify conceptual models and model updates will be performed if deviations from expected quality are noted; and
- discharge of water when water quality in discharging facilities exceeds the regulatory end-of-pipe limits. A maximum discharge rate would be calculated to meet downstream water quality guidelines and water flows above this rate would be temporarily stored in management and or control ponds or pumped to backfilled areas of the open pit.

As part of the TARP, testing of the management pond cover will be completed on the first covered facility (North Management Pond) early during the Operation Phase to improve the long-term closure strategy for revegetation and effective maintenance of water covers and the effectiveness of the cover reducing evaporative losses.

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APPENDIX 4.3-A: TENAS PROJECT – WATER AND LOAD BALANCE MODELING REPORT (UPDATED 2025), SRK CONSULTING

FINAL

Tenas Project – Water and Load Balance Modeling Report (Updated 2025)

Tenas Project, Telkwa, BC, Canada

Telkwa Mining Limited

SRK Consulting (Canada) Inc. ▪ CAPR002055 ▪ September 2025

srk consulting

FINAL

Tenas Project – Water and Load Balance Modeling Report (Updated 2025)

Tenas Project, Telkwa, BC, Canada

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Photo of Goathorn Creek and unnamed tributary discharge, taken in May 2025

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Useful Definitions

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

7Q10	7-day low flow in a 1 in 10-year return period
AIR	Application Information Requirements
BC AWQG	British Columbia Approved Water Quality Guideline
BC WWQG	British Columbia Working Water Quality Guideline
CCME	Canadian Council of Ministers of Environment
POC	Parameter of concern
CPP	Coal Processing Plant
EA	Environmental Assessment
EAO	Environmental Assessment Office
ECCC	Environment Canada and Climate Change
EDP	Effluent Discharge Permit
EMP	East Management Pond
ENV	BC Ministry of Environment and Climate Change Strategy
LSA	Local Study Area
NMP	North Management Pond
NSE	Nash Sutcliffe efficiency
PAG	Potentially acid-generating
PRISM	Parameter-elevation regressions on independent slopes model
RSA	Regional Study Area
TSS	Total suspended solids
WMP	West Management Pond
WQG	Water quality guideline
WQS	Water quality station

Executive Summary

A water and load balance model has been developed in support of the BC Environmental Assessment Certificate Application (EA) and joint application submission for a BC *Mines Act* permit and BC *Environmental Management Act* discharge permit for the Tenas Project (the Project) in northwest British Columbia. The Project consists of an open pit, a series of management ponds which will contain submerged potentially acid-generating materials, a coal processing plant, water management infrastructure, ancillary facilities, and rail infrastructure. The mine will take 1.5 years to construct and will operate for 21 years. Decommissioning and reclamation will take approximately 4 years with a further 50 years being assigned to the Post-closure phase.

Inputs to the model include groundwater modeling results, climate and hydrology datasets, performance and Operations of mining elements, water management infrastructure, catchment areas, geochemical source terms and baseline water quality. Model results provide expected and worst-case water quantity and quality, during and after mining is complete. Sensitivity analyses conducted in the model are used to understand what variables the model results are most sensitive to. Where applicable, model results were calibrated using baseline information. Results are summarized in terms of water quantity and quality changes to the surrounding watercourses which may be expected to occur in Construction, Operation, Decommissioning and Reclamation, and Post-closure phases.

Modeling was completed in GoldSim software package, which uses a daily time step and reports monthly average results. Hydrologic components of the model were calibrated to regional and local streamflow datasets and encompass interactions between surface water and groundwater. Streamflow is generated on a daily timestep based on precipitation and temperature datasets, which include an orographic gradient adjustment. Both precipitation and temperature have additional adjustments included to account for climate change, which projects an increase in temperature year-round and an increase in precipitation for most months, through the year 2100.

The load balance component is based on the conservation of mass, assuming complete mixing for each prediction node and time step. Geochemical characterization results are included to estimate mass of constituents released per mass of mine rock stored in various mine waste facilities such as a backfill in the open pit. The in-stream water quality is calculated based on the mixing of Project discharge with background loading estimated from baseline monitoring of surface and groundwater quality.

Within the proposed Project area, the model simulates the flux of water and mass. Monthly withdrawals of water because of diverted catchment areas and monthly discharges into the downstream environment are estimated. A further 2.5% of water was withdrawn from Goathorn Creek to evaluate the contingency of withdrawing water for Project demands though not required by the model. Prediction nodes were selected to represent expected conditions in the downstream environment and are evaluated in relation to a baseline condition, which estimates streamflow and quality through 2100 without influence of the proposed Project.

Multiple Project alternative assessment cases were selected to understand the range of potential effects from the Project throughout the life of mine. These cases incorporate variability in hydrologic conditions, groundwater conditions and geochemical source terms. The main results reported describe the Project

Case, which incorporates Project design mitigation measures and expected inputs for geochemical source terms and average hydrology. Results for each alternative assessment case are presented in Appendix F (water quantity) and Appendix G (water quality). The Project Case model conditions are incorporated to simulate the expected, or most likely estimate based on available information. Where input assumptions are uncertain, more conservative assumptions were made. Preliminary model results were used to develop mitigation measures which were applied in subsequent model versions as appropriate.

A prior report was submitted as part of the 2022 EAC application, and while the main structure and assumptions of the model remained the same, the following changes to inputs were made:

- Review and update of water quality guidelines with respect to recent provincial publications, used for the screening of water quality modeling results and identification of potential effects.
- Review and update the Tenas Project climatic records, based on additional data from the local station since the development of the EA baseline report (SRK 2024a).
- Review of streamflow model performance against measurements collected in 2022, along with implementation of an alternative dynamic streamflow model.
- In addition to climate records and streamflows, the climate change model has been updated to match current approved scientific requirements. All three updates are summarized in the updated hydrometric report (SRK 2024a).
- Update of background source terms incorporating seasonality (summer and winter conditions) in the model based on updated baseline data.
- Update of geochemical source terms related to barrel monitoring undertaken over the past four years which was used for quality predictions (SRK 2024b).
- Update of source terms related to the non-PAG backfill in the open pit to account for methodology of constructing this backfill in thinner lifts from the bottom up and progressive reclamation through the addition of overburden and surface soil (topsoil) covers (Okane, 2024).
- Review and update to the groundwater model which led to updated calculations to estimate the load in the creeks through groundwater seepage from the Project (SRK 2024c).

Project Results

- Sufficient water is expected within the Project area to maintain the minimum 0.5 m water cover above PAG materials within 6 months of rock placement on average, and 1.5 m of water cover throughout the rest of Operations and during Post-closure.
- Process and potable water demand as well as water to mix with sewage effluent will be met throughout operation based on available water in the Open Pit sump, keeping Tenas Control Pond as a contingency.
- Project discharge ranging from 9,000 m^3/day to 24,700 m^3/day from the Tenas Control Pond will include pumped flows and overflows via the spillway into a tributary of Goathorn Creek. Additional discharge to the Bulkley River is anticipated from the Rail Infrastructure Sedimentation Pond at a

rate of up to 260 m^3/day. In closure, Project discharge will occur from the North Management Pond to the tributary of Goathorn Creek at a rate of up to 28,800 m^3/day.

- Discharging facilities (Rail Infrastructure Sedimentation Pond, Tenas Control Pond and North Management Pond) have the following parameters of concern identified in their effluent (80% of corresponding water quality guideline calculated for the receiving stream) during active discharge periods under Project Case conditions: nitrate-nitrogen, nitrite-nitrogen, sulfate, total aluminum, dissolved cadmium, dissolved cobalt, dissolved copper, total iron, total molybdenum, total nickel, total selenium, total thallium, dissolved zinc.

Receiving Environment Results

Water Quantity

Effects to surface water quantity were evaluated based on relative change over baseline conditions. A parallel pre-mining model was run in tandem with each assessment case using baseline conditions, and monthly percent change was calculated by comparing the proposed conditions with mining relative to pre-mining results. Results are summarized in relation to changes to mean annual discharge, monthly discharge, and low and high flows.

- Four Creek prediction nodes, including WQ03, WQS21, WQS20 and WQS03DS, show as high as 37% reduction and as high as 48% increase to monthly streamflow during operation. These results reflect the maximum change to catchment area and baseflow because of mining Operations. Diversion channels and mine plan optimizations help to reduce the Project footprint as much as possible. However, the open pit and the Management Ponds continue to route water that would have otherwise drained to Four Creek towards Goathorn Creek via the Tenas Control Pond discharge, resulting in a reduction of catchment area, while the C02 channel diversion results in an increase in catchment area in portions of Four Creek.
- Tenas Creek is expected to experience up to a 10% reduction in monthly streamflow during low flow periods (April and August) during operation because of open pit groundwater drawdown and catchment area reductions. The seepage from Management Ponds counters this effect by the end of operation and into Post-closure, resulting in a long-term change to mean annual discharge of less than 6%.
- Goathorn Creek flows are expected to be reduced by up to 8% during low flow months in operation. Flows downstream of the Project discharge are expected to increase by up to 6% in operation during high flow months and 11% in Post-closure due to routing of water through the Project infrastructure that would otherwise have reported to the Tenas Creek catchment. The change to mean annual discharge is less than a 3% reduction in operation and Post-closure.
- The Project may reduce monthly average flows in the Telkwa River downstream of Goathorn Creek by less than 2% in operation and an increase of 1% in Post-closure due to seepage from Management Ponds. Bulkley River monthly streamflow changes are negligible (less than 0.1% change during any phase of the Project).

Water Quality

Effects to surface water quality were evaluated based on screening against selected water quality guidelines (WQG) as well as variability within the historical monitoring record. Baseline monitoring data show the streams are naturally elevated for total aluminum, total iron, and dissolved copper and have experienced periods above the WQG values. Exceedances for modelled results are summarized by model cases and stream:

Project Case

Under expected conditions, in terms of hydrology, groundwater and source terms:

- Exceedances of the dissolved cobalt WQG may occur in Four Creek in Closure only for a few years (4 years) in Post-closure.
- Exceedances for dissolved copper WQG may occur in Goathorn Creek in winter and summer during the Operations and Post-closure phases, but results are within the natural variability of baseline monitoring data (i.e., less than the 95th percentile from baseline datasets). Because these exceedances are driven by naturally elevated concentrations of dissolved copper in the background, the concentrations do not decrease over time.
- In Telkwa River, exceedances of the total aluminum and dissolved copper WQG occur in summer months during the Operations phase in the Project Case. The results for total aluminum are less than the natural variability recorded in the baseline monitoring data (i.e. less than the 95th percentile from baseline datasets). Exceedances of the WQG of dissolved copper are experienced in summer throughout operation phase only but results are less than the 50th percentile from baseline data.

Alternative Project Case 2 (High Source terms)

Under the upper-case geochemical source term conditions, the following water quality results are noted:

- The total selenium WQG is exceeded in both summer and winter months during Post-closure by up to 1.6 times in Four Creek. The long-term winter and summer results in 2100 are below the WQG.
- The dissolved cobalt WQG is exceeded in both summer (maximum monthly only) and winter months (monthly maximum and average) up to 4.3 times the guideline in Four Creek.
- The nitrite-nitrogen WQG is exceeded in winter months by up to 1.7 times the guideline in Four Creek with some exceedances in summer months.
- The total selenium WQG is exceeded in Tenas Creek at downstream prediction nodes WQS22 and WQS04 in winter months during Post-closure by up to 1.5 times the guideline.
- The dissolved cobalt WQG is exceeded in winter months only up to 1.8 times the guideline in the downstream prediction nodes from the Project in Tenas Creek.
- Exceedances for total selenium by up to 1.5 times the WQG in Goathorn Creek, occurring only in Post-closure during the winter months. These exceedances are below the WQG by 2100.

- Exceedances for dissolved cobalt by up to 1.1 times in prediction nodes in Goathorn Creek during Operations due to higher discharge from the Project, and in WQS05 (most downstream node) in Closure up to 1.1 times the guideline due to groundwater seepage.

Alternative Project Case 5 (Low flows)

Under 7Q10 low flow conditions, the following water quality results are noted:

- The total selenium WQG is exceeded in both summer and winter months during Post-closure by up to 2.7 times in Four Creek. The long-term winter and summer results in 2100 are below the guideline.
- The nitrite-nitrogen WQG is exceeded in winter months by up to 2.9 times the guideline in Four Creek with some exceedances in summer months.

Other observations from the water quality modelling results:

- Groundwater seepage from management ponds into portions of Tenas, Goathorn, and Four Creek is expected to increase the total dissolved solids concentration and conductivity of the stream above baseline levels. In Tenas and Four creeks, the model results are within 10% of the 95th percentile from baseline monitoring. In lower reaches of Goathorn Creek, however, the model results are greater than 10% above the 95th percentile from baseline monitoring. These changes to Goathorn Creek persist into steady-state conditions.

The effects to both stream water quantity and quality were further evaluated in terms of the affected area within the spatial boundaries of the Project, including the local stream watersheds, the local study area (LSA) and the regional study area (RSA).

- In terms of water quality:
  - The modelled prediction nodes that experience long-term exceedances above water quality guidelines include the downstream portions of Four Creek only, which represents an area equal to 5.7 km^2. This affected area represents approximately 3% of the LSA and 0.4% of the RSA.
  - The modelled prediction nodes that experience valuess of other parameters (Total dissolved solids and specific conductivity) greater than 10% above the 95th percentile of the baseline monitoring records include downstream Goathorn Creek (WQSEA1, WQS06, WQS05), which represents an area equal to 6.7 km^2. This affected area represents approximately 3% of the LSA and 0.5% of the RSA.
- In terms of water quantity:
  - The modelled prediction nodes that experience a change to mean annual discharge greater than 10% reduction or 30% increase include WQS21, WQS20 and WQ03DS, which encompasses an area equal to 7.6 km^2. This affected area represents approximately 3.6% of the LSA and 0.5% of the RSA.
  - A change in seasonal flow distribution greater than 10% reduction or 30% increase in any given month under average conditions is predicted to occur at WQS03, WQS21, WQS20 and

WQS03DS. This change encompasses an area equal to 11 km^2, which represents approximately 5% of the LSA and 0.8% of the RSA.

- High flows are expected to be reduced over baseline conditions for all prediction nodes which will experience a reduction in catchment area. For the segment of Four Creek which will experience a net increase in catchment area, downstream of the diversion channel, an engineering control structure will limit the discharge during extreme events, sending excess water to the East Management Pond. Similarly, the Tenas Control Pond will have the ability to control high flood events through an additional attenuation capacity up to the 1 in 10-year flood event. As a result, the increase to high flows is expected to be minimal.
- Low flows are expected to be reduced in Operations along sections of Tenas and Four creeks because of drawdown of the groundwater table around the open pit. It is expected that extreme low flows will be similarly affected.

1 Introduction

1.1 Background

Telkwa Mining Limited (TML) are proposing to develop the Tenas Coal Deposit (the Project) in northwest British Columbia. The Project is located approximately 25 km southwest of the town of Smithers within the Telkwa River watershed and will comprise of an open pit, backfill, external material stockpiles, Management Ponds, Control Ponds, a coal processing plant, and rail infrastructure area. The Tenas Project's total mine life is 25 years including Construction, Operation, Decommissioning and Reclamation phases.

SRK Consulting (Canada) Inc. have developed a water quantity and quality model based on the proposed water management designs for the Tenas Project in support of the Environmental Assessment Certificate application (EA). The EA has been prepared in accordance with the BC Environmental Assessment Office (BC EAO) Guidelines for Preparing Environmental Assessments (BC EAO 2016) and the approved Application Information Requirements document issued in 2020.

In May 2020, the EAO issued an Application Information Requirements (AIR) document that provided the requirements of the EA (EAO, May 2020). This report supports the requirements of the EA including:

- Part A, Section 1.3, Project Design and/or Alternative Means of Carrying out the Project.
- Part B, Section 3.5, Assessment Methodology and Mitigation Measures.
- Part B, Section 4.0, Environmental Effects Assessment, Surface Water Intermediate Component.
- Part E, Management Plans and Management Strategies.

The objectives of the water quantity and quality model (Water and Load Balance Model) are defined in this report, along with the model inputs, assumptions, and results. Results of the model are used to inform the EA at the regional study area level.

This report is an updated version of the Water and Load Balance Model report submitted in August 2022 as part of the Projects EA submission. Various inputs to the WLBM were also updated since 2022 and have been integrated into this revision. The following inputs and changes were made:

- Review and updates to water quality guidelines based on provincial publications, used for screening of water quality modeling results and identification of potential effects.
- Review and update the Tenas Project climatic records, based on additional data from the local station since the development of the EA baseline report (SRK 2024a).
- Review of streamflow model performance against measurements collected in 2022, along with implementation of an alternative dynamic streamflow model.
- In addition to climate records and streamflows, the climate change model has been updated to match current approved scientific requirements. All three updates are summarized in the updated hydrometric report (SRK 2024a).

- Updated background source terms incorporating seasonality (summer and winter conditions) in the model.
- Update of source terms related to barrel monitoring undertaken over the past four years which was used for quality predictions as provided in (SRK 2024b).
- Update of source terms related to the non-PAG backfill to account for methodology of constructing this dump in lifts from the bottom up and progressive reclamation through the addition of overburden and surface soil (topsoil) covers as provided in (Okane 2024).
- Review and update to the groundwater model which led to updated calculations to estimate the load in the creeks through groundwater seepage from the Project (SRK 2024c).

Details about the updates to the inputs can be found in Section 3.

1.2 Scope of Work

This report presents the inputs, methodologies, and results of the water and load balance model ("the model"). As part of this work, the following were completed:

- Develop conceptual water balance flow diagrams.
- Compile climatic and hydrologic inputs.
- Develop water balance model and evaluate effects of the Project against baseline flow conditions.
- Modify water management infrastructure as required to achieve desired objectives.
- Develop background water quality source terms and geochemical source terms for load balance model.
- Develop load balance model and evaluate effects of the Project against baseline water quality conditions.

1.3 Model Objectives

Geochemical characterization studies have shown that a portion of waste rock from mining activities is expected to be potentially acid generating (PAG) material. To minimize oxidation of this material and the generation acid drainage and/or metal leaching, PAG rock will be stored in Management Ponds to maintain a perpetual water cover. One of the primary functions of the model is to test the ability of the Project water management infrastructure to maintain water cover.

The objectives of the model and water management plans include:

- Ensuring a minimum of 0.5 m water cover is maintained in Management Ponds within 6-months of PAG rock placement and a minimum 1.5 m throughout the rest of life of mine and Post-closure.
- Ensuring sufficient water is available to meet coal preparation plant (CPP) demand throughout Operations.
- Estimating the quality and quantity of water to be discharged to the receiving environment.

- Estimating the quality and quantity of water in the receiving environments at discharge locations and at prediction nodes in the receiving environment.
- Providing a basis for determining water management infrastructure requirements and water treatment requirements (if any).
- Providing a basis for the estimation of water management costs and water treatment costs (if any).

2 Model Overview

2.1 Regulatory Requirements and Commitments

Water takings for the Project are expected to be subject to the provincial *Water Sustainability Act* via a license for the use of surface and/or groundwater. The Project is expected to be subject to the federal *Fisheries Ac*t via the future *Coal Mining Effluent Regulations* which are currently in development (ECCC 2018), as well as the provincial *Environmental Management Act* via a Waste Discharge Authorization permit.

The *Coal Mining Effluent Regulations* are expected to specify end of pipe limits for total suspended solids (TSS), nitrate, and selenium for new and existing coal mines.

In the BC provincial jurisdiction, end of pipe limits for discharge of excess water to the environment may be specified in an Effluent Discharge Permit (EDP) issued by the BC Ministry of Environment (BC MOE) under the provincial *Environmental Management Act,* in addition to established surface water quality guidelines (WQG) for receiving environments. In advance of an EDP, the long-term average BC Approved Water Quality Guidelines or BC AWQG (ENV 2025a) and the BC Working Water Quality Guidelines or BC WWQG (ENV 2025b) for freshwater aquatic life were applied for the evaluation of results from the load balance. Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CCME WQG) are applied for parameters for which there is no BC AWQG or BC WWQG.

The WQG incorporated for the Project are summarized in Section 3.9.

2.2 Model Description

2.2.1 Simulation Approach

The model uses a daily time step, and reports results as monthly averages throughout the life of mine through the year 2100. The year 2100 was selected based on the current extent of available global circulation models for climate change evaluation.

Water quantity results were generated using two sets of hydrologic conditions, both of which account for climate change:

- Historical hydrologic conditions based on select years from the historical record including a composite year with monthly historical records corresponding to monthly average conditions and resulting in similar annual precipitation to the mean annual precipitation, a 1 in 100-year dry and a 1 in 10-year wet historical year. Details on this methodology are described in Section 3.1.1. Climate change adjustment factors were applied to temperature and precipitation inputs (Section 3.1.5).
- Monte Carlo simulation using a weather generating (WGEN) software with climatic data, including daily precipitation and daily temperature, for the Project area. A total of 100 model runs were completed using this approach. Climate change adjustment factors were applied to the daily generated temperature and precipitation values. At the end of 100 model runs, all results were

compiled, and probability distributions of the results were generated (i.e., 5th, 50th and 95th percentiles). Details of this methodology are described in Section 3.1.2.

Water quality predictions were completed using deterministic model runs (i.e., a single run with no probabilistic elements for climatic variables) with average hydrologic conditions to be consistent with the derivation of source terms.

2.2.2 Governing Equations

The water and load balance model operates based on conservation of mass. The water balance component tracks all inputs, outflows, and available storage at the Project. The water balance can be represented in a simplistic form as follows:

$$Water\ Storage = Water\ Input - Water\ Output \quad \text{(Eq. 2.1)}$$

Where the total water inputs include groundwater and precipitation, and water outputs include groundwater, evaporation, process water demand, discharge offsite and water loss to rock void space. Storage is available in various Project facilities.

The load balance for the Project was developed to evaluate loadings from Project components to the receiving environment. The load balance and resultant receiving water quality predictions were used as a tool to iteratively refine water management infrastructure for the Project throughout the life of mine.

The load balance assumes fully mixed conditions at each prediction node and time step. The mass balance does not account for some physical, chemical, and/or biological processes such as aerobic and anaerobic degradation, sorption and desorption, oxidation and reduction, dissolution and precipitation, and incomplete mixing within receiving environments.

Loadings and concentrations were calculated for each Project component, and loadings were generated for each corresponding receiving environment node in the water balance. Two types of loadings included in the load balance:

- Direct loadings based on defined input source terms.
- Linked loadings from reservoirs (from one reservoir to another).

Direct loadings are calculated based on the concentrations of source terms (eq. 2.2).

$$Direct\ Loading\ [mg] = Inflow\ Volume[m^3] \times Source\ Term\ Concentration\left[\frac{mg}{L}\right] \times 1000\ L/m^3 \quad \text{(eq. 2.2)}$$

Linked loadings (eq. 2.3) from reservoirs are calculated based on the calculated concentration (eq. 2.4) for the reservoir and associated inflow from the water balance.

$$Linked\ Loading\ [mg] = Inflow[m^3] \times Concentration[\frac{mg}{L}] \times 1000\ L/m^3 \quad \text{(eq. 2.3)}$$

$$Concentration = \frac{Mass\ (mg)}{Volume\ (L)} \quad \text{(eq. 2.4)}$$

2.3 Project Overview

The Project is located approximately 25 km southwest of the town of Smithers and is in the Telkwa River watershed, amongst the smaller watersheds of Tenas, Four, and Goathorn creeks (Figure 2-1). Workings will consist of an open pit, generation of both PAG and non-PAG rock as well as overburden material, Management Ponds, sedimentation ponds, a Coal Processing Plant (CPP), and rail infrastructure. The Project's total mine life is approximately 25 years including the Construction, Operation, Decommissioning and Reclamation phases. The Post-closure phase will occur after the decommissioning and reclamation phase are completed and will have an unspecified timing but will likely be approximately 50 years.

Downstream water users include fish populations in Four, Tenas and Goathorn creeks as well as Telkwa and Bulkley Rivers. The Village of Telkwa is located downstream at the confluence of the Telkwa and Bulkley Rivers, and further downstream on Bulkley River is the Town of Smithers following by Witset.

Tenas Project

Site Location

610000 615000 620000 625000 630000 635000

6070000 6065000 6060000 6055000 6050000

SMITHERS
16
CN
TELKWA
BURNT CABIN BOG ECOLOGICAL RESERVE
Tyhee Lake
Bulkley River
TELKWA COALMINE RD
LAWSON RD
Telkwa River
AVELING COALMINE RD
Helps Creek
RAIL LOADOUT
TELKWA RIVER FSR
Tenas Creek
BYPASS ROAD
Goat Horn Creek
Four Creek

Legend

- Rail Line
- Highway
- Road
- Watercourse
- Wetland
- Waterbody
- Park or Protected Area
- Municipal Area
- General Private Property
- 138 kV Transmission Line
- 500 kV Transmission Line

Project Features

- Existing 25 kV Power Line
- 25 kV Power Line
- Haul Road
- Rail Loop
- Discharge Path
- Tenas Access Corridor
- Backfill Area
- Control and Plant Sedimentation Pond
- Explosive Infrastructure
- Management Pond
- Mine Infrastructure Complex
- Open Pit
- Pit Lake
- Quarry
- Rail Infrastructure
- Topsoil Stockpile
- Tenas Coal Licenses
- Telkwa Coal Limited Private Property
- Project Area
- Wildlife LSA

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.
3. Project line features are for display only.

Sources

- Project Features: Allegiance Coal, April 21, 2021.
- Basedata: Government of British Columbia
- Basemap: World Topo Base

N

1:100,000

0 1 2 3 4 5

Kilometres

NAD 1983 UTM Zone 9N

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1CT027.003	Production Date: Apr 29, 2021	Figure 2.1

ALLEGIANCE COAL LIMITED

srk consulting

Path: C:\Users\conant\OneDrive - SRK Consulting\Projects\Telkwa\2020\1026_Water_Monitoring_Plan\1CT027_003_Water_Monitoring_Plan.aprx

2.3.1 Project Infrastructure

Project infrastructure incorporated into the model is described below. Figure 2-1 presents the Project infrastructure footprint at the end of the life-of-mine.

Sedimentation Ponds

Sedimentation ponds provide residence time for sediment removal and water storage. Ten ponds will be included at the Project, including the Tenas Control Pond, the Coal Processing Plant (CPP) Sedimentation Pond, the Rail Infrastructure Sedimentation Pond, the Explosives Facility and Explosives Magazine East and West Tenas Access Corridor, Gravel Quarry 1 and 2, and Rock Quarry Sedimentation Ponds. Due to their small footprints (less than 0.01 km^2), disconnectedness from the main mining water management system, primarily TSS as the only POC, and timing, the Explosives Facility, Explosives Magazine, East and West Tenas Access Corridor, Gravel Quarry 1 and 2, and Rock Quarry Sedimentation Ponds Sedimentation Ponds were not included in the water and load balance model.

The Tenas Control Pond will be constructed downstream of all mining infrastructure and will also serve as the secondary water supply source to the CPP[1] as well as providing water supply to the Management Ponds. Excess water will be pumped from Tenas Control Pond to a tributary of Goathorn Creek, which will include a minimum discharge rate during open water months (May until October) to mix with treated sewage effluent.

The CPP Sedimentation Pond and Rail Infrastructure Sedimentation Pond are local facilities at the CPP area and rail infrastructure area, respectively. Inflows to these ponds will include drainage from associated infrastructure, and outflows will consist of evaporation and discharges to downstream creeks and rivers via pumping systems and emergency spillways.

Management Ponds

The Project will include three Management Ponds for subaqueous storage of PAG rock and processed rock: North Management Pond (NMP), East Management Pond (EMP) and West Management Pond (WMP). All Management Ponds will be lined to reduce seepage losses to the environment. Upon completion of PAG rock placement within each facility, a non-PAG rock cover will be placed across the top of PAG, followed by a layer of overburden to reduce evaporation losses.

The NMP ring-dyke dam will be constructed during pre-mining at the downstream extent of the open pit and will store PAG rock during the first years of mining. Due to its geometry, all inflows other than direct precipitation will be pumped into the NMP, including water from Tenas Control Pond, subsequent Management Ponds, and inflows from the open pit. Outflows include groundwater seepage and evaporation, overflow via gravity spillway to the Tenas Control Pond, and pumped flow to the subsequent Management Ponds.

[1] Primary water supply source to the CPP is the open pit sump.

The EMP will consist of a dam along the northern extents of the facility, upstream of the NMP. PAG rock placement in the EMP will begin once the NMP is full. A division dam will also be constructed to separate between the subsequent WMP. Inflows will include natural upstream runoff, direct precipitation, and pumped flows from Tenas Control Pond, NMP and the open pit. Outflows include groundwater seepage and evaporation, and discharge via pump or spillway to the NMP and EMP.

The WMP will consist of a dam along the northern and western extents of the facility, adjacent to the EMP dam and directly upstream of the NMP. WMP will consist of a storage area on natural ground as well as a portion of the open pit, referred to herein as the In-Pit WMP and Ex-Pit WMP. Like the EMP, inflows to the WMP will include natural upstream runoff, direct precipitation and pumped flows from the other Management Ponds and the open pit. At closure, the backfilled open pit will discharge via gravity through a rock drain directly into the WMP. Outflows include groundwater seepage and evaporation, and discharge via pump or spillway to the NMP and EMP.

Open Pit

A single open pit will be mined throughout Operations and will be backfilled with Non-PAG rock. The open pit is dewatered via pumping from a sump to the active Management Pond[2] during active mining.

Non-PAG rock is backfilled into the open pit throughout Operations. At closure, Non-PAG rock is covered with overburden and active dewatering will cease, allowing the remaining areas to flood and form the End Pit Lake. Discharge at closure will occur through the Non-PAG rock towards the WMP.

Coal Processing

Coal processing will occur on-site at the CPP. The CPP will produce coal that will be transported to the Rail Infrastructure Area for transport off-site, as well as processed rock which will be deposited in Management Ponds with PAG rock.

2.3.2 Project Stages

Four Project stages are described in Table 2-1.

[2] A Management Pond is considered active when PAG is being placed in it.

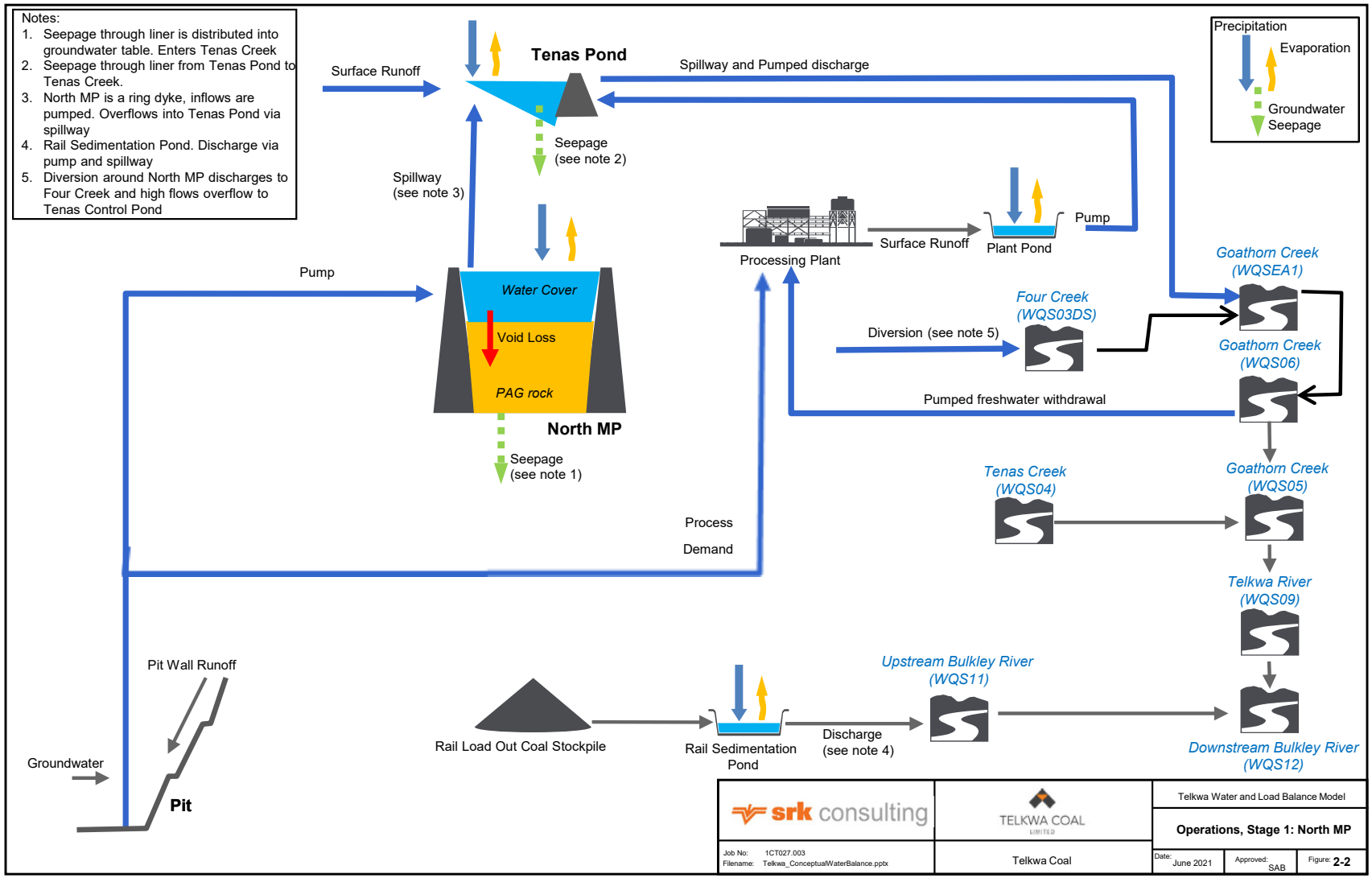
Table 2-1: Project Phases

Project Stage	Project Years	Modelled Calendar Year	Length of Phase (years)	Description of Activities
Construction	-0.5 to 0	2020	1.5	Site clearing, soil salvage, open pit development, building construction, service and haul road development, Rail Infrastructure construction, bridge construction and development of onsite utilities and services. Development of mine rock, and overburden storage piles, stockpiling of reclamation material such as soil, overburden, and other materials suitable for reclamation. Development of water management systems and management ponds for storage of potentially acid generating (PAG) materials.
Operation	1 to 21	2022	21	Development of the open pit through drilling, blasting, loading, and hauling functions. Development of mine rock, and overburden storage piles, stockpiling of reclamation material such as soil, overburden, and other materials suitable for reclamation. Development of water management systems and management ponds for PAG storage. Conducting coal processing, stockpiling of raw coal prior to processing, and stockpiling of processed coal prior to shipping. Progressive reclamation will be accomplished during operation including, where available, reclamation activities such as sloping, topsoil placement and revegetation.
Decommissioning and Reclamation	22 to 25	2043	4	Decommissioning of infrastructure onsite plus reclamation activities, including sloping of storage piles, backfill materials, and placement of reclamation materials including growth media, overburden and non-PAG rock for management pond covers and revegetating surfaces that are planned to be reclaimed.
Post-closure	26 to 50	2047	53	Approximately 10 years of Active Post-Closure. This involves the filling of the open pit with water, monitoring of vegetation growth and water quality for both groundwater and surface water and wildlife. Control and sedimentation ponds may still be needed for settling of total suspended solid levels. The management ponds are left as dry land reclamation except for portions that will be left as open water. Passive closure when the control and sedimentation ponds are no longer required for settling of total suspended solid (TSS) levels and the management ponds are covered and reclaimed except for portions left as open water. Telkwa Coal Limited (TCL) will monito site

Note: Modelled Calendar year have been used historically, starting in 2020. Future modelling revisions will likely update these dates to reflect actual start date of mining.

2.3.3 Flow Diagrams

The water balance conceptual flow diagrams are provided in Figure 2-2, Figure 2-3 and Figure 2-4 for Operations with the NMP, EMP and WMP, respectively, as well as in Figure 2-5 for Post-closure.


Notes:
1. Seepage through liner is distributed into groundwater table. Enters Tenas Creek
2. Seepage through liner from Tenas Pond to Tenas Creek.
3. North MP is a ring dyke, inflows are pumped. Overflows into Tenas Pond via spillway
4. Rail Sedimentation Pond. Discharge via pump and spillway
5. Diversion around North MP discharges to Four Creek and high flows overflow to Tenas Control Pond
Precipitation
Evaporation
Groundwater Seepage
Surface Runoff
Tenas Pond
Spillway and Pumped discharge
Seepage (see note 2)
Spillway (see note 3)
Pump
Water Cover
Void Loss
PAG rock
North MP
Seepage (see note 1)
Processing Plant
Surface Runoff
Plant Pond
Pump
Goathorn Creek (WQSEA1)
Four Creek (WQS03DS)
Diversion (see note 5)
Goathorn Creek (WQS06)
Pumped freshwater withdrawal
Tenas Creek (WQS04)
Goathorn Creek (WQS05)
Process Demand
Telkwa River (WQS09)
Pit Wall Runoff
Groundwater
Pit
Rail Load Out Coal Stockpile
Rail Sedimentation Pond
Discharge (see note 4)
Upstream Bulkley River (WQS11)
Downstream Bulkley River (WQS12)
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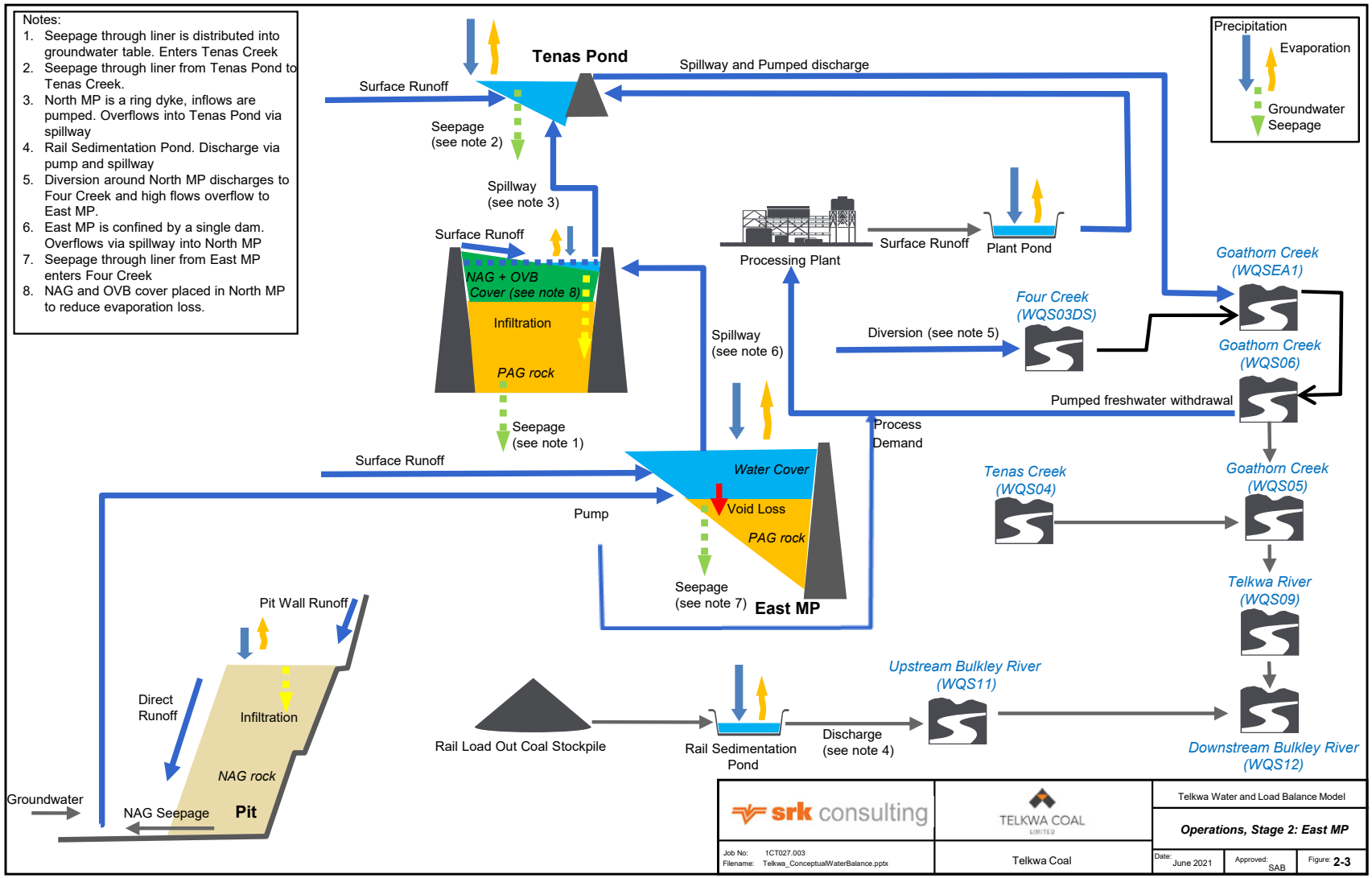
TELKWA COAL LIMITED
Telkwa Water and Load Balance Model
Operations, Stage 1: North MP
Job No: 1CT027.003
Filename: Telkwa_ConceptualWaterBalance.pptx
Telkwa Coal
Date: June 2021
Approved: SAB
Figure: 2-2


Notes:
1. Seepage through liner is distributed into groundwater table. Enters Tenas Creek
2. Seepage through liner from Tenas Pond to Tenas Creek.
3. North MP is a ring dyke, inflows are pumped. Overflows into Tenas Pond via spillway
4. Rail Sedimentation Pond. Discharge via pump and spillway
5. Diversion around North MP discharges to Four Creek and high flows overflow to East MP.
6. East MP is confined by a single dam. Overflows via spillway into North MP
7. Seepage through liner from East MP enters Four Creek
8. NAG and OVB cover placed in North MP to reduce evaporation loss.
Precipitation
Evaporation
Groundwater Seepage
Tenas Pond
Spillway and Pumped discharge
Surface Runoff
Seepage (see note 2)
Spillway (see note 3)
Surface Runoff
NAG + OVB Cover (see note 8)
Infiltration
PAG rock
Seepage (see note 1)
Processing Plant
Surface Runoff
Plant Pond
Goathorn Creek (WQSEA1)
Four Creek (WQS03DS)
Diversion (see note 5)
Spillway (see note 6)
Goathorn Creek (WQS06)
Pumped freshwater withdrawal
Process Demand
Surface Runoff
Water Cover
Void Loss
PAG rock
Pump
Seepage (see note 7)
East MP
Tenas Creek (WQS04)
Goathorn Creek (WQS05)
Telkwa River (WQS09)
Pit Wall Runoff
Direct Runoff
Infiltration
NAG rock
Groundwater
NAG Seepage
Pit
Rail Load Out Coal Stockpile
Rail Sedimentation Pond
Discharge (see note 4)
Upstream Bulkley River (WQS11)
Downstream Bulkley River (WQS12)
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Telkwa Water and Load Balance Model
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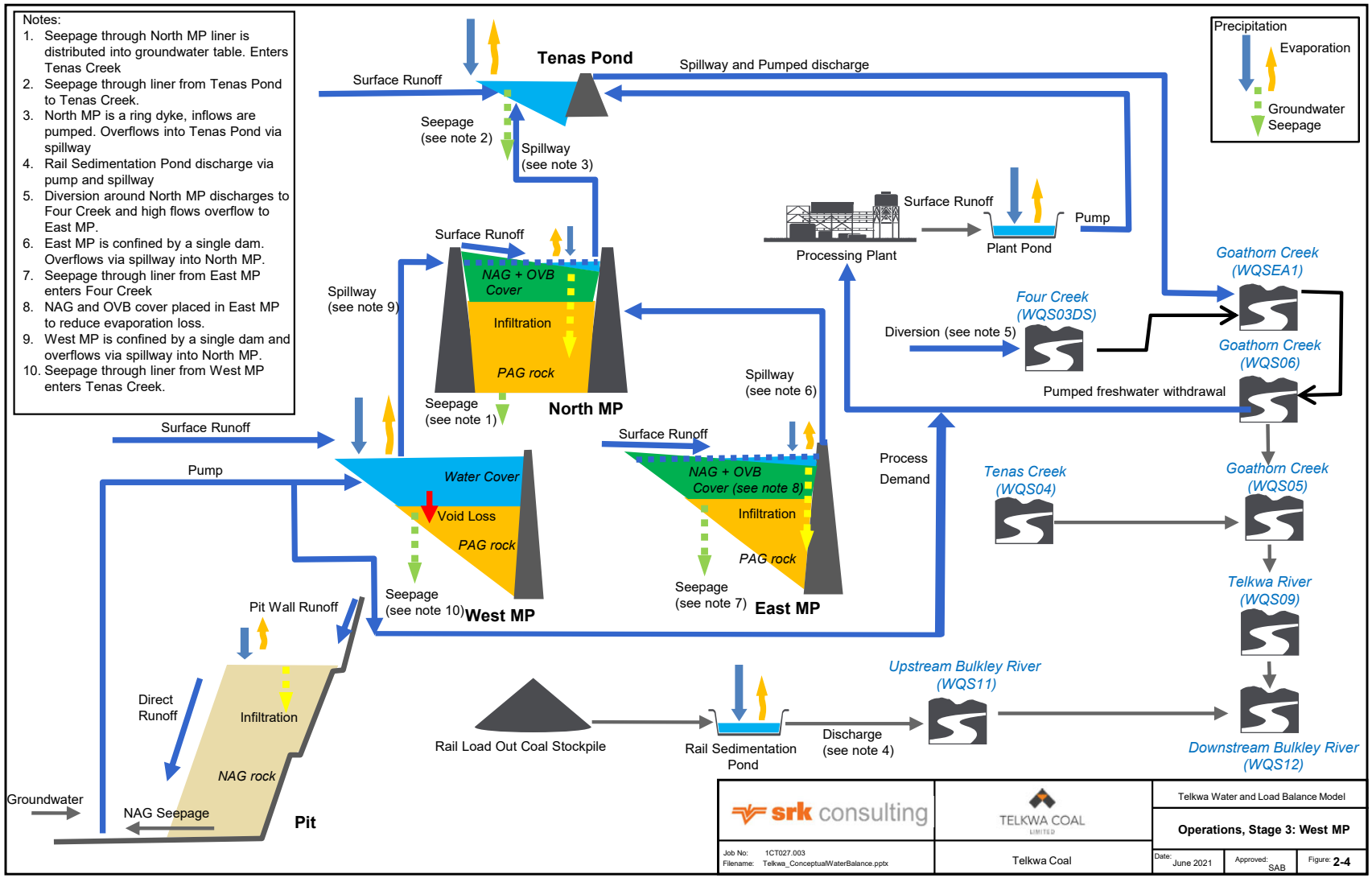
Figure: 2-3


Notes:
1. Seepage through North MP liner is distributed into groundwater table. Enters Tenas Creek
2. Seepage through liner from Tenas Pond to Tenas Creek.
3. North MP is a ring dyke, inflows are pumped. Overflows into Tenas Pond via spillway
4. Rail Sedimentation Pond discharge via pump and spillway
5. Diversion around North MP discharges to Four Creek and high flows overflow to East MP.
6. East MP is confined by a single dam. Overflows via spillway into North MP.
7. Seepage through liner from East MP enters Four Creek
8. NAG and OVB cover placed in East MP to reduce evaporation loss.
9. West MP is confined by a single dam and overflows via spillway into North MP.
10. Seepage through liner from West MP enters Tenas Creek.
Precipitation
Evaporation
Groundwater Seepage
Tenas Pond
Surface Runoff
Spillway and Pumped discharge
Seepage (see note 2)
Spillway (see note 3)
Surface Runoff
NAG + OVB Cover
Infiltration
PAG rock
Spillway (see note 9)
Seepage (see note 1)
North MP
Processing Plant
Surface Runoff
Pump
Plant Pond
Goathorn Creek (WQSEA1)
Four Creek (WQS03DS)
Diversion (see note 5)
Goathorn Creek (WQS06)
Pumped freshwater withdrawal
Spillway (see note 6)
Surface Runoff
Pump
Water Cover
Void Loss
PAG rock
Seepage (see note 10)
West MP
Surface Runoff
NAG + OVB Cover (see note 8)
Infiltration
PAG rock
Seepage (see note 7)
East MP
Process Demand
Tenas Creek (WQS04)
Goathorn Creek (WQS05)
Telkwa River (WQS09)
Pit Wall Runoff
Direct Runoff
Infiltration
NAG rock
Groundwater
NAG Seepage
Pit
Rail Load Out Coal Stockpile
Rail Sedimentation Pond
Discharge (see note 4)
Upstream Bulkley River (WQS11)
Downstream Bulkley River (WQS12)
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Operations, Stage 3: West MP
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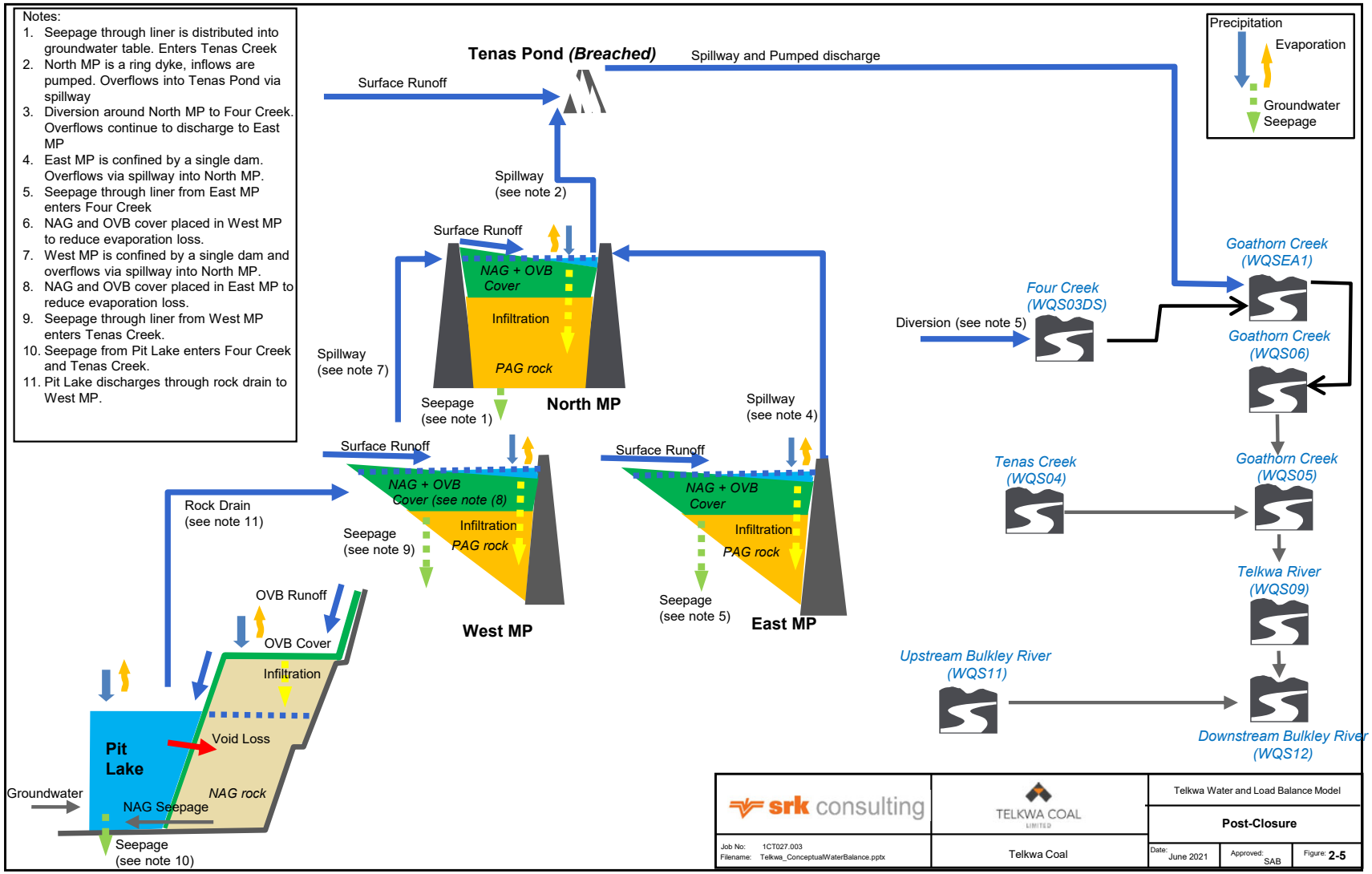
Figure: 2-4


Notes:
1. Seepage through liner is distributed into groundwater table. Enters Tenas Creek
2. North MP is a ring dyke, inflows are pumped. Overflows into Tenas Pond via spillway
3. Diversion around North MP to Four Creek. Overflows continue to discharge to East MP
4. East MP is confined by a single dam. Overflows via spillway into North MP.
5. Seepage through liner from East MP enters Four Creek
6. NAG and OVB cover placed in West MP to reduce evaporation loss.
7. West MP is confined by a single dam and overflows via spillway into North MP.
8. NAG and OVB cover placed in East MP to reduce evaporation loss.
9. Seepage through liner from West MP enters Tenas Creek.
10. Seepage from Pit Lake enters Four Creek and Tenas Creek.
11. Pit Lake discharges through rock drain to West MP.
Precipitation
Evaporation
Groundwater Seepage
Tenas Pond (Breached)
Spillway and Pumped discharge
Surface Runoff
Spillway (see note 2)
Surface Runoff
NAG + OVB Cover
Infiltration
PAG rock
Spillway (see note 7)
Seepage (see note 1)
North MP
Spillway (see note 4)
Surface Runoff
NAG + OVB Cover (see note 8)
Infiltration
PAG rock
Seepage (see note 9)
West MP
Surface Runoff
NAG + OVB Cover
Infiltration
PAG rock
Seepage (see note 5)
East MP
Rock Drain (see note 11)
OVB Runoff
OVB Cover
Infiltration
Void Loss
Pit Lake
NAG rock
Groundwater
NAG Seepage
Seepage (see note 10)
Four Creek (WQS03DS)
Diversion (see note 5)
Goathorn Creek (WQSEA1)
Goathorn Creek (WQS06)
Tenas Creek (WQS04)
Goathorn Creek (WQS05)
Telkwa River (WQS09)
Upstream Bulkley River (WQS11)
Downstream Bulkley River (WQS12)
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Telkwa Water and Load Balance Model
Post-Closure
Job No: 1CT027.003
Filename: Telkwa_ConceptualWaterBalance.pptx
Telkwa Coal
Date: June 2021
Approved: SAB
Figure: 2-5

2.4 Overview of Predictions

2.4.1 Prediction Nodes

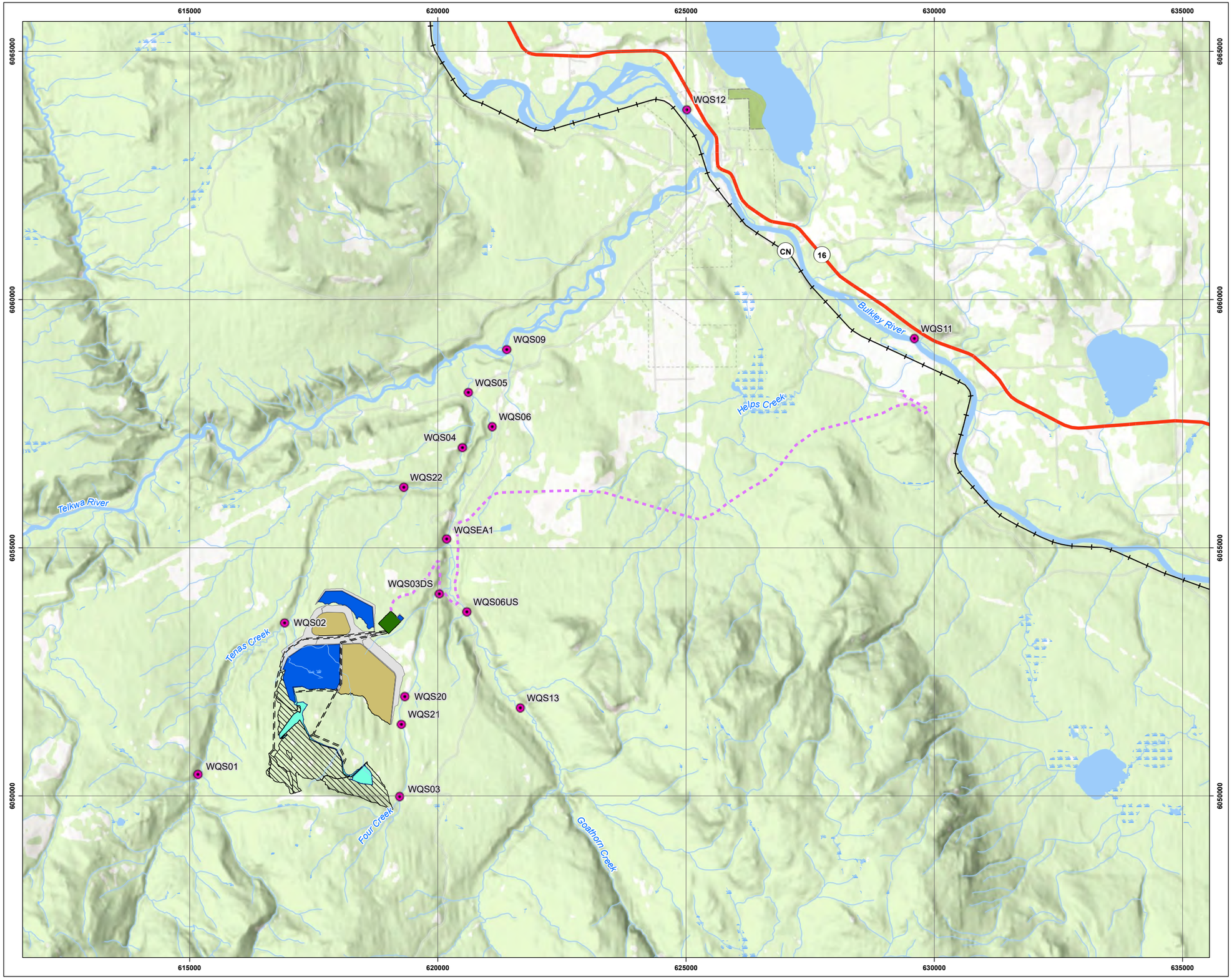
Model prediction nodes were selected to characterize upstream and downstream conditions in relation to the Project and its discharges. Creeks and rivers which were identified as providing habitat to fish and aquatic life have multiple prediction nodes. Node locations were typically located at historic water quality monitoring sites, with several additional prediction nodes beyond the water quality campaigns on Four Creek and Tenas Creek.

Table 2-2 summarizes the prediction nodes in terms of their geographic location and the stream in which they are located. Justification for node selection is also presented, based on coordination with other EA value component disciplines and review of potential effects from the Project. Node locations are also presented on Figure 2-6 with the final footprints of the Project. Of note, the prediction node WQSEA1 was added after the first version of this report based on feedback during the EA review process.

Table 2-2: In-Stream Prediction Nodes

Prediction Node	Receiving Environment	Justification for Node Selection	Coordinates NAD 1983 UTM Zone 9N	
			Easting	Northing
WQS01	Tenas Creek, upstream of Project	Minor effects from Project anticipated from open pit groundwater table drawdown	615,171	6,050,438
WQS02	Tenas Creek, adjacent (West) to Project	Potential effects anticipated from open pit drawdown and management pond seepage, minor reduction of catchment area	617,171	6,053,841
WQS03	Four Creek, upstream of Project	Minor effects from Project anticipated from open pit groundwater table drawdown	619,235	6,049,989
WQS03DS	Four Creek, downstream of WQS20 and Project	Potential effects anticipated from open pit drawdown and management pond seepage, reduction of catchment area	620,034	6,054,076
WQS04	Tenas Creek, downstream of WQS02 and Project	Potential effects anticipated from open pit drawdown and management pond seepage, reduction of catchment area	620,499	6,057,020
WQS05	Goathorn Creek, downstream of Tenas Creek and WQS06	Potential effects anticipated, based on summation of effects to Four and Tenas creeks and Project discharge into Goathorn Creek	620,615	6,058,133
WQS06_US	Goathorn Creek, upstream of Four Creek	Minor effects from Project anticipated from open pit groundwater table drawdown	620,587	6,053,711
WQS06	Goathorn Creek, upstream of Tenas Creek, downstream of Four Creek	Potential effects anticipated from Project discharge and effects to Four Creek	621,095	6,057,390
WQSEA1	Goathorn Creek, upstream of Tenas Creek, downstream of Four Creek, located 100m downstream of the confluence with the unnamed tributary, receiving discharge from	Potential effects anticipated from Project discharge and effects to Four Creek	620,184	6,055,180

Prediction Node	Receiving Environment	Justification for Node Selection	Coordinates NAD 1983 UTM Zone 9N	
			Easting	Northing
	the Project, closer to discharge than WQS06			
WQS09	Telkwa River, downstream of Goathorn Creek	Potential effect from Project anticipated from catchment area reduction and summation of effects from Goathorn, Tenas and Four creeks	621,394	6,058,998
WQS11	Bulkley River, upstream of Telkwa River, downstream of Rail Infrastructure	Minor effects from Project anticipated from Rail Infrastructure runoff	629,601	6,059,221
WQS12	Bulkley River, downstream of Telkwa River	Minor effects anticipated, based on summation of effects in Telkwa River and all upstream creeks, as well as upstream Bulkley River	625,021	6,063,831
WQS13	Goathorn Creek, upstream of Project	Minor effects from Project anticipated from open pit groundwater table drawdown	621,664	6,051,778
WQS20	Four Creek, adjacent (East) of Project	Potential effects anticipated from open pit drawdown and management pond seepage, reduction of catchment area	619,344	6,052,005
WQS21	Four Creek, upstream of WQS20 and Project	Potential effects anticipated from open pit drawdown and management pond seepage, reduction of catchment area	619,269	6,051,446
WQS22	Tenas Creek, downstream of WQS02 and Project	Potential effects anticipated from open pit drawdown and management pond seepage, minor reduction of catchment area	619,313	6,056,222



Tenas Project

Receiving Environment Prediction Nodes Map

Legend

- Surface Water Monitoring Station
- Highway
- Rail Line
- Wetland
- Watercourse
- Waterbody

Mine Features

- Bypass Road
- Proposed Pit Haul Road
- Backfill
- Core Footprint
- Pit Lake
- Plant and Maintenance Area
- Pond
- Rock Cover

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a "stand-alone" document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Features: Allegiance Coal, 2020
- Basedata: Government of British Columbia
- Basemap: World Topo Base

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Kilometers

NAD 1983 UTM Zone 9N

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2.4.2 Modelled Assessment Cases

Multiple assessment cases were developed to understand the range of potential effects from the Project throughout the life of mine. Cases incorporate variability in hydrologic conditions, groundwater conditions and geochemical source terms:

- **Background concentrations**: Concentration (in mg/L of water) of each water quality parameter applied to streamflow or groundwater generated from natural catchments. All assessment cases consider the median (50th percentile) water quality data. The upper percentile (95th) is used for screening purposes of model results.
- **Geochemical source terms**: Concentration (in mg/L of water from a given source) or loading rate (in mg per kg of mine rock placed over time) source terms were developed from review of geochemical datasets. Results are presented for the base case source term, which is most likely to occur, and a high source term for a reasonable worst case.
- **Hydrology:** Streamflow and Project discharge are driven by precipitation and temperature inputs and calibrated runoff parameters. Hydrologic scenarios are further described in Section 3.1. and include:
  - Repeated average year precipitation and temperature,
  - Consecutive wet or dry year precipitation,
  - Stochastically generated daily precipitation, and
  - A low flow condition using the 7-day low flow in a 1 in 10-year return period (7Q10).
- **Groundwater seepage**: Groundwater modeling results were incorporated into the model (Section 0). Two cases are presented, including the expected groundwater conditions and sensitivity case seepage (high hydraulic conductivity) rates.

A Pre-Mining Case was simulated in parallel to each assessment case to evaluate the effects of the Project for surface water quantity with respect to a similar baseline. The hydrologic scenario applied to each assessment case was mirrored in the Pre-Mining Case for the same years, enabling comparisons with identical assumptions without mining influences. The assessment considers effects in relation to surface water quantity based on the percent change over Pre-Mining Case (i.e., without effects of mining) conditions.

Table 2-3 presents a summary of assessment cases applied in the model. Relevant results include water quantity and water quality in the receiving environment (Stream) as well as within Project infrastructure (Project).

Table 2-3: Summary of Modelled Assessment Cases

Assessment Case	Background Concentrations	Geochemical Source Terms	Hydrology	Groundwater Seepage	Relevant Results	Purpose
Project Case	Median from Baseline	Typical	Average Annual Precipitation	Expected Groundwater Conditions	Stream and Project Water Quantity, Water Quality	Applied and evaluated for all prediction nodes, forming the basis of the effects assessment of the Project
Alternative Case 1	Median from Baseline	Typical	Average Annual Precipitation	Increased hydraulic conductivity Groundwater Conditions	Stream and Project Water Quantity, Water Quality	Considers higher seepage rates from Project infrastructure and higher drawdown from open pit and the effects on Four Creek and Tenas Creek baseflow rates and winter (low flow) water quality
Alternative Case 2	Median from Baseline	High	Average Annual Precipitation	Expected Groundwater Conditions	Stream and Project Water Quality	Considers higher loading rates from Project to downstream environment and the associated in-stream water quality. Used for Initial Dilution Zone model scenarios in Goathorn Creek (SRK 2025b)
Alternative Case 3	n.a.	n.a.	Consecutive 100-year Dry Events	Expected Groundwater Conditions	Project Water Quantity	Minimize water available for water covers
Alternative Case 4	Median from Baseline	Typical	Consecutive 10-year Wet Events	Expected Groundwater Conditions	Stream and Project Water Quantity, Water Quality	Maximize Project discharge rates and the effects to receiving environment (Goathorn Creek) in terms of flow rates and water quality

Assessment Case	Background Concentrations	Geochemical Source Terms	Hydrology	Groundwater Seepage	Relevant Results	Purpose
Alternative Case 5	Median from Baseline	Typical	7Q10 Low Flow with Average Annual Precipitation[1]	Expected Groundwater Conditions	Stream Water Quantity, Water Quality	Project influence on low flow conditions. Water quality predictions used in Initial Dilution Zone model (SRK 2025c)
Alternative Case 6	n.a.	n.a.	Stochastic Precipitation	Expected Groundwater Conditions	Project Water Quantity	Effect on water covers and Project discharge rates
Alternative Case 7	Median from Baseline	Typical	10% increased Annual precipitation	Expected Groundwater Conditions	Stream and Project Water Quantity, Water Quality	Effect on Project discharge rates and water quality in receiving environment
Pre-Mining Case	n.a.	n.a.	Variable to coincide with selected assessment case	Pre-Mining	Stream Water Quantity	Baseline conditions without Project interaction (i.e., no-mining condition)

n.a. = not applicable

2.4.3 Spatial Boundaries of Assessment

Two spatial boundaries were considered in the EA for surface water:

- the Local Study Area (LSA).
- the Regional Study Area (RSA).

The LSA is defined where direct discharges occur to watercourses within the vicinity of the mine (e.g., Tenas Creek, Four Creek, and Goathorn Creek), to the edge of the mixing zone in the Telkwa River, and downstream of the Rail Infrastructure Area in the Bulkley River. The total area of the LSA is 208.3 km^2.

The RSA, which encompasses the LSA, extends to monitoring location WQS12 in the Bulkley River, approximately 2km downstream of the confluence with the Telkwa River, and includes the Telkwa River catchment area to be consistent with other valued component boundaries. The RSA continues upstream of the confluence of the Telkwa River to the Bulkley River at Quick Water Survey of Canada station (08EE004), which captures conditions upstream of the Rail infrastructure Area. The total area of the RSA is 1430 km^2.

Spatial boundaries are presented in Figure 2-7, where the LSA is a purple dashed line, and the RSA is a green dashed line.

DRAFT
For Discussion Purposes Only

BABINE MOUNTAINS PARK

SMITHERS

CN

16

JEAN BAPTISTE 28

BURNT CABIN BOG ECOLOGICAL RESERVE

Tyhee Lake

TELKWA

AVELING COALMINE RD

TELKWA COALMINE RD

Teras Creek

BYPASS ROAD

LAWSON RD

Bulkley River

TELKWA RIVER FSR

Telkwa River

Goathorn Creek

BURNIE-SHEA PARK

570000 580000 590000 600000 610000 620000 630000 640000

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Tenas Project

Surface Water Local Study Area (LSA) and Regional Study Area (RSA)

Legend

- RSA Boundary
- LSA Boundary
- City/Town
- Rail Line
- Highway
- Tenas Access Corridor
- Road
- Proposed Water Pipeline
- Watercourse
- Wetland
- Waterbody
- Park or Protected Area
- First Nation Reserve
- Municipal Area
- Telkwa Coal Private Land
- Private Land
- Project Area

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Area: Allegiance Coal, 2020
- Basedata: Government of British Columbia
- Basemap: World Topo Base

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2.4.4 Predicted Parameters

The following types of model results are presented for water quality and water quantity to support the EA Application.

Water Quantity Results

Internal Project Results:

- Ability of the Project to maintain the minimum water cover requirements for all Management Ponds throughout life of mine.
- Ability of the Project to meet process water demands at the CPP.
- Project discharge rates to Goathorn Creek tributary.

Receiving Environment Results:

- Relative change to streamflow under a no-mining condition (Pre-Mining Case). Monthly percent change over Pre-Mining conditions were calculated at each node and summarized per Project stage.

Water Quality Results

Parameters included in the model are summarized in Table 2-4. Other parameters estimated outside of the model include temperature, pH, conductivity, total suspended solids, total dissolved solids, PAHs, and turbidity. Estimates for these parameters were developed based on relationships to modelled parameters, or qualitatively.

Internal Project Results:

- Monthly average and maximum concentrations within Management Ponds as well as all discharging facilities, including the Tenas Control Pond and the Rail Infrastructure Sedimentation Pond. Note that due to their small footprints (less than 0.01 km^2), disconnectedness from the main mining water management system, primarily TSS as the only POC, and timing, the Explosives Facility, Explosives Magazine, East and West Tenas Access Corridor, Gravel Quarry 1 and 2, and Rock Quarry Sedimentation Ponds Sedimentation Ponds were not included in the Goldsim water and load balance model but will discharge runoff to the downstream environment. Changes to water quality downstream of these ponds is expected to be minimal based on use of best management practices. Total suspended solids will be controlled with sedimentation pond designs.
- Results are screened against the WQG as outlined in Section 2.1, as well as against baseline conditions.

Receiving Environment Results:

- Monthly average water quality results at each prediction node, screened against the WQG.
- For each period and each Project stage, both the average and maximum monthly results are presented for winter and summer conditions:
  - Winter extends from November through April (frozen conditions)

– Summer extends from May through October (open-water season).

Table 2-4: Water Quality Parameters Modelled in the Load Balance

Parameters Included in Predictions				
Aluminum, dissolved	Cadmium, dissolved	Iron, total	Nickel, dissolved	Sodium, total
Aluminum, total	Cadmium, total	Lead, dissolved	Nickel, total	Strontium, dissolved
Ammonia-Nitrogen, total	Calcium, dissolved	Lead, total	Nitrate-Nitrogen	Sulfate
Antimony, dissolved	Calcium, total	Lithium, dissolved	Nitrite-Nitrogen	Thallium, dissolved
Antimony, total	Chloride	Lithium, total	Phosphorus, total	Thallium, total
Arsenic, dissolved	Chromium, dissolved	Magnesium, dissolved	Potassium, dissolved	Tin, dissolved
Arsenic, total	Chromium, total	Magnesium, total	Potassium, total	Tin, total
Barium, dissolved	Cobalt, dissolved	Manganese, dissolved	Selenium, dissolved	Uranium, dissolved
Barium, total	Cobalt, total	Manganese, total	Selenium, total	Uranium, total
Beryllium, dissolved	Copper, dissolved	Mercury, dissolved	Silica, dissolved	Vanadium, dissolved
Beryllium, total	Copper, total	Mercury, total	Silver, dissolved	Vanadium, total
Boron, dissolved	Fluoride	Molybdenum, dissolved	Silver, total	Zinc, dissolved
Boron, total	Iron, dissolved	Molybdenum, total	Sodium, dissolved	Zinc, total

2.4.5 In-Stream Characteristics

Changes from the Project on streamflow are characterized in accordance with guidance documents for the EA Application. Surface water has been identified as a valued component, of which water quantity and water quality are each sub-components. The characterization of effects (magnitude, frequency, duration, context, reversibility, and extent) is discussed in the EA Application.

Surface water quantity results are evaluated in terms of:

- Change to mean annual discharge, based on percent change between mean annual discharge in Project Case conditions and Pre-Mining conditions.
- Change to seasonal flow distribution, based on percent change between monthly average discharge in Project Case conditions and Pre-Mining conditions.
- Change to low flows, based on percent change between the 7Q10 in Alternative Assessment Case 5 and Pre-Mining conditions.

Surface water quality results are evaluated in relation to WQG, in context with the natural variability from baseline monitoring data.

3 Model Inputs and Assumptions

3.1 Climate and Hydrology

SRK prepared a hydrometeorological characterization report for the Project to support water management designs and water balance modeling (SRK 2024a). Outputs from the analyses relevant to the water balance include:

- Average lake evaporation rates.
- Long-term temperature and precipitation records developed from Smithers Airport and other regional datasets and corrected for the Project location and prediction node catchments.
- Rainfall-runoff models calibrated for each stream.

Inputs to the water balance are summarized in the following sections.

3.1.1 Historical Climate Conditions

The Project-specific precipitation record includes 77 years of data, from 1943 to 2022. Annual precipitation values were compared with the annual frequency analysis results presented in the hydrometeorological characterization report (SRK 2024a), and select years were identified to simulate dry and wet conditions. Average conditions were represented by a composite year made from average monthly precipitation from the synthetic record. Table 3-1 presents the historical precipitation datasets incorporated into the model for select hydrologic conditions, including the 100-year dry and 10-year wet.

Table 3-1: Historical Precipitation Data Incorporated for specific Hydrologic Conditions in the Model

Hydrologic Condition	Return Period (years)[1]	Frequency Analysis Results for Annual Precipitation (mm/a) [2]	Corresponding Historical Year with Similar Annual Precipitation	Historical Annual Precipitation (mm/a)
Wet	10	798	1957	799
Mean	n.a.	676	Composite	666
Dry	100	454	1970	467

Source:https://srk.sharepoint.com/sites/NACAPR002055/Internal/200_Review%20New%20Climate%20and%20Streamflow%20Data/Met_Data/TenasStation_Review%20of%20Average%20Year_202403_njs.xlsx?web=1

Notes:

1. Frequency analysis described in SRK 2024a.
2. Return periods were selected based on available historical information.

The precipitation inputs used to simulate mean hydrologic conditions were updated. Instead of selecting a year from the historical record which matched the mean annual precipitation, a synthetic year was generated, with monthly precipitation sums that matched the monthly average precipitation distribution, as well as the mean annual precipitation. This provided a better approximation of monthly

average conditions and is run as the base condition climate to simulate the historical mean hydrologic conditions.

Sensitivity analyses (Section 2.4.2) were prepared to assess three consecutive wet or dry years applied at critical periods throughout the life of mine:

- Three consecutive dry years were applied at the most critical period for water demand, during operation of all three Management Ponds. The Project discharge during this period is minimized, which influences downgradient streamflow.
- Three consecutive wet years were applied at the most critical period of the mine life, at the end of Operations when the Project footprint is maximized and the Management Ponds approach their maximum capacity. This period produced the highest annual discharge rates and therefore increases stream water quantity and impacts stream water quality.

Under all historical precipitation conditions, the historical temperature record coinciding with precipitation inputs was used.

3.1.2 WGEN and Stochastic Hydrology

The weather-generating (WGEN) model stochastically generates daily precipitation and minimum and maximum air temperature based on monthly statistics. WGEN generates precipitation independently of other variables and air temperature is dependent on the occurrence of rain. The long-term timeseries for air temperature and total precipitation developed for the Project were used as inputs to generate statistical parameters for the WGEN model.

Precipitation is first determined by the probability of consecutive precipitation days, then the precipitation amount is generated according to a gamma distribution. The monthly probabilities of a wet day occurring after a wet day, *P(W/W)*, or dry day, *P(W/D)*, are given in Table 3-2. A wet day is defined as having more than 0.25 mm of precipitation. Table 3-3 shows the fitted gamma distribution parameters (α and β). The WGEN methodology is described in (Richardson and Wright, 1984).

Table 3-2: Probabilities of Wet or Dry Day Occurrence

Month	P(W/W)	P(W/D)
January	0.670	0.375
February	0.608	0.272
March	0.476	0.262
April	0.538	0.235
May	0.544	0.291
June	0.620	0.346
July	0.617	0.277
August	0.617	0.273
September	0.613	0.341
October	0.694	0.422

Month	P(W/W)	P(W/D)
November	0.652	0.435
December	0.624	0.390

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/ Water Balance Modelling/Mode/Updated EA Case/TelkwaEAModel_v41.gsm

Table 3-3: Precipitation Gamma Distribution Parameters

Month	α	β
January	0.826	4.50
February	0.768	4.09
March	0.837	3.20
April	0.822	3.90
May	0.748	5.55
June	0.747	6.60
July	0.807	5.44
August	0.749	5.68
September	0.808	5.92
October	0.717	6.53
November	0.777	5.63
December	0.765	4.68

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/ Water Balance Modelling/Mode/Updated EA Case/TelkwaEAModel_v41.gsm

Air temperature is generated based on the occurrence of precipitation, and the seasonal change in the means and coefficients of variation for minimum and maximum air temperature fitted with a sinusoidal curve:

$$u_i = \bar{u} + C\cos\left(\frac{2\pi}{365}(i - 200)\right), i = 1, \ldots, 365$$

Where u_i is the air temperature or coefficient of variation value on day *I,* $\bar{u}$ is the mean of u_i, *C* is the seasonal amplitude, and *i* is the amplitude position in days. Richardson and Wright (1984) recommends a *i* of 200 days. The maximum daily air temperature is highly dependent on the occurrence of precipitation; however, the minimum daily air temperature is not, and statistics were generated using both wet and dry days. These parameters are presented in Table 3-4, where temperature is presented in units of Kelvin.

Table 3-4: WGEN Air /temperature Parameters

Parameter	Value
Mean of maximum air temperature (dry) (K)	281
Mean of maximum air temperature (wet) (K)	279.8
Amplitude of maximum air temperature (wet or dry) (K)	13.6
Mean coefficient of variation of maximum air temperature (wet or dry)	0.0184
Amplitude of coefficient of variation of maximum air temperature (wet or dry)	-0.00529

Parameter	Value
Mean of minimum air temperature (wet or dry) (K)	269.9
Amplitude of minimum air temperature (wet or dry) (K)	9.763
Mean coefficient of variation of minimum air temperature (wet or dry)	0.0188
Amplitude of coefficient of variation of minimum air temperature (wet or dry)	-0.0.0112

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/ Water Balance Modelling/Mode/Updated EA Case/TelkwaEAModel_v41.gsm

3.1.3 Prediction Node Climate Adjustments

Based on the range of terrain and elevation bands within the watersheds of each prediction node, an adjustment to climate parameters was required to develop streamflow estimates in each stream. Detailed methodology for the climate adjustments is presented in Appendix A.

The long-term Project temperature and precipitation records were adjusted using the Parameter-elevation Relationships on Independent Slopes Model (PRISM) to estimate climate parameters for each of the local hydrometric stations within each stream. An average monthly precipitation for each hydrometric station watershed was derived from the gridded PRISM monthly precipitation model. These monthly precipitation values were compared against the monthly precipitation estimates for the Project, and a ratio was calculated for each month and each station (Table 3-5).

Table 3-5: Monthly Precipitation Correction Factors applied to Project Precipitation based on PRISM

Month	Tenas Hydro	Four-Hydro	Goathorn Hydro	Telkwa Hydro	Bulkley Hydro
Jan	1.84	1.30	1.88	2.06	1.74
Feb	1.68	1.19	1.71	1.89	1.81
Mar	2.00	1.42	2.03	2.29	2.07
Apr	1.81	1.39	1.87	2.05	1.83
May	1.28	1.04	1.26	1.31	1.14
Jun	1.18	1.15	1.23	1.19	1.09
Jul	1.11	1.13	1.16	1.10	1.03
Aug	1.28	1.03	1.28	1.31	1.17
Sep	1.52	1.09	1.53	1.60	1.33
Oct	1.53	1.09	1.56	1.79	1.70
Nov	1.92	1.37	1.94	2.20	1.95
Dec	1.92	1.36	1.96	2.22	1.93

Appendix A

A similar process was employed for temperature. A monthly average temperature for each hydrometric station watershed was derived from the gridded PRISM monthly temperature model. These monthly temperature values were compared against the monthly temperature estimates for the Project, and a correction addend was calculated for each month and each station (Table 3-6).

Table 3-6: Monthly Average Temperature Correction Addends (in degrees Celsius) applied to Project Average Temperature based on PRISM

Month	Tenas Hydro	Four-Hydro	Goathorn Hydro	Telkwa Hydro	Bulkley Hydro
Jan	-0.45	-0.24	-0.52	-0.45	-0.27
Feb	-0.88	-0.37	-0.98	-1.03	-0.73
Mar	-1.27	-0.43	-1.54	-1.66	-0.93
Apr	-1.64	-0.68	-1.96	-2.13	-1.19
May	-1.74	-0.78	-2.03	-2.29	-1.26
Jun	-1.81	-0.74	-2.06	-2.46	-1.38
Jul	-1.77	-0.80	-2.00	-2.33	-1.24
Aug	-1.48	-0.51	-1.71	-2.00	-0.92
Sep	-1.28	-0.43	-1.51	-1.73	-0.70
Oct	-1.17	-0.55	-1.46	-1.50	-0.58
Nov	-0.93	-0.30	-1.08	-1.16	-0.43
Dec	-0.32	-0.04	-0.36	-0.37	-0.15

Appendix A

The daily temperature and precipitation time series adjusted for each streamflow station were used to calibrate rainfall-runoff model inputs (Section 3.1.7) as well as in the water balance model.

3.1.4 Evaporation

Lake surface evaporation for the Project was developed using the Morton CRWE shallow lake evaporation (SRK 2024a). Based on the Project temperature record, as well as modelled solar radiation, relative humidity and wind speeds from the Smithers Airport station, the estimated mean annual evaporation for the Project is 598 mm. Table 3-7 presents the monthly average lake evaporation rates applied in the model.

Table 3-7: Historical Project Monthly Open Water Evaporation Rates (mm)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Monthly Evaporation (mm/mo)	0	0	0	64	101	111	120	101	52	0	0	0	598
Daily Evaporation (mm/d)	0		0	2.1	3.3	3.7	3.8	3.3	1.7	0	0	0	n.a

Source: SRK 2024a

The evaporation rates were assigned an adjustment factor calculated for each pond, depending on the dominant wind direction (S-W), and the longest width based on the dominant direction for each pond, according to the following table 3-8:

Table 3-8: Adjustment factor for evaporation rate for each pond of the Project

	NMP	EMP	WMP	Pit Sump	Plant Pond	Rail Load Out Pond
Jan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Feb	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mar	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Apr	4.5%	3.7%	3.1%	12.9%	15.2%	25.6%
May	3.2%	2.7%	2.2%	9.3%	11.0%	18.5%
Jun	2.4%	2.0%	1.7%	7.0%	8.2%	13.8%
July	2.1%	1.7%	1.4%	6.0%	7.1%	11.9%
Aug	2.6%	2.1%	1.8%	7.5%	8.9%	14.9%
Sep	3.6%	2.9%	2.5%	10.2%	12.1%	20.3%
Oct	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Nov	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Dec	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source:.https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Inputs/morton_pond_evap_correction_coef_20240821.xlsx?web=1

Changes to evaporation rates for Management Ponds when they become covered are described in Section 3.4.4.

3.1.5 Climate Change

Climate change was evaluated for the Project in terms of rates of change using monthly adjustment factors for three published projection periods. Dates to effect climate change in the model were selected as the center of each published projection period. All scenarios, hydrologic conditions and water management cases include climate change. Selection of climate change scenario for the purpose of the Project evaluation and model are reported in SRK2024a as well as methodologies for developing rates of change are presented.

Daily precipitation rates were multiplied by monthly adjustment factors presented in Table 3-9, where a value of 100% represents the use of historical data, a value less than 100% represents a decrease in monthly precipitation, and a value greater than 100% represents an increase in monthly precipitation. Results indicate a net increase in precipitation for most months with an annual adjustment factor

increasing over time, except for the last decade of this dataset. These values were interpolated to have changes for each decade in the WLBM based on values reported in SRK 2024a.

Table 3-9: Daily Precipitation Adjustment Factors for Climate Change

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
1/1/2020	106%	110%	114%	94%	96%	96%	101%	99%	100%	111%	93%	118%	**103%**
1/1/2030	118%	112%	122%	101%	104%	99%	96%	103%	108%	113%	99%	123%	**108%**
1/1/2040	115%	112%	120%	104%	111%	100%	102%	105%	109%	122%	102%	124%	**110%**
1/1/2050	123%	113%	124%	112%	115%	103%	105%	104%	116%	124%	106%	121%	**114%**
1/1/2060	123%	117%	128%	117%	123%	100%	108%	104%	120%	126%	110%	132%	**117%**
1/1/2070	121%	119%	130%	119%	119%	103%	106%	101%	120%	135%	113%	136%	**118%**
1/1/2080	126%	113%	130%	122%	124%	111%	106%	103%	120%	133%	117%	140%	**121%**
1/1/2090	133%	125%	135%	131%	130%	110%	111%	105%	130%	145%	123%	135%	**126%**
1/1/2100	138%	98%	111%	116%	130%	107%	89%	100%	100%	132%	118%	133%	**114%**

Source: SRK 2024a

Note: Red text reflects a decrease over baseline conditions. A decrease for the decade starting in 2020 indicate that it's decreasing compared to historical baseline average.

Daily temperature changes were included as a net increase or decrease to historical values, as presented in Table 3-10. A value of 0 represents no change from historical temperature data, where a value greater than 0 represents a net increase in daily temperature in degrees Celsius (°C). The annual trend is a net increase in temperature for all months of the year.

Table 3-10: Daily Mean Temperature Increase for Climate Change (°C)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
1/1/2020	-1.62	1.29	0.24	0.93	0.94	1.19	1.10	0.98	0.97	0.97	0.70	0.86	**0.71**
1/1/2030	-0.97	1.78	0.73	1.19	1.25	1.48	1.49	1.46	1.25	1.35	1.03	1.48	**1.13**
1/1/2040	-0.28	2.32	1.09	1.59	1.88	1.79	1.94	1.90	1.80	1.77	1.42	1.77	**1.58**
1/1/2050	0.65	2.52	1.21	1.89	2.14	2.21	2.12	2.17	2.02	2.03	2.08	2.72	**1.98**
1/1/2060	0.68	3.41	1.81	2.32	2.62	2.59	2.60	2.69	2.50	2.55	2.44	2.71	**2.41**
1/1/2070	1.05	3.35	2.13	2.52	3.11	2.76	2.74	3.05	2.69	2.80	2.78	3.37	**2.70**
1/1/2080	1.63	3.74	2.45	2.92	3.29	3.17	3.31	3.52	3.16	3.13	3.11	4.13	**3.13**
1/1/2090	2.07	4.47	2.53	2.99	3.49	3.33	3.53	3.74	3.38	3.42	3.60	4.40	**3.41**
1/1/2100	3.35	4.76	3.17	3.56	4.16	3.53	4.30	4.17	3.70	3.75	4.56	5.32	**4.03**

Source: SRK 2024a

Daily evaporation rates were multiplied by monthly adjustment factors presented in Table 3-11, where a value of 100% represents the use of historical data, a value less than 100% represents a decrease in monthly evaporation, and a value greater than 100% represents an increase in monthly evaporation. The annual trend is a net increase in evaporation for all months of the year.

Table 3-11: Daily Evaporation Adjustment Factors for Climate Change

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
1/1/2020	99%	101%	100%	98%	100%	103%	105%	102%	102%	98%	104%	101%	**101%**
1/1/2030	99%	101%	100%	98%	99%	104%	106%	104%	103%	98%	104%	101%	**102%**
1/1/2040	100%	103%	100%	99%	101%	104%	107%	106%	103%	98%	104%	102%	**102%**
1/1/2050	100%	103%	101%	99%	101%	106%	108%	107%	104%	99%	105%	102%	**103%**
1/1/2060	101%	103%	101%	99%	102%	107%	109%	108%	106%	100%	105%	102%	**104%**
1/1/2070	101%	103%	101%	100%	101%	107%	109%	109%	107%	100%	105%	103%	**104%**
1/1/2080	101%	104%	102%	101%	104%	108%	113%	111%	108%	101%	106%	103%	**105%**
1/1/2090	102%	104%	101%	100%	104%	109%	115%	112%	110%	102%	106%	104%	**106%**
1/1/2100	102%	104%	100%	98%	102%	109%	115%	114%	113%	101%	106%	103%	**106%**

Source: SRK 2024a

Climate inputs are drivers of the streamflow modeling in the water balance model, as described in Section 3.1.7. Effects of climate change on streamflow is therefore carried forward through the adjustments to temperature and precipitation.

3.1.6 Snowmelt

The SNOW-17 snow accumulation and ablation model developed by the National Weather Service River Forecast System (NWSRFS) was implemented in GoldSim to model snowmelt for the Project. The main processes included in this model are dividing precipitation into rain or snow, accumulation of snowpack, energy exchange, heat deficit in the snowpack, ground melt and snowmelt as a snow water equivalent (Anderson 2006). Model inputs include temperature and precipitation, based on the selected climate scenario, and input parameters to model a column of snow. Details on model inputs and calibration using a regional snow gauging station are described in SRK 2024a.

The routine in Goldsim produces an excess water term daily, which is the sum of rainfall and snowmelt.

3.1.7 Project Runoff Model

Runoff is frequently presented as the depth of water distributed evenly throughout the watershed area. Since the Project is located within the Goathorn Creek, Tenas Creek, Four Creek, Telkwa River and Bulkley River watersheds, rainfall-runoff models were calibrated for each stream based on the excess water produced from the snowmelt model described in Section 3.1.6.

Constant variables including the lag time, minimum baseflow and recession coefficient, along with monthly runoff coefficients, were adjusted to fit the modelled daily flow to the observed daily flow at each stream. A Nash Sutcliffe Efficiency (NSE) function was included in GoldSim, comparing the modelled vs. observed flow results. Model calibration results are described in SRK 2024a and summarized in Table 3-12.

Impacted catchments, including open pit wall areas and Management Ponds or other ponded areas, incorporated a different set of monthly runoff coefficients. Basin lag and recession were not incorporated

for these types of catchments, allowing all runoff to report to the downstream node in a single timestep. Open pit walls were assumed to consist primarily of exposed mine rock, resulting in fewer losses to infiltration than natural runoff. In this case, a monthly runoff coefficient of 0.8 or 1.0 was used, based on the corresponding values for natural catchments. Pond surfaces were assumed to have runoff coefficients equal to 1.0 year-round. Model inputs for open pit wall and pond areas are also presented in Table 3-12.

Table 3-12: Rainfall-Runoff Model Inputs

Location		Goathorn	Telkwa	Tenas	Bulkley	Four	Project	Open pit Wall	Waterbody
Minimum Unit Baseflow [L/s/km^2]		1.4	4.1	0.43	3.5	0.3	0.69	n.a	n.a
Lag Time [days]		1	1	1	1	1	1	n.a	n.a
Recession		0.9	0.92	0.91	0.96	0.77	0.86	n.a	n.a
Runoff Coefficient	January	1	1	1	1	1	1	1	1
	February	1	1	1	1	1	1	1	1
	March	0.45	1	1	1	1	0.82	1	1
	April	0.91	1	1	0.67	0.34	0.75	0.8	1
	May	0.26	0.78	0.31	0.54	0.10	0.22	0.8	1
	June	0.21	0.28	0.11	0.34	0.10	0.14	0.8	1
	July	0.76	0.92	0.12	0.53	0.04	0.31	0.8	1
	August	0.28	0.54	0.20	0.26	0.02	0.17	0.8	1
	September	0.14	0.28	0.10	0.35	0.04	0.09	0.8	1
	October	0.37	0.49	0.15	0.39	0.02	0.18	0.8	1
	November	0.14	098	0.88	0.90	0.50	0.51	0.8	1
	December	1	1	1	1	0.4	0.80	1	1

Source: SRK 2024a

Note: runoff coefficients and the baseflow value for the Project are the average for Tenas, Four and Goathorn Creeks

Runoff from overburden stockpiles was assumed to mimic natural runoff conditions, based on the expectation that dumps will be vegetated once completed, and were assigned the same parameters as natural catchments. Runoff for Non-PAG rock are discussed in Section 3.67.

3.1.8 Low Flow Model

Low flow conditions are an important indicator of stream stability in terms of its capacity to provide habitat for fish and aquatic life, as well as other users. The water and load balance model incorporates a baseflow rate calibrated on historical records (Section 3.1.7), which represents typical monthly average low flow conditions. The baseflows were selected based on review of the extended historical records at each hydrometric station, converted to unit baseflows ($m^3/s/km^2$) and applied to each modelled prediction node (SRK 2024a, summarized in Table 3-12). However, the model is unable to simulate more extreme low flow conditions, such as the 7-day low flow for specific return periods.

Low flow conditions were evaluated in two ways:

- Change to low flow conditions were developed external to the water and load balance model based on a ratio of modelled baseflow and the statistical 7-day low flow for a 1 in 10-year return period event (7Q10). Baseline 7Q10 conditions were calculated for each stream based on the extended long-term flow records. A ratio of modelled baseflow over statistical 7Q10 was calculated for each stream or river, based on the unit 7Q10 and the unit baseflow inputs. This ratio was applied to the modelled low flow conditions, which are the same under average precipitation and the 100-year dry conditions based on the constant baseflow input, to calculate the corresponding 7Q10 under post-mining conditions. Percent change relative to Pre-Mining 7Q10 was calculated for each stream node.
- Change to water quality under low flow conditions were evaluated in the Initial Dilution Zone model (SRK 2025c) and are not presented in this report.

3.2 Mine Plan

A mine plan summarizing tonnages and/or volumes of overburden, PAG, and non-PAG rock and PAG processed rock was provided by Telkwa Mining Limited as input to the water and load balance. Cumulative annual volumes of open pit capacity, Non-PAG backfill, PAG material and processed rock are presented in Table 3-13.

Table 3-13: Mine Plan Annual Volumes

Year	Mine Year	Cumulative Non-PAG Backfill Volume (Mm^3)	Cumulative PAG Volume (Mm3)	Cumulative Processed Rock Volume (Mm3)
2021	-1	-	-	-
2022	1	1.16	0.33	0.04
2023	2	2.61	1.54	0.23
2024	3	3.72	3.09	0.41
2025	4	7.55	4.80	0.58
2026	5	11.95	6.57	0.76
2027	6	15.73	8.55	0.94
2028	7	19.30	10.32	1.12
2029	8	21.64	12.08	1.30
2030	9	23.79	13.21	1.51
2031	10	26.17	14.93	1.70
2032	11	29.87	16.37	1.88
2033	12	33.14	18.23	2.06
2034	13	35.83	20.06	2.24
2035	14	38.17	21.21	2.41
2036	15	40.32	22.53	2.56
2037	16	42.22	24.12	2.73
2038	17	44.54	25.28	2.90
2039	18	46.79	26.52	3.07
2040	19	48.57	28.23	3.26
2041	20	50.02	29.43	3.47
2042	21	51.00	30.91	3.65
2043	22	51.00	31.83	3.77

Source: /NACAPR002055/Internal/Water Balance Modelling/Inputs/MasterInputs_TelkwaEA_Rev09_sab_ccm.xlsm

3.3 Catchment Areas

The expansion of mining footprints and resulting reduction in natural catchments contributing to each facility is captured in the varying catchment area timeline. A total of 13 catchment regions were delineated and sub-delineated based on varying land types.

Appendix B includes catchment area figures for each phase of the Project, as well as summary tables with model input areas for each catchment and sub-catchment. Tables are also provided for the changing catchment areas of downstream prediction nodes, while figures for the pre-mining and post-mining prediction node areas are presented in Appendix A.

3.4 Management Ponds

Each Management Pond was modelled with two reservoir elements in GoldSim: one representing the free water volume and one representing the water in the void space of deposited PAG rock and processed rock. Inflows including precipitation and runoff or pumped water from other facilities are linked to the free water reservoir. Outflows from the free water reservoir include evaporation, pumped water to other facilities, and water lost (infiltration) to the void space of placed rock. The only outflow from the rock voids reservoir is seepage into the ground, which is replaced by infiltration from the free water reservoir. This approach enables the separation of water quality in the rock voids from water quality in the free water body, which accounts for the difference in retention time of each facility. Retention time in the rock voids reservoir is the quotient of the void volume and the groundwater seepage rate. The retention time in the void space of the placed waste rock is much longer than the flushing time of the free water reservoir.

Free water reservoirs are used to track the water cover depth above PAG and processed rock to ensure the minimum water cover of 1.0 m is achieved during placement of PAG and 1.5 m after management pond is completed. Water more than target water cover depths is pumped or discharged via spillway from the pond to manage the water level (SRK 2021d). Controls to manage water cover depths are to:

- Activate pump at a rate of 9,000 m^3/day from Tenas Control Pond to any given Management Pond when that ponds' water cover depth is less than 0.50 m.
- Activate pump at a rate of 9,000 m^3/day from any given Management Pond to the Tenas Control Pond when water cover depth exceeds 0.70 m.

Pumping rates were determined based on a monthly water balance for the Tenas Control Pond, presented in the Water Management Design Technical Report (SRK 2021a).

3.4.1 Management Pond Volumetrics

Management Pond capacity and water cover thicknesses are calculated in the model based on stage-storage relationships developed from the final dam and open pit configuration of each facility (Appendix C).

Table 3-14 presents the design levels and volumes for each Management Pond, including the dam crest, spillway invert and cumulative volume, as well as the cumulative PAG rock, processed rock, Non-PAG rock and overburden volumes deposited in each pond. Volumes include total volume occupied by material, including void space. The void volumes were assumed to be 30% of the total volume for placed Non-PAG (and overburden) and PAG rock, and 15% for processed rock. These void volumes are conservative and are expected to be smaller due to natural compaction that will occur during placement in shallow lifts.

Table 3-14: Summary of Management Pond Levels and Capacities

Parameter	NMP	EMP	WMP	Notes
Total Saturated PAG Rock Volume [m^3]	2,386,000	11,561,000	27,432,000	Total volume with water in voids,
Total Saturated Processed Rock Volume [m^3]	3004,000	858,000	2,614,000	Total volume with water in voids,
Top of PAG Rock Elevation [masl]	825.2	847.3	846.9	Based on stage-storage curves (Appendix C)
Non-PAG Rock Cover average approximate Thickness [m]	1.5	1.5	1.5	Selected by TCL and SRK
Non-PAG Rock Cover Volume [m^3]	425,000	1,5750,000	1,422,000	Based on stage-storage curves (Appendix C)
Top of Non-PAG Rock Elevation [masl]	826.7	848.8	848.4	
Closure Spillway Invert [masl]	828.0	850.0	850.0	Selected by Telkwa Mining and SRK
Overburden Cover average approximate Thickness [m]	1.3	1.2	1.6	Calculated based on spillway invert and top of Non-PAG rock
Overburden Cover Volume [m^3]	848,000	1,356,000	1,548,000	Based on stage-storage curves (Appendix C)
Dam Crest Elevation [masl]	830.0	852.0	852.0	Selected by TCL and SRK

Source: /NACAPR002055/Internal/Water Balance Modelling/Inputs/MasterInputs_TelkwaEA_Rev09_sab_ccm.xlsm

3.4.2 PAG Rock Deposition

The PAG rock deposition schedule by volume for each Management Pond is presented in Figure 3-1.

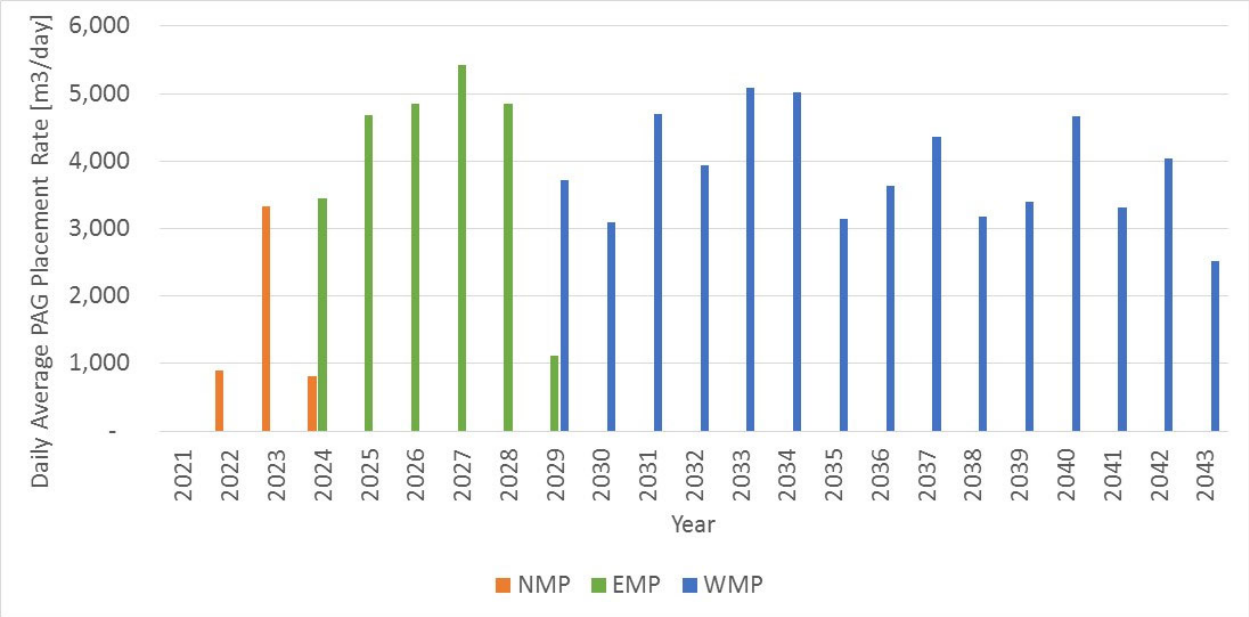


Figure 3-1: Annual Average PAG Placement Rates, m^3/day

Source: /NACAPR002055/Internal/Water Balance Modelling/Inputs/MasterInputs_TelkwaEA_Rev09_sab_ccm.xlsm

3.4.3 Processed Rock Deposition

Processed rock from the CPP is deposited in the active Management Ponds, comingled with PAG rock deposition. The deposition rate of processed coal is 500 m^3/day on average.

3.4.4 Management Pond Covers

Upon completion of PAG rock and processed rock deposition in each Management Pond, a cover system will be constructed to provide the following:

1. Reduce evaporative losses by decreasing the water vapor gradient between the water and atmosphere.
2. Isolate PAG rock from potential human and environmental influence and exposure (i.e. from oxidation from oxygen ingress).
3. Help return the landscape to pre-mining conditions.

The cover design is discussed in Appendix C of the Water Management Technical Design Report (SRK 2021a).

Evaporation rates from the Management Ponds once covered were reviewed as part of the scoping-level cover design. Covers will be vegetated with plant species that meet closure objectives. Based on existing vegetation in the area, a forest of black spruce and aspen will be planted across the Management Pond covers as part of progressive closure of each facility. Actual evapotranspiration rates from similar forests

range from 252 mm/year to 450 mm/year (SRK 2021a, Appendix C). Based on this range, it was assumed that the cover would reduce annual evaporation rates from the Management Ponds to 400 mm/year, or effectively reducing evaporation by 25% over an open-water body. A sensitivity analysis was performed on this assumption, which considered the ability of Management Ponds to maintain minimum water covers without the benefit of the cover (i.e., evaporation rates are equal to open-water conditions). Results are discussed in Section 4.1.1.

3.4.5 Management Pond Dams and Buttresses

Seepage and runoff from Management Pond dams and buttresses will be captured in peripheral ditches and conveyed to the Tenas Control Pond.

The dams and long-term buttresses constructed for each Management Pond will be constructed with Non-PAG rock and overburden. The volume of Non-PAG rock and overburden will be approximately equal throughout the life of mine. Modeling assumes that the water chemistry of buttress and dam runoff and seepage will be the average of the Non-PAG rock and overburden source terms.

Once construction of each dam and buttress are complete, a compacted overburden layer will be placed over each facility to reduce the infiltration rate into the structures from 40% to 10% of precipitation (Section 3.7). This will be followed by layer of growth media and/or soil for final vegetation planting for the decommissioning and reclamation and Post-closure phases. Runoff from the cover will have overburden source term and seepage will have the average of the Non-PAG rock and overburden source terms. Runoff and seepage rates are described with the waste rock hydrology conceptual model (Section 3.7).

3.5 Water Supply

Tenas Control Pond supplies water for the Project. Water is distributed to three locations:

- the Management Ponds to maintain water covers over PAG rock.
- mixing with the treated effluent from the sewage treatment plant discharge during May through October.
- the CPP if not enough is available from the Open Pit sump.

3.5.1 CPP Process Requirements

The CPP water demand is approximately 15,000 m^3/month based on the processing rate of 1.05 million tonnes per annum. A maximum water demand of 130 litres per tonne, and an allowance of 3,625 m^3/month for wash bays and dust suppression (all rates provided by TML) were also implemented. Water is supplied by the sump located downstream of the Open Pit, collecting seepage from the backfill, then from the Tenas Control Pond as a contingency if the Pit sump is unable to provide enough for process water throughout Operations. The water balance completed for the EA shows that the Pit sump can always provide water for process and therefore Tenas Control Pond is not required as a water supply source. A contingency water supply source from Goathorn Creek was also simulated at a rate equal to

2.5% percent of the pre-mining flow rate. This source is configured to be utilized as needed based on low water volumes in the Project area, however the modelled removal of water from Goathorn Creek at node WQS06 occurs throughout the entire Project Operations period for the purpose of the EA. This condition is discussed in model results (Section 4.1.2). The water balance completed showed that this contingency is not required.

3.5.2 Management Pond

Management Ponds are required to maintain a minimum water cover above stored PAG rock and processed rock to reduce the risk of oxidation (Section 3.4) and subsequent acid rock drainage. Water supply requirements for the Management Ponds vary throughout the life of mine and are expected to increase with increasing PAG rock and processed rock volumes. The Management Ponds collect flows from active open pit mining and natural runoff from undisturbed catchment areas. Any deficits are made up by pumping from the Tenas Control Pond, supplied by a pumping system with a capacity of 9,000 m^3/day.

3.5.3 Sewage Effluent

The sewage treatment plant will discharge 5,000 m^3 of treated effluent per year into the tributary of Goathorn Creek (Radloff 2021) during the open-water season (May through September). A dilution rate of 10:1 is required, which will be supplied by a minimum discharge rate from the Tenas Control Pond of 8,300 m^3/month during the discharge period (50,000 m^3/year).

3.5.4 Tenas Control Pond Operations

The Tenas Control Pond design is presented in SRK (2021d), which includes a maximum operating level, an emergency spillway, a minimum operating level, and a contingency storage volume to attenuate storm events. Target volumes are used in the model to trigger actions including discharge to environment or pumps to Management Ponds. The following triggers have been included:

- The design volume of the Tenas Control Pond to its spillway is 1,060,300 m^3. The design stipulates that a minimum of 210,300 m^3 of storage be maintained as contingency for storm events (SRK 2021d). The model does not simulate storm events and uses an upper bound equal to the target maximum operating volume of 850,000 m^3, thereby ensuring that the contingency storage is maintained. Pond overflows in the model represent depletion of contingency storage and the model was optimized to ensure overflows do not occur under average hydrologic conditions.
- Discharge to Goathorn Creek tributary at a rate of 15,000 m^3/d or less is enabled when the Tenas Control Pond volume exceeds 500,000 m^3, which only occurs during open water season months (May to October). This volume was selected as part of pond optimization to avoid depletion of contingency storage during average conditions. Discharge during winter months is prevented through active discharge throughout open water season to avoid reduced dilution capacity in Goathorn Creek at that time.

- Pumping to Management Ponds for water cover supply is disabled when the pond volume is reduced below 50,000 m^3/month. This target volume ensures that a minimum volume is available for sediment control and potentially to provide process water supply.

The Tenas Control Pond stage-storage curve is presented in Appendix C.

3.6 Collection Channel Efficiency

A diversion channel south of the EMP (channel C02) will divert runoff to Four Creek. Ditch bypass contributes to water availability to maintain the Management Pond water cover. A sensitivity analyses was completed on the dich efficiency for this system to ensure water cover could be maintained without relying on ditch bypass (20% of flows).

3.7 Waste Rock Hydrology

The hydrologic model for waste rock storage facilities differs from natural catchment hydrology, due to the lack of overburden and vegetation and the ability of dumps to temporarily store water in their void space (assumed to be 30%). During active material placement, all rock piles, including Non-PAG rock backfill, dams, and buttresses, are modelled as water reservoirs, accumulating inflow until the internal moisture content reaches a specified level. At the specified saturation level, water is assumed to discharge as seepage from the toe of the facilities, where it is captured by collection channels and diverted to downstream management and/or control ponds.

Figure 3-2 presents the conceptual model and Table 3-15 summarizes the model inputs and assumptions.

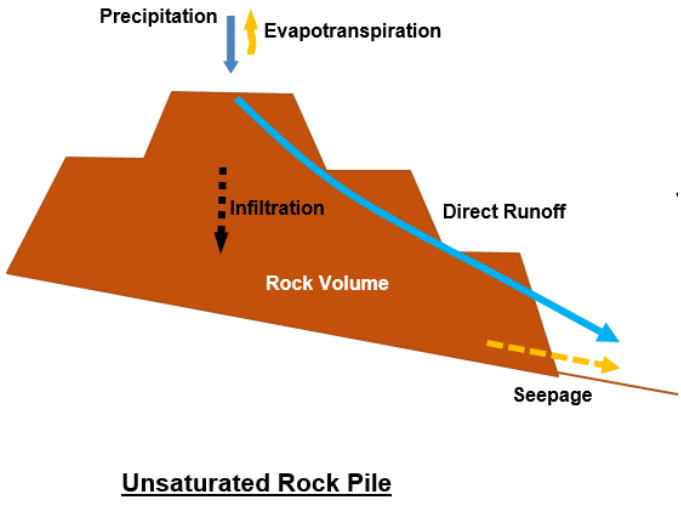


Figure 3-2: Conceptual Waste Pile Model for Unsaturated Rock

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\ConceptualModel\Planning\TelkwaWB_Planning_01292021.pptx

Open Pit Backfilled Material during Operations and closure

The seepage produced by the backfill (Non-PAG and overburden) during Operations and closure were modeled separately to the SRK Goldsim water balance model. The seepage was estimated in parallel to the development of a source term for the Non-PAG backfill, as described in Okane 2024, and these seepage rates were used as an input to the SRK Goldsim water balance model. Okane used a different framework to SRK to estimate seepage from the backfill with the use of a Wetting-up and Draindown model, but the resulting seepage are of the same order of magnitude as the SRK water balance model and therefore acceptable as inputs for the Goldsim model. Okane's model differs in that the backfill is separated into different mine rock layers, and considers hydraulic conductivity for each layer, as new rock is being placed (Okane 2024).

All Non-PAG rock will be covered with overburden at the end of Operations, reducing infiltration and increasing direct runoff rates, and approximately 70% of total rock volume placed in the open pit will be Non-PAG with the remainder is overburden which is also non-PAG.

Once the mine rock backfill is saturated, seepage is conveyed to the West Management Pond.

Other Unsaturated Rock Piles

Other unsaturated rock piles include the rock dams and buttresses of Management and Control Ponds. The model assumes fixed percentages of precipitation falling on unsaturated rock pile areas will become runoff, evaporate, or infiltrate. Water that infiltrates will be stored in the rock pile until the pile reaches the target moisture content of 7.0% by mass, after which any additional water will discharge as seepage at the toe of the pile.

The mine plan currently states that dams and buttresses will be 30% Non-PAG rock and 70% overburden material by volume. Seepage water chemistry is modeled based on a combined source term developed by SRK assuming the mixed material proportion detailed above (SRK 2024b). This assumes that overburden will be distributed throughout the rock pile, ensuring that water is in contact with both materials equally limiting the chance of preferential flow pathways in the Non-PAG rock which could result in Non-PAG rock dominated seepage water chemistry. Seepage will be lagged with a recession value, like natural runoff rates. A recession value of 0.995 was selected for seepage to simulate a relatively smooth outflow.

Table 3-15: Assumptions for Saturated and Unsaturated Rock Piles

Parameter	Unsaturated Rock	Saturated Rock	Justification
% of Precipitation that Infiltrates	40%	10%, based on Okane water balance modelling	Okane 2024 for Saturated Rock
% of Precipitation as Direct Runoff	10%	Varies per month based on natural runoff rates	
% of Precipitation that Evaporates on surface	50%	50%, based on Okane water balance modelling	Based on monthly water balance

Parameter	Unsaturated Rock	Saturated Rock	Justification
Target Moisture Content which enables Seepage	7%[1]	~30%, based on Okane models (Okane 2024)	Based on SRK experience with operational waste rock dumps (unsaturated)
Runoff Recession Value	0.995	Unknown, part of Okane's internal modelling	Selected to create an even outflow with minimal response to peak rainfall events

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\ConceptualModel\Planning\TelkwaWB_Planning_01292021.pptx

Note: [1] 7% by mass of placed rock

3.8 Groundwater

A regional groundwater model was developed for the EA. The model estimated groundwater fluxes, discharge, and recharge from the Project (SRK 2024c). Model results assume that management and control ponds are lined, including the in-pit portions of the WMP which are in contact with overburden. All non-overburden contact areas in the WMP in-pit area are not lined. Two modelled scenarios were considered:

- Expected groundwater scenario corresponds to the best fit model inputs, calibrated against head observations and average annual baseflows in each stream. This condition produced a normalized root mean square error (NRMSE) of 3.2% for hydraulic heads and 3.6% for baseflows (SRK 2024c).
- A sensitivity groundwater scenario corresponds to an outlier condition where the hydraulic conductivities are maximized, while the calibration target is held near the minimum generally accepted in British Columbia (10% NRMSE [Normalized Root Mean Square Error]). This condition emphasizes the potential groundwater flows into the open pit, underneath the waste and water management facilities, and into the creeks (SRK 2024c).

Four snapshot periods were evaluated in the groundwater model:

- End of Year 1: The North Management Pond and Tenas Control Pond are filled with water and PAG rock. No other Management Ponds are active. Connections to the open pit are dictated by the facility footprint and depth currently and active dewatering is occurring.
- End of Year 7: The East Management Pond is filled with water and PAG rock, joining the North Management Pond and the Tenas Control Pond. The open pit extents have increased, and active dewatering continues.
- End of Mining: The West Management Pond is filled with water and PAG rock, joining the North and East Management Ponds and the Tenas Control Pond. The open pit is filled to the maximum level but the open pit is still being actively dewatered.
- Post-Closure: All Management Ponds remain in-place, however the Tenas Control Pond has been breached and no longer stores water. Dewatering from the open pit has ended and the end pit lake and saturated waste rock have formed.

Groundwater connections are incorporated into the water and load balance model based on three components: direct connections to Project infrastructure, changes to stream baseflow, and load transport to streams.

3.8.1 Groundwater Flow Rates through Project Infrastructure

Instantaneous connections occur between the groundwater system and each mining facility, including the open pit, Management Ponds, and the Tenas Control Pond. Groundwater inflows and groundwater seepage loss connected to each facility occur on a daily timestep throughout the model period and are presented in Table 3-16 for the expected case groundwater model scenario and in Table 3-17 for the high case groundwater model scenario.

Table 3-16: Expected Case Groundwater Connections to Mining Facilities throughout Life of Mine [m^3/day]

Phase	WMP	NMP	EMP	Tenas Control Pond	Open Pit	Open pit with Saturated Backfill
Inflows						
EoY1	0.0	0.0	0.0	0.0	317	n.a
EoY7	0.0	0.0	0.0	0.0	888	n.a
End of Mining	139	0.0	0.0	0.0	550	n.a
Post-Closure	137	0.0	0.0	0.0	n.a.	171
Outflows						
EoY1	0.0	198	0.0	140.0	0.0	n.a
EoY7	0.0	198	458	140.0	0.0	n.a
End of Mining	836	198	458	140.0	0.0	n.a
Post-Closure	819	198	458	0.0	n.a.	7.1

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Groundwater\Telkwa_Summary_2020_GW_model_results_Draft_20201203_gf_sab_rev03.xlsx

Notes:

Connections are not applicable (n.a.) for end pit lake at closure since it is replaced by the end pit lake and saturated backfill components. The reverse is true for the End Pit Lake and saturated backfill during Operations.

Table 3-17: Sensitivity Case Groundwater Connections to Mining Facilities throughout Life of Mine [m^3/day]

Phase	WMP	NMP	EMP	Tenas Control Pond	Open Pit	Open Pit with Saturated Backfill
Inflows						
EoY1	0.0	0.0	0.0	0.0	408	n.a
EoY7	0.0	0.0	0.0	0.0	1144	n.a

Phase	WMP	NMP	EMP	Tenas Control Pond	Open Pit	Open Pit with Saturated Backfill
End of Mining	95	0.0	0.0	0.0	671	n.a
Post-Closure	86	0.0	0.0	0.0	n.a.	110
Outflows						
EoY1	0.0	210	0.0	290.0	0.0	n.a
EoY7	0.0	210	535	290.0	0.0	n.a
End of Mining	2073	210	535	290.0	0.0	n.a
Post-Closure	1919	210	535	0.0	n.a.	189

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Groundwater\Telkwa_Summary_2020_GW_model_results_Draft_20201203_gf_sab_rev03.xlsx

3.8.2 Changes to Stream Baseflow

The change in water levels within the Management Ponds, Control Ponds, and the open pit affect the groundwater discharge rates to each downstream creek and river. The calibrated rainfall-runoff model included a constant unit baseflow for each major creek, which is applied to each associated prediction node. The baseflows were simplified in the groundwater model calibration (SRK 2024c). To understand the change to baseflows because of the mine, the groundwater model predicted baseline baseflow and baseflow during mining at each prediction node for each scenario. The rate baseflow changed between baseline conditions and mining conditions were directly applied to the baseflow component for each prediction node in the water balance model.

The baseflow dominates the total streamflow during winter months but represents a minor portion of the total streamflow during the open-water season, even during the late summer flows. Baseflow rates in the receiving environment increase or decrease, depending on location in relation to the open pit and the Management Ponds. These changes are linearly interpolated between each snapshot for each prediction node. Table 3-18 presents the rate of change to prediction node baseflows under base case groundwater modeling conditions, and Table 3-19 presents the results for sensitivity groundwater case conditions.

Four Creek baseflow contribution

A recent study (SLR 2025) specifically analyzed data collected for the groundwater system and streamflow regime of Four Creek and developed a water balance model to examine whether Four Creek exhibits perched conditions. Perched conditions would imply that baseflow found in the Creek are disconnected for part or all of the reach of the Creek. Their conclusions suggest that perched conditions are likely "*due to the presence of fine till in the shallow overburden which acts as a low permeability layer inhibiting water from percolating down to the main deep groundwater table.*[SLR 2025]. This implies that changes to the groundwater table due to mining (i.e. drawdown from open pit and raised levels in Management Ponds) would not impact the baseflows in upstream Four Creek.

Other reasons that support their results are as follow:

- *"Vertical hydraulic gradients consistently show negative values, indicating that Four Creek is a losing stream, where water from the creek seeps outwards into the shallow subsurface.*
- *Conductivity measurements along Four Creek show minimal variation except for a few locations. These conductivity measurements suggest contributions to streamflow along Four Creek come from direct precipitation and recently fallen precipitation that arrives at the creek as interflow along the creek's length.*
- *Discharge measurements collected along the length of the channel network do not indicate the presence of consistent groundwater contributions to baseflow."* [SLR 2025]

While these results indicate perched conditions that would disconnect prediction nodes WQS03, WQS20, and WQS21, this report and the WLBM uses the results from the hydrogeological model (SRK 2024c) as these are considered more conservative in terms of changes to Four Creek.

Table 3-18: Rate of Change to Baseflow for Prediction Nodes throughout Life of Mine under Base Case Groundwater Conditions (SRK 2024c)

Node	Stream	End of Year1	End of Year7	End of Mining	Post-Closure
WQS01	Tenas Creek	-0.1%	-0.2%	-0.4%	-0.3%
WQS02	Tenas Creek	-1.1%	-3.9%	1.7%	1.9%
WQS03	Four Creek	-0.7%	-20.5%	-29.8%	-22.7%
WQS03DS	Four Creek	-4.2%	-5.0%	-0.3%	4.0%
WQS04	Tenas Creek	-0.9%	-5.6%	3.3%	3.0%
WQS05	Goathorn Creek	-0.5%	-1.9%	0.8%	1.1%
WQSEA1	Goathorn Creek	-0.3%	-0.5%	-0.1%	0.3%
WQS06	Goathorn Creek[1]	0.0%	0.0%	0.0%	0.0%
WQS06US	Goathorn Creek	0.0%	-0.2%	-0.2%	0.0%
WQS09	Telkwa River	-0.4%	-1.6%	0.7%	1.0%
WQS11	Bulkley River	0.0%	0.0%	0.0%	0.0%
WQS12	Bulkley River	-0.01%	-0.02%	0.01%	0.01%
WQS13	Goathorn Creek	0.0%	-0.2%	-0.3%	0.0%
WQS20	Four Creek	-2.6%	-21.3%	-32.8%	-22.3%
WQS21	Four Creek	-1.5%	-22.0%	-34.4%	-25.0%
WQS22	Tenas Creek	-1.0%	-5.9%	3.4%	3.1%

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Groundwater\Telkwa_Summary_2020_GW_model_results_Draft_20201203_gf_sab_rev03.xlsx

Note: [1] WQSEA1 was not modelled in the previous version of the model (from August 2022) and was added after the groundwater model results were made available. Due to the close proximity between WQSEA1 and WQS06, the changes to baseflows are now applied to WQSEA1 instead of WQS06.

Table 3-19: Rate of Change to Baseflow for Prediction Nodes throughout Life of Mine under High Case Groundwater Conditions (SRK 2024c)

Node	Stream	End of Year1	End of Year7	End of Mining	Post-Closure
WQS01	Tenas Creek	-0.1%	-0.5%	-0.5%	-0.3%
WQS02	Tenas Creek	-1.6%	-6.6%	10.9%	11.5%
WQS03	Four Creek	0.0%	0.0%	0.0%	0.0%
WQS03DS	Four Creek	-16.8%	-13.4%	92.2%	121.3%
WQS04	Tenas Creek	0.0%	-10.6%	32.0%	30.7%
WQS05	Goathorn Creek	-0.2%	-2.1%	7.1%	7.1%
WQSEA1	Goathorn Creek	-0.3%	-0.3%	1.9%	2.2%
WQS06	Goathorn Creek	0.0%	0.0%	0.0%	0.0%
WQS06US	Goathorn Creek	0.0%	-0.2%	-0.2%	-0.3%
WQS09	Telkwa River	-0.2%	-1.5%	5.2%	5.3%
WQS11	Bulkley River	0.0%	0.0%	0.0%	-0.2%
WQS12	Bulkley River	0.0%	-0.02%	0.08%	0.08%
WQS13	Goathorn Creek	0.0%	-0.1%	-0.3%	-0.6%
WQS20	Four Creek	-22.9%	-100.0%	-100.0%	-100.0%
WQS21	Four Creek	-22.9%	-100.0%	-100.0%	-100.0%
WQS22	Tenas Creek	-0.2%	-12.4%	36.4%	35.1%

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Groundwater\Telkwa_Summary_2020_GW_model_results_Draft_20201203_gf_sab_rev03.xlsx

Under the sensitivity case groundwater model predictions, there is no baseflow to Four Creek at WQS20 and WQS21 (i.e., 100% reduction in Table 3-19). Rate of change to combined streamflow, including runoff contributions, is discussed with the model results.

3.8.3 Contaminant Plume from Project Infrastructure

Water outflows from the Management Ponds, Tenas Control Pond and the open pit into the groundwater system take place instantaneously. However, there is a natural lag between the timing of seepage at the source and seepage being observed within the various stream prediction nodes. Particle tracing within the groundwater model revealed that a portion of seepage reaches the adjacent reach of Tenas Creek before end of mining, but that most of the seepage will not be observed until well past closure.

The model assumes the following:

- Seepage contributions into Tenas Creek prediction nodes WQS02 and WQS22 begin at end of Year 7 and increase linearly to their end of mining.
- Seepage from each Management Pond is delayed 25 years from infiltrating into the facility to reaching prediction nodes. This timing is conservatively early based on the particle tracing results.
- Tenas Control Pond is decommissioned in closure; however, the seepage plume is assumed to continue contributing to the streams for 25 years beyond its decommissioning. Modeling assumes the pond is decommissioned 5 years after the start of closure, and seepage is assumed to continue to discharge to the creeks for an additional 25 years.

The contaminant load reaching each prediction node is calculated based on the percentage of particles leaving each Management Pond, open pit or Control Pond that reach each node under steady-state conditions, considering the dilution of the mine seepage into the total groundwatershed for each stream calculated by the groundwater model. Results for expected case conditions are presented in Table 3-20 and sensitivity case groundwater seepage conditions in Table 3-21.

Table 3-20: Percentage of Groundwater Seepage from each Mining Facility Reporting to Downstream Prediction Nodes under Expected Case Groundwater Conditions (SRK 2024c)

Facility	Node	Phase			
		End of Year1	End of Year7	End of Mining	Post-Closure
North Management Pond	WQS04	0%	0%	7%	67%
	WQS05	0%	0%	5%	67%
	WQS09	0%	0%	8%	0%
	WQS22	0%	0%	7%	67%
East Management Pond	WQS03DS	0%	0%	0%	56%
	WQS04	0%	0%	0%	7%
	WQS05	0%	0%	0%	98%
	WQSEA1	0%	0%	0%	91%
West Management Pond	WQS02	0%	0%	5%	38%
	WQS04	0%	0%	7%	83%
	WQS05	0%	0%	7%	89%
	WQSEA1	0%	0%	0%	6%
	WQS09	0%	0%	7%	0%
	WQS22	0%	0%	7%	76%
Tenas Control Pond (1)	WQS04	0%	0%	0%	37%
	WQS05	0%	0%	0%	38%
	WQS03DS	0%	0%	0%	0%
Saturated Open pit Backfill	WQS02	0%	0%	0%	17%
	WQS04	0%	0%	0%	67%
	WQS05	0%	0%	0%	83%
	WQSEA1	0%	0%	0%	17%
	WQS22	0%	0%	0%	50%

Notes:

1. Seepage from the Tenas Control Pond is reduced to zero from 1/1/2074 onwards to reflect the decommissioning of the facility.

Table 3-21: Percentage of Groundwater Seepage from each Mining Facility Reporting to Downstream Prediction Nodes under High Case Groundwater Conditions (SRK 2024c)

Facility	Node	Phase			
		End of Year1	End of Year7	End of Mining	Post-Closure
North Management Pond	WQS04	0%	0%	15%	32%
	WQS05	0%	0%	15%	32%
	WQS09	0%	0%	15%	0%
	WQS22	0%	0%	15%	32%
East Management Pond	WQS03DS	0%	0%	0%	34%
	WQS04	0%	0%	0%	10%
	WQS05	0%	0%	0%	98%
	WQSEA1	0%	0%	0%	87%
West Management Pond	WQS02	0%	0%	25%	48%
	WQS04	0%	0%	51%	81%
	WQS05	0%	0%	51%	87%
	WQSEA1	0%	0%	0%	5%
	WQS09	0%	0%	51%	0%
	WQS22	0%	0%	51%	77%
Tenas Control Pond (1)	WQS04	0%	0%	0%	28%
	WQS05	0%	0%	0%	38%
	WQS03DS	0%	0%	0%	0%
Saturated Open pit Backfill	WQS02	0%	0%	0%	8%
	WQS03DS	0%	0%	0%	8%
	WQS04	0%	0%	0%	58%
	WQS05	0%	0%	0%	100%
	WQSEA1	0%	0%	0%	42%
	WQS22	0%	0%	0%	25%

Notes:

1. Seepage from the Tenas Control Pond is reduced to zero from 1/1/2074 onwards to reflect the decommissioning of the facility.
2. End Pit Lake discharge to groundwater only occurs under Sensitivity Case groundwater modeling predictions and is therefore excluded from Table 3-20 (base case).

3.9 Water Quality Objectives

The following sections present the proposed in-stream guidelines and end of pipe limits.

3.9.1 In-Stream Guidelines

The long-term average BC Approved Water Quality Guidelines or BC AWQG (ENV 2025a) and the BC Working Water Quality Guidelines or BC WWQG (ENV 2025b) for freshwater aquatic are applied in the evaluation of results from the load balance for most cases, exceptions are laid out below. When both a dissolved and a total guideline was found for a parameter (e.g. nickel), only the dissolved value was kept. Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Aquatic Life (CCME WQG) are applied for parameters for which there is no BC AWQG or BC WWQG. WQG values for various parameters depend on the water quality in the receiving environment itself. WQG values are established for different potential receiving environments, based on average background concentrations (i.e., pre-mining conditions). When guidelines depend on hardness, the median hardness from baseline datasets within each creek was selected. Post-mining stream hardness will be higher than baseline and are presented with water quality results in Section 0.

In the case of selenium, the CCME WQG is 0.001 mg/L, which was developed as an alert concentration for early detection of selenium concerns. The BC Ministry of Environment proposed a guideline value of 0.002 mg/L by comparing ambient selenium surface water concentrations in British Columbia (ENV 2014), Alberta and across Canada. With the review of existing toxicological data, the CCME advise that the BC WQG for selenium can be applied across Canada based on jurisdiction's needs and policy goals (ECCC 2021). For this reason, the BC WQG for total selenium was selected as the in-stream target threshold concentration for the Project.

The BC WQG for total mercury is dependent on the in-stream concentration of methyl mercury (MeHg) and can range from 0.02 µg/ for streams where MeHg represents 0.5% or less of total mercury, 0.01 µg/L for streams where MeHg represents 1.0% of total mercury, and 0.00125 µg/L for streams where MeHg represents more than 8.0% of total mercury. Concentrations of MeHg were not measured as part of the baseline monitoring program. The detection limit for total mercury in baseline datasets is 0.0025 µg/L, which is greater than the lowest BC WQG of 0.00125 µg/L for higher proportions of MeHg. The geochemical characterization found mercury concentrations in the humidity cell data were always below the detection limit of 0.01 µg/L. For these reasons, mercury is not expected to be a parameter of concern for the Tenas Project, and the mid-range BC WQG (0.01 ug/L) was used to assess model results.

In the case of total molybdenum, the BC wildlife (ruminant) long-term Chronic WQG was chosen as it was the most stringent (WQG=0.034mg/L) and was applicable for the Project.

There was no BC WQG (Approved or Working), and no CCME guideline for Total Strontium. Therefore, the ECCC FEQG (environment guideline for Aquatic Life was applied as a default (WQG= 2.5mg/L).

Proposed long-term average WQG for the protection of freshwater aquatic life and human health at the Project are summarized in Table 3-22.

Table 3-22: Proposed Long-term Average Water Quality Guidelines for Freshwater Aquatic Life in receiving Environments

Receiving Environment		Tenas Creek					Four Creek					Goathorn Creek					Telkwa River					Bulkley River				
Parameter	**Units**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**
Ammonia, total	mg-N/L	1.3		1.27	**1.3**	Used BC AWQG	0.992		1.27	**0.992**	Used BC AWQG	1.56		1.27	**1.56**	Used BC AWQG	1.66		1.27	**1.66**	Used BC AWQG	1.6		1.27	**1.6**	Used BC AWQG
Chloride	mg/L	150		120	**150**	Used BC Acute AWQG	150		120	**150**	Used BC AWQG	150		120	**150**	Used BC AWQG	150		120	**150**	Used BC AWQG	150		120	**150**	Used BC AWQG
Fluoride	mg/L	1.22		0.12	**1.22**	Used BC AWQG	1.37		0.12	**1.37**	Used BC AWQG	1.19		0.12	**1.19**	Used BC AWQG	0.99		0.12	**0.99**	Used BC AWQG	0.84		0.12	**0.84**	Used BC AWQG
Nitrate	mg-N/L	3		13	**3**	Used BC AWQG	3		13	**3**	Used BC AWQG	3		13	**3**	Used BC AWQG	3		13	**3**	Used BC AWQG	3		13	**3**	Used BC AWQG
Nitrite	mg-N/L	0.02			**0.02**	Used BC AWQG	0.02			**0.02**	Used BC AWQG	0.02			**0.02**	Used BC AWQG	0.02			**0.02**	Used BC AWQG	0.02			**0.02**	Used BC AWQG
Sulphate	mg/L	218			**218**	Used BC AWQG	309			**309**	Used BC AWQG	218			**218**	Used BC AWQG	218			**218**	Used BC AWQG	128			**128**	Used BC AWQG
Aluminum, total	mg/L	0.35		0.1	**0.35**	Used BC AWQG	0.69		0.1	**0.69**	Used BC AWQG	0.27		0.1	**0.27**	Used BC AWQG	0.19		0.1	**0.19**	Used BC AWQG	0.18		0.1	**0.18**	Used BC AWQG
Antimony, total	mg/L	0.074			**0.074**	Used BC AWQG	0.074			**0.074**	Used BC AWQG	0.074			**0.074**	Used BC AWQG	0.074			**0.074**	Used BC AWQG	0.074			**0.074**	Used BC AWQG
Arsenic, total	mg/L	0.005		0.005	**0.005**	Used BC AWQG	0.005		0.005	**0.005**	Used BC AWQG	0.005			**0.005**	Used BC AWQG	0.005		0.005	**0.005**	Used BC AWQG	0.005		0.005	**0.005**	Used BC AWQG
Barium, total	mg/L	1			**1**	No AWQG, Used WWQG	1			**1**	No AWQG, Used WWQG	1			**1**	No AWQG, Used WWQG	1			**1**	No AWQG, Used WWQG	1			**1**	No AWQG, Used WWQG
Beryllium, total	mg/L	0.00013			**0.00013**	No AWQG, Used WWQG	0.00013			**0.00013**	No AWQG, Used WWQG	0.00013			**0.00013**	No AWQG, Used WWQG	0.00013			**0.00013**	No AWQG, Used WWQG	0.00013			**0.00013**	No AWQG, Used WWQG
Boron, total	mg/L	1.2		1.5	**1.2**	Used BC AWQG	1.2		1.5	**1.2**	Used BC AWQG	1.2		1.5	**1.2**	Used BC AWQG	1.2		1.5	**1.2**	Used BC AWQG	1.2		1.5	**1.2**	Used BC AWQG

Receiving Environment		Tenas Creek					Four Creek					Goathorn Creek					Telkwa River					Bulkley River				
Parameter	**Units**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**
Cadmium, dissolved	mg/L	0.00017			**0.00017**	Used BC AWQG	0.00023			**0.00023**	Used BC AWQG	0.00016			**0.00016**	Used BC AWQG	0.00011			**0.00011**	Used BC AWQG	0.000085			**0.00009**	Used BC AWQG
Chromium (Cr(VI)), total	mg/L		0.0025	0.001	**0.0025**	No AWQG, Used WWQG		0.0025	0.001	**0.0025**	No AWQG, Used WWQG		0.0025	0.001	**0.0025**	No AWQG, Used WWQG		0.0025	0.001	**0.0025**	No AWQG, Used WWQG		0.0025	0.001	**0.0025**	No AWQG, Used WWQG
Cobalt, dissolved	mg/L	0.00045			**0.00045**	Used BC AWQG	0.00056			**0.00056**	Used BC AWQG	0.00045			**0.00045**	Used BC AWQG	0.00039			**0.00039**	Used BC AWQG	0.00039			**0.00039**	Used BC AWQG
Copper, dissolved	mg/L	0.0026			**0.0026**	Used BC AWQG	0.0047			**0.0047**	Used BC AWQG	0.0013			**0.0013**	Used BC AWQG	0.0008			**0.0008**	Used BC AWQG	0.0011			**0.0011**	Used BC AWQG
Iron, total	mg/L	1		0.3	**1**	Used BC Acute WQG	1		0.3	**1**	Used BC Acute WQG	1		0.3	**1**	Used BC Acute WQG	1		0.3	**1**	Used BC Acute WQG	1		0.3	**1**	Used BC Acute WQG
Iron, dissolved	mg/L	0.35			**0.35**	Used BC Acute WQG	0.35			**0.35**	Used BC Acute WQG	0.35			**0.35**	Used BC Acute WQG	0.35			**0.35**	Used BC Acute WQG	0.35			**0.35**	Used BC Acute WQG
Lead, dissolved	mg/L	0.0031		0.002	**0.0031**	Used BC AWQG	0.0061		0.004	**0.0061**	Used BC AWQG	0.0026		0.002	**0.0026**	Used BC AWQG	0.0022		0.001	0.0022	Used BC AWQG	0.0022		0.001	**0.0022**	Used BC AWQG
Manganese, total	mg/L	0.94			**0.94**	Used BC AWQG	1.09			**1.09**	Used BC AWQG	0.91			**0.91**	Used BC AWQG	0.79			**0.79**	Used BC AWQG	0.73			**0.73**	Used BC AWQG
Mercury, total	mg/L	0.00002		0.000026	**0.00002**	Used BC AWQG	0.00002		0.000026	**0.00002**	Used BC AWQG	0.00002		0.000026	**0.00002**	Used BC AWQG	0.00002		0.000026	**0.00002**	Used BC AWQG	0.00002		0.000026	**0.00002**	Used BC AWQG
Molybdenum, total	mg/L	7.6		0.073	**0.034**	Used BC ruminant wildlife guideline	7.6		0.073	**0.034**	Used BC ruminant wildlife guideline	7.6		0.073	**0.034**	Used BC ruminant wildlife guideline	7.6		0.073	**0.034**	Used BC ruminant wildlife guideline	7.6		0.073	**0.034**	Used BC ruminant wildlife guideline
Nickel, dissolved	mg/L	0.003			**0.003**	Used BC AWQG	0.005			**0.005**	Used BC AWQG	0.002			**0.002**	Used BC AWQG	0.001			**0.001**	Used BC AWQG	0.001			**0.001**	Used BC AWQG
Selenium, total	mg/L	0.002		0.001	**0.002**	Used BC AWQG	0.002		0.001	**0.002**	Used BC AWQG	0.002		0.001	**0.002**	Used BC AWQG	0.002		0.001	**0.002**	Used BC AWQG	0.002		0.001	**0.002**	Used BC AWQG

Receiving Environment		Tenas Creek					Four Creek					Goathorn Creek					Telkwa River					Bulkley River				
Parameter	**Units**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**	**BC AWQG**	**BC WWQG**	**CCME WQG**	**Selected for FEAC 2025**	**Rationale**
Silver, total	mg/L	0.00005		0.00025	**0.00005**	Used BC AWQG	0.0015		0.00025	**0.0015**	Used BC AWQG	0.00005		0.00025	**0.00005**	Used BC AWQG	0.00005		0.00025	**0.00005**	Used BC AWQG	0.00005		0.00025	**0.00005**	Used BC AWQG
Strontium, dissolved	mg/L				**2.5**	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life				**2.5**	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life				**2.5**	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life				**2.5**	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life				**2.5**	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life
Thallium, total	mg/L		0.00003	0.0008	**0.00003**	No AWQG, Used WWQG		0.00003	0.0008	**0.00003**	No AWQG, Used WWQG		0.00003	0.0008	**0.00003**	No AWQG, Used WWQG		0.00003	0.0008	**0.00003**	No AWQG, Used WWQG		0.00003	0.0008	**0.00003**	No AWQG, Used WWQG
Uranium, total	mg/L		0.0085	0.015	**0.0085**	No AWQG, Used WWQG		0.0085	0.015	**0.0085**	No AWQG, Used WWQG		0.0085	0.015	**0.0085**	No AWQG, Used WWQG		0.0085	0.015	**0.0085**	No AWQG, Used WWQG		0.0085	0.015	**0.0085**	No AWQG, Used WWQG
Zinc, dissolved	mg/L	0.0071		0.014	**0.0071**	Used BC AWQG	0.0139		0.028	**0.0139**	Used BC AWQG	0.0074		0.015	**0.0074**	Used BC AWQG	0.0042		0.008	**0.0042**	Used BC AWQG	0.0039		0.008	**0.0039**	Used BC AWQG

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20240516_UEA_to%20BAT%20Team/New%20Results%20to%20BAT%20Team/BAT_Calcs_05042024/Telkwa_BAT_assessment_BCWQGused_15072025.xlsx?web=1

Notes:

* Guidelines determined by baseline receiving water quality.
** Short-term maximum BC AWQG are provided for fluoride and total and dissolved iron.
*** All chromium in baseline monitoring data is assumed to be Cr(VI)
**** The guideline for total mercury is dependent on the methyl mercury concentrations of the receiving environment, which is not measured in the baseline data. The mid-range guideline was selected, which assumes a concentration of MeHg that is 1.% of total mercury. since the lowest limit is below the detection limit of the baseline monitoring data.

3.10 Source Term Summary

The load balance considers multiple scenarios of source term combinations, based on alternative rock management strategies and ranges in geochemical source terms.

Two PAG rock exposure scenarios were considered, including a 6-month exposure period (typical exposure), and a 12-month exposure period (high case exposure). The longer exposure period simulates a scenario where the PAG rock may oxidize for a longer period, and therefore generate more soluble load that will be flushed from surfaces when placed in the management ponds.

For baseline surface water and groundwater concentrations 50th (P50) and 95th percentile (P95) source terms were developed. Specifically, seasonal surface water concentrations were applied in the model following the open water season (May to October) and the frozen winter season (November to April).

Base case and high case source terms were developed for non-PAG rock runoff, pit wall rock runoff and coal stockpile runoff. The base case uses geochemical inputs that are representative of the average bulk properties of the mine rock. The high case source term is calculated assuming the drainage from each source is in equilibrium with gypsum (i.e., sulfate concentrations are increased to gypsum saturation) and scaling up elemental concentrations assuming the base case element sulfate ratios are preserved. Additional detail on the source term derivation methods is provided in Appendix E, as well as in Okane's report specifically for the backfill Non-PAG seepage (Okane 2024).

Table 3-23 shows a summary of geochemical source terms developed for the Project where each source term represents an estimate of water quality (mg/L), or parameter loadings (kg/t of rock) contributed by a Project component. The following sections provide more detailed explanations of the source terms included in the load balance.

Table 3-23: Summary of Load Balance Source Terms

Source Term	Units	Applies to
Background Groundwater Concentration	mg/L	Groundwater inflows to open pit and Management Ponds
Background Surface Water Concentrations	mg/L	Applied to undisturbed catchments. Includes separate terms for Telkwa River, Bulkley River, Four Creek, Tenas Creek and Goathorn Creek based on two different seasons: open water season (May to October) and a winter season (November to April).
Backfill Non-PAG seepage	mg/L	Applied to the backfill in the Pit in Operations in Closure, from Okane's 2024 report. Was blended with overburden, and considered progressive cover
Non-PAG Runoff/Seepage Concentration	mg/L	Non-PAG waste rock storage piles, also applied to infrastructure pad surface areas, rail infrastructure area and CPP area. Was blended with overburden for the dams and buttresses
Coal stockpile runoff	mg/L	Applied to temporary coal stockpiles in the Rail Infrastructure area
Open pit wall runoff	mg/L	Applied to exposed open pit wall area
Processed Rock Runoff Concentration	mg/L	Applied to surface runoff volume from coal stockpiles in the Rail Infrastructure area

PAG Rock Flush Rate	kg/t	PAG waste rock backfill to Management Ponds
NAG Rock Flush Rate	kg/t	Non-PAG waste rock backfill to the Management Ponds
Coal Reject Flush Rate	Kg/t	Coal reject to the Management Ponds
Blasting Residue	mg/a	Non-PAG, PAG and coal waste rock volumes
Sewage Treatment Plant Effluent	mg/L	Applied to effluent water from sewage treatment plant into Tenas Pond

Source: Generated in report.

3.10.1 Background Water Quality

Background water quality has been monitored since at least the early 1980s. Baseline water quality monitoring specific to the Project was initiated in 2017 by ERM and has continued since. There is a considerable amount of existing surface water and groundwater quality baseline information available.

Available water quality data were reviewed in support of the EA, and statistics were developed for both surface water and groundwater. Detailed baseline water quality characterization is presented in ERM 2021, including reference to the certified laboratories that conducted sample analysis and quality assurance completed with result compilation, and were updated in 2024 with new available data up to May 2024.

Groundwater Quality

50th and 95th percentile background groundwater chemistry for wells in the Project area was used for groundwater inflows to the open pit. Total or dissolved concentrations for each parameter were applied depending on whether the WQG for the parameter applies to total or dissolved fractions. For some parameters of particular interest for the Project (namely, aluminum, chromium, copper, and iron), both total and dissolved concentrations were applied regardless of whether the WQG for the parameter applies to total or dissolved fractions.

Background groundwater chemistry is summarized in Appendix D. In processing the background and receiving water quality data, values presented as less than the method detection limit were assumed equal to the method detection limit to be conservative.

Groundwater in the overburden and bedrock wells exceed CCME WQG for fluoride on average. Groundwater exceedances of WQG for total metals are likely an artefact of high TSS concentrations and were corrected accordingly to match observed dissolved concentrations. Both overburden wells and bedrock wells exceed the BC WQG for dissolved cadmium on average.

Surface Water Quality

50th and 95th percentile background surface water quality in Tenas Creek, Four Creek, and Goathorn Creek was applied for the Tenas area, as well as excess water from overburden and topsoil stockpiles. Background surface water quality is summarized in Appendix D. The data used to produce the 50th and 95th background surface quality for the Receiving Environment used in the water and load balance model

comes from the water quality baseline study done between 2017 and 2019 (ERM 2019) and updated with water quality data up to 2024.

50th and 95th percentile background surface water quality in each of Four Creek, Goathorn Creek, Tenas Creek, Telkwa River, and Bulkley River was applied as receiving water quality for associated prediction nodes. Receiving environment water quality is summarized in Appendix D.

In processing the baseline water quality data, values presented as less than the method detection limit were assumed to be equal to the method detection limit to be conservative.

Based on grab samples, all surface water streams have occasionally exceeded the BC AWQG for total aluminum and exceedances typically occur during the spring freshet.

Based on grab samples, most surface water streams have exceeded the BC AWQG for dissolved copper, namely Goathorn Creek, Telkwa, and Bulkley River.

Based on grab samples, surface water Telkwa River, and Bulkley River have exceeded the short-term BC AWQG for total iron.

3.10.2 Non-PAG backfill Seepage Source Terms

Supporting information on the geochemical and reactive transport modelling for the Non-PAG backfill source terms can be found in Okane (2024). Concentrations accompanied by seepage rates (as described in section 3.7) were detailed for two cases, a base case representative of typical conditions and a high case for higher loadings due to higher oxidation in the backfill:

The monthly seepage flow rates and corresponding monthly concentrations can be found in Appendix E and in Okane 2024.

3.10.3 Open Pit Wall, Coal Stockpile, and Non-PAG runoff Source Terms

Estimated source term ranges for non-PAG runoff for dams and buttresses of Management Ponds and Tenas Control Ponds, coal stockpile runoff, and open pit wall runoff are summarized in Appendix E. Base case and high case source terms were developed. As described in Section 3.10, the base case uses geochemical inputs that are representative of the average bulk properties of the mine rock and the high case source term is calculated assuming the drainage from each source is in equilibrium with gypsum. Element concentrations are scaled-up in the high case assuming the base case element sulfate ratios.

Open pit wall source terms were generated for three periods throughout the life of mine based on the exposed pit wall area at the end of deposition of PAG rock in each management pond. The model conservatively incorporates a constant source term for pit wall runoff based on the maximum source term concentration for each element across the three periods. Runoff from pit wall areas is expected to be neutral throughout Operations. Modeling assumes that 95% of open pit walls will be covered by end of closure, including all areas that have the potential to become acid-generating.

Source terms for non-PAG rock, coal stockpiles and open pit walls are dissolved element concentrations. Particulate element concentrations were calculated for ponds discharging to the environment based on

an assumed TSS concentration of 35 mg/L and proportions of TSS comprised by various elements based on whole rock analysis for non-PAG and PAG rock. Total element concentrations were calculated by adding dissolved and particulate concentrations (Appendix E).

Particulates were assumed to be filtered in groundwater pathways. All groundwater loadings to downstream prediction nodes were assumed to be dissolved concentrations only.

3.10.4 PAG Rock, Coal Rejects (Processed Rock), and Non-PAG Flushing Terms

Supporting information on the derivation of flushing source terms are presented in Appendix E.

Loading from PAG rock, coal rejects and non-PAG rock used in the management pond covers is assumed to be flushed from the rock when it is placed in the management ponds into the ponded water within an average of one year of placement. Annual PAG rock and unit coal reject and non-PAG rock flushing rates were prepared for the following two scenarios:

- Typical Exposure Scenario: assuming PAG rock is stored on surface for six months.
- High Exposure Scenario: assumes PAG rock is stored on surface for 12 months.

3.10.5 Nitrogen Species derived from Blasting

Nitrogen loading from blasting with ammonium nitrate and fuel oil (ANFO) explosives was accounted for using estimates of explosive usage and the annual tonnages of waste rock. Explosive characteristics were developed based on Fergusson and Leask 1988 and SRK experience (Table 3-24). Typical ammonium nitrate and nitrogen contents, and nitrogen distribution were applied to estimate concentrations of ammonia, nitrate, and nitrite, based on volumes of waste rock reported in the mine plan. Nitrogen losses were decreased from typical values as the mine plan integrates the use of blasthole liners, which would significantly reduce the nitrogen losses in the system (conservatively by a factor of 4). Delayed release and natural attenuation of nitrogen species have not been accounted for within the water and load balance at this time to be conservative, and it is assumed that all nitrogen species are flushed from waste rock on an annual basis.

Table 3-24: Explosive demand and characteristics

Parameter	Units	Value
Powder Factor	g/m^3 waste rock	500
Explosive Loss	%	1.25[1]
Explosives Mix		
% Bulk ANFO	%	75
% Bulk Emulsion	%	25
Quantities in Ammonium Nitrate		
% Nitrogen	% of ANFO	35
Nitrogen Composition		
% Nitrate	%	87
% Nitrite	%	2
% Ammonia	%	11

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Model\EA_Modeling\TelkwaEAModel_v24.gsm

Note: [1] This value is assuming the use of blasting liners, based on a mix of ANFO (25%) and emulsion (75%)

Nitrate, nitrite, and ammonia loading were added to each Management Pond or Tenas Control Pond based on the mass of PAG or Non-PAG rock upstream of each facility.

The ANFO model assumptions accounts for operational controls and mitigation measures during blasting to reduce the potential release of blast residuals such as the use of blasting liners. A high case of 5% explosive loss is also used along with the high case source term to look at potential higher nitrogen residue released.

3.10.6 Sewage Treatment Plant

A sewage treatment plant will operate onsite and will discharge treated effluent to Goathorn Creek tributary at a rate of 5,000 m^3/year from May through September. The effluent water quality for parameters in the model are presented in Table 3-25 (Radloff 2021).

Table 3-25: Sewage Treatment Plant Effluent Water Quality

Parameter	Units	Value
Nitrate (as N)	mg-N/L	36.9
Nitrite (as N)	mg-N/L	0.1
Total Ammonia (as N)	mg-N/L	1.9

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Model\EA_Modeling\TelkwaEAModel_v24.gsm

3.11 Model Quality Assurance and Quality Control

SRK's quality assurance and quality control (QA/QC) procedures include:

- Verification that all model elements were correctly linked.
- Cross-checking of flows and source terms to ensure model elements not duplicated or missed.
- Cross-checking of model elements and mine phases to ensure the timing of events is accurate as per the EA mine plan.
- Confirmation that the inputs and assumptions were correct and consistent with other EA models.
- Verification of model functions and expressions to ensure are working as intended.
- Professional judgement and experience to evaluate if results reflect the understanding of the conceptual model.

3.12 Uncertainty, Complexity, and Conservatism

Project Case Results and Mitigation Measures

The Project Case model conditions, including the source terms and average hydrologic conditions are incorporated to simulate the expected (typical), or best estimate, based on available information. An appropriate level of conservativism was used for model assumptions as described in the sections above. Mitigation measures were incorporated into the water management plan to address impacts to water quantity or quality.

The alternative assessment cases are intended to represent the reasonable worst case, or the upper bound of expected changes to water quality and quantity. Mitigation measures have not necessarily been incorporated to address potential water quality or quantity considerations identified in the Alternative Assessment cases. Contingency planning and/or adaptive management may be more appropriate if concentrations exceed the Project Case estimates. These contingencies were modelled separately in the mitigation report (SRK 2025b) and assessed in the framework of a Best Available Technology Assessment report (SRK 2025a).

4 Model Results

Model results are presented in the following sections for all assessment cases described in Section 2.4.2.

Results are grouped into sub-sections on water quantity and water quality.

4.1 Project Water Quantity Results

4.1.1 Water Cover

Water balance results are used to determine whether the minimum water cover thickness of 0.5 m during PAG placement can be maintained in all Managements Ponds within 6-months of PAG rock placement and 1.5 m for the rest of the life of mine and closure. The depth of the water cover 30 days after rock placement is also predicted.

Water cover results for each relevant assessment case area summarized in the following sections.

Project Case

Monthly average water cover results for the Project Case are presented in Figure 4-1, including the PAG rock elevation (red), the water surface elevation (black), the monthly average water cover depth (green) and the 30-day lagged water cover depth (blue). A temporary (4-month) reduction in NMP water cover occurred in the winter of 2024 due to the small footprint of the Project at that time. Water in EMP and WMP is stored there prior to adding PAG, but is quickly drawn back to between 0.5 m and 1.0 m for operational purposes during PAG placement. Water is occasionally pumped from Tenas Control Pond to NMP, EMP and WMP while PAG is being placed to maintain water cover, but these pumping events are infrequent. Since the duration of low water cover in NMP is less than 6 months (duration of exposure in source terms), and the water cover is not depleted, results show that the minimum water cover can be maintained in operation and closure. The 30-day lagged water cover is always above 1.0 m under average conditions outside of PAG placement. The system is sufficiently robust for average conditions.

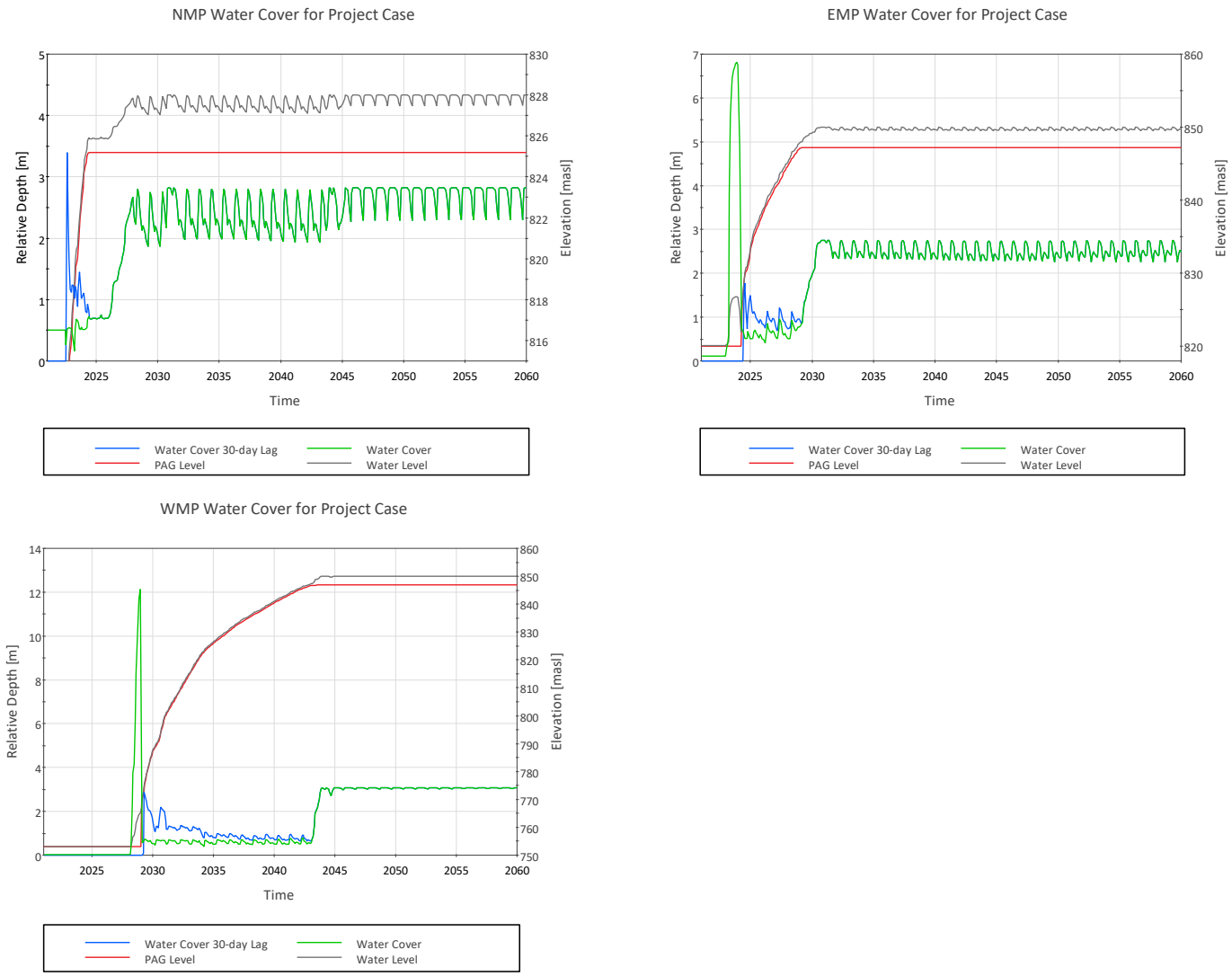


Figure 4-1: Monthly Average Water Cover in Management Ponds for Project Case

Source: CAPR002055 Telkwa Project general EA Support\Internal\Water Balance Modelling\Model\202309_Updated EA Case\2025_submitted_modelresults\TelkwaEAModel_v40_UEA_new hydro_updatedSTs_newGW_BCresults.gsm

Alternative Case 1

Water cover thickness results for Alternative Case 1, with groundwater seepage rates that represent maximized hydraulic conductivity in the groundwater model, are presented in Figure 4-2 for each Management Pond. Like Project Case results, a short-term low water cover period is observed in the NMP during 2024, while the minimum 1.0 m thickness is maintained in all other years throughout operation and closure outside of PAG placement. The 30-day lagged water cover is always above 0.5 m during PAG placement and 1.5 m after completion of the management pond.

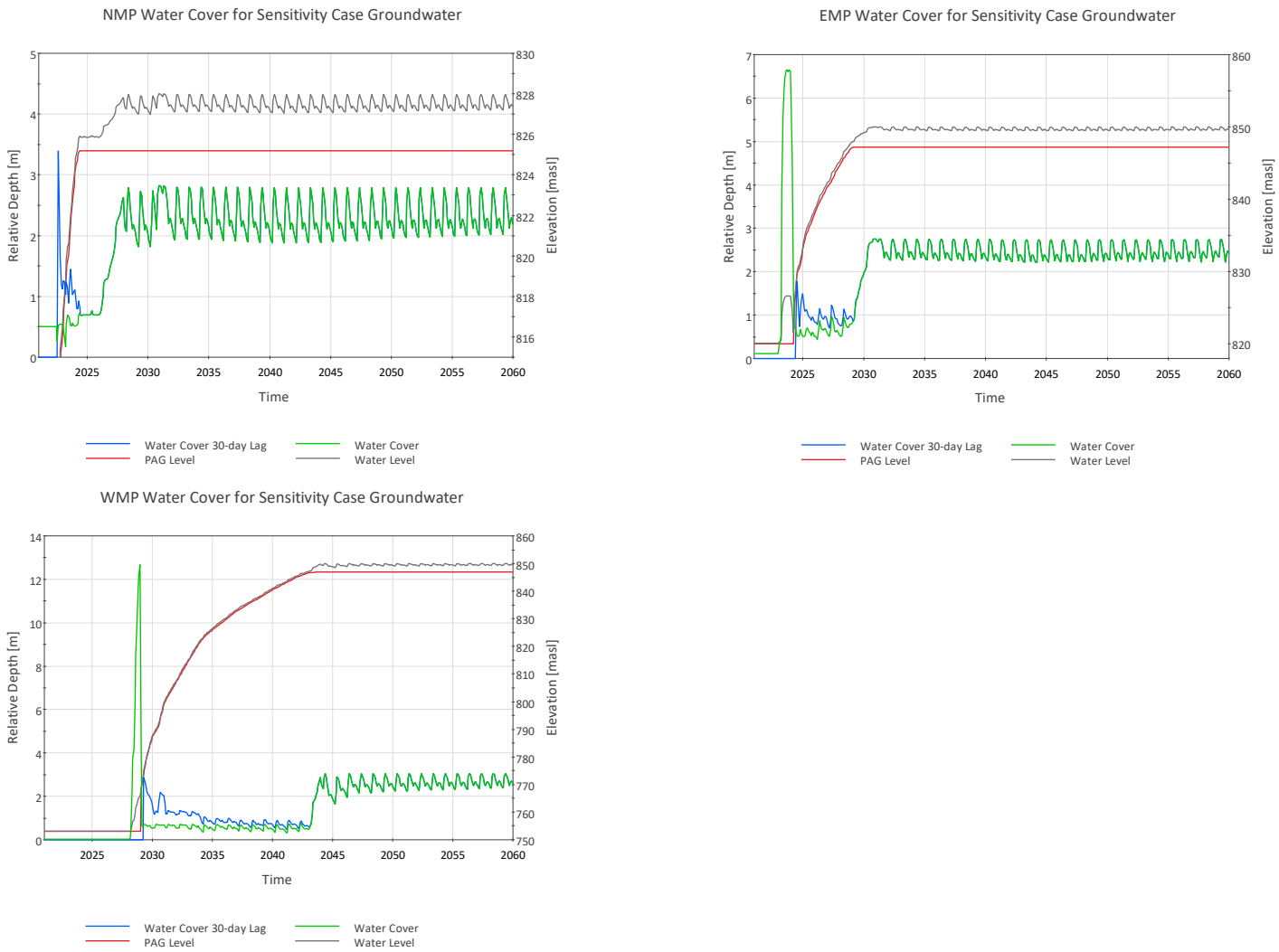


Figure 4-2: Monthly Average Water Cover in Management Ponds for Alternative Case 1 for Groundwater Seepage Loss with increased hydraulic conductivity

Source: : CAPR002055 Telkwa Project general EA Support\Internal\Water Balance Modelling\Model\202309_Updated EA Case\2025_submitted_modelresults\TelkwaEAModel_v40_UEA_newhydro_updatedSTs_newGW_Alt1results.gsm

Alternative Case 3

Alternative Case 3 applies three consecutive 100-year dry precipitation conditions to the Project area. An early Operations period was evaluated (Figure 4-3) as well as a late Operations period (Figure 4-4), for years 2022 through 2024 and 2041 through 2044, respectively. Results show the 10-year operating period around each scenario.

The early Operations period is more critical than the late Operations period. The water cover in the NMP is less than 0.5 m for multiple months in early 2024. In this scenario, the Tenas Control Pond is discharging to Goathorn Creek in May 2024 during freshet. As an operational decision water could be stored to provide additional water cover. In the event of an extreme period of dry years, contingency pumping of 2.5% from Goathorn Creek may also be enabled to provide water supply which has been provided in the model. During these prolonged dry periods, the 30-day lagged cover remains greater than 0.5 m. At no time would PAG rock be directly exposed. For this reason, and accounting for alternative pumping sources or storage of water during freshet, the water management system is sufficiently robust to meet management objectives under the extreme dry scenario considered.

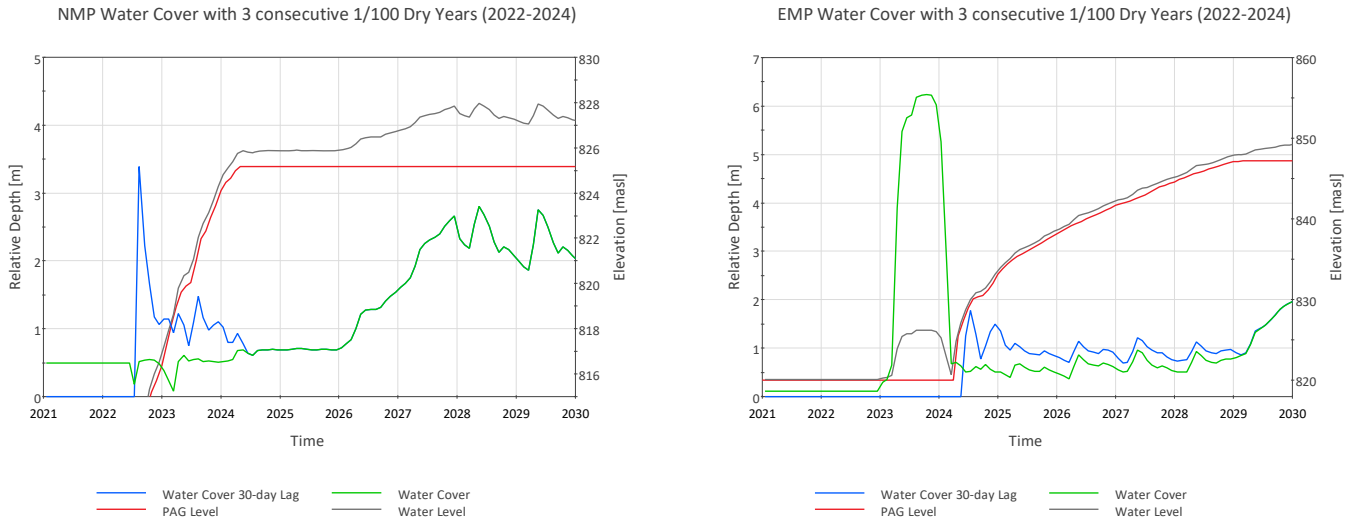


Figure 4-3: Monthly Average Water Cover in Management Ponds for Alternative Case 3 with Three Consecutive 100-year Dry Years in Early Operations (2022-2024)

Source: : CAPR002055 Telkwa Project general EA Support\Internal\Water Balance Modelling\Model\202309_Updated EA Case\2025_submitted_modelresults\TelkwaEAModel_v40_UEA_newhydro_updatedSTs_newGW_Alt3aresults.gsm

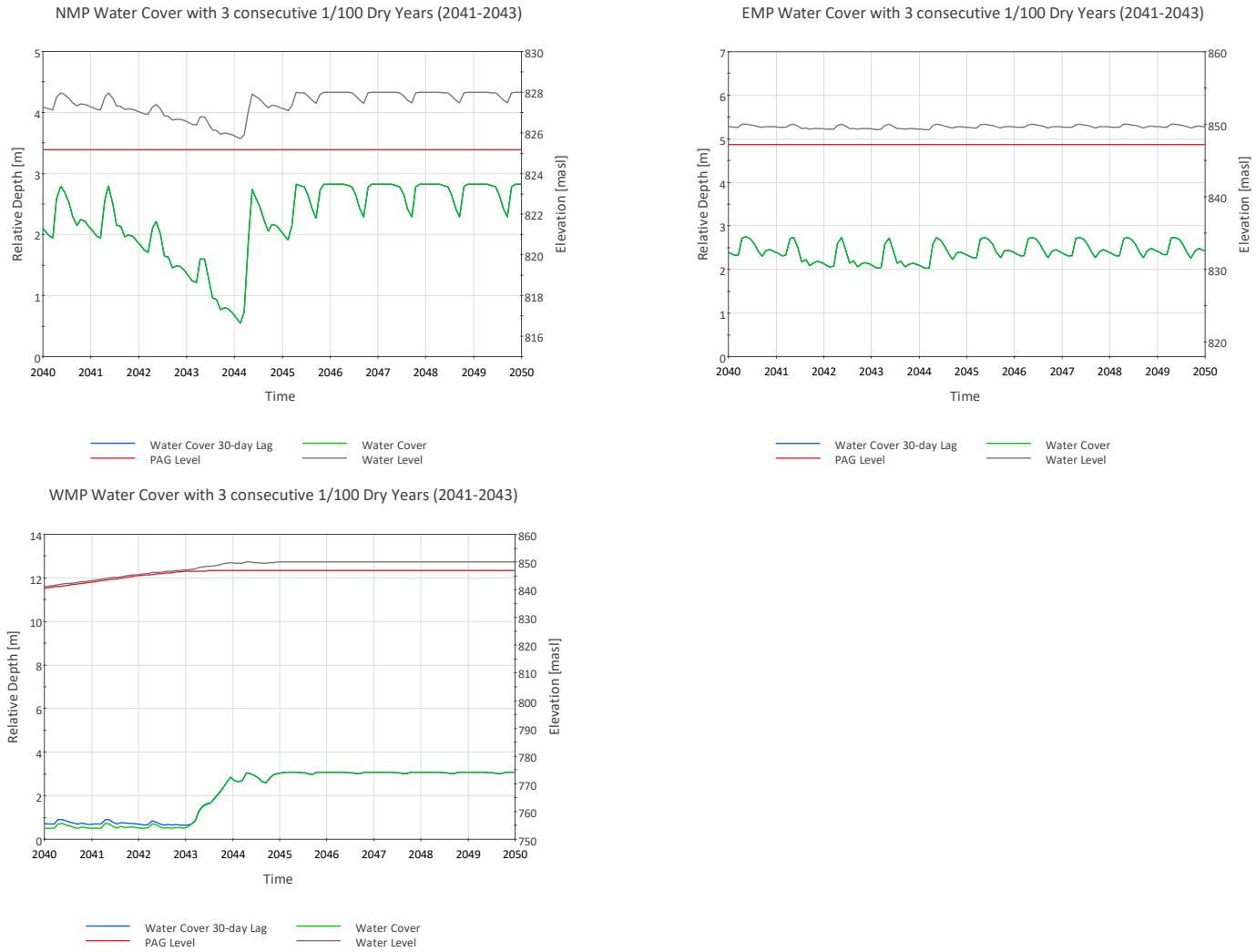


Figure 4-4: Monthly Average Water Cover in Management Ponds for Alternative Case 3 with Three Consecutive 100-year Dry Years in Late Operations (2041-2043)

Source: : CAPR002055 Telkwa Project general EA Support\Internal\Water Balance Modelling\Model\202309_Updated EA Case\2025_submitted_modelresults\TelkwaEAModel_v40_UEA_new hydro_updatedSTs_newGW_Alt3bresults.gsm

Alternative Case 6

Stochastic modeling of climatic variables (temperature and precipitation) over the life of mine was also used to test the robustness of the water management system. On each timestep (daily), the WGEN climate model selects a precipitation, daily maximum and daily minimum temperature value based on historical statistics. A total of 100 realizations of the full mine life were simulated. The statistical distribution of modelled simulations from the Monte Carlo simulation are presented in Figure 4-5, including the 1%, 50% and 99% percentile of results. Note that the plots were cropped to 2050 for ease of presentation, however the full closure period was simulated to 2100. Water cover fluctuations beyond 2050 are like those observed from 2045 to 2050, without being depleted below the 1.0 m minimum thickness.

Results indicate that temporary reductions in water cover below the 1.0 m target are plausible in the Management Ponds, however these periods are less than 6 months in duration and the water cover is never fully depleted (to 0 m thickness). Like Alternative Assessment 3, alternative water supply sources may be incorporated as mitigation measures throughout the operational period if extreme dry conditions persist. Water covers are maintained at the 99% result level in closure.

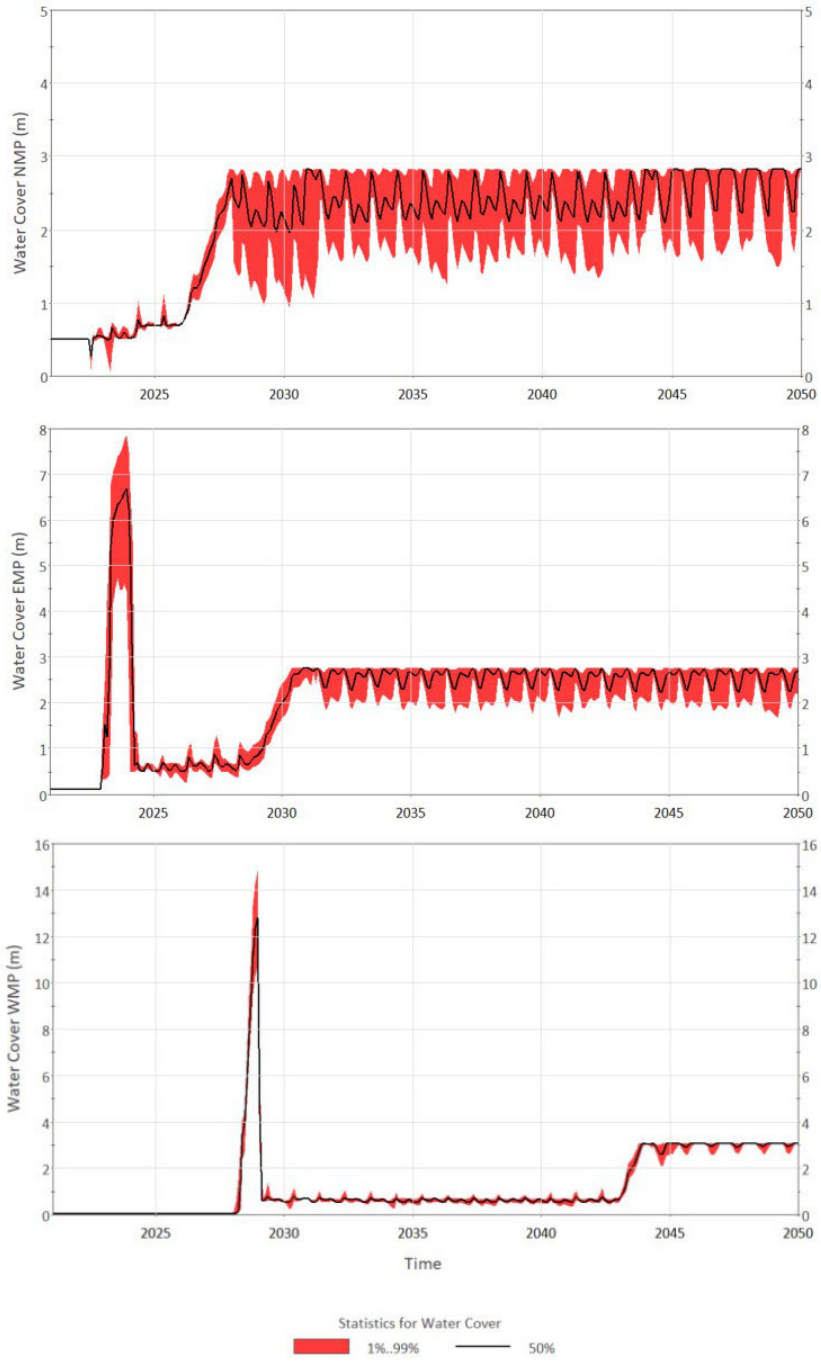


Figure 4-5: Monthly Average Water Cover in Management Ponds for Alternative Case 6 with Stochastic Climate, including the 1%, 50% and 99% Results

Source: : CAPR002055 Telkwa Project general EA Support\Internal\Water Balance Modelling\Model\202309_Updated EA Case\2025_submitted_modelresults\TelkwaEAModel_v40_UEA_new hydro_updatedSTs_newGW_Alt6results.gsm

Additional Sensitivity Analyses

Other sensitivity analyses included:

- An upper-case evaporation analysis was modelled where Management Pond water covers were left without soil and rock covers. This increased evaporation rates to the full open-water values, instead of 25% reduction (as described in Section 3.4.4). Results show that the water cover requirements are still achieved in all three management ponds under average hydrologic conditions.
- The capture efficiency of the diversion channel upstream of the East Management Pond was assumed to be 80%, which results in 20% of upstream runoff contributing to the pond's water cover in perpetuity. A case was modelled assuming 100% diversion efficiency, which reduces the inflows to the water cover. In this case and under average hydrologic conditions, the minimum water covers are maintained.

4.1.2 Process Water Supply

The Open Pit Sump is the primary source of process water for the CPP at a rate of approximately 500 m^3/day. Under Project Case conditions, process water supply is met year-round throughout the operation period. Tenas Control Pond is a back-up source for process water supply but is never needed under average conditions.

Alternative Assessment Case 6 was used to test process water supply under variable annual climatic conditions. Results presented in Figure 4-6 show that water supply can be met even under extreme dry conditions. No water needs to be drawn from Tenas Control Pond under variable annual climate conditions. The 2.5% contingency of water withdrawal from Goathorn Creek was also not required.

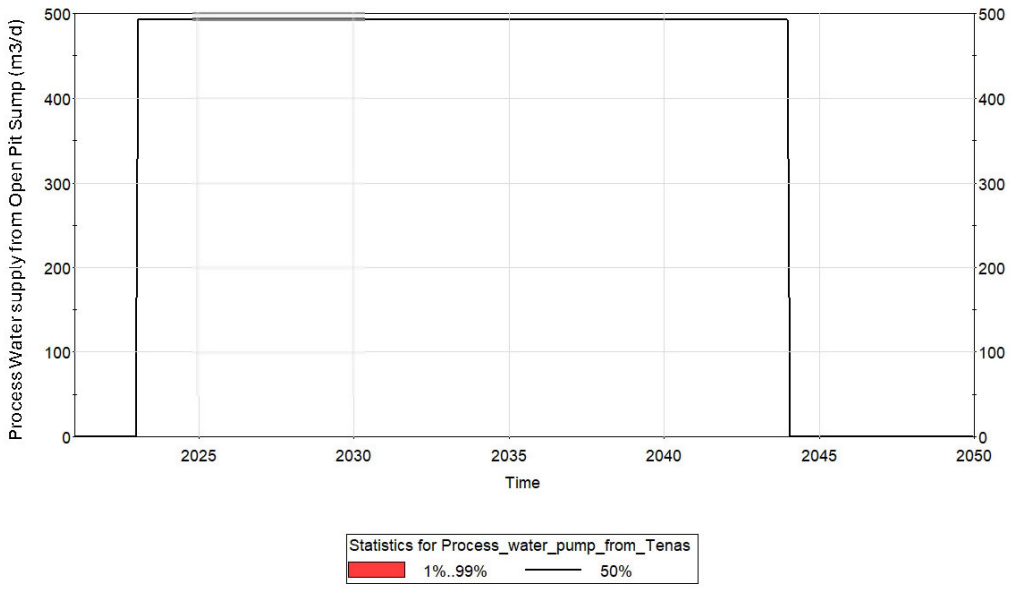


Figure 4-6: Monthly Average Process Water Supply in Alternative Assessment Case 6 with Stochastic Climate, including the 1%, 50% and 99% Results

Source: : CAPR002055 Telkwa Project general EA Support\Internal\Water Balance Modelling\Model\202309_Updated EA Case\2025_submitted_modelresults\TelkwaEAModel_v40_UEA_new hydro_updatedSTs_newGW_Alt6results.gsm

4.1.3 Project Discharge

Tenas Control Pond, the Rail Infrastructure Sedimentation Pond, and the North Management Pond. discharge surface water to the receiving environment (Table 4-1).

Table 4-1: Summary of Discharging Facilities Throughout Life of Mine

Project Facility	Means of Discharge	Receiving Environment	Active Project Stage
Tenas Control Pond	Pump or spillway	Tributary of Goathorn Creek	Construction, Operation, Closure and Reclamation
Rail Infrastructure Sedimentation Pond	Pump of spillway	Tributary of Bulkley River	Construction, Operation
North Management Pond	Spillway	Tributary of Goathorn Creek	Post-Closure

Source: Prepared in text.

The monthly average discharge rates and annual total discharge volumes for the Project Case, Alternative Assessment Cases 4 and 7 are presented in Table 4-2. For Alternative Assessment Case 4, the consecutive wet periods were applied to years where the discharge would be maximized for each facility. In the case of the Tenas Control Pond, maximum discharge occurs in early Operations when the Project water storage capacity is minimized. For the North Management Pond, maximum discharge occurs near the end of the Post-closure model period, when climate change effects to precipitation are maximized and available storage is minimized.

Table 4-2: Project Facility Discharge Rates

Assessment Case	Project Facility		
	Tenas Control Pond	Rail Infrastructure Sedimentation Pond	North Management Pond
Project Stage	Operation and Closure Reclamation	Operation and Construction	Post-Closure
Maximum Monthly Discharge Rates [m³/day]			
Project Case	22,000	240	26,300
Alt Case 4: 3 Wet Years (1) (2)	24,700	240	25,700
Alt Case 7: 10% increased precipitation	24,300	260	28,800
Maximum Annual Discharge Volume [m³]			
Project Case	1,741,000	21,200	1,494,000
Alt Case 4: 3 Wet Years (1)	2,181,000	24,800	1,849,000
Alt Case 7: 10% increased precipitation	2,054,000	23,600	1,775,000
Average Annual Discharge Volume [m³]			
Project Case	1,139,400	19,600	1,342,400

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Project_discharge_EASubmitted_20250717.xlsx?web=1

Notes:

1. Three consecutive wet years (approximately the 1 in 10-year wet return period) applied to most critical period, depending on the structure. For Tenas Control Pond and Rail Infrastructure Pond, critical period is 2028-2030 when EMP starts overflowing into NMP, which in turns fills Tenas Control Pond and higher discharge rate, while the critical period is 2068-2070 for North Management Pond which only discharges to environment in Post-closure.
2. The maximum monthly discharge rate is higher for an average year vs 1/10 wet year due to the timing of the precipitation in both representative years chosen. This is because precipitation during the freshet months is higher in the average year but are higher later in the year for the 1./10 wet year throughout the open-water season. However, the maximum annual discharge is higher for the 1/10 wet year vs the average year.

The Tenas Control Pond pumping rate to the tributary for Goathorn Creek was 15,000 m³/day between May and October. The maximum discharge in the Project Case exceeds the pumping rate, which means the spillway is used during Operations. The overflow occurs during spring freshet (May) when the EMP is also overflowing.

The NMP only discharges to the tributary of Goathorn Creek in Post-closure after the Tenas Control Pond has been decommissioned. It discharges over the closure spillway. Highest flows occur in April (i.e. spring freshet).

Changes to Goathorn Creek and Bulkley River from the Project discharges are discussed in Section 4.3.

4.2 Project Water Quality Results

Modelled water quality in the sedimentation ponds and Management Ponds are a function of the following loading sources:

- PAG, Non-PAG, and processed rock loading rates based on volume of rock placed in the Management Ponds per year.
- Water pumped from the open pit, which includes open pit wall runoff and non-PAG rock backfill seepage.
- Natural runoff.
- Seepage from Non-PAG rock and overburden in Management Pond dams and buttresses.

Results were screened against water quality guidelines in the receiving environment. Results were also compared to receiving water baseline water quality statistics. The Management Ponds void water results are compared to baseline statistics and the stream water quality guidelines for which most seepage from a specific management pond is received. Specifically, North Management Pond is compared to Goathorn Creek, East Management Pond is compared to Four Creek, and West Management Pond is compared to Tenas Creek. The Tenas Control Pond is compared to Goathorn Creek water quality guidelines and baseline statistics as surface water from site are directly discharged to Goathorn Creek, as well as results for water contained in the water cover of the Management Ponds. The Rail Infrastructure Sedimentation Pond is compared to the Bulkley River water quality statistics and guidelines.

Monthly average and maximum concentrations are presented for winter and summer periods. Winter is the 6-month period from November to April (frozen conditions). Summer is from May to October (open-water season). Ponds decommissioned during closure and reclamation are only evaluated during Operations. Ponds that operate through Post-closure are evaluated during Operations and closure. Results are presented in Appendix G for Project Case conditions and for alternative assessment cases.

The following parameters were identified as Parameters of Concern (POCs) in the framework of the Best Achievable Technology (BAT) Assessment report (SRK 2025a) as these had maximum monthly values in the effluent end of pipe (surface water discharge or groundwater seepage) equal to or higher than 80% of the water quality guideline calculated for the receiving stream, for the Final EAC Project Case (2024), also called Project Case:

- Nitrate-nitrogen
- Nitrite-nitrogen
- Sulfate
- Aluminum total
- Cadmium dissolved
- Cobalt dissolved
- Copper dissolved
- Iron total
- Molybdenum total
- Nickel total
- Selenium total

- Thallium total[3]
- Zinc dissolved

4.2.1 Management Ponds

The Management Ponds do not discharge directly to the environment during Operations. The Management Ponds discharge excess water via pumps and spillways to the Tenas Control Pond (discussed in Section 4.2.2).

Figure 4-7 and Figure 4-8 present the modelled concentrations of total selenium and nitrate, respectively, in each Management Pond over time for the Project Case, including the water quality in the water cover (solid lines) and the water quality in the rock voids (dashed lines). Results for other parameters are presented in Appendix G (Tables G1-G9), and are compared to water quality guideline for each stream, as outline in Section 4.2.

As discussed in Section 3.4, the water cover and water in rock voids within each Management Pond were modelled as two separate reservoirs. The water cover quality fluctuates seasonally (Figure 4-7). Concentrations increase as PAG rock is added but decrease because of dilution during freshet (May). The water quality in the voids is more constant throughout the year. Peak concentrations in each Management Pond occur near the end of each ponds' operation, prior to the placement of Non-PAG and overburden rock covers. A secondary spike occurs in the NMP from the WMP near the end of Operations. After PAG rock and processed rock placement is complete, the water cover quality in WMP is mainly due to the load received from the Pit backfill, which continues to produce load for the remainder of the modelling period (Okane 2024). Dilution of the void water concentrations (Figure 4-7) occurs more slowly, based on the lower flushing rate controlled by seepage to groundwater. The water quality in the voids is used for seepage water quality to downstream prediction nodes. The travel times from the pond to downgradient receivers is approximately 25-years (see Section 3.8.3).At the end of Operations when Tenas Control Pond has been decommissioned, the NMP will discharge to a tributary to Goathorn Creek.

Other POCs are described in Appendix G (Tables G1-G9).

[3] Thallium total was identified after the BAT report was produced as this is a newly updated BC AWQG (March 2025)

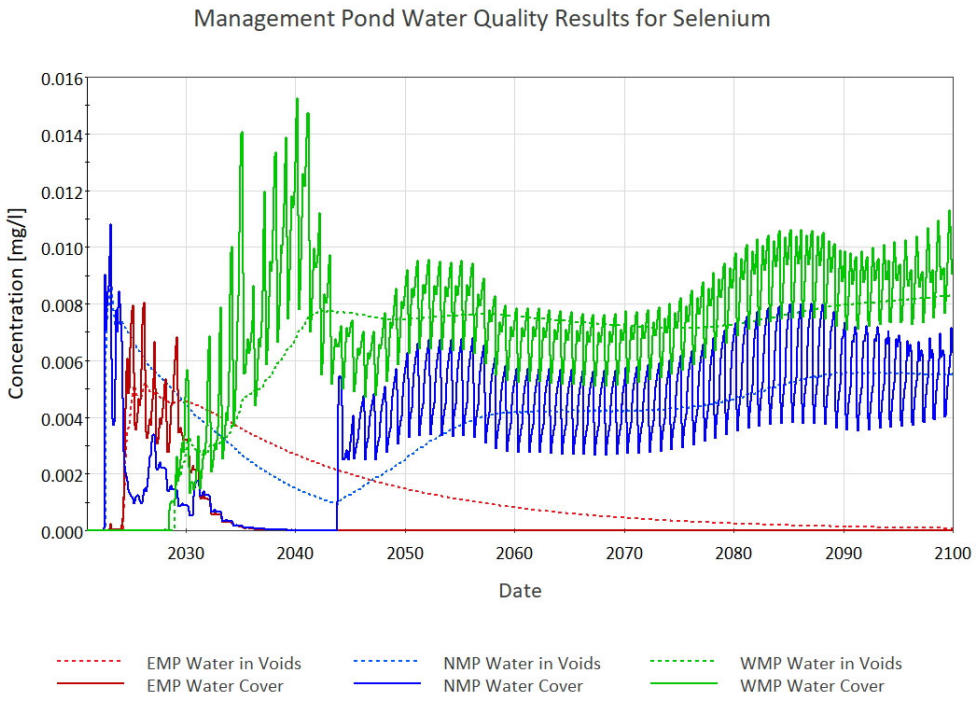


Figure 4-7: Management Pond Total Selenium Results for Project Case

Source: https://srk.sharepoint.com/:f:/s/NACAPR002055/Etr0F_6Ta99CoZITrRJypV0BGK97wtulX609l8LLiQTzXA?e=qNt9UM

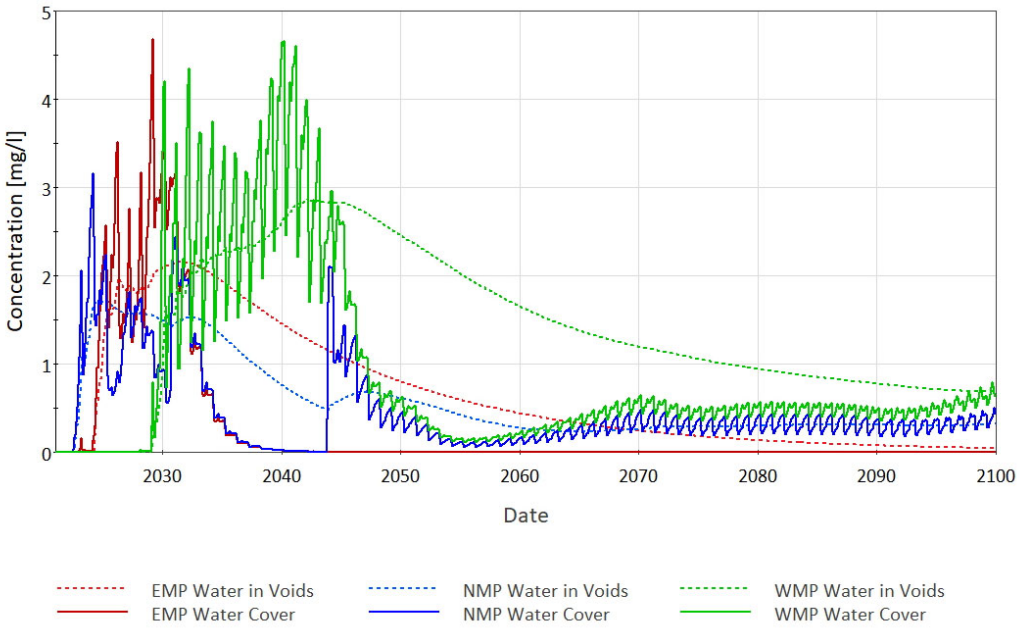


Figure 4-8: Management Pond Nitrate-Nitrogen Results for Project Case

Source: https://srk.sharepoint.com/:f:/s/NACAPR002055/Etr0F_6Ta99CoZITrRJypV0BGK97wtulX609l8LLiQTzXA?e=qNt9UM

4.2.2 Tenas Control Pond

The Tenas Control Pond will discharge to a tributary of Goathorn Creek during Operations until it is decommissioned. Since the Tenas Control Pond is assumed to be fully mixed, the water quality of any seepage is expected to be equal to the pond water quality, and therefore separate seepage water quality is not presented. Water quality results for the Tenas Control Pond are presented in Appendix G. Figure 4-9 and Figure 4-10 present Tenas Control Pond total selenium and nitrate-nitrogen concentrations, respectively. The water volume is also shown in both figures. Results extend through 2050, which includes the pond dewatering period. Tenas Control Pond will be dewatered in 2048 and is decommissioned by 2050.

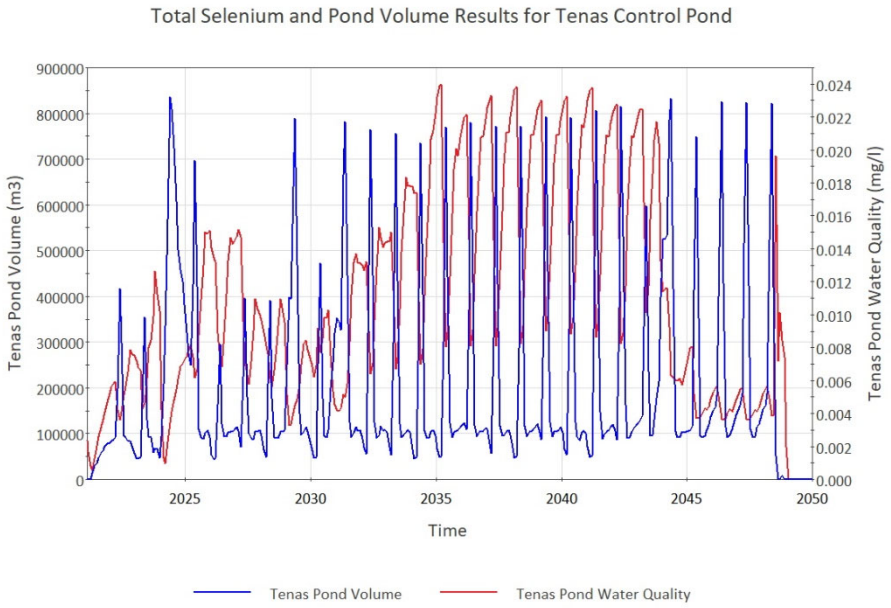


Figure 4-9: Tenas Control Pond Volume and Total Selenium Concentration in Tenas Control Pond

Source: https://srk.sharepoint.com/:f:/s/NACAPR002055/Etr0F_6Ta99CoZITrRJypV0BGK97wtulX609l8LLiQTzXA?e=qNt9UM

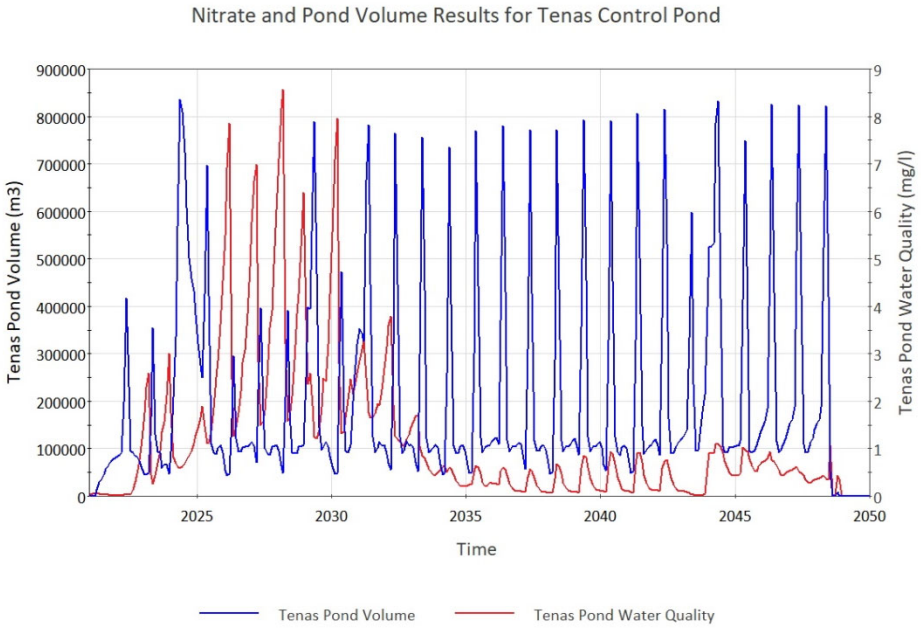


Figure 4-10: Tenas Control Pond Volume and Nitrate-Nitrogen Concentration in Tenas Control Pond

Source: https://srk.sharepoint.com/:f:/s/NACAPR002055/Etr0F_6Ta99CoZITrRJypV0BGK97wtulX609l8LLiQTzXA?e=qNt9UM

Selenium concentrations increase over time in the Tenas Control Pond as the volume of PAG and Non-PAG rock in the Project's footprint expand to maximum extent. Seasonal fluctuations occur.

Concentrations are lowest in freshet (May) each year. The Tenas Control Pond volume is highest during freshet (Figure 4-9). While the selenium concentrations are higher than the water quality guideline for Goathorn Creek, (0.002mg/L), no selenium exceedances are found in the receiving environment (see Section 4.4). Peak concentrations for selenium is 0.023 mg/L towards the end of Operations.

Nitrate-nitrogen concentrations are highest in the first 15 years of Operations after the construction of the Management Pond dams and buttresses. The peak concentration is approximately 8 mg/L, which occurs over winter months when the pond doesn't discharge. The concentration in Tenas Control Pond is above the water quality guideline for nitrate (WQG = 3 mg/L), but never exceeds when discharged in the receiving environment.

Other POCs are described in Appendix G.

4.2.3 Rail Infrastructure Sedimentation Pond

Modelled water quality in the Rail Infrastructure Sedimentation Pond is a function of processed coal rock source terms, with dilution from runoff and direct precipitation. The pond is decommissioned in closure. Pond concentrations increase in the summer months from evaporation. Average water quality in the pond in summer and winter during Operations are summarized and compared against WQG calculated for Bulkley River in Appendix G. Changes to the Bulkley River are discussed in Section 4.4. No exceedances of WQG are expected because of Rail Infrastructure Sedimentation Pond discharges. Figure 4-11 presents the modelled total selenium concentrations at the Rail Infrastructure Sedimentation Pond. Applying the processed coal rock source terms to the full pad area is conservative because coal isn't stockpiled for long before being loaded on a train. It is not likely to oxidize.

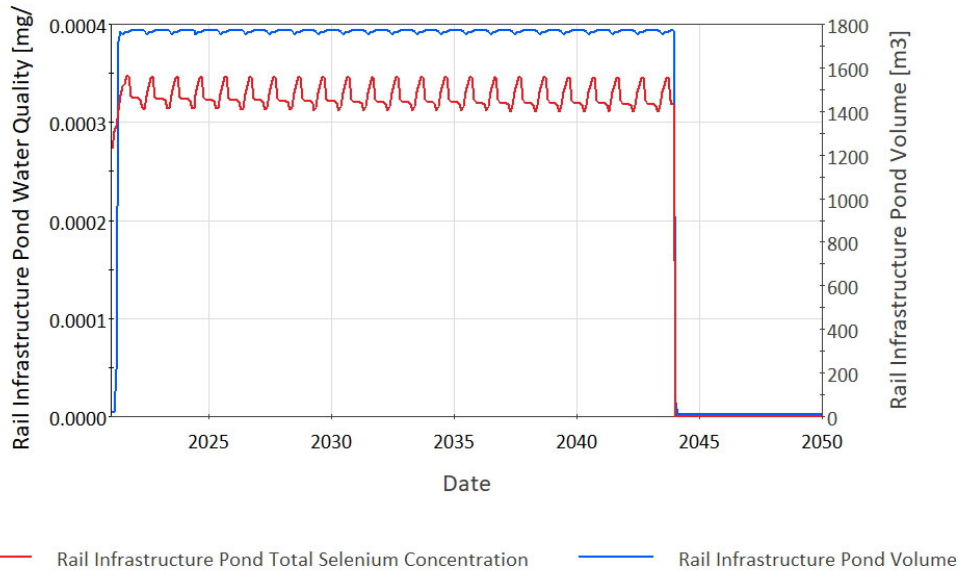


Figure 4-11: Total Selenium Concentration in Rail Infrastructure Sedimentation Pond for Project Case

Source: https://srk.sharepoint.com/:f:/s/NACAPR002055/Etr0F_6Ta99CoZITrRJypV0BGK97wtulX609l8LLiQTzXA?e=qNt9UM

4.2.4 Alternative Assessment Cases

The only alternative assessment case which affects the pond water quality is Case 2, using high geochemical source terms. Table 4-3 compares the maximum monthly water quality in each operating facility for the Project Case and Alternative Assessment Case 2 model conditions. Results for other parameters in Case 2 are presented in Appendix G (Figures G-1 to G-5 and Tables G1-G9), including time series plots of results, similar to those presented in Section 4.2.1, 4.2.2 and 4.2.3.

Table 4-3: Project Water Selenium Results for Project Case and Alternative Assessment Case 2 with High Source Terms

Facility	Maximum Monthly Total Selenium Concentration [mg/L]	
	Project Case	Alt Case 2: High Source Terms
WMP	0.015	0.048
EMP	0.008	0.026
NMP	0.011	0.034
Tenas Control Pond	0.024	0.049
Rail Infrastructure Sedimentation Pond	0.00035	0.008

Source: compiled in the text.

While Selenium concentrations are higher than the water quality guideline (WQG total selenium = 0.002 mg/L) in the effluents, no exceedances are found in the streams in the Project Case (see section 4.4). Discussion for the Alternative cases affecting stream water quality can be found in Section 4.4.2.

Table 4-4: Project Water Nitrate-Nitrogen Results for Project Case and Alternative Assessment Case 2 with High Source Terms during Operations

Facility	Maximum Monthly Nitrate-Nitrogen Concentration [mg/L]	
	Project Case	Alt Case 2: High Source Terms
WMP	4.7	17
EMP	4.7	19
NMP	3.2	13
Tenas Control Pond	8.6	34
Rail Infrastructure Sedimentation Pond	/	/

Source: compiled in the text.

While nitrate concentrations are higher than the water quality guidelines (WQG nitrate = 3mg/L) in the effluent, no exceedances are found in the streams (see section 4.4).Monthly maximum concentrations for other POCs are summarized in tables for the facilities in Appendix G. While these POCs are exceeding their respective water quality guidelines in the effluent, the only exceedances found in the streams for the Project Case is dissolved copper in Goathorn Creek, which is naturally high in the background concentrations and would be similar without the Project's impact. Other results for the Alternative Cases affecting the water quality in the stream can be found in Section 4.4.2.

4.3 Change to Streamflow

The relative change between streamflow for each assessment case and the Pre-Mining Case were calculated using the monthly average water balance model result time series.

Results are discussed in relation to change to mean annual discharge (MAD), seasonal flow distribution, and high and low flows.

4.3.1 Project Case Results for Mean Annual Discharge

The change to mean annual discharge was evaluated using the following thresholds:

- 10% decrease from mean annual discharge.
- 30% increase from mean annual discharge.

The water quantity thresholds were selected based on the BC Environmental Flow Needs environmental risk management framework, which uses a 10% reduction or withdrawal from streamflow as an indicator of stream sensitivity for fish habitat (BC ENV, 2016).

Table 4-5 presents the maximum increase, average change and maximum decrease in MAD based on the Project Case relative to Pre-Mining Case for each Project Stage. Yellow highlighted cells identify prediction nodes and Project stages where an increase in streamflow exceeds 30% and orange highlighted cells identify prediction nodes where streamflow is reduced by more than 10%. Results indicate whether a net increase or net decrease is not expected for a node or Project stage as not applicable (n.a.).

Table 4-5: Percent Change in Mean Annual Discharge for Project Case Relative to Pre-Mining Case, including Maximum Increase, Maximum Decrease and Average Change, over each Project Stage

		% Change in Mean Annual Discharge relative to Base Case Conditions								
		Construction			Operation			Post-Closure		
Stream	Node	Maximum Increase	Average Change	Maximum Decrease	Maximum Increase	Average Change	Maximum Decrease	Maximum Increase	Average Change	Maximum Decrease
Tenas Creek	WQS01	n.a	0.0%	0.0%	n.a	0.0%	0.0%	n.a	0.0%	0.0%
	WQS02	n.a	0.0%	0.0%	n.a	-1.5%	-1.6%	n.a	-1.4%	-1.4%
	WQS22	n.a	0.0%	0.0%	n.a	-6.3%	-6.9%	n.a	-5.9%	-6.1%
	WQS04	n.a	0.0%	0.0%	n.a	-7.3%	-7.9%	n.a	-6.1%	-6.3%
Four Creek	WQS03	n.a	0.0%	0.0%	n.a	-1.0%	-1.5%	n.a	-0.9%	-1.1%
	WQS21	n.a	-0.1%	-0.1%	48.3%	37.2%	-0.1%	34.2%	33.8%	n.a
	WQS20	n.a	-0.1%	-0.1%	46.8%	35.3%	-0.1%	32.3%	31.9%	n.a
	WQS03_DS	n.a	-0.1%	-0.1%	2.8%	-15.1%	-24.2%	n.a	-19.2%	-19.3%
Goathorn Creek	WQS13	n.a	0.0%	0.0%	n.a	0.0%	0.0%	n.a	0.0%	0.0%
	WQS06_US	n.a	0.0%	0.0%	n.a	0.0%	0.0%	0.0%	0.0%	0.0%
	WQSEA1	n.a	0.0%	0.0%	2.7%	1.6%	n.a	1.6%	1.2%	n.a
	WQS06	n.a	0.0%	0.0%	2.7%	1.5%	n.a	1.6%	1.2%	n.a
	WQS05	n.a	0.0%	0.0%	0.8%	-1.5%	-2.2%	n.a	-1.5%	-2.0%
Telkwa River	WQS09	n.a	0.0%	0.0%	0.1%	-0.2%	-0.4%	0.1%	0.0%	-0.1%
Bulkley River	WQS11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	WQS12	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	n.a	0.0%	0.0%

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_ChangetoMAD_20250722_CCM.xlsx?web=1

Note: n.a. (not applicable) values represent prediction nodes which do not experience a net increase or net decrease over Pre-Mining conditions

The maximum percent decrease to MAD is greater than 10% at downstream Four Creek node, WQS03DS, and increases by more than 30% in the Four Creek prediction nodes WQS20 and WQS21 during the operation and Post-closure Project stages. Figure F-1 in Appendix F presents a time series of the annual change to mean annual discharge throughout the modelled period at Four Creek prediction nodes.

All other streams are not expected to have greater than 10% reduction to MAD.

4.3.2 Project Case Results for Seasonal Flow Distribution

Changes to seasonal flow distribution are evaluated for each node and Project stage. Results discussed below focus on Four Creek prediction nodes, where MAD could decrease by at least 10% or increase by more than 30%.

Table 4-6 presents the monthly variability of the change in streamflow at Four Creek for the Project Case relative to the Pre-Mining Case, while the results through the life of mine are plotted in Figure F-2 in Appendix F. Results highlight the monthly maximum, average and minimum percent change in monthly streamflow throughout each Project stage.

Table 4-6: Four Creek Project Case Streamflow Monthly Change over Pre-Mining Case

Scenario		Four Creek Monthly % Change Relative to Pre-Mining Case											
		WQS03			WQS21			WQS20			WQS03DS		
Period	Month	Maximum Increase	Average	Maximum decrease	Maximum Increase	Average	Maximum decrease	Maximum Increase	Average	Maximum decrease	Maximum Increase	Average	Maximum decrease
Construction	January		-0.16			-0.3			-0.6			-1.0	
	February		-0.19			-0.4			-0.7			-1.2	
	March		-0.15			-0.3			-0.6			-0.9	
	April		0.00			0.0			0.0			0.0	
	May		-0.02			0.0			-0.1			-0.1	
	June		-0.05			-0.1			-0.2			-0.3	
	July		-0.07			-0.2			-0.3			-0.5	
	August		-0.19			-0.4			-0.7			-1.2	
	September		-0.18			-0.4			-0.7			-1.1	
	October		-0.22			-0.5			-0.8			-1.4	
	November		-0.32			-0.7			-1.2			-2.0	
	December		-0.33			-0.7			-1.3			-2.1	
Operations	January	-	-17.5	-29.1	-	-19.7	-33.6	-	-19.2	-32.1	-	-3.2	-5.0
	February	-	-17.6	-29.2	-	-19.8	-33.6	-	-19.3	-32.1	-	-3.2	-5.0
	March	-	-12.1	-19.0	8.7	-2.4	-13.3	7.7	-2.6	-12.9	-	-6.8	-9.1
	April	-	-0.2	-0.3	49.9	37.6	0.0	48.4	35.7	0.0	4.8	-14.4	-24.7
	May	-	-0.4	-0.6	49.9	37.3	0.0	48.3	35.4	-0.1	2.7	-14.6	-24.8
	June	-	-2.3	-4.8	49.8	35.1	-0.1	48.1	33.2	-0.2	0.7	-15.0	-24.9
	July	-	-4.3	-7.7	49.6	32.7	-0.2	47.6	30.9	-0.3	-	-15.5	-24.7
	August	-	-11.3	-20.0	44.8	20.0	-5.3	42.5	18.6	-5.6	-	-13.3	-19.7
	September	-	-9.4	-17.0	48.1	22.3	-3.2	45.7	20.8	-3.6	-	-13.4	-21.2
	October	-	-11.6	-18.3	26.5	9.6	-6.2	24.7	8.7	-6.3	-	-11.0	-15.8
	November	-	-18.3	-28.4	-	-20.1	-32.5	-	-19.6	-31.1	-	-3.6	-6.6
	December	-	-18.7	-29.7	-	-21.0	-34.4	-	-20.4	-32.8	-	-3.1	-5.0
Post-Closure	January	-	-18.8	-22.7	11.3	-13.6	-25.0	11.2	-11.8	-22.3	4.0	-0.5	-10.3
	February	-	-21.9	-22.7	-	-21.7	-25.0	-	-19.2	-22.3	4.0	2.7	-4.2
	March	-	-12.8	-14.0	4.0	1.5	-1.8	4.4	2.1	-0.9	-	-6.4	-7.4
	April	-	-0.2	-0.2	35.0	35.0	-	33.0	33.0	-	-	-19.5	-19.5
	May	-	-1.5	-2.8	34.2	33.5	-	32.3	31.6	-	-	-19.3	-19.4
	June	-	-3.2	-4.2	32.7	31.7	-	31.0	30.0	-	-	-19.0	-19.2
	July	-	-5.4	-6.6	30.4	29.2	-	28.9	27.9	-	-	-18.5	-18.8
	August	-	-14.6	-15.8	20.9	13.1	-	20.4	13.1	-	-	-11.5	-15.5
	September	-	-11.9	-13.6	25.3	15.8	-	24.4	15.5	-	-	-12.4	-17.4
	October	-	-11.1	-11.9	17.2	15.9	-	16.8	15.6	-	-	-13.1	-13.7
	November	-	-4.4	-9.9	32.5	26.6	-	30.7	25.3	-	-	-16.6	-18.7
	December	-	-12.7	-22.7	23.0	7.9	-25.0	22.1	8.1	-22.3	4.0	-9.1	-15.1

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm?web=1

Notes:

Construction stage is only 1.5 years in duration. Results reflect maximum monthly percent change for months which occur twice in the construction period.
Blank rows represent periods where an increase or decrease in flows is not expected based on model results.

Monthly streamflow during Operations in Four Creek (WQ03, WQS21, WQS20 and WQS03DS) decrease by up to 34% and increase up to 48% (Table 4-6). Diversion channels and mine plan optimizations reduced the Project's footprint as much as practical. However, the open pit and the Management Ponds route water that would normally flow to Four Creek towards Goathorn Creek via the Tenas Control Pond discharge. This reduces the catchment area for Four Creek while the C02 channel diversion increases the catchment area.

Monthly flow in Four Creek varies from upstream to downstream (Table 4-6). WQS21 and WQS20, located adjacent to the East Management Pond, gain flow, or lose insignificant flow during open water season months. During the winter, flow at these locations decreases. Flow at WQS03DS decreases year-round during Operations. This decrease is most apparent during the open water season months.

The causes of these changes in flow are:

- Winter flow at WQS03, WQS20 and WQS21 decreases from the drawdown of the groundwater table by the adjacent open pit. Flow decreases proportionally to the expansion of the open pit (Table 4-6). At closure, the open pit is backfilled and floods. The groundwater table rises but not to pre mining levels. Post-closure flow is lower in Four Creek than baseline conditions.
- WQS03DS is located downstream of the open pit and the East and North Management Ponds. The drawdown of the groundwater table by the open pit is countered by the mounding of groundwater under the East and North Management Ponds. Water seeps from these Management Ponds to the Four Creek in the long-term during Post-closure. Accounting for both conditions, there is still a net reduction of winter streamflow in Operations and a net increase in winter streamflow after mine closure.
- A diversion channel south of the East Management Pond will direct undisturbed surface runoff towards Four Creek throughout Operations and Post-closure. In the Pre-Mining case, this area would report to Four Creek downstream of the outlet of the proposed C02 channel, increasing surface runoff in the upstream portion of the creek (e.g., WQS20 and WQS21). The increased flow in the upstream prediction nodes (WQS20 and WQS21) is highest in early Operations when the catchment area reporting to the diversion channel is largest. As the footprint of the open pit expands, the diversion's catchment area decreases and flow decreases. At closure, a portion of the backfilled open pit will drain towards the diversion channel, increasing open-water season flow by approximately 30% long-term. These percent changes assume 100% of the diverted area reports to Four Creek, however the hydraulic designs include a flow control structure which will limit erosion from individual flow events up to the 1 in 10-year event (SRK 2021a).
- Downstream (e.g., WQS03DS), the effect of the diversion partially mitigates the reduction of streamflow. The catchment area reduction is reduced from pre-mining conditions in Operations and Post-closure.

Appendix F includes the results for prediction nodes in other streams (Table F-1, Table F-2, and Table F-3 for Tenas Creek, Goathorn Creek, Telkwa River and Bulkley River, respectively).

Tenas Creek flow may decrease by up to 11% during low flow periods (April and August) in Operations because of groundwater drawdown and catchment area reductions. The seepage from Management

Ponds counters some of this flow reduction by the end of Operations and into Post-closure. The maximum monthly flow is just 3% less than average monthly flow.

Goathorn Creek flows are expected to be reduced by up to 8% during low flow periods in Operations. Flows downstream of the Project discharge may also increase by up to 6% in Operations and 11% after closure due to routing of water that would otherwise have reported to the Tenas Creek catchment.

The Project may reduce monthly average flows in the Telkwa River downstream of Goathorn Creek by less than 2% in Operations and an increase of 1% in Post-closure due to seepage from Management Ponds. Bulkley River monthly streamflow changes are negligible (less than 0.1%).

4.3.3 Project Case Results for High and Low Flows

The changes to high and low flow were evaluated using Alternative Assessment cases 4 and 5 at each modelled node. Summary tables with results for Alternative Assessment cases are presented in Appendix F.

High Flows and Alternative Assessment Case 4: Three Consecutive Wet Years

In general, the relative change to high flows is driven by the relative change to stream catchment area. As such, high flows are reduced at prediction nodes and stream sections where the catchment area (and MAD as presented in Section 4.3.1) decreases.

The catchment area will increase for two prediction nodes on Four Creek, downstream of the C02 channel discharge. A control structure has been designed to mitigate high flows in Four Creek at prediction nodes WQS20 through WQS21 in Four Creek from C02 high runoff conditions (SRK 2021d).

Discharge from Tenas Control Pond in Operations and North Management Pond in Post-closure may also increase streamflow in Goathorn Creek. This was assessed in Alternative Assessment Case 4 with three consecutive wet years (1 in 10-year wet return periods) to examine the expected discharge rates under more extreme conditions. The results show a potential increase over baseline streamflow of 13% at WQSEA1 and 2% further downstream at WQS05 during spring freshet (Table F-4, Appendix F). Further downstream in the Telkwa River, the change relative to baseline is negligible under consecutive wet years.

The Tenas Control Pond will provide additional attenuation up to the 1 in 10-year flood event, reducing the peak flows in tributaries to Goathorn Creek and downstream in Goathorn Creek. This attenuation has not been incorporated into the water and load balance model but is expected to reduce the expected change in streamflow in Goathorn Creek during high flow events.

Low Flows and Alternative Assessment Case 5: 7Q10 Low Flow

Seasonally flow is lowest in the winter when streamflow is primarily baseflow (i.e., groundwater discharge). The annual low flow is most sensitive to changes in groundwater table and the stream's catchment area. Alternative Assessment Case 5 was also included to evaluate changes to 7Q10 flow rates in stream prediction nodes. Change to low flows are presented in Table F-5 (Appendix F) for each

Project stage, based on the minimum monthly average flow projected for modelled conditions and the most downstream node on each stream.

Extreme low flows are expected to be lower than Pre-Mining conditions by the same percentage as monthly average baseflow. Low flows in Four Creek and Tenas Creek downgradient of the open pit could be reduced by 54% and 7% respectively.

4.3.4 Other Alternative Assessment Cases

Results for the alternative assessment cases are presented in Appendix F and summarized in Table 4-7. Alternative Assessment Case 1 (see Section 2.4.2) is the sensitivity groundwater seepage case. Streamflow changes are likely in Four, Tenas and Goathorn creeks but these changes are negligible in the Telkwa River and Bulkley River (Appendix F, Tables F-6 to F-10 and Figure F-3).

Table 4-7: Summary of Change to Streamflow for Alternative Assessment Cases

Alternative Assessment Case	Stream	Prediction nodes Affected	Project-related Effects
Case 1: High Groundwater Seepage	Four Creek	WQS21 WQS20	Reduction in winter streamflow equal to 100% from drawdown of groundwater table from open pit (Table F-6 and F-7)
	Tenas Creek	WQS22 WQS04	Reduction to MAD remains less than 10%, however monthly flow during Operations decreases more than 10% for the winter months (Table F-6 and F-8) with maximum increases of 30% also for the winter months. Similar effects are also seen in Post-closure.
Case 4: Consecutive Wet Years (High Flow)	Goathorn Creek	WQSEA1, WQS06 WQS05	Increased Project discharge rates to Goathorn Creek, increase the maximum monthly over baseline streamflow by of 13% at WQS06 and 2% further downstream at WQS05 (Table F-4)
Case 5: Low Flow	Four Creek	WQS03DS	Extreme low flows are expected to be reduced over Base Case conditions by the same percentage as monthly average baseflow (Table F-5)
	Tenas Creek	WQS04	

Source: this table was compiled in the text

4.4 Change to Stream Water Quality

Water quality model results in the receiving environment are presented in summary tables by node and are screened against the natural variability within each stream and the selected WQG.

Results are presented as monthly average and maximum concentrations in winter (November through April) and summer (May to October) to demonstrate seasonal variability. Results are colored red where the average or maximum monthly water quality is expected to exceed the applicable guideline value.

Baseline data (50th and 95th percentile from monitoring results) were also compared against the applicable guideline value.

Appendix G provides each prediction node summary table under the Project Case conditions, as well as for other assessment cases,

The only parameters exceeding water quality guidelines under the Project Case are dissolved cobalt in Four Creek for a period of four years in Post-closure, which did not exceed in the water quality baseline data, and dissolved copper in Goathorn Creek and total aluminum in Telkwa River, which are known to be elevated and exceed water quality guidelines in the baseline data.

Note that water quality results are only presented for prediction nodes that are located downstream of the Project (i.e., receiving discharge or seepage). Prediction nodes upstream of interactions are expected to continue to have baseline or pre-mining water quality. Similarly, prediction nodes on Four Creek and Tenas Creek only experience a change in stream water quality after closure, resulting from Management Ponds seeping to groundwater. For these prediction nodes, only the Post-closure water quality results are presented, and operations water quality is expected to equal baseline conditions. Goathorn Creek, Telkwa River and Bulkley River prediction nodes include operation water quality to express the change from expected Project discharges.

4.4.1 Project Case Results

Chemical constituents (or parameters) were identified in this section if the maximum monthly average concentrations from the model results exceeded the water quality guideline in any month. Summary tables present the prediction nodes which exceed, along with the average long-term winter and summer concentrations and the baseline 50th and 95th percentile concentrations. Results are presented for water quality parameters in Appendix G.

The following general observations can be made for changes in concentrations in the receiving streams:

- Higher concentrations of parameters for which the source is mining (e.g. sulfate, cobalt, selenium, nitrate) occur more frequently during the winter months from seepage discharge to the receiving environment(s) during periods of low flow, and therefore low dilution / assimilation capacity.
- Similarly, an increase in concentrations for parameters for which the source is mining are driven by seepage from the Management Ponds and occur at prediction nodes along Tenas Creek and Four Creek located downstream of the West, North and East Management Ponds.
- The stream concentrations peak approximately 25 years after the peak concentrations are expected in each Management Pond, reflecting the delay in seepage migration described in Section 3.8.3.
- The dissolved cobalt exceedance found in Four Creek occurs only in Post-closure and for a duration of four years. There are no exceedances in the stream expected during Operations. Only the prediction nodes downstream of infrastructure (WQS03DS in Four Creek) experience changes to water quality in these systems, for a few years only.
- Increase to Goathorn Creek water quality parameter concentrations from the Project impacts occur from Project discharge during Operations and typically are only a single month. The only WQG

exceedance recorded in Goathorn Creek is dissolved copper and its source is mainly from background loading. The Project contribution to the load is less than 1% during the exceedance months.

- Model results for total aluminum and dissolved copper in Telkwa show exceedances of the water quality guideline. Like Goathorn Creek, the source of both parameters is the background loading, with the Project's contribution even lower at less than 1%. Furthermore, the Project does not have exceedances for total aluminum in Goathorn Creek.

Dissolved Cobalt

The water quality guideline for dissolved cobalt is 0.00056 mg/L in Four Creek, which is exceeded in Closure for maximum monthly values calculated for the winter months, occurring for four years in the model results. Average winter conditions show modelled results below the water quality guideline. Table 4-8 summarizes the exceedances of WQG for dissolved cobalt.

Table 4-8: Dissolved cobalt Exceedances for Project Case Conditions

Node	WQG [mg/l]	Background Concentration [mg/l]		Project Case Modelled Concentrations [mg/l]				Max Multiplier (2)	Project Stage (1)
		P50	P95	Max Summer	Max Winter	Long-term Average Summer	Long-term Average Winter		
Four Creek									
WQS03_DS	0.00056	0.000050	0.00014	0.00052	0.00063	0.00017	0.00019	1.1	PC

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm?web=1

Figure 4-12 presents the modelled dissolved cobalt concentrations for prediction nodes that exceed the WQG in the Project Case.

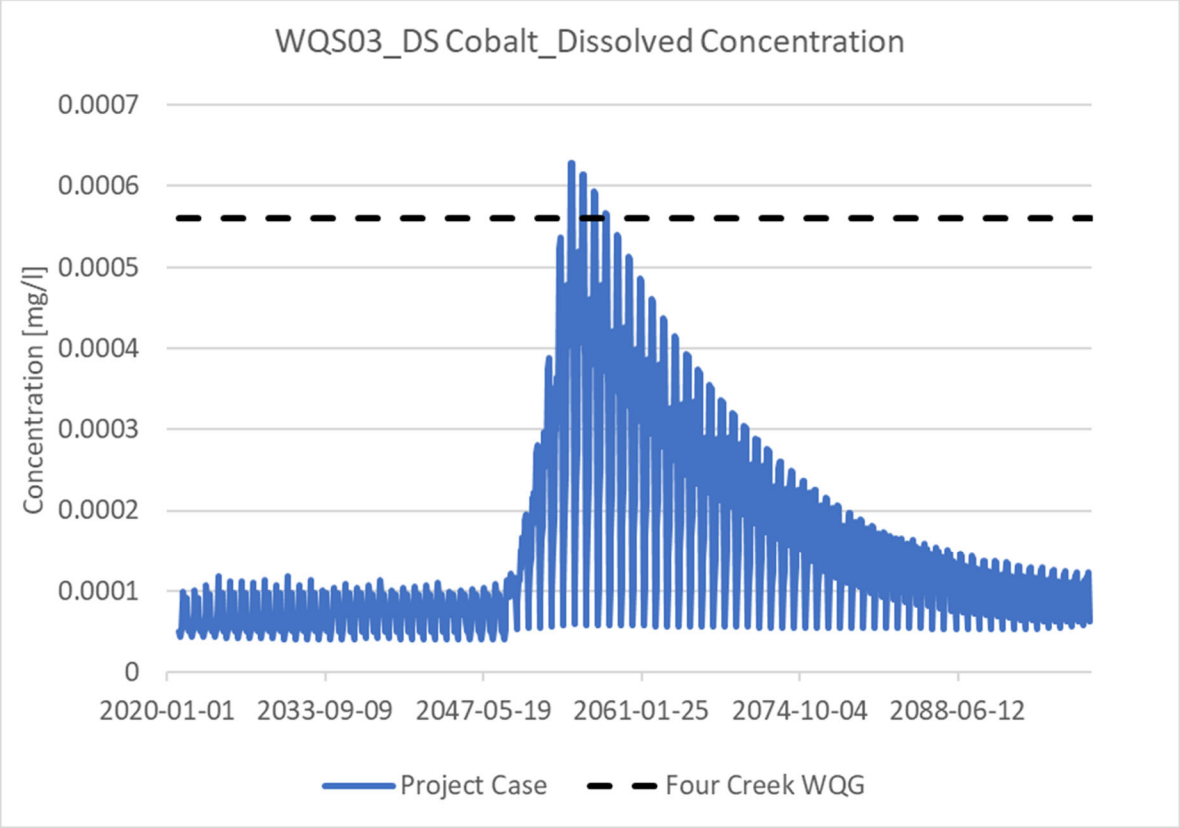


Figure 4-12: Modelled Dissolved cobalt Concentrations for Prediction nodes with Exceedances of WQG in Project Case.

Dissolved Copper

The water quality guideline for dissolved copper is 0.0013mg/L in Goathorn Creek, which is exceeded in Operations and Closure for maximum monthly values calculated for summer and winter months. Average winter conditions show modelled results below the water quality guideline, likely driven by lower P50 background concentrations for that season. Table 4-9 shows exceedances in the baseline data for copper in Goathorn by up to 4 times the WQG for the 95th percentile baseline data in the winter and the summer, and exceedance equal to the WQG for the 50th percentile baseline data in the summer months. The load from the Project contributing to the dissolved copper modelled results is less than 1% of the total load found in the Goathorn Creek.

The water quality guideline for dissolved copper is 0.0008mg/L in the Telkwa River, and it is also exceeded in Operations and Closure, only in the summer months with the maximum monthly model results. Like Goathorn Creek, the Project contributes less than 1% of the load for copper in the Telkwa River. The 95th percentile values from the baseline data exceed by up to 2 times the WQG in the summer and winter months.

Table 4-9 summarizes the exceedances of WQG for dissolved copper.

Table 4-9: Dissolved copper Exceedances for Project Case Conditions

Node	WQG [mg/l]	Background Concentration [mg/l]				Project Case Modelled Concentrations [mg/l]				Max Multiplier (2)	Project Stage (1)
		P50 summer	P50 winter	P95 summer	P95 winter	Max Summer	Max Winter	Long-term Average Summer	Long-term Average Winter		
Goathorn Creek											
WQSEA1	0.0013	0.0013	0.0010	0.0034	0.0041	0.0016	0.0010	0.0014	0.00092	1.2	CN, OP, PC,
WQS06	0.0013	0.0013	0.0010	0.0034	0.0041	0.0017	0.0014	0.0014	0.00099	1.3	
WQS05	0.0013	0.0013	0.0010	0.0034	0.0041	0.0019	0.0022	0.0016	0.0016	1.5	
Telkwa River											
WQS09	0.0008	0.0007	0.0005	0.0017	0.0011	0.00080	0.00056	0.00073	0.00054	1.0	CN, OP

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm?web=1

Notes

1. Project stage acronyms: PC=Post-Closure, OP=Operations, CN=Construction
2. Maximum exceedance multiplier is a ratio of the maximum monthly water quality result over the water quality guideline (WQG)
3. Results are highlighted in red where they exceed the water quality guideline.

Figure 4-13 presents the modelled dissolved copper concentrations for prediction nodes that exceed the WQG in the Project Case.

Figure 4-13: Modelled Dissolved copper Concentrations for Prediction nodes with Exceedances of WQG in Project Case.

Source:
https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm?web=1

Total Aluminum

The WQG for total aluminum is 0.192 mg/l, which is exceeded in Telkwa River during the summer, likely driven by high TSS values which result in higher background concentrations. Table 4-10 summarizes the exceedances for total aluminum. As noted in the table, the background concentrations from the baseline data exceed for the 50th and 95th percentile values in the summer by up to 10 times the WQG, and the 95th percentile values in the winter months by 1.5 times the WQG. The Project contributes less than 1% of the load for total aluminum in the model results for the Telkwa River.

Table 4-10: Total aluminum Exceedances for Project Case Conditions

Node	WQG [mg/l]	Background Concentration [mg/l]				Project Case Modelled Concentrations [mg/l]				Max Multiplier (2)
		P50 summer	P50 winter	P95 summer	P95 winter	Max Summer	Max Winter	Long-term Average Summer	Long-term Average Winter	
Telkwa River										
WQS09	0.19	0.25	0.04	1.8	0.34	0.26	0.050	0.24	0.036	2.0

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm?web=1

Notes:

1. Project stage acronyms: PC=Post-Closure, OP=Operations, CN=Construction
2. Maximum exceedance multiplier is a ratio of the maximum monthly water quality result over the water quality guideline (WQG)
3. Results are highlighted in red where they exceed the water quality guideline.

Figure 4-14 presents the modelled total aluminum concentrations for prediction nodes that exceed the WQG in the Project Case.

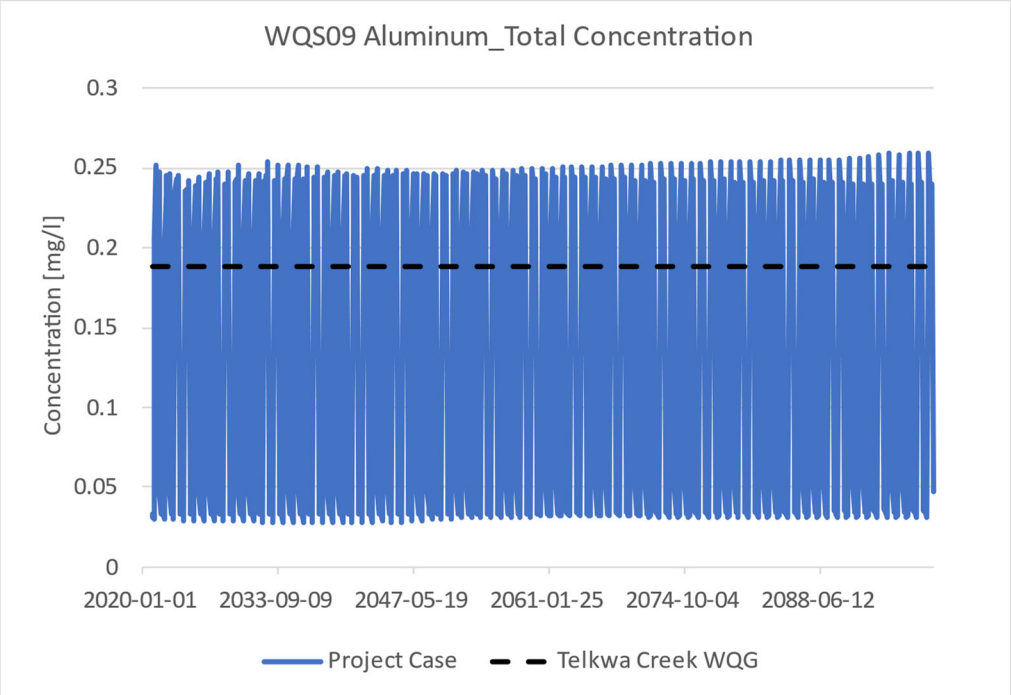


Figure 4-14: Modelled Total Aluminum Concentrations for Node WQS09 with Exceedances of WQG in Project Case

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm?web=1

Additional Observations

Total aluminum baseline 95th percentile concentrations for all streams (Four, Tenas, Goathorn Creeks as well as Telkwa and Bulkley River) are above the WQG. Four Creek 95th percentile baseline concentrations for dissolved iron are also above the WQG. The 95th percentile baseline concentrations for total iron are above WQG for Telkwa and Bulkley River. Dissolved copper 95th percentile baseline concentrations are above the WQG in Goathorn Creek, Telkwa River and Bulkley River.

4.4.2 Alternative Assessment Case Results

Alternative assessment cases include upper and lower range inputs for groundwater, geochemical source terms and hydrology. Each alternative input has been assessed on an individual basis with expected conditions (Project Case) for other parameters. Results focus on the prediction nodes and critical modeling periods associated with each case and are presented in Appendix G, tables G-10 though G-27.

Table 4-11 summarizes the additional changes to water quality under the alternative assessment cases. Results are described in the following sub-sections.

Table 4-11: Water Quality Exceedances under Alternative Assessment Cases

Alternative Assessment Case	Streams Affected	Additional Exceedances (Prediction nodes)	Comments
Case 1: High Groundwater Seepage	N/A	N/A	Despite increased seepage rates from Management Ponds, no additional exceedance is found in Four Creek or Tenas Creek. Decreased concentrations found in Four Creek as decreased groundwater seepage from open pit.
Case 2: High Source Terms	Tenas Creek, Four Creek, Goathorn Creek	Nitrite-Nitrogen (FC-03DS) Dissolved cobalt (FC-03DS, TC-22,04, GC-EA1,06,Ops only, GC-05 Ops and Closure) Total Selenium (FC-03DS, TC-22,04, GC-EA1,06,05 Closure only)	Critical period during low flow (winter months) in closure when Management Pond seepage dominates streamflow
Case 3: Consecutive Dry Years	no change expected	no change expected	Addressed with Low Flow scenario (Case 5). No results presented
Case 4: Consecutive Wet Years	Goathorn Creek only	no new exceedances	Expected Increased Project discharge rate to Goathorn Creek during critical period during EMP overflow, which increases freshet discharge in 2030. No results presented
Case 5: Low Flow	Four Creek	Nitrite-nitrogen (FC-03DS) Dissolved Cobalt (FC-03DS) Dissolved Nickel (FC-03DS) Total Selenium (FC-03DS)	All additional exceedances are driven by groundwater seepage from Management Ponds and effect the Four Creek downstream prediction nodes the most. Overall increases the average long-term values, but the not the monthly maximum values in the winter
Case 7: increased precipitation (10%)	no change expected	no new exceedances	Checked to see if additional exceedances from increased discharge

Notes:
FC = Four Creek, TC = Tenas Creek, GC = Goathorn Creek, TR = Telkwa River, BR = Bulkley River
Prediction nodes identified for each parameter represent additional exceedances beyond what is expected under Project Case conditions.

Alternative Assessment Case 1: High Case Groundwater

Appendix G tables G-10 through G-27 present the stream concentrations under high case groundwater seepage rates for prediction nodes that are downstream of Project facilities. Results reflect a combination of higher seepage rates from the Management Ponds and higher drawdown from the open pit, resulting in an increase in load at some prediction nodes and a decrease in flow at others. This case results in no flow in the upstream Four Creek prediction nodes WQS20 and WQS21 during the winter.

Despite increased load in Tenas Creek, no additional exceedance is recorded in this case. Water quality in the downstream node at WQS03DS in Four Creek improves relative to baseline because of the overall reduction in streamflow from open pit drawdown.

Alternative Assessment Case 2: High Source Terms

Case 2 applies high case geochemical source terms. Appendix G tables G-10 through G-27 present the monthly maximum and average long-term concentrations throughout relevant Project stages.

Additional parameters that exceed the WQG beyond what was exceeded in Project Case conditions include dissolved cobalt, total selenium, and nitrite-nitrogen.

The high source terms are expected to result in exceedances of the total aluminum WQG as well as dissolved copper WQG as it was already exceeding in the Project Case, but both remain below the 95th percentile for baseline datasets.

Additionally, dissolved cobalt is exceeded in new streams for this alternative Case besides Four Creek: it exceeds in Tenas Creek downstream of the Project (WQS22 and 04) in Closure, as well as in Goathorn Creek during Operations (WQSEA1, WQS06 and WQS05) as well as in Closure in WQS05 only.

High source term results are incorporated as the worst-case as part of the initial dilution zone modeling for Goathorn Creek downstream of the Project discharge (SRK 2025c) and in groundwater effects assessment and the Human Health effects assessment.

Alternative Assessment Case 4: Three Consecutive Wet Years (2028-2029-2030)

Three 1 in 10-year wet year precipitation scenarios were repeated in year 2028, 2029 and 2030, to simulate a period where we see the highest discharge during Operations, namely when East Management Pond is full. This results in the maximum Project discharge to Goathorn Creek when water quality is expected to be its worst for most parameters. In this scenario, no additional exceedances beyond what was presented in Project Case were observed.

Alternative Assessment Case 5: Low Flow Conditions

Case 5 assumes that streams experience the 7Q10 low flow condition year-round. Results presented in Appendix G tables reflect maximum concentrations from the model results.

Additional parameters that exceed the WQGs beyond what was exceeded in Project Case conditions include: nitrite, dissolved cobalt, dissolved nickel and, total selenium.

Downstream Four Creek prediction nodes present these exceedances when compared to water quality guidelines for the stream.

Low flow conditions are also evaluated as part of the initial dilution zone modeling for Goathorn Creek downstream of the Project discharge (SRK 2025c).

Alternative Assessment Case 7: 10% increased precipitation

Case 7 assumes increased precipitation by 10% to see how sensitive the water quantity and quality results are with small changes to the modelled average climate conditions. Results presented in Appendix G tables reflect maximum concentrations from the model results.

The only parameter exceeding WQGs in this case was total selenium in Goathorn Creek during Closure. The increase to the Project discharge during Operations does not result in new exceedances, because discharge is restricted to the open water season, when flows are highest. Exceedance in Closure occurs in April when receiving environment flows are often still low.

4.4.3 Additional Water Quality Parameters

Change in water quality to other measurable water quality parameters were evaluated external to the GoldSim model using conservative assumptions and, in some cases, qualitative considerations. Additional parameters include stream temperature, total suspended solids (TSS) and turbidity, pH and alkalinity, conductivity (EC) and total dissolved solids (TDS), and polycyclic aromatic hydrocarbons (PAHs).

This assessment focuses on the smaller streams, including Tenas, Four and Goathorn Creeks. The results presented above for modelled concentrations in Telkwa and Bulkley River show no measurable difference above baseline conditions and therefore the parameters listed above are also expected to remain unchanged.

Stream Temperature

A mass balance approach was utilized to evaluate the change in stream temperature from the Project discharge into Goathorn Creek. Change in temperature is not anticipated to be significant in other streams receiving Project discharge via groundwater pathways.

Temperature predictions in the Tenas Control Pond and management ponds were not developed as part of this work. As a conservative estimate, pond temperature was assumed to be equal to ambient air temperature. Monthly maximum Project temperature derived from long-term time series (SRK 2024a) were applied to the ponds. For air temperatures below freezing, pond water temperature was conservatively assumed to be 0°C. Maximum monthly Project discharge (Table 4-12) was considered from the Tenas Control Pond during operation and the NMP after closure.

Monthly mean flow in Goathorn Creek at node WQSEA1 (SRK 2024a) was considered for in-stream flow conditions, along with monthly average temperature. Stream temperature was obtained from the 2017-2019 baseline monitoring at WQS06 (ERM 2019). The temperature was highest in August, with average and maximum values of 13.8°C and 14.7°C, respectively.

The maximum increase in stream temperature from Project discharge was determined to be 0.4 °C during operation and 1.4 °C after closure (Table 4-12). These changes are within the natural variability of the stream temperature (i.e. difference between average and maximum recorded temperature). Estimates are expected to be conservative in terms of relative change in temperature to the receiving environment. For example, high temperature in April (Post-closure maximum case) is unlikely to occur, since the peak discharge is associated with spring snowmelt, when water temperatures would be close to freezing.

Table 4-12: Estimated monthly temperature change in Goathorn Creek

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tenas Control Pond (OP) [1]												
Pond Temperature (°C) [2]	2	0	3.5	7.2	10.1	20	18.6	16.9	13.7	11.5	1.5	0.5
Discharge Rate (m^3/s) [3]	-	-	-	-	0.255	0.174	0.101	0.035	0.035	0.035	-	-
North Management Pond (CL) [1]												
Pond Temperature (°C) [2]	2	0	3.5	7.2	10.1	20	18.6	16.9	13.7	11.5	1.5	0.5
Discharge Rate (m^3/s) [3]	0.033	0.009	0.127	0.304	0.082	0.021	0.009	0.007	0.006	0.055	0.085	0.046
Goathorn Creek												
Baseline Temperature (°C) [4]	0.1	0	0.1	3.3	4.6	7	10.2	13.8	7.7	3.4	1.3	0
Mean Flow (m^3/s)	0.22	0.18	0.19	1.36	5.1	5.09	3.06	1.54	1.23	1.12	0.79	0.34
Final Temperature (OP) (°C)	0.1	0.0	0.1	3.3	4.9	7.4	10.5	13.9	7.9	3.6	1.3	0.0
Temperature Change (OP) (°C)	0.0	0.0	0.0	0.0	0.3	0.4	0.3	0.1	0.2	0.2	0.0	0.0
Final Temperature (PC) (°C)	0.3	0.0	1.5	4.0	4.7	7.1	10.2	13.8	7.7	3.8	1.3	0.1
Temperature Change (PC) (°C)	0.2	0.0	1.4	0.7	0.1	0.1	0.0	0.0	0.0	0.4	0.0	0.1

Source:https://srk.sharepoint.com/sites/NA1CT027.003/Internal/700_Temperature_Model/Telkwa_TemperatureGHC_rk_updateCCM_20250723.xlsx?web=1

Notes:

1. Project stage acronyms: OP=Operations, PC=Post-Closure
2. Corresponds to Project maximum air temperature (SRK 2024a)
3. Maximum monthly discharge rate from the pond
4. Corresponds to average temperature at WQS06 based on baseline monitoring (ERM 2019)

Turbidity and Total Suspended Solids

Background concentrations of TSS and turbidity in the Tenas Project streams were obtained from 2017-2019 baseline water quality monitoring (ERM 2019) and updated with dataset up to 2024. The 50th and 95th percentile concentrations of these parameters in Tenas Creek, Four Creek and Goathorn Creek are outlined in Table 4-13. A relationship was developed between TSS, and turbidity based on linear regression considering the baseline monitoring data of streams (Figure 4-15).

Table 4-13: Baseline total suspended solids (TSS) and turbidity in the streams

Parameter	Unit	Four Creek		Goathorn Creek		Tenas Creek		All Creeks	
		P50	P95	P50	P95	P50	P95	P50	P95
Total suspended solids	mg/L	3	21	1.5	16	1.5	37	1.5	26
Turbidity	NTU	1.6	22	1.1	13	1.4	32	1.3	17

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/100_Data_Analysis/2023%20Updates/SurfaceWQ_BaselineData_rev14_cc_CCM_20250514.xlsx?web=1

Note: P50 and P95 corresponds to 50th and 95th percentile concentration, respectively

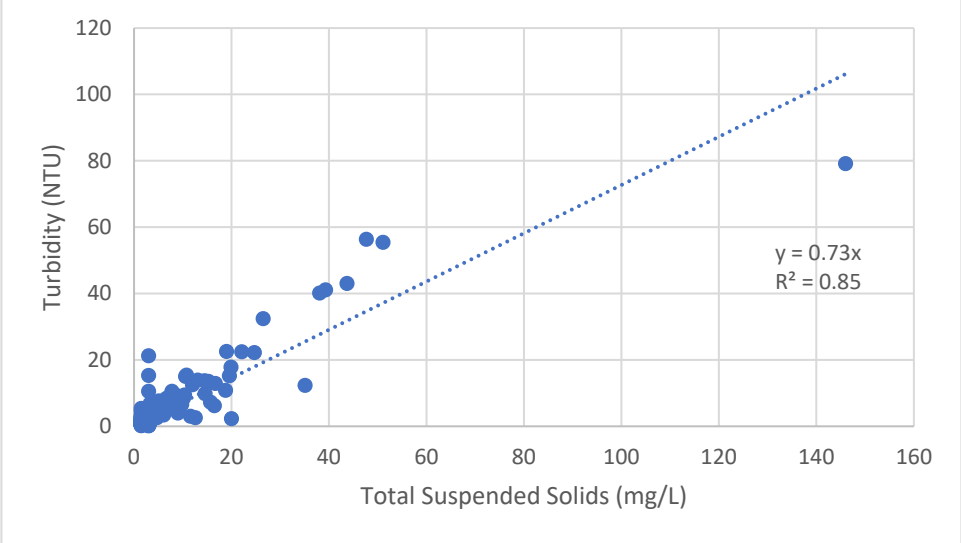


Figure 4-15: Relationship between TSS and turbidity for Goathorn, Tenas, and Four creeks

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/100_Data_Analysis/2023%20Updates/SurfaceWQ_BaselineData_rev14_cc_CCM_20250514.xlsx?web=1

TSS in Four Creek and Tenas Creek is expected to remain unchanged, as there will be no Project discharge to these streams. Suspended particles are expected to be removed during groundwater transport to these creeks. The Tenas Control Pond only discharges in open water period (May – October) during operation and will be decommissioned after closure. Suspended sediments are settled in the pond prior to discharge to a tributary of Goathorn Creek. It was assumed that TSS is discharged from the Tenas Control Pond towards Goathorn Creek at a constant concentration of 35 mg/L.

TSS in Goathorn Creek was calculated based on mass balance approach considering maximum Project discharge with background loading estimated from baseline monitoring. TSS corresponding to the 50th percentile value of 1.5 mg/L was used for Goathorn Creek background concentration. With monthly mean flow representing in-stream flow condition, the estimated TSS varied from 2.2 – 3.1 mg/L (Table 4-14). Turbidity was obtained using the linear relationship shown in Figure 4-15. The maximum turbidity in the creek after Project discharge was estimated to be 2.3 NTU.

TSS and turbidity levels in Goathorn Creek are expected to increase due to discharge from Tenas Control Pond, however the results are within the natural variability of baseline monitoring data (i.e., less than 95th percentile baseline concentration).

Table 4-14: Estimated TSS and turbidity in Goathorn Creek due to Tenas Control Pond discharge

Parameter	Open Water Period					
	May	Jun	Jul	Aug	Sep	Oct
Tenas Control Pond						
Maximum discharge rate (m^3/s)	0.255	0.174	0.101	0.035	0.035	0.035
Goathorn Creek						

Parameter	Open Water Period					
	May	Jun	Jul	Aug	Sep	Oct
Mean flow (m^3/s)	5.1	5.1	3.1	1.6	1.2	1.1
TSS (mg/L) [1]	3.1	2.6	2.6	2.2	2.4	2.5
Turbidity (NTU) [2]	2.3	1.9	1.9	1.6	1.8	1.8

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/500_Water_Balance/OtherParameters/Telkwa_OtherWQ_parameters_v1_rk_20250723_CCM.xlsx?web=1

Notes:

1. Estimated based on mass balance approach.
2. Estimated from the relationship between TSS and turbidity developed from baseline monitoring data.

pH and Alkalinity

Figure 4-16 shows the measured pH and alkalinity in Four Creek, Goathorn Creek and Tenas Creek from the 2017-2019 baseline water quality monitoring (ERM 2019) and updated with data up to 2024, which includes historical measurements from 2006 to 2008. Measured pH and alkalinity in these streams ranged from 7.2 to 8.5 and 26 to 222 mg-$CaCO_3$/L, respectively. The mean pH in Four Creek, Goathorn Creek and Tenas Creek was 7.9, 7.8 and 8.0, respectively.

Based on geochemical characterization of mine water, expected pH in the management ponds is 8.0 (Appendix E). Considering the similar pH in management ponds and baseline monitoring data of various streams, the Project is not expected to alter the in-stream pH or alkalinity.

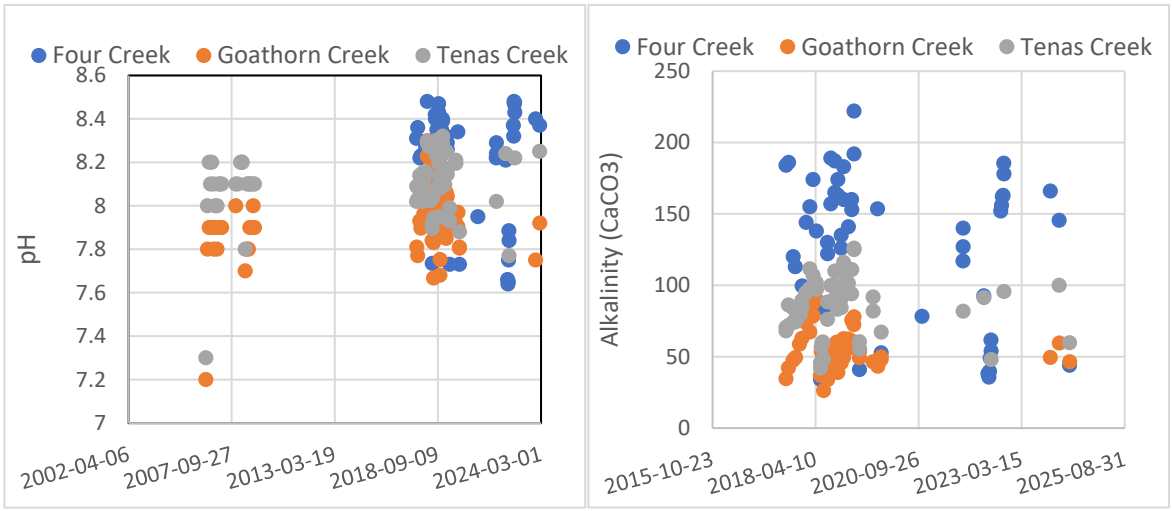


Figure 4-16: Measured (a) pH and (b) Alkalinity in Four Creek, Goathorn Creek and Tenas Creek

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/100_Data_Analysis/2023%20Updates/SurfaceWQ_BaselineData_rev14_cc_CCM_20250514.xlsx?web=1

Specific Conductance and Total Dissolved Solids

Specific conductance (SC) is correlated with total dissolved solids (TDS) and can be expressed by a linear relationship. Based on the 2017-2019 baseline water quality monitoring (ERM 2019) with updated data up to 2024, correlations were developed for Four Creek, Goathorn Creek and Tenas Creek (Figure 4-17). The 50th and 95th percentile background concentrations of TDS and SC in each stream are outlined in Table 4-15.

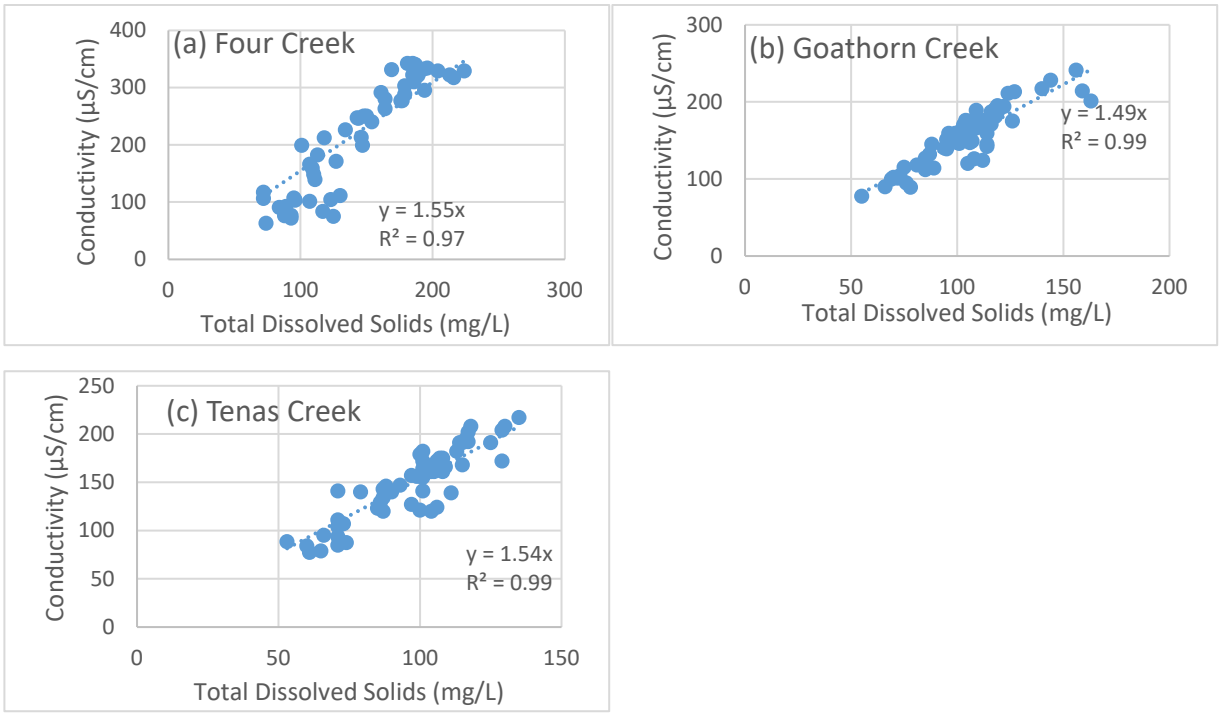


Figure 4-17: Relationship between TDS and specific conductance for (a) Four Creek, (b) Goathorn Creek, and (c) Tenas Creek

The TDS concentrations during Project Operations were calculated based on dissolved metal concentrations and alkalinity from the water and load balance model results for the Project Case. The model results from the prediction nodes with the highest concentrations in each stream were selected, including WQS03DS for Four Creek, WQS04 for Tenas Creek and WQS06 for Goathorn Creek. Calculated TDS concentrations are presented in Figure 4-18.

Maximum TDS in Four Creek, Goathorn Creek and Tenas Creek is estimated to be 233 mg/L, 160 mg/L and 182 mg/L, respectively, which is above the 95th percentile background concentration of individual streams (Table 4-15). TDS reaches its maximum level in Goathorn Creek in Post-Closure when uncontrolled discharges occur from North Management Pond. The maximum winter result is greater than 10% above the 95th percentile background concentration. Summer and winter long-term average TDS in Goathorn Creek are below or close to the 50th percentile baseline concentration. In Four Creek and

Tenas Creek, TDS also reaches its maximum levels in Post-Closure as a result of seepage from management ponds. In both creeks, the maximum values are within 10% of the 95th percentile baseline value. The long-term average TDS concentration in Four Creek is within the stream's natural variability (below 95th percentile), and the winter concentrations in Tenas Creek is within 10% of the 95th percentile baseline value through 2100.

EC was calculated using the regression relationship developed for the Project streams (Figure 4-17) and the calculated TDS concentrations at prediction nodes WQS03DS, WQS04 and WQS06 (Figure 4-18). Long-term average (summer and winter) SC are below the 50th percentile background concentration of individual streams during operation (Table 4-15). The average SC in Goathorn Creek remains below the 50th percentile background level during Post-closure as well. The maximum expected SC in Goathorn Creek is 237 µS/cm, which is above the 95th percentile baseline concentration. Like TDS, this is expected to occur as a result of Project discharge during low flow months in Post-Closure. In Four Creek and Tenas Creek, SC increases in winter months in Post-closure as a result of groundwater seepage from the management ponds. Concentrations are slightly (less than 10%) above the 95th percentile background values in Four Creek during winter months in Post-Closure, however the long-term average concentration (i.e. 2100) is within the baseline range. Tenas Creek concentrations of SC peak in Post-Closure and modeling results during winter months continue to be greater than the 95th percentile baseline value through 2100, though they remain less than 10% over the 95th percentile background values. 10% is considered within the variability of analytical results.

Table 4-15: TDS and SC estimate for Project Case condition

Parameter	Stream (Node)	Background Concentration		Project Stage [1]	Project Case Concentrations						
		P50	P95		Maximum Summer	Maximum Winter	Long-term Average Summer	Long-term Average Winter	Max Multiplier	Long-term Multiplier	Years with >10 % increase above 95th percentile baseline
TDS (mg/L)	Four Creek (WQS03DS)	150	220	OP	187	145	141	131	0.8	0.6	
				PC	183	233	150	160	1.1	0.7	0
	Tenas Creek (WQS04)	100	140	OP	101	116	90	100	0.8	0.7	
				PC	105	160	93	121	1.1	0.9	9
	Goathorn Creek (WQS06)	110	140	OP	129	124	99	107	0.9	0.8	
				PC	104	182	94	143	1.3	1.02	45
SC (µS/cm)	Four Creek (WQS03DS)	250	340	OP	289	224	218	203	0.8	0.6	
				PC	284	360	231	248	1.1	0.7	0
	Tenas Creek (WQS04)	160	220	OP	150	173	134	149	0.8	0.7	
				PC	156	237	138	180	1.1	0.8	0
	Goathorn Creek (WQS06)	170	210	OP	199	191	153	165	0.9	0.8	
				PC	160	280	144	221	1.3	1.1	48

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/500_Water_Balance/OtherParameters/Telkwa_OtherWQ_parameters_v1_rk_20250723_CCM.xlsx?web=1

Notes:

1. Project stage acronyms: OP=Operations, PC=Post-Closure
2. Modeling results that are greater than the 95th percentile baseline value by more than 10% are flagged in red

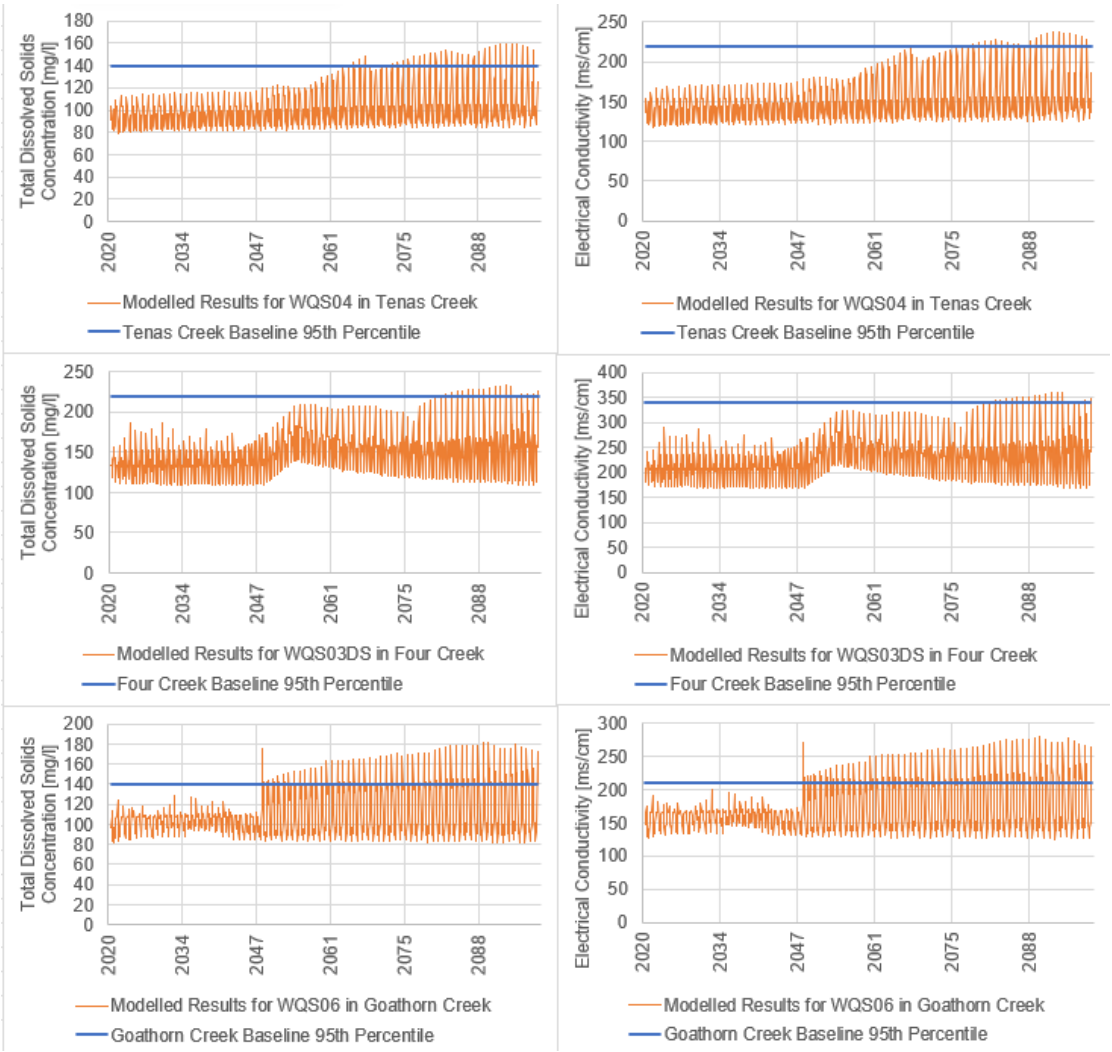


Figure 4-18: Modelled TDS and SC Results for Tenas Creek, Four Creek, and Goathorn Creek

PAHs

Polycyclic Aromatic Hydrocarbons (PAHs) will be controlled and mitigated through emergency response plans and spill response plans. No change in stream PAH concentrations is expected.

4.4.4 Exceedance Drivers and Mitigations

The sources of total selenium, dissolved cobalt and dissolved nickel is the runoff and seepage from Non-PAG rock backfill in the open pit, the buttresses, and Management and Control Ponds dams. Non-PAG areas will be covered with overburden progressively throughout Operations and into closure and reclamation. This will limit the long-term loading.

The source of nitrite-nitrogen is the blasting residue released with runoff and seepage from both PAG and Non-PAG rock. The blasting residuals model assumes a fixed percentage of load from the ANFO/Emulsion mixture is released per mass of placed rock. Assumptions are consistent with Best Practice and available literature (Ferguson and Leask 1988) but are expected to be conservative.

Other exceedances were mainly due to baseline concentrations being naturally high, such as for dissolved copper and total aluminum. Continued monitoring of the streams for their characterization has been ongoing since 2017 on a regular basis.

5 Summary of Receiving Environment Results

The following sections summarize the model results for the receiving environment. Results are discussed by stream (5.1) and in context within the RSA (5.2).

5.1 Summary of Model Results for Streams

5.1.1 Four Creek

Results indicate the following for Four Creek:

- Streamflow is reduced from baseline because the Project footprint occupies a portion of the existing Four Creek catchment.
- During open-water season months, streamflow is increased over baseline by diversions, capturing and diverting upstream runoff to portions of Four Creek.
- During the winter, baseflow is reduced in upstream prediction nodes during winter months from the open pit drawing down the groundwater table.
- Seepage from the Management and Control Ponds may increase the winter baseflow and result in elevated water quality concentrations for constituents of potential concern.

Based on conservative modelling of Four Creek (i.e. not accounting for the perched groundwater system, as described in Section 3.8), modelled results show that the Project will affect Four Creek. MAD downstream of the C02 channel will increase. MAD will decrease downstream because the Project decreases the size of the Four Creek catchment. However, based on most recent report examining whether Four Creek is perched (i.e. disconnected from the groundwater recharge) [SLR, 2025], it has shown that the upper reach of Four Creek is very likely perched, and therefore would not be directly impacted by the decrease in size of the Four Creek catchment.

High case groundwater seepage rates presented in Alternative Assessment Case 1 could reduce baseflow during winter months at prediction nodes directly downstream of the open pit (WQS20 and 21). However, based on most recent report examining whether Four Creek is perched (i.e. disconnected from the groundwater recharge) [SLR, 2025], it has shown that the upper reach of Four Creek is very likely perched, and therefore would not be directly impacted by the decrease in size of the Four Creek catchment.

Baseline water quality monitoring show that exceedances have occurred in Four Creek for total aluminum, and dissolved iron. After closure, groundwater seepage from the East Management Pond results in exceedance of water quality guidelines for dissolved cobalt during the winter months (4 years in total) and otherwise increases of concentrations for modelled parameters, in the downstream reach of Four Creek (WQS03DS). Alternative cases (case 2 and case 5) showed additional exceedances for the following parameters:

- Total selenium WQG is exceeded in both summer and winter months during Post-closure for both alternative cases by up to 2.7 times (highest total Selenium concentrations found in Alt Case 5). The long-term winter and summer results in 2100 are below the guideline.
- The nitrite WQG is exceeded in winter months by up to 2.9 times the guideline with some exceedances in summer months (both in Alt Cases 2 and 5, with highest concentrations found in Alt Case 5).
- The dissolved cobalt WQG is exceeded up to 70 times for alternative case 5, and up to 4 times for alternative case 2. No exceedances occur in summer. Long-term average winter and summer results are below the WQG.

Change in water quality in Four Creek was also evaluated for selected additional parameters:

- Stream temperature, TSS, and turbidity is expected to remain unchanged, as there will be no Project discharge to this creek. Suspended particles are settled in the management and control ponds, and are expected to be removed during groundwater transport.
- Maximum TDS and conductivity were above the 95th percentile baseline concentration for TDS and conductivity during Post-closure in the Project Case, but the change was within 10% of the baseline value. Long-term average concentrations of these parameters are within the natural variability of baseline monitoring data (i.e., less than 95th percentile baseline concentration) through 2100.
- No change is expected for in-stream pH, alkalinity, and PAH concentration.

5.1.2 Tenas Creek

Like Four Creek, changes to Tenas Creek streamflow are governed by the following Project interactions:

- Project footprint, which occupies up to 7% of the existing Tenas Creek catchment and reduces the streamflow over baseline conditions in portions of the creek that are downstream of the Project. The change ins most apparent during open-water season months when runoff rates govern streamflow.
- Groundwater table drawdown from open pit mining, which will reduce the baseflow contributions to Tenas Creek in prediction nodes adjacent to the open pit by up to 6%.
- Management Pond seepage may be minimized through implementation of liners; however, some seepage is expected to reach Tenas Creek, resulting in net increase in baseflow rates towards the end of mining and into Post-closure as well as higher water quality concentrations for constituents of concern.

Streamflow in segments of Tenas Creek will be reduced by less than 10%. The sensitivity case for groundwater seepage rates presented in Alternative Assessment Case 1 could further reduce baseflow during winter at prediction nodes directly downstream of the open pit.

Baseline water quality monitoring show that exceedances have occurred historically in Tenas Creek for total aluminum, based on 50th and 95th percentile values from baseline data calculated for the stream.

Groundwater seepage from the West and North Management Ponds in the Post-closure period results in higher concentrations of modelled parameters downstream of the Project, but no exceedances of WQG was shown to occur for the Project Case. However, Alternative case 2 (high source term) showed exceedance for the following parameter:

- The total selenium WQG is exceeded at downstream prediction nodes WQS22 and WQS04 in winter months during Post-closure by up to 1.5 times the guideline.
- The dissolved cobalt WQG is exceeded at downstream prediction nodes WQS22 and WQS04 in winter months during Post-closure up to 1.8 times the guideline.

Change in water quality in Tenas Creek was also evaluated for selected additional parameters:

- Stream temperature, TSS and turbidity is expected to remain unchanged, as there will be no Project discharge to this creek. Suspended particles are settled in the management and control ponds and are expected to be removed during groundwater transport.
- Maximum TDS and conductivity were above the 95th percentile baseline concentration for TDS and conductivity during Post-closure in the Project Case, however results were within 10% of the natural variability. Long-term average concentrations of these parameters are within the natural variability of baseline monitoring data (i.e., within 10% of the 95th percentile baseline concentration) through 2100.
- No change is expected for in-stream pH, alkalinity, and PAH concentration.

5.1.3 Goathorn Creek

The Project interacts with Goathorn Creek through surface discharge, open pit mining and Management Pond seepage, however based on the larger catchment area, the change to streamflow is less than in Four Creek and Tenas Creek.

- Groundwater table drawdown from open pit mining will reduce the baseflow contributions in prediction nodes upstream and directly downstream of the open pit. This includes WQS13 and WQS06US. The change relative to baseline is expected to be less than 3%.
- Seepage from Management Ponds counters the drawdown from open pit mining, however an overall reduction in winter baseflow is still expected. Seepage will increase overall water quality concentrations. This does not cause new exceedances in the stream.
- Project discharge from the Tenas Control Pond in Operations and the North Management Pond at closure will change streamflow downstream in Goathorn Creek at WQSEA1, WQS06 and WQS05. Despite diverting water from Tenas Creek to Goathorn, streamflow is lower in some open water months because of evaporative and seepage losses from the Project facilities. Streamflow increases at closure, when vegetated covers are in-place on Management Ponds. The Tenas Control Pond discharges in May through October. Baseline data indicate freshet usually occurs in April. During Operations in April, streamflow at WQSEA1 decreases. After the Tenas Control Pond is decommissioned, the NMP will discharge by gravity to a tributary of Goathorn Creek, which increases discharge in April after closure.

- Additional withdrawal from Goathorn Creek during Operations has been included in model results for up to 2.5% of baseline flows. This water is not used by the Project (i.e., water covers do not depend on this flow rate), and it is included as contingency source only.
- An increase in streamflow from consecutive wet years tested in Alternative Assessment Case 4 and Case 7 could result in a net increase of up to 10% in monthly average streamflow at downstream prediction nodes.

Baseline water quality monitoring show exceedances in Goathorn Creek for total aluminum, and dissolved copper based on 50th and 95th percentile values from baseline data calculated for the stream. Exceedance of water quality guideline expected to occur for the following parameters, in Operations and in Closure, therefore not driven by Project discharge under the Project Case results:

- Exceedances of the dissolved copper WQG occur in winter and summer during the operation and Post-closure phases in the Project Case, but results are within the natural variability of baseline monitoring data (i.e., less than the 95th percentile from baseline datasets). Because these exceedances are driven by naturally elevated concentrations of dissolved copper in the background, the concentrations do not decrease over time.

While no other exceedances were recorded for the Project Case, Alternative Case 2 had exceedances for the following parameters:

- Exceedances for total selenium by up to 1.5 times the WQG, occurring only in Closure during the winter months. These exceedances are below the WQG by 2100.
- Exceedances for dissolved cobalt by up to 1.5 times the WQG, occurring in Operations during the monthly maximum summer months, which corresponds to the higher discharge rates when EMP overflows in 2030. This likely could be mitigated through lower discharge in the Creek.
- Exceedances for dissolved cobalt by up to 1.1 times the WQG, occurring in Closure only in WQS05 during the monthly maximum winter months, which corresponds to seepage from the Project reaching the Creek in Post-closure. These exceedances occur for less than 10 year in the model results.

Both Alternative Case 7 and Alternative Case 4, which produces increased discharge from the Project did not record any additional exceedances in Operations or Closure.

Change in water quality in Goathorn Creek was also evaluated for selected additional parameters:

- Due to Project discharge, maximum increase in stream temperature was estimated to be 0.4 °C during operation and 1.4 °C in Post-closure. These changes are within natural variability compared to baseline stream temperature monitoring.
- TSS and turbidity levels are expected to increase due to discharge from Tenas Control Pond and North Management Pond particularly, however results are within the natural variability of baseline monitoring data (i.e., less than 95th percentile baseline concentration).
- Maximum TDS and conductivity were above the 95th percentile baseline value by more than 10% during Post-Closure in the Project Case. This is likely driven by discharge from North Management

Pond during low flow months, which likely could be mitigated based on learnings through Operations.

- No change is expected for in-stream pH, alkalinity, and PAH concentration.

Short term elevated concentrations can be prevented by controlled discharge from the ponds and active monitoring of downstream flow conditions and pond water quality.

5.1.4 Telkwa River

Minor increases in winter flows and decreases in open water season flows could occur during Operations at Telkwa River node WQS09, downstream of the confluence with Goathorn Creek. The reduction in open water season flows results from evaporative losses from the Management Ponds and end pit lake. Decreased flow in winter is from less groundwater discharge to the streams. Over time, the water levels in the Management Ponds result in a small (~1%) increase in baseflow conditions (Appendix F, Table F-3).

Baseline water quality exceedances have occurred in Telkwa River for total aluminum, dissolved copper, and total iron. Model results show exceedances of the total aluminum WQG in summer during the operation and Post-closure phases in the Project Case. However, the results are less than the natural variability recorded in the baseline monitoring data (i.e. less than the 95th percentile from baseline datasets). Exceedances of the WQG of dissolved copper are experienced in summer throughout operation phase only but results are less than the 50th percentile from baseline data.

No additional water quality exceedances are expected beyond what has been experienced historically based on Project Case conditions or Alternative Assessment cases.

5.1.5 Bulkley River

The Bulkley River at node WQS11 receives Project discharge from the Rail Infrastructure Sedimentation Pond. The change to MAD is less than a 0.01% increase from the higher runoff coefficient for the stockpile area compared to natural conditions.

WQS12 is located on Bulkley River downstream of the Telkwa River confluence. Changes described for the Telkwa River propagate into the Bulkley River but have a much smaller effect in relation to baseline, with a maximum percent reduction of less than 0.1%.

Baseline water quality monitoring show that exceedances have occurred in the Bulkley River for total aluminum, dissolved copper, and total iron. Model results show no during the operation and Post-closure phases in the Project Case.

No additional water quality exceedances are expected beyond what has been experienced historically. This is consistent for the Project Case as well as the Alternative Assessment cases.

5.2 Summary in Context with Regional Study Area

5.2.1 Change to Streamflow

Table 5-1 and Table 5-2 summarize the change to mean annual discharge and seasonal flow distribution, respectively, with the affected streams' watershed, the LSA and the RSA. Results are based on the Project Case.

The change to mean annual discharge and the seasonal streamflow distribution reflect the area where the annual average flows or the monthly average flows are either reduced by more than 10% or increased by more than 30% relative to pre-mining conditions. The effects are local to Four Creek, however in the case of seasonal flow distribution, the effect propagates further upstream and includes node WQS03.

Table 5-1: Summary of Change to Mean Annual Discharge for Project Case

Stream	Four Creek
Prediction nodes Affected	WQS20, WQS21, WQS03DS
Project Stage	Operation, Post-Closure
Affected Area [km^2]	7.6
Total Stream Area [km^2]	11.0
% of Total Stream Area Affected by Project	69%
% of LSA Affected by Project (1)	3.6%
% of RSA Affected by Project (2)	0.5%

Notes:

1. LSA is 208.3 km^2
2. RSA is 1430 km^2

Table 5-2: Summary of Change to Seasonal Flow Distribution for Project Case

Stream	Four Creek
Prediction nodes Affected	WQS03, WQS20, WQS21, WQS03DS
Project Stage	Operation, Post-Closure
Affected Area [km^2]	11.0
Total Stream Area [km^2]	11.0
% of Total Stream Area Affected by Project	100%
% of LSA Affected by Project (1)	5%
% of RSA Affected by Project (2)	0.8%

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Results\Results_Streams_MonthlyChange_07132021_sab.xlsm

Notes:

1. LSA is 208.3 km^2

2. RSA is 1430 km^2

High flows are expected to be reduced over baseline conditions for prediction nodes with reduced catchment areas. For the segment of Four Creek with an increase in catchment area, downstream of the diversion channel, an engineering control structure will limit the discharge during extreme events, sending excess water to the East Management Pond. Similarly, the Tenas Control Pond will have the ability to control high flood events by having the capacity to attenuate flows up to the 1 in 10-year flood event. As a result, the change in high flows is expected to be minimal.

Low flows are expected to be reduced in Operations along sections of Tenas and Four creeks from the drawdown of the groundwater table around the open pit. Extreme low flows will be similarly affected. The rate of change to low flows is captured in the discussion of winter flow in the seasonal streamflow distribution results (Table 5-2).

5.2.2 Change to Stream Water Quality

Table 5-3 summarizes the change to surface water quality under the Project Case in context within the affected streams' watershed, the LSA and the RSA. The Project Case represents the expected outcomes based on reasonably conservative assumptions and Project characterization and is used to support the EA.

According to the definitions in the EA, affected areas are identified where a water quality model result exceeds both the relevant WQG and the variability in the background water quality (95th percentile). The only parameter in the model that exceeds both background water quality and the WQG is dissolved cobalt in Four Creek. In the case of specific conductance and total dissolved solids, where no WQG is available, the model results show that only Goathorn Creek is expected to be affected, with model results greater than 10% above the 95th percentile background water quality in Post-Closure.

As a result, only Four and Goathorn creeks are presented as being affected by the Project (Table 5-3).

While model results show exceedances for total aluminum and dissolved copper in Goathorn Creek and Telkwa River, these results are driven by the elevated concentrations in the background data. The incremental increase because of the Project is minimal (<1%), as described in Section 4.4.1. Therefore, these areas are not presented as being affected by the Project.

Table 5-3: Summary of Change to Water Quality for Project Case

Stream	Four Creek	Goathorn Creek	Total Affected
Prediction nodes Affected	WQS03DS	WQSEA1, WQS06, WQS05	
Parameters with Exceedances of water quality guidelines (1)	Dissolved Cobalt	N/A	
Additional Parameters greater than baseline (2)	N/A	TDS, SC	
Project Stage	Post-Closure	Post-Closure	Post-Closure
Affected Area [km^2]	5.7	6.7	12.4
Total Stream Area [km^2]	11.0	195	206
% of Total Stream Area Affected by Project	52%	3%	6.0%
% of LSA Affected by Project (3)	3%	3.2%	6.0%
% of RSA Affected by Project (4)	0.4%	0.5%	0.9%

Notes:

1. Exceedances occur for a minimum of 1-month under Project Case
2. Exceedances are in relation to the 95th percentile of baseline monitoring data and occur for a minimum of 1-month under Project Case
3. LSA is 208.3 km^2
4. RSA is 1430 km^2

The affected area in Four Creek represents the catchment area between nodes WQS20 and WQS03DS. This area is expected to be significantly lower based on the perched nature of the majority of the creek (SLR 2025). Due to the uncertainty associated with the extents of the perched vs. unperched creek segments, the full area between these nodes was carried forward into the EA.

6 Conclusions and Recommendations

A water and load balance model has been developed based on Feasibility-level Project characterization, including hydrology, geochemical source terms, groundwater modeling, and the detailed mine plan and associated water management systems. The model produced time series of monthly flows and water quality within the Project infrastructure and in the receiving environment throughout the life of mine to 2100.

Within the Project facilities, the model demonstrates the minimum water cover target of 0.5m within 6 months of PAG rock placement can be maintained in all Management Ponds during Operations and a water cover target of 1.5 m for Post-closure. Temporary water cover reductions may be experienced under extreme dry or highly constrained periods, however sufficient water is expected to be available within other facilities (Tenas Control Pond, other Management Ponds or Goathorn Creek) to manage the water covers and PAG rock is subsequently covered with 0.5 m of water within 6-months of placement.

The Project has the potential to interact with receiving environment water quantity and water quality via four primary mechanisms:

- Reduction of natural catchment area, resulting in an equal reduction to streamflow over baseline conditions.
- Change in winter groundwater seepage (baseflow) to streams because of open pit mining (groundwater drawdown) and mounding of groundwater from increased head in Management Ponds and the Tenas Control Pond (increased seepage rates).
- Seepage from the West Management Ponds, the Tenas Control Pond will have elevated concentrations relative to baseline conditions, resulting in potential exceedances of WQG in the receiving environment for dissolved cobalt.
- Project discharge to the downstream environment may result in changes to streamflow and water quality.

Discharging facilities (Rail Infrastructure Sedimentation Pond, Tenas Control Pond and North Management Pond) have effluent concentrations that are higher than the WQGs for the following parameters of concerns in the end-of-pipe effluent: total selenium , nitrate-nitrogen, nitrite-nitrogen, sulfate, total aluminum, dissolved cadmium, dissolved cobalt, dissolved copper, total iron, total molybdenum, dissolved nickel, total thallium and dissolved zinc during active discharge periods under Project Case conditions, and only resulted in one exceedance from the Project discharge once in the stream, only in Closure in Four Creek for a few years (4 consecutive years). The high source term case (Alternative Assessment Case 2) may require additional mitigation measures to manage selenium concentrations for short periods of time in the Tenas Control Pond/North Management Pond.

Stream results are screened against applicable guidance to evaluate the change resulting from the Project on the environment, which include:

- Whether streamflow is increased by more than 30% or decreased by more than 10% relative to baseline conditions.

- Whether seasonal flow distribution changes.
- Changes to high and low flows.
- Whether stream water quality exceeds relevant water quality guidelines when exceedances did not occur historically (within natural variability).

Changes to streamflow are summarized as follows:

- Change in streamflow is expected to occur in Four Creek, from an increase in flow from diversion channels and a reduction in flow from groundwater drawdown and catchment reductions. The change relative to baseline is greater than 10% reduction to mean annual discharge, with higher changes monthly.
- Tenas Creek will experience months, predominantly in April and August, with up to 10% reduction to baseline streamflow, however the change to mean annual discharge is less than 10% throughout Operations and closure periods.
- Goathorn Creek flows are expected to be reduced by up to 6% in low flow months in Operations, while increasing by up to 8% during freshet. The overall change to mean annual discharge is a reduction of 4% in Operations and 1% Post-closure.
- Both Telkwa and Bulkley Rivers experience less than 1% change relative to baseline conditions due to the relatively small Project footprint with respect to the total catchment areas of each river.

WQG exceedances is expected under Project Case conditions for dissolved cobalt in Four Creek for a period of four years, as well as for dissolved copper and total aluminum in Goathorn Creek and Telkwa River, which are naturally elevated in the background concentrations. The baseline water quality records already show exceedances for these parameters as part of the natural variability of the stream.

Elevated levels of TDS and EC are also expected in Tenas, Four and Goathorn Creeks downstream of the Project because of seepage from management ponds and discharge from the Project. Results in Tenas and Four creeks are within 10% of the 95th percentile from baseline data in each stream, however the results in Goathorn Creek are up to 30% increase relative to the 95th percentile baseline data. This effect occurs in the Post-Closure Phase only.

The change to both stream water quantity and quality were further evaluated in terms of the affected area within the spatial boundaries of the Project, including the local stream watersheds, the LSA and the RSA.

- In terms of water quality, the only modelled prediction node that is expected to experience long-term exceedances of the WQGs and the 95th percentile of background data is in Four Creek at node WQS03DS for dissolved cobalt for a period of four years. In addition, the modelled TDS and SC concentrations are expected to be above the 95th percentile of background monitoring by more than 10% in Goathorn Creek during Post-Closure. The affected area includes the lower portions of Four and Goathorn creeks, which is an area equal to 12.4 km^2. This affected area represents approximately 6% of the LSA and less than 1% of the RSA.
- In terms of water quantity, the modelled prediction nodes that experience a change to mean annual discharge greater than 10% reduction or 30% increase include WQS21, WQS20 and WQ03DS, which encompasses an area equal to 7.6 km^2. This affected area represents approximately 3.6% of the LSA and 0.5% of the RSA.

The results from this study and report will be used as part of the EA Application.

Recommendations:

- Continue to collect water quality and quantity data throughout project implementation.
- Model to be reviewed and updated as-needed annually with results from monitoring.
- No additional strategies to reduce concentrations in Management Ponds and Control Ponds are recommended at this point as there are no exceedances resulting from the Project. However, contingencies measures are put in place to mitigate any deviations from these results, as recommended in the conclusions of the BAT assessment report (SRK 2025a). Contingencies include in-situ Gravel Bed reactors treatment in Management Ponds and Active treatment post Tenas Control Pond.

6.1 Risks and Limitations and Opportunities

Risks and limitations of the model are summarized below based on assumptions and data incorporated into the model:

- The Project area rainfall-runoff model simulates an earlier freshet onset than the Goathorn Creek rainfall-runoff model, based on the median elevation and climate correction factors (Section 3.1.7). The modelled increase over pre-mining conditions during freshet at closure may not be as prominent as the model estimates since the rock covers will likely remain frozen for a longer period once vegetation is established due to the relatively flat slopes in comparison to the natural topography.
- Rainfall-runoff models are developed based on constant monthly runoff coefficients, calibrated from historical records. Changes to the timing of spring freshet or other annual hydrologic phenomenon which may be expected with climate change projections could result in changes to the monthly runoff rates. These types of effects are not currently captured in the water balance model. Additional climate change -related risks include:
  - Increased occurrence of wildfires which could result in higher runoff during rainfall and snowmelt events (because of reduction of vegetative cover, hydrophobic soils, etc.), and could result in greater sediment loading to the receiving environment(s),
  - Changes in hydrograph seasonality, which could result in shifting low flows to the summer months which coincide with planned discharges and could reduce dilution / assimilation capacity in the receiving environment(s), and
  - Altered interactions with natural groundwater system, which could result in reduced baseflow contributions and could reduce dilution/ assimilation capacity in the receiving environment(s) during winter or summer months.
- Ongoing collection of hydrometric and meteorological data will be completed through the subsequent Project design phases. The Project climatic records, as well as the calibrated rainfall-runoff models should be revisited based on additional data collected on-site, specifically to improve the characterization of Tenas Creek and Four Creek, which have limited records.

- The water balance for the historic years was calibrated based on measured site data. Any error in this data collection would directly affect the reliability of the model calibration.
- Solubility limits were not universally applied in the model. Consequently, some parameters may precipitate prior to reaching the modelled concentrations.
- The model treated all reservoirs as perfectly mixed containers. This mixing occurred instantaneously at every time step and may not be reflective of actual conditions.
- Groundwater and impacted seepage flows are based on hydrogeologic models which are based on a limited hydrogeologic dataset.
- Uncertainty in MAP and evaporation predictions.
- Additional limitations of input data are discussed in topic-specific reports.

Opportunities:

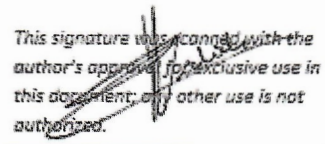
- The primary driver of increased water quality concentrations in the receiving environment is seepage from Management Ponds and the Tenas Control Pond. The model assumes that 100% of the mass of constituents leaving the Management Ponds via seepage eventually reaches the streams, without any attenuation. Constituents transported through groundwater pathways may be attenuated through dispersion and advection mechanisms, which could ultimately improve the water quality discharging downstream. In addition, the extended period between when seepage leaves the facility and discharges to surface water provides a significant time for intervention or mitigation measures to be employed. Active groundwater monitoring will be incorporated into the monitoring plans to capture the rate and concentrations of migration of the seepage plume.
- Increase efficiency of liners in Management Ponds and the Tenas Control Pond in terms of minimizing seepage rates could be investigated to reduce the amount of load entering the receiving environment via groundwater pathways (SRK 2025b).
- Active monitoring of pond water quality in tandem with in-stream water quality along with streamflow is expected to enable control of pond discharges to reduce the occurrence of exceedances in Goathorn Creek during Operations.

Contingencies (SRK 2025a and b):

- Organic carbon addition to the covered management ponds Post-closure to create reducing conditions to decrease selenium mobility using Gravel Bed reactor within the management ponds.
- Active water treatment plant of water collected in management and control ponds.
- Increasing water stored through low flow period in the summer and discharge more during freshet when dilution capacity is greater.
- Utilize the 2.5% water withdrawal from Goathorn Creek in Project's overall water management plan.
- Evaluate the construction schedule of the management ponds and potentially build the dams earlier to create additional storage before PAG placement is required.

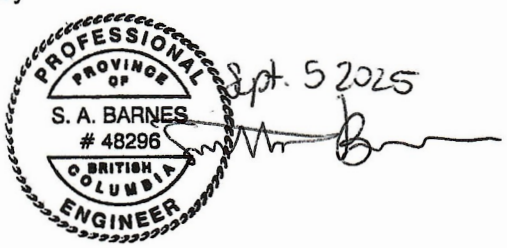
Closure

This report, Tenas Project – Water and Load Balance Modeling Report (Updated 2025), was prepared by



Celine Michiels, MSc, PhD
Senior Consultant

and reviewed by



Samantha Barnes, P.Eng
Principal Consultant

SRK Consulting (Canada) Inc Engineers and Geoscientist BC Permit to Practice No: EGBC 1003655

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendix A Prediction Node Climate Adjustment Memo

Memo

To:	File	**Client:**	Telkwa Coal Limited
From:	Camilo Gallard Samantha Barnes	**Project No:**	1CT027.003
Cc:		**Date:**	January 12, 2021
Subject:	Prediction Node Streamflow Assessment to Support Water and Load Balance Model		

1 Introduction

An Environmental Assessment (EA) is being completed for the Tenas Project (the "Project") near Smithers B.C, which includes a water and load balance model to evaluate impacts to downstream creeks and rivers. Prediction nodes included in the model include locations along Tenas Creek, Four Creek, Goathorn Creek, Telkwa River and Bulkley River, as defined in the Tenas Project Water and Load Balance Report (SRK 2021a).

The following memorandum presents the methodology for evaluating streamflow within each watercourse and at each prediction node. Results are incorporated into the water and load balance model to develop water quality and quantity estimates pre- and post-mining.

1.1 Supporting Information

1.1.1 Climate Data

A detailed meteorological analysis was presented in the 2021 Hydrometeorological Baseline and Model Development Report (SRK Consulting, 2021b). The Project climate timeseries described in this work were used as an input for this analysis.

1.1.2 Regional Hydrometric Data

Water Survey of Canada (WSC) is the national authority responsible for the collection, interpretation and dissemination of standardized water resource data in Canada. Four WSC regional stations maintain long term records on streams and locations relevant to the Project as illustrated on Figure 1-1. These stations have more than 10 years of data and catchment areas ranging between 125 km^2 to 8940 km^2. Table 1-1 shows a summary of the metadata for these stations.

Table 1-1: Summary of Regional Hydrometric Stations

Station ID	Station Name	Longitude	Latitude	Area (km^2)	First Year	Last Year
08EE008	GOATHORN CREEK NEAR TELKWA	54.65	-127.12	125	1960	2016
08EE020	TELKWA RIVER BELOW TSAI CREEK	54.61	-127.50	367	1975	2018
08EE004	BULKLEY RIVER AT QUICK	54.62	-126.90	7340	1930	2018
08EE005	BULKLEY RIVER NEAR SMITHERS	54.77	-127.13	8940	1945	2018

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.002 2017-18 permitting Support (Phase 2)\0200_SurfaceWater\Hydrology\R files\Flows_update_rev06.Rmd

1.1.3 Project Hydrometric Data

Four hydrometric stations were installed at the Project in 2017.

- Tenas-Hydro was established on Tenas Creek upstream of the confluence with Goathorn.
- Goathorn-Hydro was established on Goathorn Creek upstream of the Goathorn-Tenas confluence.
- Telkwa-Hydro was established on the Telkwa River upstream of the confluence with Goathorn Creek.
- Four-Hydro was established on Four Creek in April 2020, upstream of the confluence with Goathorn Creek.

Table 1-2 summarizes the metadata for these stations, and their location and catchment delineations are shown in Figure 1-1. The Goathorn-Hydro station is located at the same location as the WSC Goathorn station (08EE008).

Table 1-2: Summary of Local Hydrometric Stations

Station Name	Longitude	Latitude	Area (km^2)	Average Catchment Elevation (masl)	Start of Record
Four Hydro	54.62	-127.14	11.0	985	April 2020
Tenas-Hydro	54.62	-127.19	47.4	1181	May 2017
Goathorn-Hydro	54.65	-127.12	121.6	1243	May 2017
Telkwa-Hydro	54.65	-127.17	966.9	1243	May 2017

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.002 2017-18 permitting Support (Phase 2)\0200_SurfaceWater\Hydrology\R files\Flows_update_rev06.Rmd

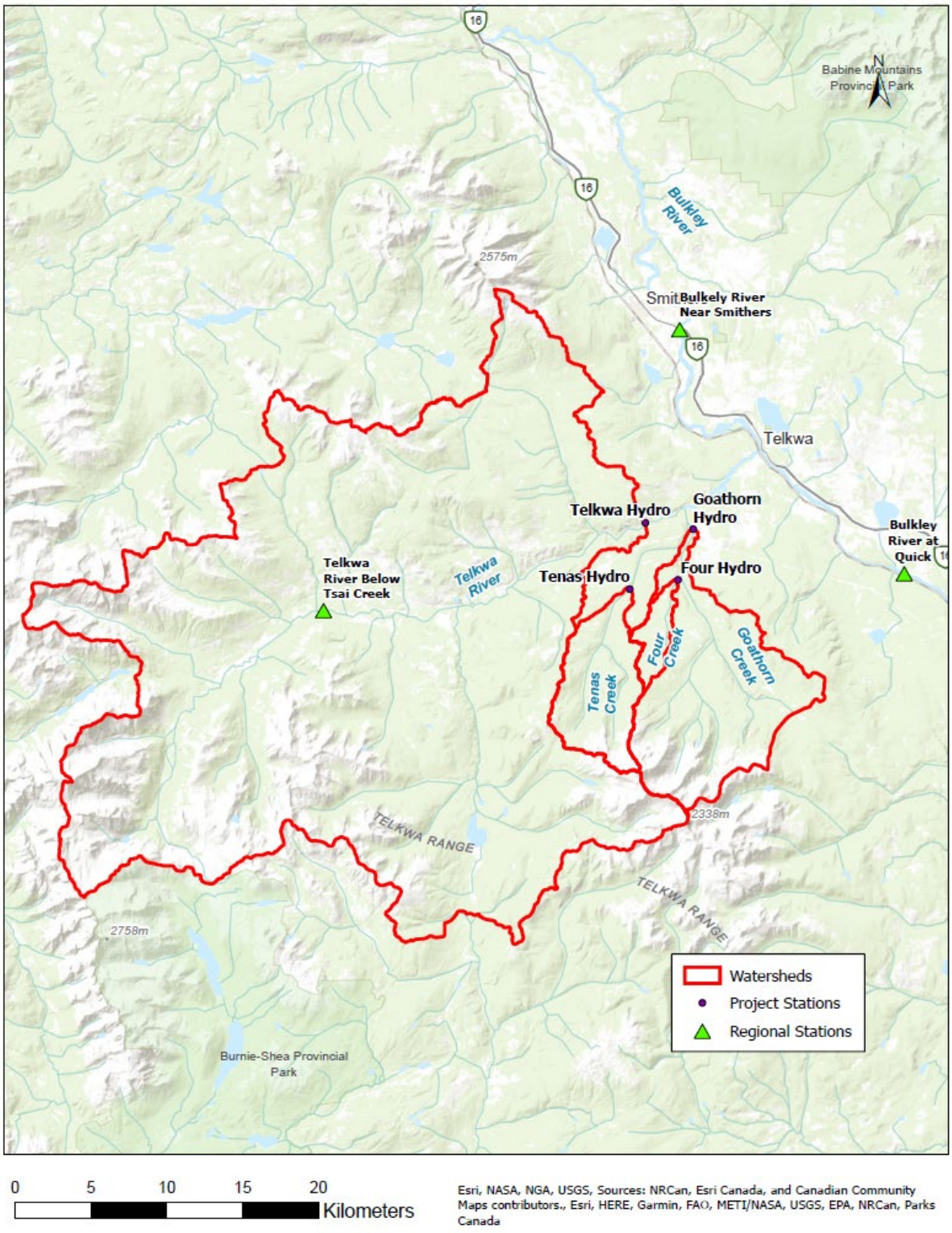


Figure 1-1: Regional and Project Hydrometric Stations

Source: \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!080_Deliverables\Hydromet Baseline Update\040_Figures\Figure3.1_Hydrometric_Stations_20201023.jpg

Project records and regional records were compared and patched together as described in SRK 2021b to provide the long-term flow timeseries that were used in this analysis.

2 Location of Prediction Nodes

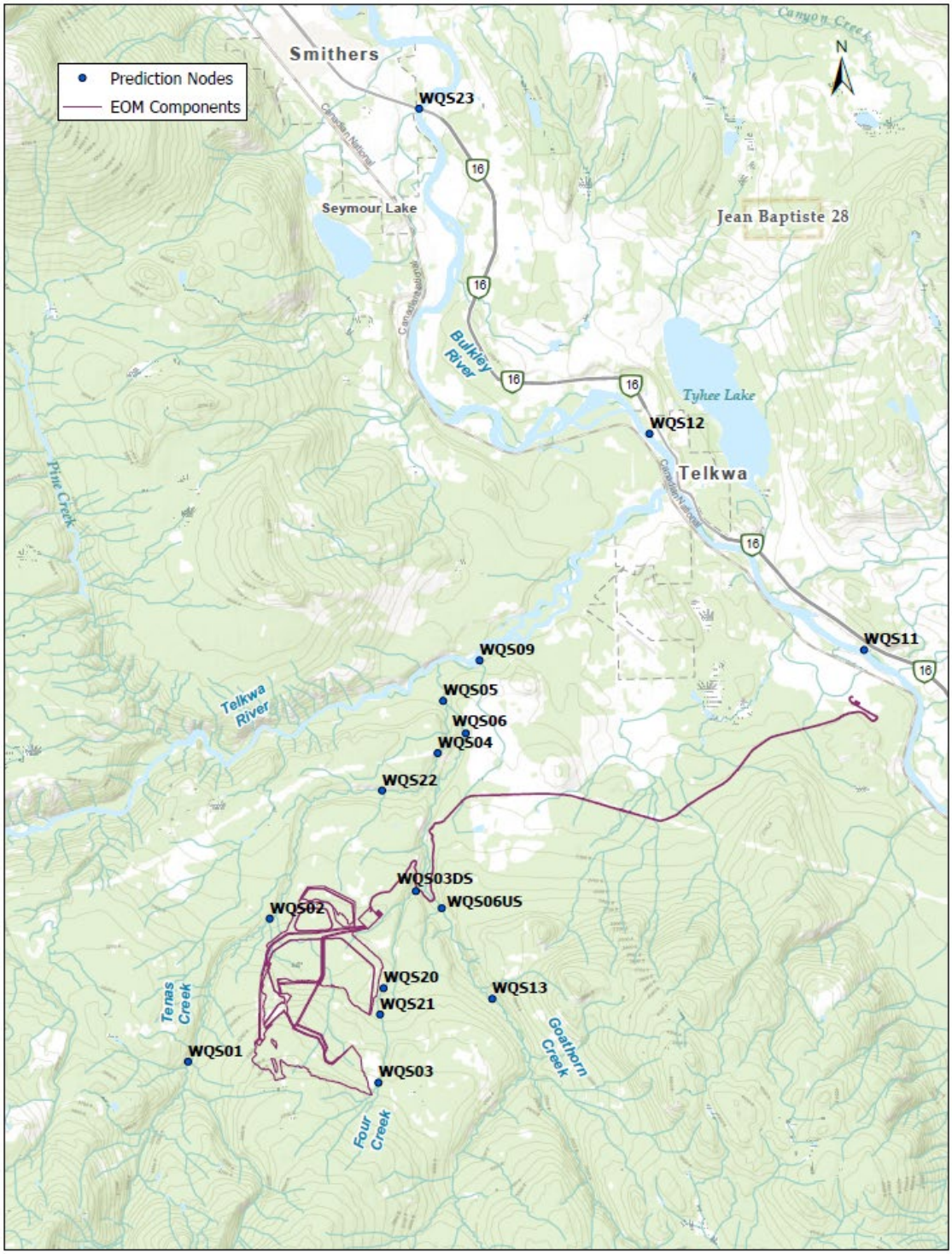
A total of 16 in-stream prediction nodes were selected for the water and load balance to evaluate impacts from the Project, including nodes along Tenas Creek, Four Creek, Goathorn Creek, Telkwa River and Bulkley River.

Project infrastructure will result in changes to the catchment area contributing to each prediction node. Table 2-1 summarises the prediction node coordinates, as well as associated catchment area pre- and post-mining. Node locations are presented in Figure 2-1. Figure 2-2 and Figure 2-3, present the catchment area for each node under pre- and post-mining conditions, respectively.

Table 2-1: Receiving Environment Prediction Nodes, from Upstream to Downstream

Prediction Node	Stream and Description	Coordinates NAD 1983 UTM Zone 9N (m)		Total Catchment Area (km^2)	
		Easting	Northing	Pre-mining	Post-mining
WQS01	Tenas Creek, upstream of Project	615,171	6,050,438	40.7	40.7
WQS02	Tenas Creek, adjacent to Project	616,914	6,053,490	47.6	47.0
WQS22	Tenas Creek, upstream of Project discharge (Unnamed Stream below Tenas Pond)	619313	6056222	65.7	61.9
WQS04	Tenas Creek, downstream of Project discharge (Unnamed Stream below Tenas Pond)	620,499	6,057,020	70.8	65.9
WQS03	Four Creek, upstream of Project	619,235	6,049,989	3.3	3.9
WQS21	Four Creek, upstream of East Management Pond	619269	6051446	5.2	4.9
WQS20	Four Creek, downstream of East Manageemnt Pond	619344	6052005	5.3	5.0
WQS03DS	Four Creek, downstream of Project, upstream of confluence with Goathorn Creek	620,034	6,054,076	10.9	6.9
WQS13	Goathorn Creek, upstream of Project	620,867	6,049,161	97.9	97.9
WQS06US	Goathorn Creek, upstream of Tenas Creek and Four Creek	620,587	6,053,711	107.1	107.1
WQS06	Goathorn Creek, upstream of Tenas Creek, downstream of Four Creek	621,100	6,057,441	123.5	119.1
WQS05	Goathorn Creek, downstream of Tenas Creek	620,615	6,058,133	195.5	186.2
WQS09	Telkwa River, downstream of Goathorn Creek	621,394	6,058,998	1198.9	1189.6
WQS11	Bulkley River, upstream of Telkwa River, downstream of Rail Load Out Pad	629,601	6,059,221	7175.0	7175.0
WQS12	Bulkley River, downstream of Telkwa River	625,021	6,063,831	8505.8	8496.5
WQS23	Bulkley River, at Smithers	620,102	6,070,765	8609.8	8600.5

Source: Generated in report.



Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!040_AutoCAD\1.GIS\Telkwa_reviewed_catchments032020.aprx

Figure 2-1: Prediction Nodes Location

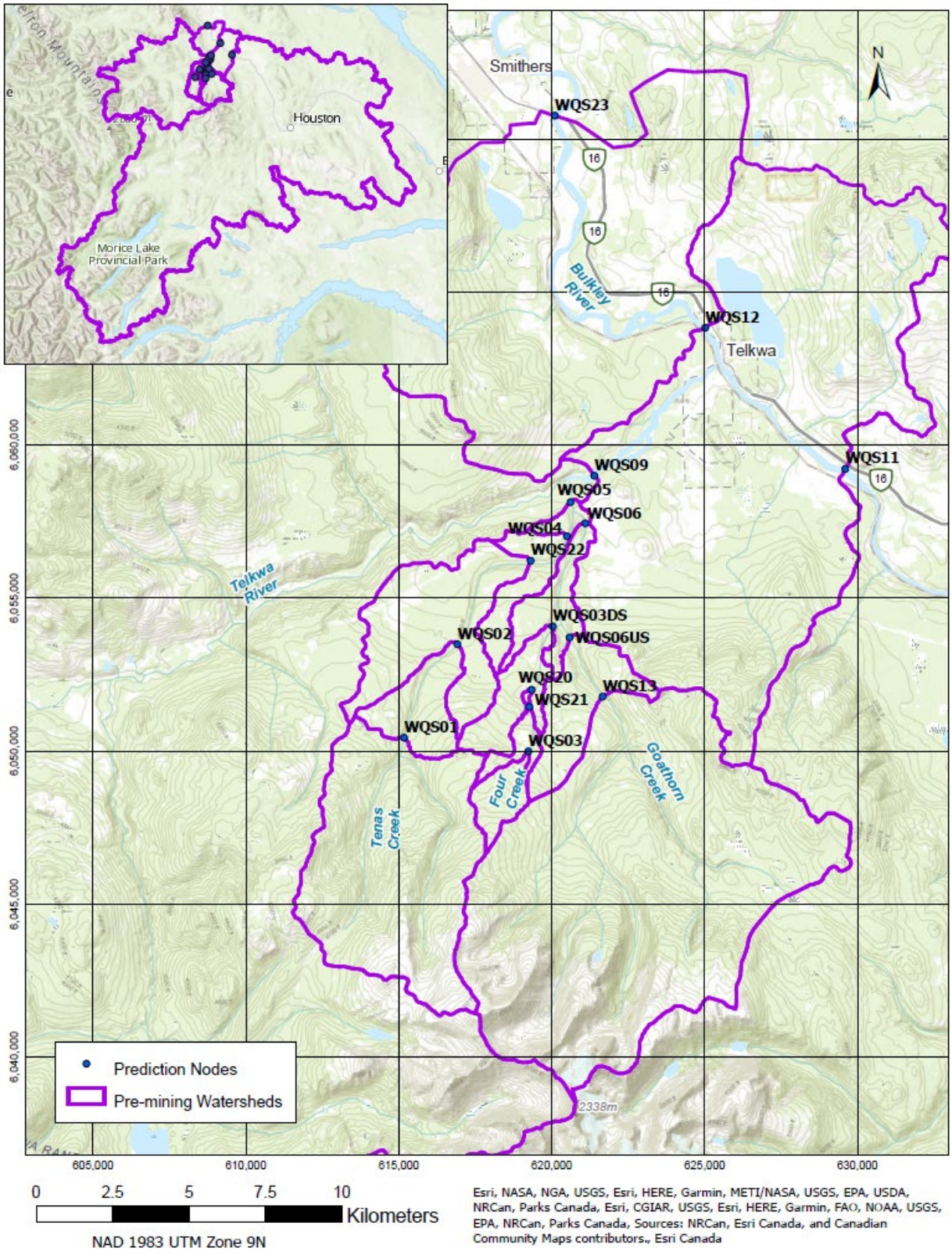


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Figure 2-2: Prediction Nodes Catchment Areas Pre-Mining

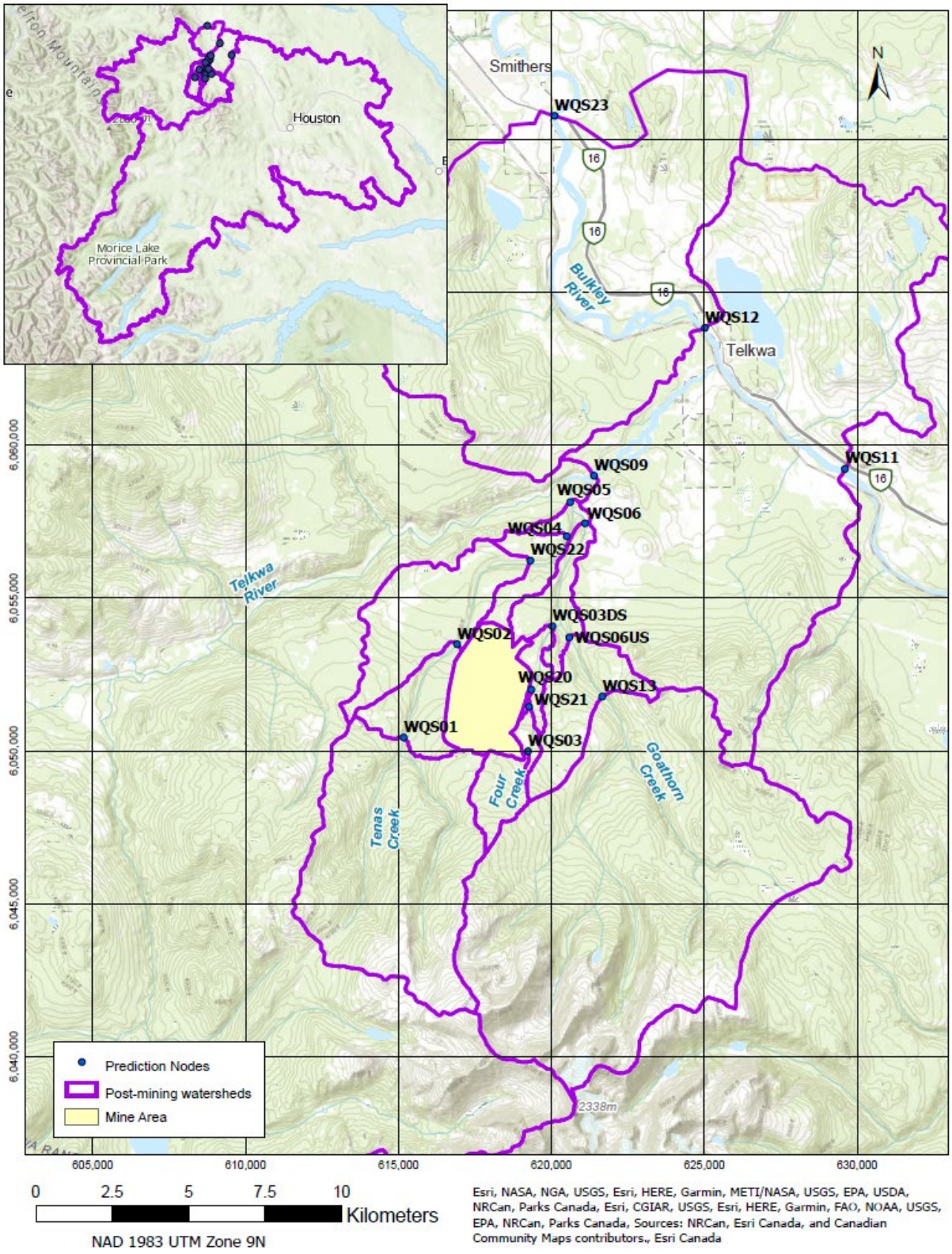

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Figure 2-3: Prediction Nodes Catchment Areas Post-Mining

3 Streamflow Methodology

Correction factors were developed to apply the Project climate timeseries (SRK 2021b) for the catchments of Four Creek, Tenas Creek, Goathorn Creek, Telkwa River, and Bulkley River. These corrected climatic datasets, along with extended streamflow time series (SRK 2021b) were used to calibrate monthly runoff coefficients for each stream. Streamflow at each prediction node was then derived from the corresponding watershed climate timeseries and runoff calibration.

3.1 Climate Analysis

3.1.1 Methodology

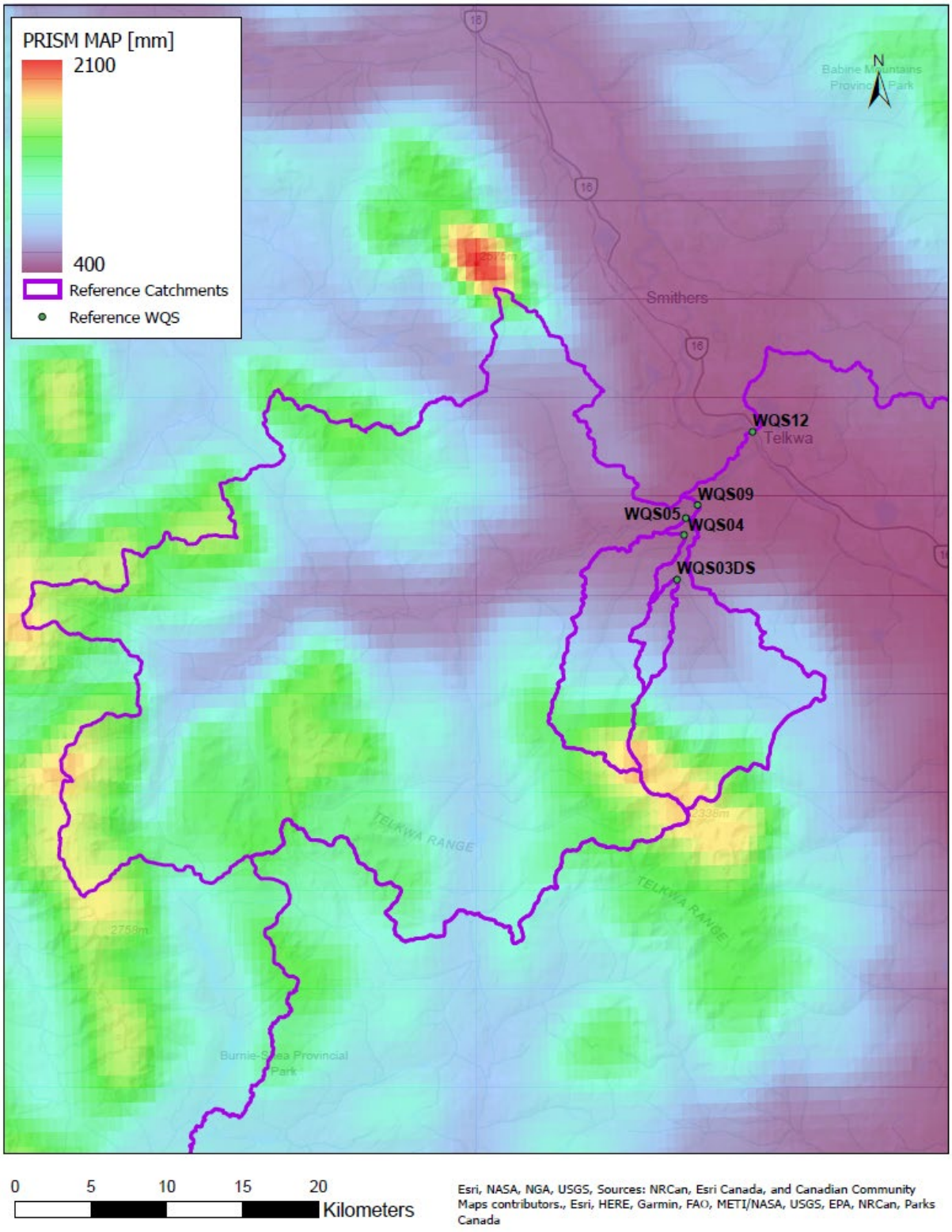
To estimate the average climate conditions for the main Project watersheds accounting for orographic trends, climate correction factors were developed based on the PRISM reanalysis dataset, consistently with SRK 2021b.

PRISM is a climate-elevation regression model, used to generate a reanalysis dataset that provides precipitation and maximum and minimum temperature averages on a monthly timestep for the Pacific Region of Canada and the northwestern USA.

For each stream, a prediction node was selected to define a reference catchment area. PRISM datasets were then averaged over each of these catchments with an iterative raster calculation tool built in ArcGIS Pro (ESRI 2020) to obtain monthly averages for precipitation and temperature parameters for each area. For this analysis:

- Four Creek was represented by WQS03DS catchment area
- Tenas Creek was represented by WQS04 catchment area
- Goathorn Creek was represented by WQS05 catchment area
- Telkwa River was represented by WQS09 catchment area
- Bulkley River was represented by WQS12 catchment area

An illustration of a PRISM dataset and the reference catchments is presented in Figure 3-1.



Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\l040_AutoCAD\1.GIS\Telkwa_PRISMMAP.aprx

Figure 3-1: PRISM Mean Annual Precipitation (MAP) Dataset and Reference WQS and Catchments

The obtained monthly averages were then compared to the reference Project location PRISM results to obtain monthly correction coefficients for each climate parameter.

3.1.2 Climate correction coefficients

Monthly correction coefficients were calculated for the monthly maximum, average and minimum temperatures, as well as precipitation based on the ratio of Project records (SRK 2021b) and the PRISM datasets for each stream. These are presented for each watershed in Table 3-1, Table 3-2, Table 3-3 and Table 3-4 respectively.

Table 3-1: Monthly Precipitation Correction Factors

Month	Four Creek	Tenas Creek	Goathorn Creek	Telkwa River	Bulkley River
Jan	1.30	1.84	1.88	2.06	1.74
Feb	1.19	1.68	1.71	1.89	1.81
Mar	1.42	2.00	2.03	2.29	2.07
Apr	1.39	1.81	1.87	2.05	1.83
May	1.04	1.28	1.26	1.31	1.14
Jun	1.15	1.18	1.23	1.19	1.09
Jul	1.13	1.11	1.16	1.10	1.03
Aug	1.03	1.28	1.28	1.31	1.17
Sep	1.09	1.52	1.53	1.60	1.33
Oct	1.09	1.53	1.56	1.79	1.70
Nov	1.37	1.92	1.94	2.20	1.95
Dec	1.36	1.92	1.96	2.22	1.93

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\PredictionNodes\WQS_Climate_Correction_Coefs_20200420.xlsx

Table 3-2: Monthly Maximum Daily Temperature Correction Addends

Month	Four Creek	Tenas Creek	Goathorn Creek	Telkwa River	Bulkley River
Jan	-0.23	-0.59	-0.67	-0.68	-0.20
Feb	-0.53	-1.32	-1.50	-1.69	-0.81
Mar	-0.71	-1.83	-2.20	-2.37	-1.08
Apr	-1.00	-2.20	-2.67	-2.85	-1.49
May	-1.25	-2.52	-2.93	-3.38	-1.76
Jun	-1.00	-2.38	-2.73	-3.32	-1.64
Jul	-0.97	-2.31	-2.65	-3.18	-1.48
Aug	-0.87	-2.19	-2.53	-3.01	-1.30
Sep	-0.72	-1.89	-2.23	-2.58	-0.86
Oct	-0.82	-1.75	-2.10	-2.32	-0.95
Nov	-0.40	-1.23	-1.39	-1.54	-0.57
Dec	-0.23	-0.67	-0.73	-0.85	-0.35

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\PredictionNodes\WQS_Climate_Correction_Coefs_20200420.xlsx

Table 3-3: Monthly Average Daily Temperature Correction Addends

Month	Four Creek	Tenas Creek	Goathorn Creek	Telkwa River	Bulkley River
Jan	-0.24	-0.45	-0.52	-0.45	-0.27
Feb	-0.37	-0.88	-0.98	-1.03	-0.73
Mar	-0.43	-1.27	-1.54	-1.66	-0.93
Apr	-0.68	-1.64	-1.96	-2.13	-1.19
May	-0.78	-1.74	-2.03	-2.29	-1.26
Jun	-0.74	-1.81	-2.06	-2.46	-1.38
Jul	-0.80	-1.77	-2.00	-2.33	-1.24
Aug	-0.51	-1.48	-1.71	-2.00	-0.92
Sep	-0.43	-1.28	-1.51	-1.73	-0.70
Oct	-0.55	-1.17	-1.46	-1.50	-0.58
Nov	-0.30	-0.93	-1.08	-1.16	-0.43
Dec	-0.04	-0.32	-0.36	-0.37	-0.15

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\PredictionNodes\WQS_Climate_Correction_Coefs_20200420.xlsx

Table 3-4: Monthly Minimum Daily Temperature Correction Addends

Month	Four Creek	Tenas Creek	Goathorn Creek	Telkwa River	Bulkley River
Jan	-0.26	-0.32	-0.37	-0.22	-0.34
Feb	-0.20	-0.44	-0.47	-0.37	-0.65
Mar	-0.14	-0.70	-0.89	-0.94	-0.78
Apr	-0.37	-1.07	-1.25	-1.41	-0.88
May	-0.30	-0.96	-1.12	-1.20	-0.75
Jun	-0.47	-1.23	-1.38	-1.58	-1.12
Jul	-0.63	-1.23	-1.35	-1.48	-1.00
Aug	-0.14	-0.77	-0.88	-0.99	-0.55
Sep	-0.14	-0.67	-0.78	-0.87	-0.54
Oct	-0.27	-0.58	-0.82	-0.66	-0.21
Nov	-0.19	-0.63	-0.78	-0.77	-0.30
Dec	0.16	0.03	0.01	0.10	0.04

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\PredictionNodes\WQS_Climate_Correction_Coefs_20200420.xlsx

3.2 Runoff model

3.2.1 Methodology

Surface runoff is defined as the total amount of surface water discharged from a watershed and is frequently presented as the depth of water distributed evenly throughout the watershed area.

A daily rainfall-runoff model was generated to support streamflow estimations and to provide Project-specific runoff rates. The runoff model for the Project Area was developed using a

snowmelt model, a minimum baseflow function, a lag time, recession coefficient and monthly runoff coefficients for each of the main catchments. Monthly runoff coefficients were calibrated automatically within GoldSim by optimizing the Nash Sutcliffe Efficiency, based on the difference between observed and modelled daily flow. Observed flows, in this case, were the extended records for each of the local hydrometric stations, described in Section 1.1.3. The calibration is described in SRK 2021b.

Precipitation was converted to runoff using a two-step process. The first step converts precipitation to either rainfall or snowfall using the SNOW-17 snow accumulation and ablation model described in SRK 2021b. The output from the snowmelt model is a daily effective precipitation value, representing the sum of rainfall and snowmelt available for runoff.

The second step uses a function from the Snowmelt Runoff Model (SRM), a program and methodology designed to simulate and forecast daily streamflow in mountain basins (J. Martinec, 2008). Each day, water produced from snowmelt and rainfall is superimposed on the calculated recession flow and transformed into a daily discharge from the basin. The discharge is calculated as the minimum of baseflow or runoff from snowmelt and rainfall, according to Equation 1:

$$Q_{n+1} = minimum\ of \begin{cases} C \times P_{eff} \times \frac{A \times 10{,}000}{86{,}400} \times (1 - k_{n+1}) + Q_n \times k_{n+1} \\ B\,x\,A \end{cases} \quad \text{Eq [1]}$$

Where:

Q = average daily discharge [m^3/s]

C = monthly runoff coefficient expressing losses as a ratio (runoff/precipitation)

P_{eff} = Effective precipitation as the sum of snowmelt and rainfall

A = area of the basin [km^2]

k = recession coefficient indicating the decline of discharge in a period without snowmelt or rainfall, $k = \frac{Q_{m+1}}{Q_m}$ where m, m+1 are the sequence of days during a true recession flow period

n = sequence of days during the discharge computation period, also referred to as the lag time.

B = unit baseflow [m^3/s]

Calibration of recession coefficients, *k*, monthly runoff coefficients, *C*, and unit baseflow, *B*, were developed in GoldSim by optimizing the Nash Sutcliffe Efficiency based on the difference between observed and modelled daily discharge. A separate calibration model was prepared for Four Creek, Goathorn Creek, Telkwa River, Bulkley River, and Tenas Creek.

Long term daily flow records at each prediction node were calculated based on corresponding hydrometric station synthetic flow records, minimum unit baseflow values (SRK 2021b), n values and Equation (1).

3.2.2 Rainfall-Runoff Model Inputs

Table 3-3 presents the rainfall-runoff model parameters calibrated for each stream, also presented in SRK 2021b.

Table 3-5: Rainfall-Runoff Model Inputs

Location		Goathorn	Telkwa	Tenas	Bulkley	Four	Project
Minimum Unit Baseflow [L/s/km^2]		1.8	4.1	0.43	3.0	0.3	1.1
Lag Time [days]		1	1	1	1	1	1
Recession		0.9	0.92	0.91	0.96	0.90	0.905
Runoff Coefficient	January	1	1	1	1	1	1
	February	1	1	1	1	1	1
	March	1	1	1	1	1	1
	April	0.42	1	0.45	0.76	0.5	0.43
	May	0.27	0.83	0.32	0.50	0.01	0.30
	June	0.20	0.38	0.17	0.36	0.1	0.18
	July	0.46	0.59	0.09	0.88	0.05	0.28
	August	0.33	0.74	0.03	0.22	0.05	0.18
	September	0.29	0.54	0.19	0.48	0.08	0.24
	October	0.29	0.69	0.28	0.47	0.03	0.28
	November	0.56	0.5	0.88	0.81	0.9	0.72
	December	1	1	1	1	0.4	1

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Model\RunoffCalibration\Project_RunoffModel.gsm

Parameters were assigned to each node as follows:

- Tenas Creek runoff coefficients were applied to all Tenas Creek nodes including WQS01, WQS02, WS22, WQS04, as well as nodes on Four Creek, due to a lack of continuous Four Creek flow data at this time of the study, including WQS03, WQS21, WQS20, WQS03DS.
- Goathorn Creek runoff coefficients were applied to all Goathorn nodes including WQS13, WQS06US, WQS06, WQS05.
- Telkwa River runoff coefficients were applied to WQS09.
- Bulkley River runoff coefficients were applied to WQS11, WQS12 and WQS23.

4 Summary

The water and load balance model, developed in support of the Telkwa Project EA, uses a daily precipitation and temperature record generated for the Project (SRK 2021b) to simulate water volumes within the Project facilities and in the receiving environment. In order to account for the range in topography, from the Telkwa River valley to the upper reaches of the Goathorn and Tenas Creek watersheds, correction factors are required to account for orographic gradients of temperature and precipitation. These correction factors were established based on a published climate-elevation regression model (PRISM), that provides precipitation and maximum and minimum temperature averages on a monthly timestep for the Pacific Region of Canada and the northwestern USA.

Monthly climate correction factors were developed for each of the five watercourses surrounding the Telkwa Project, including Four Creek, Tenas Creek, Goathorn Creek, Telkwa River and Bulkley River, based on the Project-specific records for daily maximum and minimum temperature, and daily precipitation. A calibrated rainfall-runoff model was developed for each stream using the adjusted climate parameters and a series of other runoff-related constants, as described in SRK 2021b. The model allows for estimation of streamflow based on precipitation and temperature inputs for the Project.

Note that based on the methodology applied, the low flow conditions are governed by a constant baseflow value which was selected to match the average low flow in summer and winter months. Extreme low flow conditions, such as the 7-day low flow event for a range of return periods, cannot be directly estimated from this method. Extreme low flows are calculated externally from this modeling approach and are presented in SRK 2021b and utilized in water balance modeling.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

5 References

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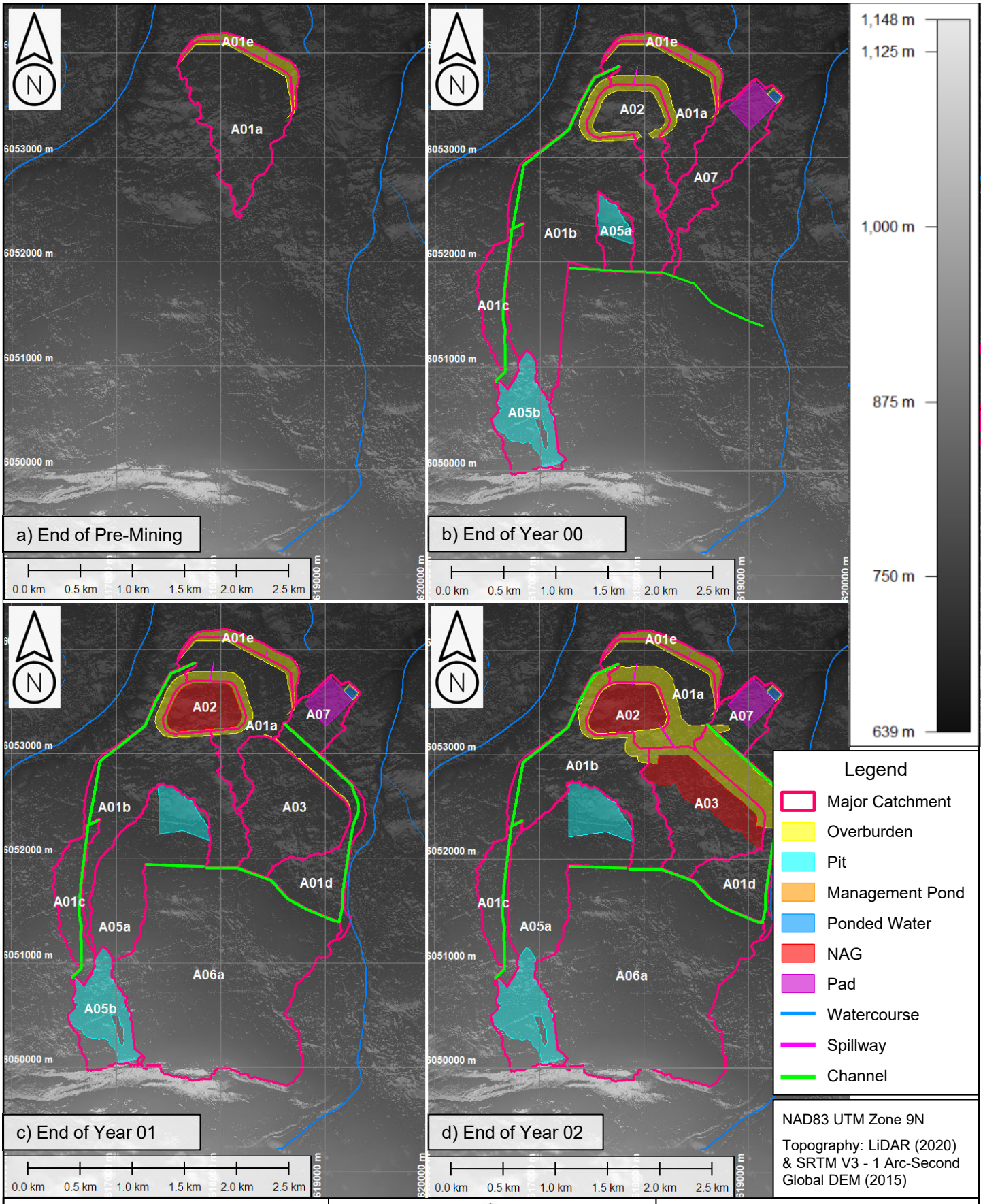
[Obedkoff *et al*] C. H. Coulson & W. Obedkoff, 1998. British Columbia Streamflow Inventory. Province of British Columbia, Ministry of Environment Lands and Parks.

[PCIC 2020] Pacific Climate Impacts Consortium. “Data Portal.” Accessed: 20 March 2020. URL: www.pacificclimate.org/data

[SRK 2021a] Tenas Project Water and Load Balance Report. SRK, 2021. Prepared for Telkwa Coal Limited. Vancouver BC

[SRK 2021b] Tenas Project Hydrometeorological Baseline and Model Development Report. SRK, 2021. Prepared for Telkwa Coal Limited. Vancouver BC

Appendix B Catchment Area Summaries



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TELKWA COAL LIMITED

Water Management Design

Major Catchments

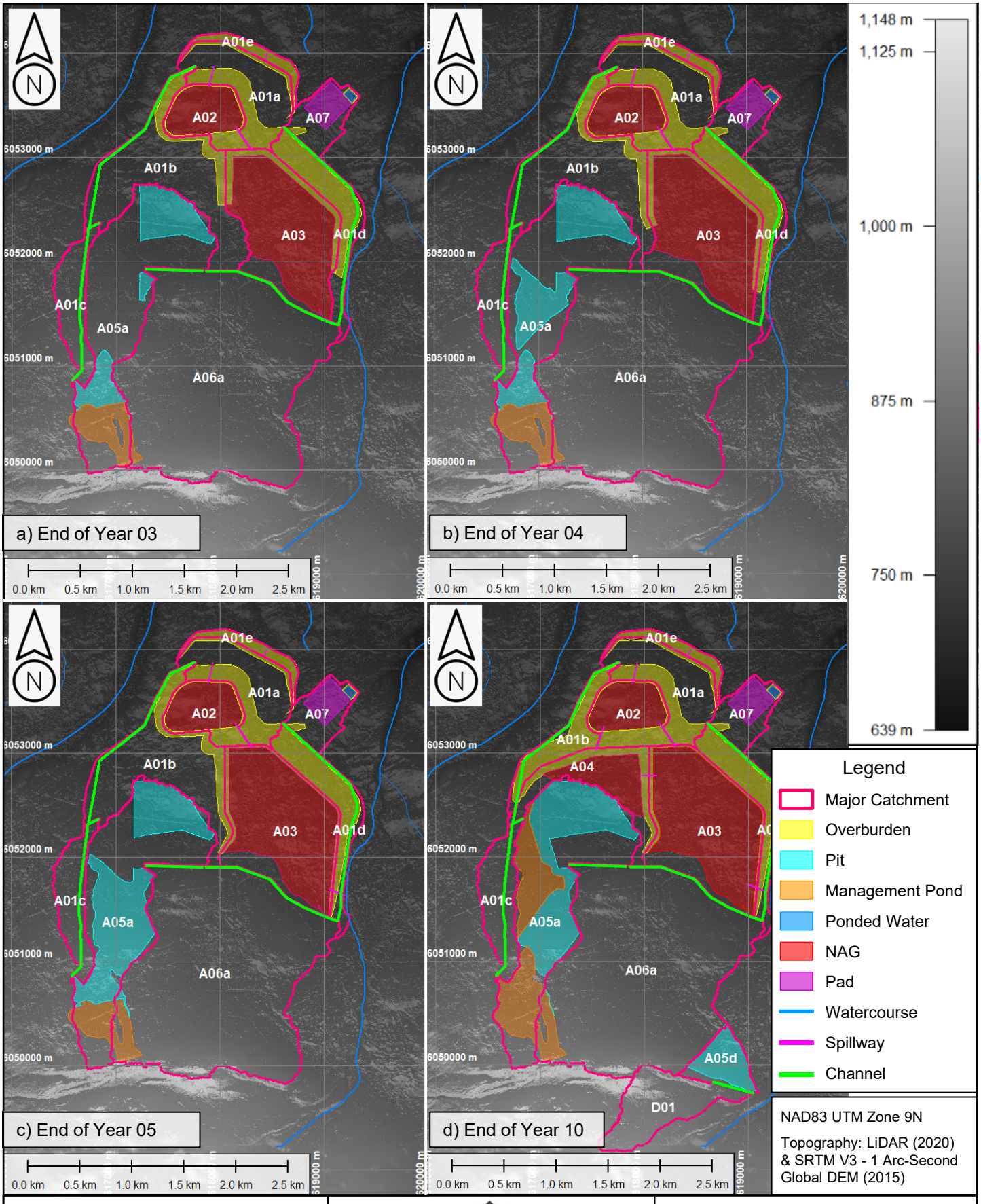
End of Pre-Mining to End of Year 02

Job No: 1CT027.003

Filename: Telkwa_WMCatchments_1CT027-003_rev00_nf.pptx

Tenas Project – EA Water Management

Date:	Approved:	Figure:
July 2021	SAB	B-1



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TELKWA COAL LIMITED

Water Management Design

Major Catchments

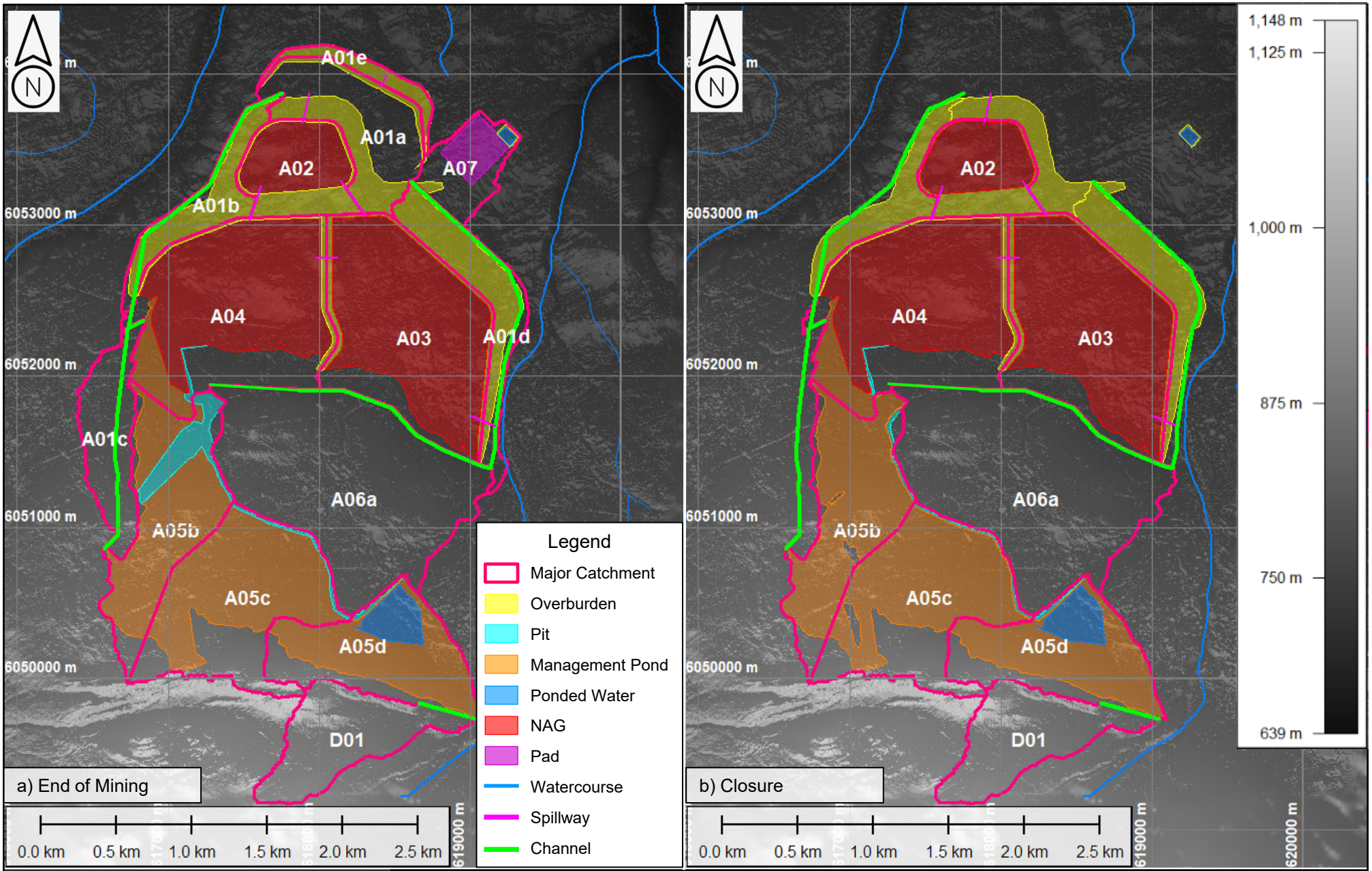
End of Year 03 to End of Year 10

Job No: 1CT027.003

Filename: Telkwa_WMCatchments_1CT027-003_rev00_nf.pptx

Tenas Project – EA Water Management

Date:	Approved:	Figure:
July 2021	SAB	B-2



Datum: NAD83 UTM Zone 9N

Topography: LiDAR (2020) & SRTM V3 - 1 Arc-Second Global DEM (2015)

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Job No: 1CT027.003

Filename: Telkwa_WMCatchments_1CT027-003_rev00_nf.pptx

TELKWA COAL LIMITED

Tenas Project – EA Water Management

Water Management Design

Major Catchments

End of Mining and Closure

Date:	Approved:	Figure:
July 2021	SAB	B-3

Table B 1: A01a (Tenas Control Pond) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A01a	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	1	0.99	0.049	0	0	0	0	0
	EOY0	2022-12-31	0.67	0.54	0.13	0	0	0	0	0
	Y1	2023-03-01	0.74	0.59	0.14	0	0	0	0	0
	EOY1	2023-12-31	0.74	0.59	0.14	0	0	0	0	0
	EOY2	2024-12-31	0.59	0.33	0.25	0	0	0	0	0
	EOY3	2025-12-31	0.59	0.33	0.25	0	0	0	0	0
	EOY4	2026-12-31	0.59	0.33	0.25	0	0	0	0	0
	EOY5	2027-12-31	0.59	0.33	0.25	0	0	0	0	0
	EOY10	2032-12-31	0.59	0.33	0.25	0	0	0	0	0
	EOM	2043-12-31	0.59	0.33	0.25	0	0	0	0	0
	SOC	2044-01-01	0	0	0	0	0	0	0	0
	Closure	2100-01-01	0	0	0	0	0	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 2: A01b (Channel C03 South to Tenas Control Pond) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A01b	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	2.7	2.7	0.065	0	0	0	0	0
	EOY1	2023-12-31	1.3	1.2	0.065	0	0	0	0	0
	EOY2	2024-12-31	1.1	1	0.12	0	0	0	0	0
	EOY3	2025-12-31	1.1	0.92	0.15	0	0	0	0	0
	EOY4	2026-12-31	0.98	0.81	0.17	0	0	0	0	0
	EOY5	2027-12-31	0.97	0.8	0.18	0	0	0	0	0
	EOY7	2029-12-31	0.3	0.051	0.25	0	0	0	0	0
	EOY10	2032-12-31	0.3	0.051	0.25	0	0	0	0	0
	EOM	2043-12-31	0.3	0.051	0.25	0	0	0	0	0
	SOC	2044-01-01	0	0	0	0	0	0	0	0
	Closure	2100-01-01	0	0	0	0	0	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 3: A01c (Channel C03 North to Tenas Control Pond) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A01c	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0.33	0.33	0	0	0	0	0	0
	EOY1	2023-12-31	0.33	0.33	0	0	0	0	0	0
	EOY2	2024-12-31	0.34	0.34	0	0	0	0	0	0
	EOY3	2025-12-31	0.34	0.34	0	0	0	0	0	0
	EOY4	2026-12-31	0.34	0.34	0	0	0	0	0	0
	EOY5	2027-12-31	0.34	0.34	0	0	0	0	0	0
	EOY10	2032-12-31	0.4	0.4	0	0	0	0	0	0
	EOM	2043-12-31	0.4	0.4	0	0	0	0	0	0
	SOC	2044-01-01	0	0	0	0	0	0	0	0
	Closure	2100-01-01	0	0	0	0	0	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 4: A01d (Channel C01 to Tenas Control Pond) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A01d	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0	0	0	0	0	0	0	0
	Y1	2023-03-01	0.6	0.58	0.018	0	0	0	0	0
	EOY1	2023-12-31	0.6	0.58	0.018	0	0	0	0	0
	EOY2	2024-12-31	0.7	0.43	0.27	0	0	0	0	0
	EOY3	2025-12-31	0.44	0.14	0.3	0	0	0	0	0
	EOY4	2026-12-31	0.43	0.12	0.31	0	0	0	0	0
	EOY5	2027-12-31	0.43	0.11	0.32	0	0	0	0	0
	EOY10	2032-12-31	0.43	0.11	0.32	0	0	0	0	0
	EOM	2043-12-31	0.43	0.11	0.32	0	0	0	0	0
	SOC	2044-01-01	0	0	0	0	0	0	0	0
	Closure	2100-01-01	0	0	0	0	0	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 5: A02 (North Management Pond) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A02	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0.48	0.38	0.1	0	0	0	0	0
	EOY1	2023-12-31	0.32	0	0.06	0	0	0.26	0	0
	EOY2	2024-12-31	0.38	0	0.086	0	0	0.29	0	0
	EOY3	2025-12-31	0.38	0	0.086	0	0	0.29	0	0
	EOY4	2026-12-31	0.38	0	0.086	0	0	0.29	0	0
	EOY5	2027-12-31	0.38	0	0.086	0	0	0.29	0	0
	EOY10	2032-12-31	0.43	0	0.14	0	0	0.29	0	0
	EOM	2043-12-31	0.43	0	0.14	0	0	0.29	0	0
	SOC	2044-01-01	0.43	0	0.14	0	0	0.29	0	0
	Closure	2100-01-01	0.43	0	0.14	0	0	0.29	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 6: A03 (East Management Pond) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A03	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0	0	0	0	0	0	0	0
	Y1	2023-03-01	0.92	0.92	0	0	0	0	0	0
	EOY1	2023-12-31	0.92	0.92	0	0	0	0	0	0
	EOY2	2024-12-31	0.91	0.43	0.12	0	0	0.35	0	0
	EOY3	2025-12-31	1.2	0.099	0.14	0	0	0.94	0	0
	EOY4	2026-12-31	1.3	0.14	0.14	0	0	1	0	0
	EOY5	2027-12-31	1.3	0.13	0.096	0	0	1.1	0	0
	EOY10	2032-12-31	1.3	0.13	0.096	0	0	1.1	0	0
	EOM	2043-12-31	1.3	0.13	0.096	0	0	1.1	0	0
	SOC	2044-01-01	1.3	0.13	0.096	0	0	1.1	0	0
	Closure	2100-01-01	1.3	0.13	0.096	0	0	1.1	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 7: A04 (West Management Pond) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A04	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0	0	0	0	0	0	0	0
	EOY1	2023-12-31	0	0	0	0	0	0	0	0
	EOY2	2024-12-31	0	0	0	0	0	0	0	0
	EOY3	2025-12-31	0	0	0	0	0	0	0	0
	EOY4	2026-12-31	0	0	0	0	0	0	0	0
	EOY5	2027-12-31	0	0	0	0	0	0	0	0
	EOY7	2029-12-31	0.56	0.12	0.17	0	0	0.27	0	0
	EOY10	2032-12-31	0.56	0.12	0.17	0	0	0.27	0	0
	EOM	2043-12-31	1.4	0.25	0.058	0.0099	0.12	0.95	0	0
	SOC	2044-01-01	1.4	0.25	0.058	0.0067	0.12	0.95	0	0
	Closure	2100-01-01	1.4	0.25	0.058	0.0067	0.12	0.95	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 8: A05a (Pit Backfill Area North) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A05a	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0.27	0.18	0	0.092	0	0	0	0
	EOY1	2023-12-31	1.4	0.92	0	0.51	0	0	0	0
	EOY2	2024-12-31	1.6	1	0	0.57	0	0	0	0
	EOY3	2025-12-31	1.6	1.2	0	0.42	0	0	0	0
	EOY4	2026-12-31	1.7	0.98	0	0.67	0	0	0	0
	EOY5	2027-12-31	1.6	0.78	0	0.87	0	0	0	0
	EOY10	2032-12-31	1.7	0.41	0	0.75	0.5	0	0	0
	EOM	2043-12-31	0	0	0	0	0	0	0	0
	SOC	2044-01-01	0	0	0	0	0	0	0	0
	Closure	2100-01-01	0	0	0	0	0	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 9: A05b (Pit Backfill Area West) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A05b	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0.48	0.13	0	0.35	0	0	0	0
	EOY1	2023-12-31	0	0	0	0	0	0	0	0
	EOY2	2024-12-31	0	0	0	0	0	0	0	0
	EOY3	2025-12-31	0	0	0	0	0	0	0	0
	EOY4	2026-12-31	0	0	0	0	0	0	0	0
	EOY5	2027-12-31	0	0	0	0	0	0	0	0
	EOY10	2032-12-31	0	0	0	0	0	0	0	0
	EOM	2043-12-31	0.81	0.21	0	0.12	0.47	0	0	0
	SOC	2044-01-01	0.81	0.098	0	0.015	0.69	0	0	0
	Closure	2100-01-01	0.81	0.098	0	0.015	0.69	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 10: A05c (Pit Backfill Area South) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A05c	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0	0	0	0	0	0	0	0
	EOY1	2023-12-31	0	0	0	0	0	0	0	0
	EOY2	2024-12-31	0	0	0	0	0	0	0	0
	EOY3	2025-12-31	0	0	0	0	0	0	0	0
	EOY4	2026-12-31	0	0	0	0	0	0	0	0
	EOY5	2027-12-31	0	0	0	0	0	0	0	0
	EOY10	2032-12-31	0	0	0	0	0	0	0	0
	EOM	2043-12-31	1	0.27	0	0.023	0.73	0	0	0
	SOC	2044-01-01	1	0.29	0	0.021	0.71	0	0	0
	Closure	2100-01-01	1	0.29	0	0.021	0.71	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 11: A05d (Pit Backfill Area East and Pit Lake) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A05d	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0	0	0	0	0	0	0	0
	EOY1	2023-12-31	0	0	0	0	0	0	0	0
	EOY2	2024-12-31	0	0	0	0	0	0	0	0
	EOY3	2025-12-31	0	0	0	0	0	0	0	0
	EOY4	2026-12-31	0	0	0	0	0	0	0	0
	EOY5	2027-12-31	0	0	0	0	0	0	0	0
	EOY10	2032-12-31	0.24	0.035	0	0.21	0	0	0	0
	EOM	2043-12-31	0.73	0.15	0	0.0073	0.47	0	0.1	0
	SOC	2044-01-01	0.73	0.15	0	0.0064	0.47	0	0.1	0
	Closure	2100-01-01	0.73	0.15	0	0.0064	0.47	0	0.1	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 12: A06a (Channel C02 to Four Creek) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A06a	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	0	0	0	0	0	0	0	0
	Y1	2023-03-01	3.2	3.2	0	0	0	0	0	0
	EOY1	2023-12-31	3.2	3.2	0	0	0	0	0	0
	EOY2	2024-12-31	3.2	3.2	0	0	0	0	0	0
	EOY3	2025-12-31	3.2	3.2	0	0	0.015	0	0	0
	EOY4	2026-12-31	3.2	3.2	0	0	0.015	0	0	0
	EOY5	2027-12-31	3.2	3.1	0	0.0069	0.082	0	0	0
	EOY10	2032-12-31	3.1	3	0	0.0026	0.087	0	0	0
	EOM	2043-12-31	1.6	1.6	0	0	0	0	0	0
	SOC	2044-01-01	1.6	1.6	0	0	0	0	0	0
	Closure	2100-01-01	1.6	1.6	0	0	0	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Table B 13: A07 (Coal Processing Plant) Sub-Catchment Summary through the LOM

Area	Phase	Start Date	Major Catchment Area (km^2)	Sub-Catchment Area (km^2)						
				Natural	Overburden	Pit	Non-Acid Generating Rock	Management Pond	Ponded Water	Pad
A07	Start	2021-01-01	0	0	0	0	0	0	0	0
	EOPM	2021-12-31	0	0	0	0	0	0	0	0
	EOY0	2022-12-31	1.5	1.4	0.0047	0	0	0	0.007	0.11
	Y1	2023-03-01	0.28	0.17	0.0047	0	0	0	0.007	0.11
	EOY1	2023-12-31	0.28	0.17	0.0047	0	0	0	0.007	0.11
	EOY2	2024-12-31	0.28	0.16	0.014	0	0	0	0.007	0.11
	EOY3	2025-12-31	0.28	0.16	0.014	0	0	0	0.007	0.11
	EOY4	2026-12-31	0.28	0.16	0.014	0	0	0	0.007	0.11
	EOY5	2027-12-31	0.28	0.16	0.014	0	0	0	0.007	0.11
	EOY10	2032-12-31	0.28	0.16	0.014	0	0	0	0.007	0.11
	EOM	2043-12-31	0.28	0.16	0.014	0	0	0	0.007	0.11
	SOC	2044-01-01	0	0	0	0	0	0	0	0
	Closure	2100-01-01	0	0	0	0	0	0	0	0

Sources: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Catchments\Telkwa_WMCatchments_1CT027-003_rev10_sab_nf.xlsx

Appendix C Stage-Storage Relationships

Table C- 1: Management Pond Stage-Storage-Elevation Relationships

Elevation [masl]	Cumulative volumes [m3]			Surface Area [m2]		
	North MP	East MP	West MP	North MP	East MP	West MP
753.0	-	-	1	-	-	-
753.5	-	-	158	-	-	-
754.0	-	-	906	-	-	-
754.5	-	-	2,332	-	-	3,085
755.0	-	-	4,404	-	-	4,363
755.5	-	-	7,105	-	-	5,670
756.0	-	-	10,512	-	-	7,150
756.5	-	-	14,868	-	-	9,240
757.0	-	-	20,458	-	-	11,650
757.5	-	-	27,329	-	-	14,210
758.0	-	-	36,011	-	-	16,740
758.5	-	-	46,879	-	-	22,650
759.0	-	-	59,579	-	-	26,000
759.5	-	-	73,865	-	-	29,350
760.0	-	-	89,696	-	-	32,330
760.5	-	-	106,984	-	-	35,040
761.0	-	-	125,555	-	-	37,650
761.5	-	-	145,444	-	-	40,240
762.0	-	-	166,661	-	-	42,880
762.5	-	-	189,282	-	-	45,680
763.0	-	-	213,354	-	-	48,560
763.5	-	-	238,832	-	-	51,300
764.0	-	-	265,706	-	-	54,100
764.5	-	-	293,983	-	-	56,800
765.0	-	-	323,643	-	-	59,500
765.5	-	-	354,661	-	-	62,100
766.0	-	-	387,023	-	-	64,800
766.5	-	-	420,676	-	-	67,200
767.0	-	-	455,502	-	-	69,500
767.5	-	-	491,462	-	-	71,700
768.0	-	-	528,531	-	-	74,000
768.5	-	-	566,688	-	-	76,100
769.0	-	-	605,936	-	-	78,300
769.5	-	-	646,276	-	-	81,900
770.0	-	-	687,695	-	-	85,500
770.5	-	-	730,173	-	-	87,900
771.0	-	-	773,697	-	-	90,100
771.5	-	-	818,248	-	-	92,100
772.0	-	-	863,781	-	-	94,100

Elevation [masl]	Cumulative volumes [m3]			Surface Area [m2]		
	North MP	East MP	West MP	North MP	East MP	West MP
772.5	-	-	910,295	-	-	96,100
773.0	-	-	957,801	-	-	98,200
773.5	-	-	1,006,315	-	-	100,200
774.0	-	-	1,055,844	-	-	102,300
774.5	-	-	1,106,399	-	-	104,400
775.0	-	-	1,157,984	-	-	106,500
775.5	-	-	1,210,602	-	-	108,700
776.0	-	-	1,264,266	-	-	110,800
776.5	-	-	1,322,177	-	-	113,000
777.0	-	-	1,381,203	-	-	115,100
777.5	-	-	1,441,272	-	-	117,100
778.0	-	-	1,502,357	-	-	119,100
778.5	-	-	1,564,448	-	-	121,100
779.0	-	-	1,627,554	-	-	123,100
779.5	-	-	1,691,688	-	-	125,100
780.0	-	-	1,756,845	-	-	127,100
780.5	-	-	1,823,031	-	-	129,100
781.0	-	-	1,890,246	-	-	131,100
781.5	-	-	1,958,490	-	-	133,200
782.0	-	-	2,027,767	-	-	135,200
782.5	-	-	2,098,078	-	-	137,200
783.0	-	-	2,169,433	-	-	139,200
783.5	-	-	2,241,912	-	-	141,500
784.0	-	-	2,315,618	-	-	143,900
784.5	-	-	2,390,689	-	-	146,900
785.0	-	-	2,467,148	-	-	149,600
785.5	-	-	2,545,068	-	-	152,600
786.0	-	-	2,624,532	-	-	155,600
786.5	-	-	2,705,621	-	-	158,900
787.0	-	-	2,788,365	-	-	162,200
787.5	-	-	2,872,732	-	-	165,300
788.0	-	-	2,958,701	-	-	168,500
788.5	-	-	3,046,286	-	-	171,800
789.0	-	-	3,135,510	-	-	175,100
789.5	-	-	3,226,391	-	-	181,100
790.0	-	-	3,319,017	-	-	186,900
790.5	-	-	3,413,568	-	-	191,000
791.0	-	-	3,510,406	-	-	194,800
791.5	-	-	3,609,548	-	-	201,700
792.0	-	-	3,711,020	-	-	206,800
792.5	-	-	3,815,026	-	-	212,700

Elevation [masl]	Cumulative volumes [m3]			Surface Area [m2]		
	North MP	East MP	West MP	North MP	East MP	West MP
793.0	-	-	3,921,701	-	-	218,000
793.5	-	-	4,030,771	-	-	222,300
794.0	-	-	4,141,625	-	-	225,700
794.5	-	-	4,254,107	-	-	229,000
795.0	-	-	4,368,103	-	-	232,000
795.5	-	-	4,483,523	-	-	234,800
796.0	-	-	4,599,998	-	-	236,900
796.5	-	-	4,717,374	-	-	238,800
797.0	-	-	4,835,632	-	-	240,600
797.5	-	-	4,954,783	-	-	242,300
798.0	-	-	5,075,065	-	-	244,000
798.5	-	-	5,196,508	-	-	246,700
799.0	-	-	5,319,055	-	-	248,700
799.5	-	-	5,442,668	-	-	250,600
800.0	-	-	5,567,360	-	-	252,500
800.5	-	-	5,703,541	-	-	254,500
801.0	-	-	5,840,754	-	-	256,400
801.5	-	-	5,978,984	-	-	258,400
802.0	-	-	6,118,222	-	-	260,300
802.5	-	-	6,258,458	-	-	262,200
803.0	-	-	6,399,688	-	-	264,200
803.5	-	-	6,541,941	-	-	266,300
804.0	-	-	6,685,320	-	-	268,400
804.5	-	-	6,829,891	-	-	271,000
805.0	-	-	6,975,848	-	-	273,400
805.5	-	-	7,123,275	-	-	276,200
806.0	-	-	7,272,139	-	-	278,700
806.5	-	-	7,422,418	-	-	281,400
807.0	-	-	7,574,057	-	-	283,900
807.5	-	-	7,727,015	-	-	286,500
808.0	-	-	7,881,221	-	-	288,900
808.5	-	-	8,036,607	-	-	291,100
809.0	-	-	8,193,067	1,623	-	293,400
809.5	466	-	8,350,557	3,093	-	301,900
810.0	1,123	-	8,509,021	5,470	-	310,200
810.5	6,738	-	8,668,394	12,480	-	313,600
811.0	14,942	-	8,828,629	20,760	-	315,500
811.5	25,958	-	8,989,676	37,090	-	317,100
812.0	40,193	-	9,151,508	59,600	-	318,500
812.5	76,609	-	9,322,278	72,200	-	319,900
813.0	118,602	-	9,493,790	85,900	-	321,300

Elevation [masl]	Cumulative volumes [m3]			Surface Area [m2]		
	North MP	East MP	West MP	North MP	East MP	West MP
813.5	166,062	-	9,666,027	97,600	-	322,700
814.0	218,864	-	9,838,972	112,400	-	323,900
814.5	282,474	-	10,012,613	127,800	-	325,200
815.0	350,375	-	10,186,927	140,500	-	326,500
815.5	422,631	-	10,361,900	152,100	-	327,800
816.0	499,164	-	10,537,565	160,600	-	329,100
816.5	583,548	-	10,713,986	169,400	-	330,700
817.0	671,440	-	10,891,236	180,300	-	332,300
817.5	763,219	-	11,069,348	191,700	-	333,900
818.0	859,037	-	11,248,364	201,200	-	335,600
818.5	965,501	-	11,428,354	211,800	-	337,600
819.0	1,076,237	-	11,609,434	224,100	-	339,900
819.5	1,190,980	-	11,791,627	234,400	-	342,500
820.0	1,309,466	-	11,974,937	241,900	-	346,000
820.5	1,434,190	42	12,159,426	249,100	337	351,000
821.0	1,561,375	320	12,345,385	255,800	1,451	359,400
821.5	1,690,649	1,051	12,533,323	259,400	3,827	368,800
822.0	1,821,642	2,547	12,724,378	262,100	8,610	378,000
822.5	1,953,991	10,772	12,920,878	264,600	16,980	389,400
823.0	2,087,586	23,020	13,121,001	267,100	28,270	398,200
823.5	2,222,431	42,014	13,325,122	269,600	47,530	407,200
824.0	2,358,531	69,014	13,533,487	272,100	66,400	421,800
824.5	2,495,890	108,864	13,773,078	274,600	83,200	432,700
825.0	2,634,515	155,702	14,017,326	277,100	101,600	444,900
825.5	2,774,409	209,671	14,266,365	279,600	118,300	456,600
826.0	2,915,579	270,911	14,520,354	282,200	133,200	468,200
826.5	3,058,027	343,147	14,782,602	284,700	147,800	479,000
827.0	3,201,761	422,036	15,049,146	287,300	163,100	490,400
827.5	3,346,783	507,460	15,320,163	289,900	177,800	501,000
828.0	3,493,100	599,289	15,595,810	292,400	192,400	513,000
828.5	3,640,717	703,243	15,879,423	295,000	208,400	527,000
829.0	3,789,638	813,949	16,167,983	297,600	224,300	541,000
829.5	3,939,867	931,380	16,461,317	300,200	241,100	564,000
830.0	4,091,411	1,055,505	16,759,159	304,100	258,100	587,000
830.5	4,091,411	1,192,641	17,063,436	304,100	275,600	600,000
831.0	4,091,411	1,336,892	17,372,266	304,100	295,200	613,000
831.5	4,091,411	1,488,259	17,685,485	304,100	314,000	626,000
832.0	4,091,411	1,646,749	18,003,104	304,100	332,600	638,000
832.5	4,091,411	1,824,665	18,325,865	304,100	354,900	649,000
833.0	4,091,411	2,011,258	18,653,252	304,100	384,600	660,000
833.5	4,091,411	2,206,866	18,985,405	304,100	406,100	671,000

Elevation [masl]	Cumulative volumes [m3]			Surface Area [m2]		
	North MP	East MP	West MP	North MP	East MP	West MP
834.0	4,091,411	2,411,944	19,322,219	304,100	426,200	682,000
834.5	4,091,411	2,638,892	19,664,854	304,100	453,800	694,000
835.0	4,091,411	2,875,363	20,012,850	304,100	481,300	706,000
835.5	4,091,411	3,121,632	20,366,250	304,100	511,000	718,000
836.0	4,091,411	3,378,045	20,724,973	304,100	538,000	731,000
836.5	4,091,411	3,657,995	21,103,457	304,100	560,000	744,000
837.0	4,091,411	3,945,452	21,488,639	304,100	581,000	761,000
837.5	4,091,411	4,240,427	21,880,228	304,100	604,000	777,000
838.0	4,091,411	4,542,927	22,277,967	304,100	626,000	795,000
838.5	4,091,411	4,868,144	22,684,794	304,100	650,000	810,000
839.0	4,091,411	5,200,592	23,095,603	304,100	682,000	823,000
839.5	4,091,411	5,540,912	23,510,114	304,100	705,000	834,000
840.0	4,091,411	5,889,745	23,928,082	304,100	732,000	846,000
840.5	4,091,411	6,268,822	24,349,506	304,100	760,000	853,000
841.0	4,091,411	6,655,128	24,774,109	304,100	784,000	860,000
841.5	4,091,411	7,049,047	25,201,772	304,100	808,000	868,000
842.0	4,091,411	7,450,979	25,632,372	304,100	831,000	875,000
842.5	4,091,411	7,879,514	26,066,229	304,100	855,000	882,000
843.0	4,091,411	8,316,596	26,502,750	304,100	880,000	890,000
843.5	4,091,411	8,762,626	26,941,945	304,100	904,000	899,000
844.0	4,091,411	9,218,008	27,384,013	304,100	931,000	909,000
844.5	4,091,411	9,692,452	27,829,546	304,100	948,000	918,000
845.0	4,091,411	10,172,779	28,278,292	304,100	962,000	927,000
845.5	4,091,411	10,659,065	28,730,361	304,100	975,000	936,000
846.0	4,091,411	11,151,404	29,185,855	304,100	988,000	945,000
846.5	4,091,411	11,652,757	29,645,829	304,100	1,003,000	955,000
847.0	4,091,411	12,160,557	30,109,510	304,100	1,017,000	964,000
847.5	4,091,411	12,674,872	30,576,987	304,100	1,030,000	974,000
848.0	4,091,411	13,195,774	31,048,346	304,100	1,044,000	985,000
848.5	4,091,411	13,724,465	31,534,080	304,100	1,058,000	996,000
849.0	4,091,411	14,259,242	32,023,612	304,100	1,071,000	1,008,000
849.5	4,091,411	14,800,183	32,517,015	304,100	1,084,000	1,023,000
850.0	4,091,411	15,347,364	33,014,397	304,100	1,096,000	1,040,000
850.5	4,091,411	15,902,340	33,517,598	304,100	1,110,000	1,051,000
851.0	4,091,411	16,463,011	34,025,340	304,100	1,121,000	1,063,000
851.5	4,091,411	17,029,425	34,538,001	304,100	1,132,000	1,075,000
852.0	4,091,411	17,601,633	35,055,618	304,100	1,145,000	1,089,000

Table C- 2: Tenas Control Pond Stage-Storage-Elevation Relationship

Elevation [masl]	Cuml. Volume [m^3]	Surface Area [m^2]
785.5	-	-
786.0	87	202
786.5	534	837
787.0	1,321	1,751
787.5	2,541	3,043
788.0	4,450	5,052
788.5	8,418	9,207
789.0	14,799	15,886
789.5	24,228	21,913
790.0	36,986	29,776
790.5	55,181	38,774
791.0	77,681	49,509
791.5	105,167	59,643
792.0	137,796	71,412
792.5	178,238	83,315
793.0	224,187	96,529
793.5	275,891	108,818
794.0	333,501	122,351
794.5	399,936	135,701
795.0	472,619	150,138
795.5	551,708	164,821
796.0	637,362	180,687
796.5	733,838	195,054
797.0	836,404	210,125
797.5	945,189	224,448
798.0	1,060,335	239,564
798.5	1,187,144	256,691
799.0	1,321,141	274,806
799.5	1,462,424	290,253
800.0	1,611,092	306,428

Table C- 3: Pit Lake Stage-Volume Relationship

Elevation [masl]	Volume [m^3]	Elevation [masl]	Volume [m^3]	Elevation [masl]	Volume [m^3]
823	-	861	703,627	899	4,817,737
824	1,013	862	740,918	900	5,031,452
825	3,080	863	779,333	901	5,252,152
826	6,375	864	819,038	902	5,478,455
827	10,887	865	860,129	903	5,710,202
828	16,526	866	902,719	904	5,947,304
829	23,203	867	947,026	905	6,189,626
830	30,886	868	993,339	906	6,437,193
831	39,526	869	1,041,923	907	6,689,938
832	49,059	870	1,095,005	908	6,947,581
833	59,429	871	1,153,134	909	7,209,925
834	70,600	872	1,214,687		
835	82,554	873	1,279,964		
836	95,292	874	1,349,137		
837	108,821	875	1,422,472		
838	123,122	876	1,500,607		
839	138,177	877	1,583,875		
840	153,974	878	1,672,615		
841	170,595	879	1,766,753		
842	187,854	880	1,866,647		
843	205,785	881	1,972,436		
844	224,453	882	2,083,348		
845	243,890	883	2,199,315		
846	264,108	884	2,320,391		
847	285,126	885	2,446,467		
848	306,981	886	2,577,434		
849	329,726	887	2,713,361		
850	354,571	888	2,854,404		
851	381,678	889	3,000,718		
852	409,754	890	3,155,048		
853	438,772	891	3,317,654		
854	468,710	892	3,485,835		
855	499,551	893	3,659,558		
856	531,296	894	3,838,809		
857	563,937	895	4,023,575		
858	597,486	896	4,213,854		
859	631,936	897	4,409,654		
860	667,315	898	4,610,917		

Appendix D Background Water Quality

Parameter	Units	Receiving Water Quality																			
		Four Creek				Goathorn Creek				Tenas Creek				Telkwa River				Bulkley River			
		Average	P50	P95	Count	Average	P50	P95	Count	Average	P50	P95	Count	Average	P50	P95	Count	Average	P50	P95	Count
Temperature	degC	3	2	10	60	4	3	12	86	4	2	13	65	5	4	11	95	8	8	15	96
Conductivity	µS/cm	230	250	340	54	160	170	210	111	160	160	220	87	92	93	130	154	62	59	79	105
pH		8	8	9	54	8	8	8	111	8	8	8	87	8	8	8	152	8	8	8	132
Total Dissolved Solids	mg/L	150	150	220	54	110	110	140	88	100	100	140	64	66	68	90	87	49	49	67	70
Total Suspended Solids	mg/L	7	3	21	54	5	2	16	88	7	2	37	64	9	4	40	87	11	2	43	70
Hardness	mg-$CaCO_3$/L	110	130	170	56	74	75	100	117	75	77	110	93	43	40	65	123	29	28	37	90
Alkalinity, total	mg-$CaCO_3$/L	130	140	190	35	55	54	85	86	83	85	110	64	42	43	63	89	30	28	36	72
Chloride	mg/L	0.41	0.25	0.53	56	0.34	0.25	0.50	118	0.34	0.25	0.52	93	0.32	0.25	0.50	124	0.42	0.25	0.78	82
Fluoride	mg/L	0.05	0.05	0.07	48	0.03	0.03	0.04	85	0.03	0.03	0.05	71	0.03	0.03	0.04	96	0.02	0.02	0.04	62
Ammonia, total	mg-N/L	0.004	0.003	0.011	29	0.004	0.003	0.007	89	0.004	0.003	0.009	78	0.005	0.003	0.010	137	0.006	0.005	0.017	130
Nitrate	mg-N/L	0.041	0.016	0.170	48	0.047	0.043	0.084	87	0.019	0.005	0.060	73	0.024	0.012	0.076	101	0.018	0.013	0.041	77
Nitrite	mg-N/L	0.001	0.001	0.001	48	0.001	0.001	0.002	87	0.002	0.001	0.002	73	0.001	0.001	0.005	101	0.003	0.002	0.005	136
Sulfate	mg/L	7.2	2.1	26	48	25	25	38	99	3.1	2.6	7.3	84	5.6	5.6	9	109	4.1	4	5.0	66
Aluminum, total	mg/L	0.23	0.08	1.10	56	0.17	0.03	0.66	117	0.27	0.05	1.70	93	0.34	0.12	1.50	117	0.29	0.09	1.20	82
Aluminum, dissolved	mg/L	0.10	0.03	0.43	56	0.03	0.01	0.12	103	0.03	0.01	0.14	81	0.03	0.02	0.09	108	0.06	0.01	0.10	74
Antimony, total	mg/L	0.00008	0.00005	0.00011	56	0.00008	0.00006	0.00013	117	0.00013	0.00012	0.00024	93	0.00005	0.00005	0.00005	117	0.00007	0.00005	0.00010	82
Antimony, dissolved	mg/L	0.00007	0.00005	0.00010	56	0.00006	0.00005	0.00010	103	0.00011	0.00010	0.00023	81	0.00005	0.00005	0.00005	108	0.00006	0.00005	0.00010	74
Arsenic, total	mg/L	0.0006	0.0007	0.0010	56	0.0003	0.0002	0.0006	117	0.0005	0.0005	0.0009	93	0.0003	0.0002	0.0006	117	0.0003	0.0002	0.0007	82
Arsenic, dissolved	mg/L	0.0006	0.0006	0.0008	56	0.0002	0.0002	0.0003	103	0.0004	0.0004	0.0005	81	0.0002	0.0002	0.0003	108	0.0002	0.0001	0.0003	74
Barium, total	mg/L	0.08	0.08	0.13	56	0.06	0.06	0.07	117	0.04	0.04	0.05	93	0.04	0.04	0.05	117	0.03	0.03	0.04	82
Barium, dissolved	mg/L	0.08	0.08	0.13	56	0.06	0.06	0.07	103	0.03	0.03	0.04	81	0.04	0.04	0.05	108	0.02	0.02	0.03	74
Beryllium, total	mg/L	0.00007	0.00005	0.00010	56	0.00005	0.00005	0.00010	117	0.00005	0.00005	0.00010	93	0.00005	0.00005	0.00005	117	0.00006	0.00005	0.00010	82
Beryllium, dissolved	mg/L	0.00007	0.00005	0.00010	56	0.00005	0.00005	0.00010	103	0.00005	0.00005	0.00010	81	0.00005	0.00005	0.00005	108	0.00006	0.00005	0.00010	74
Boron, total	mg/L	0.012	0.011	0.020	56	0.010	0.005	0.050	117	0.017	0.015	0.050	93	0.010	0.005	0.050	117	0.007	0.005	0.010	79
Boron, dissolved	mg/L	0.012	0.010	0.019	56	0.010	0.005	0.050	103	0.017	0.014	0.050	81	0.010	0.005	0.050	108	0.006	0.005	0.010	74
Cadmium, total	mg/L	0.000007	0.000006	0.000018	56	0.000014	0.000010	0.000039	117	0.000006	0.000005	0.000020	93	0.000015	0.000010	0.000035	117	0.000008	0.000007	0.000018	82
Cadmium, dissolved	mg/L	0.000005	0.000005	0.000011	56	0.000011	0.000008	0.000033	103	0.000003	0.000003	0.000006	81	0.000006	0.000006	0.000010	108	0.000004	0.000003	0.000007	74
Calcium, total	mg/L	24	26	36	56	22	23	30	116	23	23	32	90	14	14	20	116	10	9	12	88
Calcium, dissolved	mg/L	24	26	37	56	23	24	32	103	23	23	33	81	14	13	20	108	10	9	12	78
Chromium, total	mg/L	0.0005	0.0004	0.0015	56	0.0003	0.0002	0.0008	117	0.0005	0.0003	0.0018	93	0.0003	0.0002	0.0010	117	0.0004	0.0002	0.0010	82
Chromium, dissolved	mg/L	0.0003	0.0003	0.0007	56	0.0001	0.0001	0.0004	103	0.0003	0.0003	0.0004	81	0.0001	0.0001	0.0002	108	0.0001	0.0001	0.0003	74
Cobalt, total	mg/L	0.0001	0.0001	0.0004	56	0.0001	0.0001	0.0005	117	0.0002	0.0001	0.0010	93	0.0002	0.0001	0.0009	117	0.0002	0.0001	0.0006	82
Cobalt, dissolved	mg/L	0.0001	0.0001	0.0001	56	0.0001	0.0001	0.0001	103	0.0001	0.0001	0.0001	81	0.0001	0.0001	0.0001	108	0.0001	0.0001	0.0001	74
Copper, total	mg/L	0.0017	0.0012	0.0037	56	0.0019	0.0013	0.0051	117	0.0016	0.0010	0.0049	93	0.0014	0.0010	0.0041	117	0.0012	0.0008	0.0026	82
Copper, dissolved	mg/L	0.0016	0.0011	0.0033	56	0.0016	0.0011	0.0036	103	0.0013	0.0009	0.0025	81	0.0007	0.0006	0.0016	108	0.0008	0.0006	0.0016	76
Iron, total	mg/L	0.21	0.078	0.78	56	0.18	0.04	0.7	117	0.23	0.043	1.2	93	0.46	0.29	1.3	117	0.34	0.12	1.3	85
Iron, dissolved	mg/L	0.08	0.02	0.35	56	0.04	0.02	0.12	104	0.04	0.02	0.14	82	0.11	0.09	0.26	109	0.08	0.03	0.15	76
Lead, total	mg/L	0.00007	0.00005	0.00020	56	0.00007	0.00003	0.00023	117	0.00007	0.00003	0.00038	93	0.00033	0.00012	0.00120	117	0.00014	0.00006	0.00050	82
Lead, dissolved	mg/L	0.00004	0.00003	0.00008	56	0.00003	0.00003	0.00005	103	0.00003	0.00003	0.00005	81	0.00004	0.00003	0.00010	108	0.00004	0.00003	0.00005	74
Lithium, total	mg/L	0.00140	0.00140	0.00180	56	0.00059	0.00050	0.00110	117	0.00063	0.00050	0.00110	93	0.00053	0.00050	0.00100	117	0.00055	0.00050	0.00100	79

Parameter	Units	Receiving Water Quality																			
		Four Creek				Goathorn Creek				Tenas Creek				Telkwa River				Bulkley River			
		Average	P50	P95	Count	Average	P50	P95	Count	Average	P50	P95	Count	Average	P50	P95	Count	Average	P50	P95	Count
Lithium, dissolved	mg/L	0.00130	0.00130	0.00180	56	0.00055	0.00050	0.00100	103	0.00054	0.00050	0.00100	81	0.00052	0.00050	0.00050	108	0.00055	0.00050	0.00100	74
Magnesium, total	mg/L	13	14	20	56	4	4	6	116	5	4	7	90	2	2	3	116	2	2	2	88
Magnesium, dissolved	mg/L	13	14	20	56	4	4	7	103	4	4	7	81	2	2	4	108	2	2	3	78
Manganese, total	mg/L	0.005	0.002	0.018	56	0.008	0.004	0.029	117	0.011	0.004	0.056	93	0.025	0.019	0.075	117	0.021	0.012	0.053	82
Manganese, dissolved	mg/L	0.002	0.001	0.007	56	0.003	0.002	0.008	104	0.003	0.002	0.006	82	0.009	0.007	0.022	109	0.007	0.005	0.014	76
Mercury, total	mg/L	0.000006	0.000004	0.000012	56	0.000003	0.000003	0.000005	92	0.000004	0.000003	0.000009	69	0.000003	0.000003	0.000007	95	0.000003	0.000003	0.000005	74
Mercury, dissolved	mg/L	0.000005	0.000003	0.000010	56	0.000004	0.000003	0.000005	92	0.000003	0.000003	0.000006	69	0.000003	0.000003	0.000003	95	0.000003	0.000003	0.000005	74
Molybdenum, total	mg/L	0.0002	0.0002	0.0004	56	0.0007	0.0005	0.0006	117	0.0001	0.0001	0.0002	93	0.0005	0.0005	0.0007	117	0.0004	0.0004	0.0005	82
Molybdenum, dissolved	mg/L	0.0002	0.0002	0.0004	56	0.0005	0.0005	0.0006	103	0.0001	0.0001	0.0002	81	0.0005	0.0005	0.0007	108	0.0004	0.0004	0.0005	74
Nickel, total	mg/L	0.0007	0.0005	0.0015	56	0.0004	0.0003	0.0010	117	0.0005	0.0003	0.0017	93	0.0004	0.0003	0.0010	117	0.0005	0.0003	0.0013	82
Nickel, dissolved	mg/L	0.0006	0.0005	0.0011	56	0.0003	0.0003	0.0006	103	0.0003	0.0003	0.0005	81	0.0002	0.0003	0.0003	108	0.0006	0.0003	0.0007	76
Phosphorus, total	mg/L	0.009	0.004	0.040	37	0.006	0.003	0.018	100	0.010	0.004	0.040	81	0.011	0.006	0.048	144	0.012	0.005	0.040	91
Orthophosphate, dissolved	mg/L	0.001	0.001	0.002	44	0.001	0.001	0.004	83	0.001	0.001	0.004	69	0.002	0.002	0.003	124	0.002	0.001	0.004	76
Potassium, total	mg/L	0.44	0.37	0.80	56	0.45	0.38	1.00	116	0.34	0.23	1.00	90	0.38	0.30	1.00	116	0.38	0.32	0.68	79
Potassium, dissolved	mg/L	0.44	0.37	0.83	56	0.37	0.36	0.47	103	0.20	0.19	0.30	81	0.28	0.28	0.35	108	0.35	0.32	0.52	74
Selenium, total	mg/L	0.00005	0.00005	0.00010	56	0.00010	0.00008	0.00020	117	0.00007	0.00005	0.00020	93	0.00009	0.00008	0.00020	117	0.00005	0.00003	0.00020	82
Selenium, dissolved	mg/L	0.00005	0.00005	0.00011	56	0.00008	0.00008	0.00012	103	0.00004	0.00003	0.00007	81	0.00007	0.00007	0.00010	108	0.00003	0.00003	0.00005	74
Silica, dissolved	mg/L	n.a.'	n.a.'	n.a.'	0	5.5	5.6	6.2	13	7.2	7.0	8.0	12	6.2	6.7	8.6	18	n.a.'	n.a.'	n.a.'	0
Sodium, total	mg/L	8.1	8.3	14.0	56	2.6	2.5	4.8	116	3.5	3.6	5.1	90	1.6	1.0	2.8	116	1.2	1.0	2.5	79
Sodium, dissolved	mg/L	8.1	8.6	14.0	56	2.7	2.5	4.9	103	3.5	3.6	5.4	81	1.6	1.0	2.8	108	1.2	1.0	2.4	76
Strontium, total	mg/L	0.2	0.2	0.2	56	0.1	0.1	0.1	117	0.1	0.1	0.1	93	0.1	0.1	0.1	117	0.0	0.0	0.1	82
Strontium, dissolved	mg/L	0.2	0.2	0.2	56	0.1	0.1	0.1	103	0.1	0.1	0.2	81	0.1	0.1	0.1	108	0.0	0.0	0.1	74
Silver, total	mg/L	0.00001	0.00001	0.00002	56	0.00001	0.00001	0.00002	117	0.00001	0.00001	0.00002	93	0.00001	0.00001	0.00002	117	0.00001	0.00001	0.00002	82
Silver, dissolved	mg/L	0.00001	0.00001	0.00001	56	0.00001	0.00001	0.00001	103	0.00001	0.00001	0.00001	81	0.00001	0.00001	0.00001	108	0.00001	0.00001	0.00001	74
Tin, total	mg/L	0.00007	0.00005	0.00010	56	0.00005	0.00005	0.00010	117	0.00005	0.00005	0.00010	93	0.00005	0.00005	0.00007	117	0.00023	0.00005	0.00010	82
Tin, dissolved	mg/L	0.00008	0.00005	0.00010	56	0.00010	0.00005	0.00010	103	0.00005	0.00005	0.00010	81	0.00005	0.00005	0.00005	108	0.00006	0.00005	0.00010	74
Thallium, total	mg/L	0.00001	0.00001	0.00001	56	0.00000	0.00001	0.00001	117	0.00000	0.00001	0.00001	93	0.00000	0.00001	0.00001	117	0.00001	0.00001	0.00001	82
Thallium, dissolved	mg/L	0.00001	0.00001	0.00001	56	0.00001	0.00001	0.00001	103	0.00000	0.00001	0.00001	81	0.00000	0.00001	0.00001	108	0.00001	0.00001	0.00001	74
Uranium, total	mg/L	0.00012	0.00010	0.00026	56	0.00007	0.00006	0.00014	117	0.00013	0.00012	0.00026	93	0.00006	0.00006	0.00009	117	0.00004	0.00004	0.00008	82
Uranium, dissolved	mg/L	0.00011	0.00010	0.00026	56	0.00007	0.00006	0.00014	103	0.00013	0.00011	0.00026	81	0.00005	0.00005	0.00008	108	0.00003	0.00003	0.00005	74
Vanadium, total	mg/L	0.0009	0.0006	0.0029	56	0.0006	0.0003	0.0017	117	0.0012	0.0009	0.0037	93	0.0009	0.0006	0.0033	117	0.0011	0.0005	0.0050	82
Vanadium, dissolved	mg/L	0.0005	0.0005	0.0011	55	0.0003	0.0003	0.0005	103	0.0007	0.0007	0.0010	81	0.0003	0.0003	0.0005	108	0.0004	0.0003	0.0006	74
Zinc, total	mg/L	0.0026	0.0030	0.0048	56	0.0031	0.0015	0.0052	117	0.0017	0.0015	0.0054	93	0.0023	0.0015	0.0067	117	0.0023	0.0015	0.0050	82
Zinc, dissolved	mg/L	0.0012	0.0010	0.0023	56	0.0012	0.0013	0.0021	103	0.0010	0.0010	0.0015	81	0.0011	0.0015	0.0015	108	0.0011	0.0008	0.0023	76

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/100_Data_Analysis/2023%20Updates/SurfaceWQ_BaselineData_rev14_cc_CCM_20250514.xlsx?web=1

Parameter	Units	Overburden Water Quality				Bedrock Water Quality				Groundwater - Combined			
		Average	P50	P95	Count	Average	P50	P95	Count	Average	P50	P95	Count
Chloride	mg/L	1.5	0.52	3.3	48	4.2	2.5	10	69	3.1	2.5	10	120
Fluoride	mg/L	0.17	0.13	0.35	41	1.7	1.5	5.1	61	1.1	0.5	5.0	100
Ammonia, total	mg-N/L	0.15	0.025	0.61	44	0.32	0.32	0.69	69	0.25	0.22	0.68	110
Nitrate	mg-N/L	0.04	0.005	0.17	41	0.07	0.025	0.16	58	0.058	0.025	0.170	99
Nitrite	mg-N/L	0.0016	0.001	0.005	41	0.0072	0.005	0.02	58	0.005	0.005	0.020	99
Nitrogen, total	mg/L	1.3	0.54	5.9	40	0.81	0.38	2.2	64	1.000	0.410	5.000	100
Sulfate	mg/L	18	11	42	48	24	6	75	69	21	9	67	120
Aluminum, total	mg/L	6.2	0.64	26	47	1.3	0.24	6.2	69	3.3	0.3	9.6	120
Aluminum, dissolved	mg/L	0.032	0.005	0.034	44	0.033	0.0086	0.1	69	0.033	0.005	0.091	110
Antimony, total	mg/L	0.00053	0.0005	0.00071	40	0.00049	0.0005	0.0005	61	0.00051	0.00050	0.00053	100
Antimony, dissolved	mg/L	0.00052	0.0005	0.00054	37	0.022	0.0005	0.00097	61	0.014	0.001	0.00072	98
Arsenic, total	mg/L	0.01	0.002	0.02	47	0.0042	0.001	0.0058	69	0.007	0.001	0.012	120
Arsenic, dissolved	mg/L	0.0034	0.00081	0.011	44	0.0011	0.0006	0.002	69	0.002	0.001	0.010	110
Barium, total	mg/L	0.29	0.13	0.86	47	1.6	0.4	4.1	68	1	0.24	3.8	120
Barium, dissolved	mg/L	0.12	0.093	0.25	45	0.85	0.33	3.6	69	0.56	0.14	3.5	110
Beryllium, total	mg/L	0.00099	0.0001	0.005	47	0.00089	0.00015	0.005	69	0.00093	0.0001	0.0050	120
Beryllium, dissolved	mg/L	0.00034	0.0001	0.0002	44	0.00079	0.0001	0.005	69	0.00062	0.00010	0.00500	110
Boron, total	mg/L	0.091	0.10	0.10	47	0.21	0.18	0.38	69	0.16	0.13	0.35	120
Boron, dissolved	mg/L	0.084	0.10	0.10	44	0.19	0.16	0.34	69	0.15	0.11	0.33	110
Cadmium, total	mg/L	0.00036	0.000056	0.00075	47	0.00029	0.000042	0.0026	69	0.00032	0.00005	0.00230	120
Cadmium, dissolved	mg/L	0.00012	0.000021	0.00027	45	0.00022	0.000012	0.0016	69	0.00018	0.000015	0.00087	110
Calcium, total	mg/L	63	55	130	47	16	16	36	68	36	25	91	120
Calcium, dissolved	mg/L	51	50	86	46	16	14	35	68	30	22	85	110
Chromium, total	mg/L	0.0065	0.001	0.033	47	0.0034	0.001	0.01	69	0.0046	0.0010	0.0150	120
Chromium, dissolved	mg/L	0.0015	0.001	0.001	44	0.0011	0.001	0.002	69	0.0013	0.0010	0.0020	110
Cobalt, total	mg/L	0.0082	0.00044	0.017	47	0.32	0.0005	0.0043	69	0.19	0.00048	0.01200	120
Cobalt, dissolved	mg/L	0.0009	0.0003	0.0041	44	0.00057	0.0003	0.0026	69	0.0007	0.00030	0.00300	110
Copper, total	mg/L	0.018	0.0016	0.025	47	0.0049	0.0018	0.014	69	0.01	0.002	0.023	120
Copper, dissolved	mg/L	0.0016	0.001	0.005	45	0.0019	0.001	0.0039	69	0.002	0.001	0.005	110
Iron, total	mg/L	17	0.5	20	47	1.4	0.53	3.9	69	7.6	0.51	17	120
Iron, dissolved	mg/L	0.043	0.03	0.099	44	0.2	0.065	0.59	69	0.14	0.05	0.55	110
Lead, total	mg/L	0.014	0.00062	0.046	47	0.0029	0.00085	0.02	69	0.0073	0.00074	0.02	120
Lead, dissolved	mg/L	0.0021	0.0005	0.00093	44	0.0014	0.0005	0.001	69	0.002	0.001	0.001	110
Lithium, dissolved	mg/L	0.0048	0.0028	0.0067	45	0.054	0.05	0.1	66	0.034	0.018	0.099	110
Lithium, total	mg/L	0.011	0.0041	0.05	47	0.07	0.051	0.11	66	0.046	0.020	0.11	110
Magnesium, total	mg/L	26	19	57	47	3.3	2.1	8.6	68	12	6	53	120
Magnesium, dissolved	mg/L	21	14	51	46	3	1.9	8.6	68	10	5.5	48	110
Manganese, total	mg/L	0.61	0.12	3.6	47	0.079	0.036	0.23	69	0.300	0.058	0.910	120
Manganese, dissolved	mg/L	0.13	0.052	0.57	45	0.061	0.017	0.25	69	0.089	0.022	0.300	110
Mercury, total	mg/L	0.0011	0.000005	0.00017	47	0.034	0.000011	0.03	69	0.021	0.000008	0.000	120
Mercury, dissolved	mg/L	0.0012	0.000005	0.00018	44	0.0029	0.000005	0.03	69	0.002	0.000005	0.000	110
Molybdenum, total	mg/L	0.0049	0.0014	0.014	47	0.0054	0.001	0.015	69	0.0052	0.0010	0.0140	120
Molybdenum, dissolved	mg/L	0.0053	0.001	0.015	45	0.0044	0.001	0.015	69	0.0047	0.0010	0.0150	110
Nickel, total	mg/L	0.0083	0.001	0.045	47	0.0036	0.0012	0.0084	69	0.0055	0.0011	0.0200	120
Nickel, dissolved	mg/L	0.0027	0.001	0.017	44	0.0021	0.001	0.005	69	0.0023	0.0010	0.0050	110
Phosphorus, total	mg/L	0.66	0.044	1.1	47	0.051	0.039	0.11	69	0.30	0.04	0.92	120
Phosphorus, dissolved	mg/L	0.18	0.012	0.89	40	0.023	0.016	0.06	61	0.08	0.01	0.79	100
Potassium, total	mg/L	2.6	2	3.6	47	2.3	2	3.8	68	2.4	2.0	3.8	120
Potassium, dissolved	mg/L	1.8	2	2	44	2.2	2	3.5	68	2.1	2.0	3.2	110
Selenium, total	mg/L	0.00037	0.0002	0.00099	47	0.00065	0.0001	0.001	69	0.0005	0.00012	0.0010	120
Selenium, dissolved	mg/L	0.00032	0.0002	0.00096	45	0.00026	0.00014	0.001	69	0.0003	0.00017	0.0010	110
Silica, dissolved	mg/L	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	n.a.	n.a.	n.a.	n.a.
Sodium, total	mg/L	44	20	110	47	350	310	750	68	220	190	730	120
Sodium, dissolved	mg/L	46	20	110	45	350	320	720	68	230	180	710	110
Silver, total	mg/L	0.00016	0.00002	0.00087	47	0.023	0.00002	0.0016	69	0.014	0.00002	0.0011	120
Silver, dissolved	mg/L	0.0001	0.00002	0.00027	44	0.059	0.00002	0.0001	68	0.036	0.00002	0.000	110
Thallium, dissolved	mg/L	0.00019	0.0002	0.0002	37	0.0002	0.0002	0.0002	58	0.0002	0.0002	0.000	95
Thallium, total	mg/L	0.000036	0.00001	0.0002	40	0.000047	0.00002	0.0002	58	0.000043	0.000014	0.000	98
Tin, total	mg/L	0.0015	0.0005	0.005	38	0.00073	0.0005	0.0013	51	0.0011	0.0005	0.0042	89
Tin, dissolved	mg/L	0.001	0.0005	0.0049	36	0.00061	0.0005	0.00053	51	0.0008	0.0005	0.0026	87
Titanium, dissolved	mg/L	0.012	0.01	0.024	44	0.013	0.01	0.05	66	0.0130	0.0100	0.0500	110
Titanium, total	mg/L	0.038	0.014	0.12	47	0.02	0.01	0.05	66	0.0270	0.0100	0.0650	110
Uranium, total	mg/L	0.0033	0.0018	0.0083	47	0.023	0.0004	0.0069	69	0.0150	0.0010	0.0080	120
Uranium, dissolved	mg/L	0.0017	0.0011	0.0032	45	0.023	0.0004	0.0071	69	0.0140	0.00068	0.0067	110
Vanadium, total	mg/L	0.016	0.0023	0.041	47	0.0055	0.001	0.03	69	0.010	0.002	0.030	120
Vanadium, dissolved	mg/L	0.0027	0.001	0.005	45	0.0039	0.00053	0.03	69	0.003	0.001	0.030	110
Zinc, total	mg/L	0.051	0.005	0.11	47	0.016	0.0073	0.05	69	0.03	0.006	0.081	120
Zinc, dissolved	mg/L	0.011	0.005	0.012	44	0.0067	0.005	0.011	69	0.008	0.005	0.012	110

Source: Z:\01_SITES\Telkwa Coal\!020_Site-Wide_Data\Groundwater\GW_Quality\GWQuality_Summary_Stats_rev08_smh.xlsx

Appendix E Geochemical Source Term Analysis

(1) SRK Consulting (Canada) Inc. 2024b. Updated Water Quality Model Source Terms. Prepared for Telkwa Mining Limited. Project Number CAPR002933. June 2024.
(2) M.A. O'Kane Consultants Inc. 2024. Tenas project - Suboxic Evaluation of Non-Acid Generating Mine Rock Report. prepared for Telkwa Mining Limited. August 2024

FINAL

Updated Water Quality Model Source Terms

Tenas Project, British Columbia, Canada

Telkwa Mining Ltd.

SRK Consulting (Canada) Inc. ▪ CAPR002933 ▪ June 2024

srk consulting

FINAL

Updated Water Quality Model Source Terms

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Useful Definitions

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

EMA	Environmental Management Act
EMP	East Management Pond
EOM	End of Mining
FS	Feasibility Study
HCT	Humidity cell testing
MA	Mines Act
Non-PAG	Non-potentially acid generating
NMP	North Management Pond
PAG	Potentially acid generating
TML	Telkwa Mining Limited
TSS	Total suspended solids

1 Introduction

Telkwa Mining Ltd (TML) submitted an Environmental Assessment Certificate (EAC), application for the Tenas Project, located at the Telkwa Property, near the town of Telkwa, British Columbia in May of 2022. In support of the EA application, SRK Consulting (Canada) Inc. (SRK) developed geochemical source terms (SRK 2022a) that formed the basis for evaluating changes to water quality in downstream receptors. The source terms were based on humidity cell testing (HCT) results. In parallel to the geochemical characterization testing program that was used to support the EAC application, TML initiated a field barrel testing program in late 2019. Release rates from the barrel testing program were compared to the scaled results that formed the basis of the source terms that were developed to support the EAC application. The outcomes indicated that the scaled HCT release rates were underestimated for some constituents while overestimated for others. Updated source terms were developed using the barrel release rates to reflect release rates more accurately under field conditions.

This report describes the conceptual models, methods and assumptions used to derive the site water quality model source term inputs based on the field barrel testing results. The site wide water quality model development and results are described in SRK (2024a).

2 Project Background

2.1 Geological Setting

2.1.1 Bedrock Geology

The Tenas Project is located within the northeast/southwest trending Skeena Arch, which separates Jurassic-age sedimentary rocks of the Bowser Basin in the north from the Jurassic to Cretaceous-age sedimentary rocks of the Nechako Basin to the south. The coal-bearing sedimentary rock sequence of the Project is associated with the Lower Cretaceous age Skeena Group, and unconformably overlies the Jurassic-age Hazelton volcanic group, which will be below the proposed pit limit. A simplified stratigraphic column of the Project's deposit is presented in Figure 2-1.

Jurassic Hazelton Volcanic Group

The volcanic rocks include andesite, trachyte, and basalt with associated tuffs and breccias.

Lower Cretaceous Skeena Group

The Lower Cretaceous Skeena Group includes marine and continental sediments interbedded with coal seams, often correlated over long lateral distances. It is subdivided into four units (Units I through IV) and a unit of undivided sediments overlying the four units (Figure 2-1).

The economic coal seams in the Tenas area are located within Coal Zone 1 of Unit I and include two seams: C seam and 1 seam (upper and lower). Coal Zones 2 through 10, located in Unit III (Figure 2-1), are absent from the Tenas area. Units I through IV are summarized below.

- The Unit I consists of more than 100 m of fine to coarse-grained cross-bedded sandstone, conglomerate, siltstone, mudstone, and coal (coal zone 1). Overall, Unit I fines upward, from primarily conglomerate and sandstone to almost entirely carbonaceous mudstone, seatearth and coal (1A to 1G). The conglomerate and sandstone were deposited in braided channels and bars, and mudstone accumulated in floodplains. Thin coal seams formed in poorly drained, peat-forming backswamps, and seatearths formed under leaching conditions in less submerged areas. With denudation of the volcanic source area, braid plains were abandoned and extensive low-energy, peat-forming swamps were established, resulting in the formation of thick coal seams in the upper part of the Unit.
- The Unit II separates coal zone 1 and coal zone 2. It consists of up to 140 m of primarily monotonous silty mudstone, occasionally interbedded with beds of chert-rich, micaceous, bioturbated or cross-bedded sandstone. The sediments were deposited in a deltaic/shallow marine environment following a regional marine transgression. The mudstone accumulated in bays, and the sandstones in distributary channels and mouthbars. Locally, thin discontinuous peat beds formed in salt marshes.
- Unit III comprises about 90 m of chert-rich, micaceous sandstone, siltstone, and mudstone, and up to nine coal zones (coal zones 2 through 10). The sandstone and mudstone were deposited and biogenically reworked in a tidal flat environment; siltstone accumulated in a restricted, nearshore marine environment. Peat accumulated in freshwater coastal marshes which periodically prograded over tidal flats.

- Unit IV consists of approximately 150 m of a laterally extensive, bright green, chert-rich, chloritic sandstone or siltstone bed at the base, overlain by massive grey silty mudstone like that of Unit II. The basal sandstone is a transgressive lag deposit, and silty mudstone, the predominant lithofacies, was deposited in a quiet, nearshore, shallow marine environment.

Intrusions

Tertiary and Cretaceous-age porphyritic dykes and sills commonly intrude this sequence, the most notable of which includes a Tertiary granodiorite intrusion located on the north side of the Telkwa River. These intrusions are not present in the Tenas area.

Geological Structures

The sedimentary sequence in the Tenas area is folded into a syncline in which the gently (typically 10 to 20°) northeast-dipping western limb of the syncline subcrops on the western side of the pit area, while the moderately (40 to 45°) southwest-dipping eastern limb subcrops on the eastern side of the pit. Faulting is generally near-vertical, and can be subdivided into two main groups, one which strikes approximately northwest/southeast and the other which strikes approximately northeast/southwest. A few east/west striking faults have also been interpreted.

The Goathorn area is located within an outlier of the Lower Cretaceous Skeena Group. The structural geology is somewhat more complex than the Tenas area and is characterized by a complex series of sub-parallel north-south trending reverse faults, and to a lesser extent east-west, trending normal faults.

Northeast striking faults are related to emplacement of the Bulkley intrusions in the Late Cretaceous.

2.1.2 Surficial Geology

The surficial geology in the Project area consists primarily of two types of deposits, glacial clay- or silt-rich till, and sand and glaciofluvial sand and gravel outwash. At upper elevations and south of the proposed pit, the terrain is mapped as having bedrock outcrops to a limited extent or thin mantles of clay- and silt-rich tills deposits, between 3 m and 10 m thick. North of the proposed pit and towards Tenas Creek and Goathorn Creek, drillholes report thin mantles of clay- and silt-rich tills deposits, between 3 m and 10 m thick underlain by a thick sand and gravel outwash deposit that can exceed 100 m.

Other types of deposits are present locally. Patches of glaciolacustrine deposits are scattered throughout the morainal landscape in low ridges and in depressions; the sediments comprise bedded and laminated mud, and minor sand and gravel (Clague 1984). Recent fluvial deposits form the narrow floodplains of Goathorn Creek and Tenas Creek, which are 40 m to 80 m deep incised into the subdued morainal landscape, and the wide floodplains of the Telkwa and Bulkley Rivers. The fluvial deposits range from extremely coarse, poorly sorted gravel on steep alluvial fans to moderately to well-sorted sand and mud on low-gradient floodplains (Clague 1984).

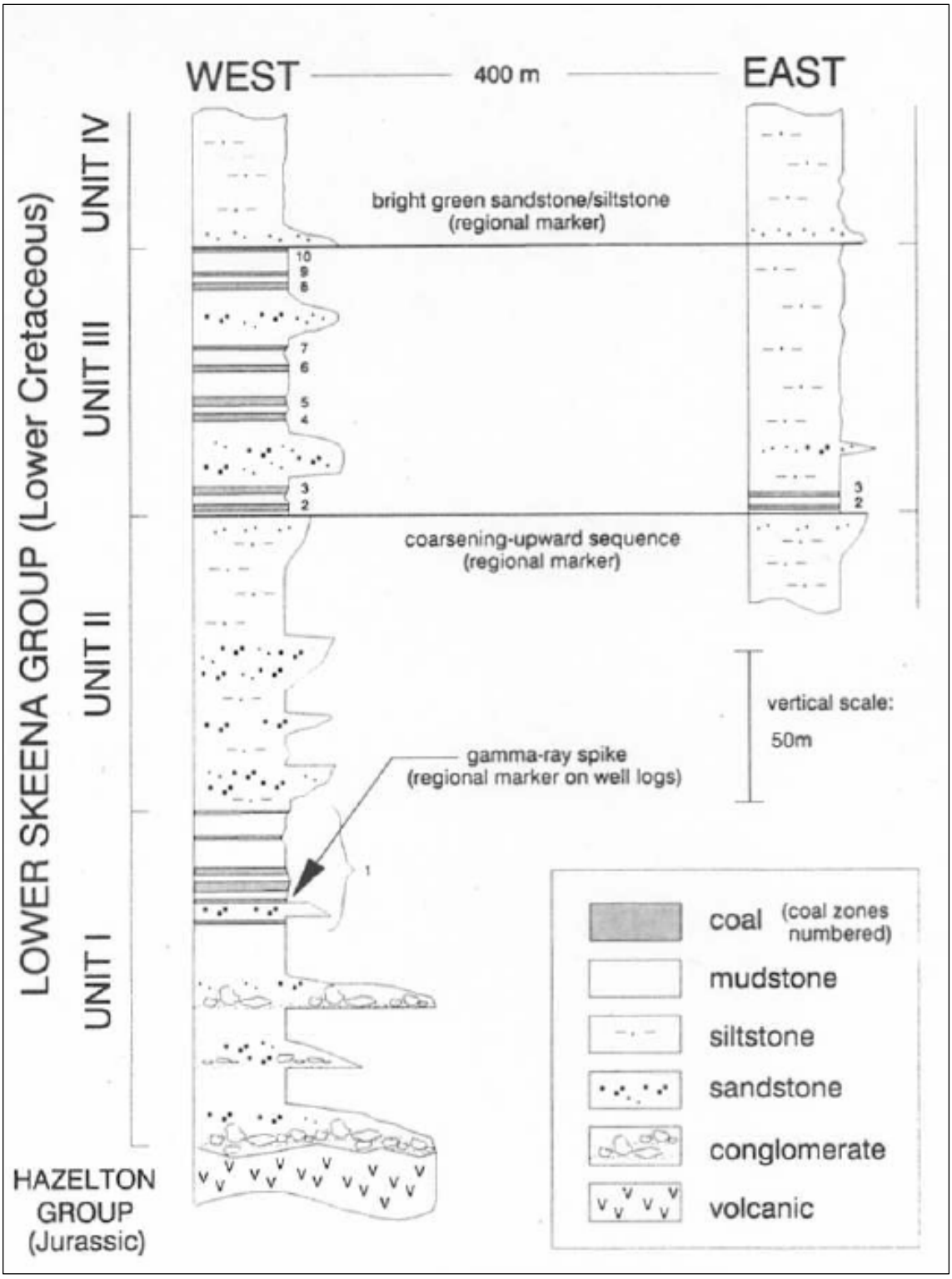


Figure 2-1. Stratigraphic Sequence of Lower Cretaceous Skeena Group Sediments.

Source: Telkwa Coal Ltd.

2.1.3 Material Zone Designations

Geochemical properties are stratigraphically constrained in coal deposits versus lithologically constrained. For example, the deposition environment of the Tenas Deposit includes marine and deltaic sedimentary sequences and rocks formed in these two different environments will be compositionally different. The deposit was demarcated into stratigraphic zones of sedimentary sequences between the mineable coal seams. The stratigraphic zones were further divided into additional zones if they had different distinct geochemical properties (e.g., Zone 1 and Zone 1a) or grouped if geochemical properties were similar between zones identified between coal seams (e.g., Zone 2 and Zone 3). The stratigraphic zones and classification of PAG and non-PAG based on an NPR of 2.0 identified for the Project are presented in Figure 2-2.

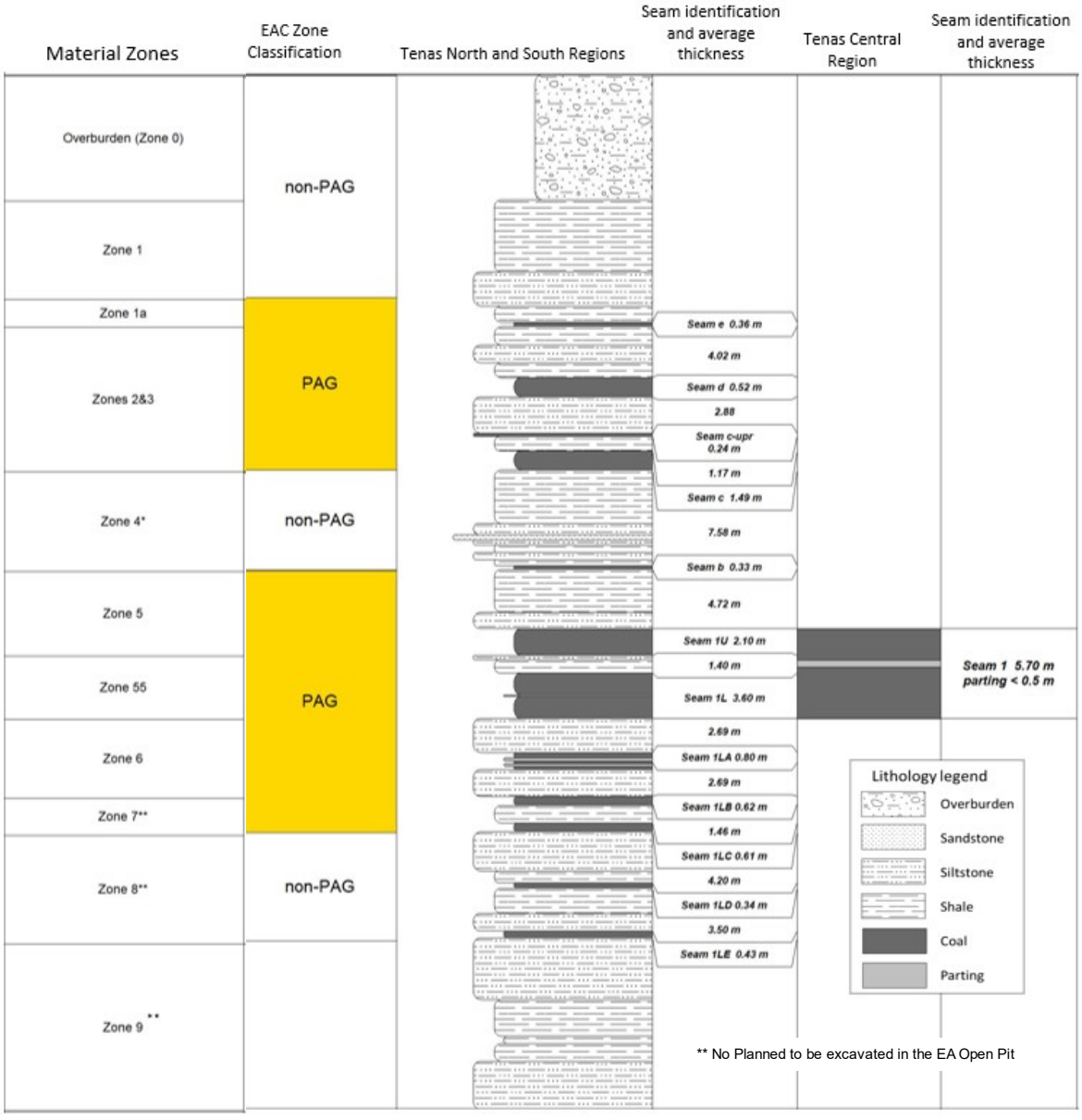


Figure 2-2. Tenas Deposit Stratigraphic Zones

2.2 Geochemical Characterization Study

Two geochemical studies have been completed to characterize the acid generating and metal leaching potential of the Tenas deposit:

- Norecol Dames and Moore (1999). Draft Report. Assessment of ARD Potential and Water Quality Predictions. Telkwa Coal Project.
- SRK (2022b). Telkwa Coal – Tenas Project Supplemental Geochemical Characterization.

The Norecol Dames and Moore (1999) study included the collection and analysis of over 700 samples. An additional 173 samples were collected as part of the supplemental geochemical characterization study (SRK 2022b). The supplemental samples were used to confirm the results of the 1999 study and correlate the test results to more up-to-date testing methods. For example, samples collected as part of the Norecol Dames and Moore (1999) study were analyzed for total sulfur only and neutralization potential was determined using the Sobek-NP (1978) method. Results from both studies were combined to form a robust geochemical characterization that is reported in SRK (2022b). The reader is referred to SRK (2022b) for additional detail on the geochemical characterization program including sample selection, collection, testing and results.

The outcomes of these studies indicated that a large volume of the rock to be mined from the Tenas deposit is potentially acid generating (PAG) and that acid generating potential is stratigraphically constrained in zones generally separated by coal seams. The geochemical properties of the deposit were therefore described based on mineable stratigraphical zones. The geochemical testing results indicate that all zones contain some PAG rock; however, there are units that are predominantly PAG versus non-PAG. Based on the site-specific neutralization potential ratio of 2.0 (NPR) and the average bulk geochemical properties, the following zones were characterized as PAG and non-PAG:

- Non-PAG: Zone 1, 4 and 8;
- PAG: Zones 1a 2/3, 5, 55, 6 and 7.

The geochemical characterization results also indicate that coarse and fine processed rock are PAG and overburden samples tested are non-PAG, including construction materials.

2.3 Summary of Mine Material Management Plan

Mining of the Tenas deposit will produce mine rock and processed rock materials. Previous geochemical testing (Norecol Dames & Moore 1999) indicates that the coarse and fine processed rock and a component of the mine rock will be PAG, and management will be required. Management of mine rock and coarse and fine processed rock are summarized in the following sections.

2.3.1 Management of PAG Rock

In advance of, and during mining, TML proposes to progressively construct Management Ponds with a combination of excavation and embankments with buttresses (Figure 2-3). The purpose of the management ponds is to store PAG and processed rock in saturated conditions preventing sulfide oxidation, limiting acidic drainage from occurring. Three management ponds will be constructed including the North, West and East Management Ponds. The North Management pond will be constructed first and is located north of the West Management Pond and is external to the open pit. The East Management is constructed next and is south of the NMP and external of the open pit. The last management pond, which is the West Management Pond which is constructed from a combination of excavation for the open pit for the North Phase and construction of an embankment external to the open pit.

PAG rock will first be placed in North Management Pond. PAG rock will be progressively placed in lifts and flooded as each lift is completed so that exposure of rock to atmospheric oxygen is minimized. TCL is proposing to place PAG rock including processed rock underwater before it becomes acid generating.

Once the storage capacity of the pond has been reached, storage will begin in the East Management pond and then the West Management Pond. The three management ponds will be independent of one another allowing different water levels and PAG material levels in each of the ponds as conditions require. The Management Ponds will be maintained with at least a two-metre water cover once PAG material disposition has been completed.

2.3.2 Management of non-PAG Rock and Overburden

Non-PAG rock will be used to progressively backfill the open pit during operations and for constructing portions of the embankments and buttresses for the Management Ponds and Control Ponds. Some non-PAG rock will also be used to cap PAG material in the management ponds once the PAG material has reached its design elevation. Non-PAG rock will be placed in lifts into water, keeping the water level at least 1 metre above PAG rock and at or below the non-PAG placement platform. A 1.5 metre thickness was selected for non-PAG as this is below the expected change in water levels during the Post-closure phase so that this material is never above water.

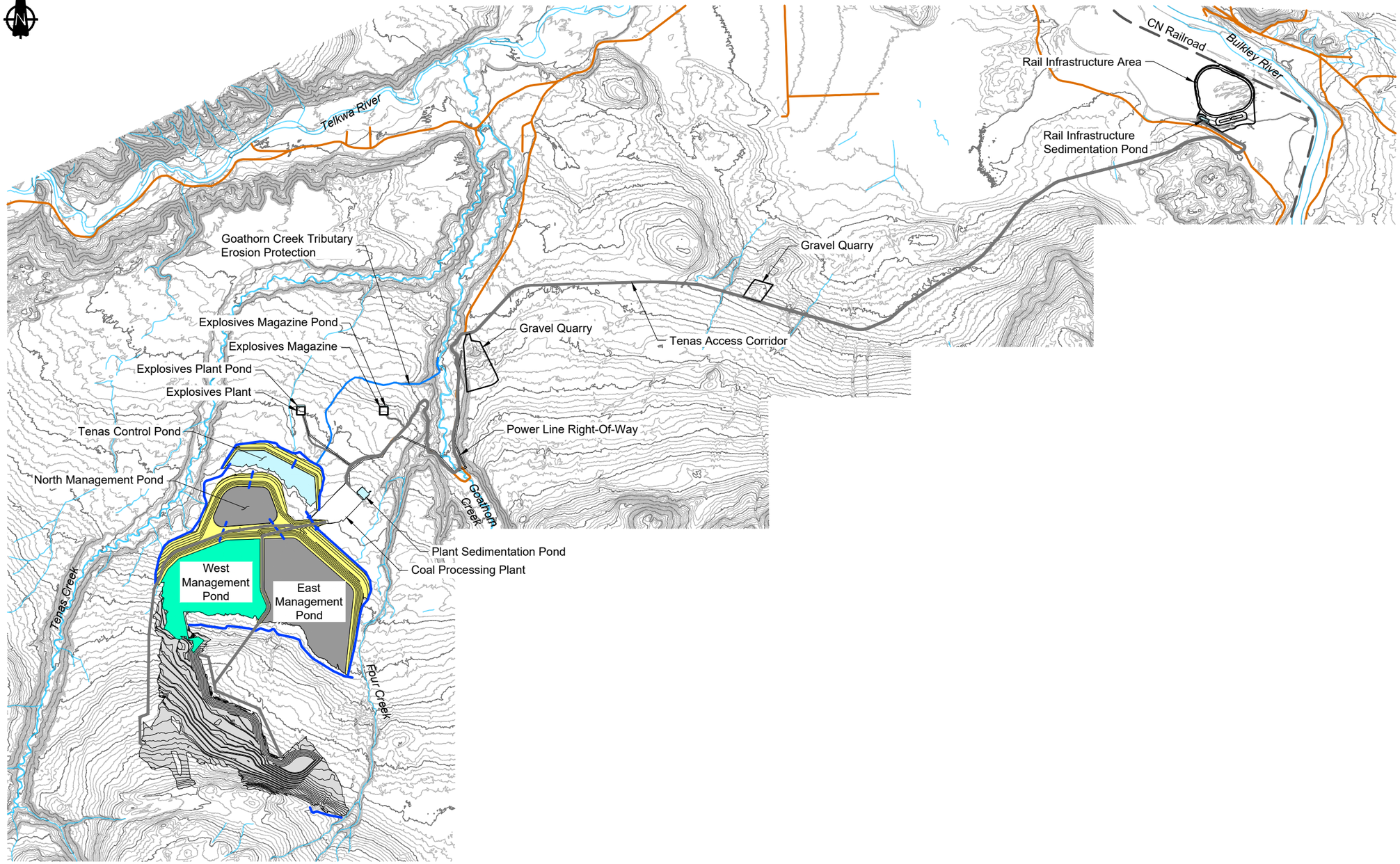
Overburden will be stored in the buttresses during operation and used as a cover material over non-PAG rock placed in the management ponds.

2.3.3 Management of Processed Rock

Coarse and fine processed rock materials are expected to be PAG and will also be placed in the Management Ponds with the PAG rock (Figure 2-3).

2.3.4 Open Pit Walls

Most of the open pit will be backfilled during the Operation phase. However, a small portion of the hanging wall will exist at post-closure. Meteoric water contacting the open pit walls will report to the end pit lakes, with one of them draining northwards by gravity and mix with Management Pond water prior to discharging into the surrounding environment while the other one discharges to Four Creek once its water quality meets regulatory requirements. Until this time, this end pit lake also drains toward the north.



LEGEND

- Water Management Feature
- Spillway
- Existing Watercourse
- Existing Road
- Proposed Road
- Dams and Buttresses
- Sedimentation Pond
- Active Management Pond
- Backfill / NAG Pile
- Covered Inactive Management Pond

NOTES

1. Contours shown at 5.0m intervals.
2. All dimensions shown in meters unless otherwise stated.
3. Pile designs by SRK Consulting Ltd.

REFERENCE

NAD83 UTM Zone 9.

0m 500 1000 1500 2000

srk consulting

TELKWA MINING LIMITED

SRK JOB NO.:	CAPR002933
FILE NAME:	1CT027.003 Overview.dwg

Tenas Project

Geochemical Source Terms

Mine Site Facilities

DATE:	APPROVED:	FIGURE:
2024/05/1	MH	2-3

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3 Conceptual Model

3.1 Unsaturated Mine Rock & Processed Rock

Pyrite (FeS_2) is the main sulfide mineral in PAG rock and processed rock at the Project (SRK 2022b). Under natural conditions, pyrite is stable in bedrock where it is isolated from atmospheric oxygen. However, following blasting and excavation of the bedrock, pyrite in the rock mined will be exposed to atmospheric oxygen prior to being placed in the management ponds and will begin to oxidize producing sulfate, ferrous iron, and acidity (Rxn1).

$$FeS_{2\,(s)} + \frac{7}{2}O_{2\,(g)} + H_2O_{\,(l)} \leftrightarrow Fe^{2+}{}_{(aq)} + 2SO_4{}^{2-}{}_{(aq)} + 2H^+{}_{(aq)} \text{ (Rxn 1)}$$

Under oxidizing conditions, ferrous iron liberated during sulfide oxidation will subsequently oxidize to ferric iron in neutral pH producing additional acidity according to the following reaction:

$$Fe^{2+}{}_{(aq)} + \frac{1}{4}O_{2\,(g)} + 2\frac{1}{2}H_2O_{\,(l)} \leftrightarrow Fe(OH)_{3\,(s)} + 2H^+{}_{(aq)} \text{ (Rxn 2)}$$

Although oxidation of mine rock and processed rock for the Project will release acidity, acidic conditions are not predicted to occur immediately since these materials also contain carbonate minerals that will neutralize the acid according to the following reactions:

$$CaCO_{3(s)} + H^+{}_{(aq)} \leftrightarrow HCO_3{}^-{}_{(aq)} + Ca^{2+}{}_{(aq)} \text{ (Rxn 3)}$$

$$CaCO_{3(s)} + 2H^+{}_{(aq)} \leftrightarrow H_2CO_{3(aq)} + Ca^{2+}{}_{(aq)} \text{ (Rxn 4)}$$

Depletion calculations (SRK 2022b) indicate that the lag times to acid generation are on the order of years (>5 years based on the average bulk rock properties). The lag time to acid generation prediction based on HCTs was confirmed by the barrel testing results. Barrel 6, which is a composite sample of rock from Zones 6 and 7, became acid generating in October 2023, four years after the barrel program was initiated. SRK (2022b) indicated that these zones were non-PAG based on their average bulk geochemical properties. However, the weighted barrel 6's NPR (0.5) was more closely aligned with the minimum and P5 NPR observed for these zones (see Table 4 in SRK (2022b)). The lag times to the onset of acid generation based on the Zone 6 and 7 minimum NPRs ranged from 3 to 5 years.

TML proposes to place PAG rock identified by verification testing and processed rock in the management ponds under saturated conditions within an average of six months after blasting but no more than 12 months. Theoretically, this will limit sulfide oxidation (i.e., oxygen becomes a limited reactant in reaction 1 limiting oxidation of the PAG rock and coarse and fine processed rock precluding acidic conditions at the Project. However, any oxidation products that are produced prior to placement of PAG rock and processed rock underwater will be flushed and dissolve in water stored in the management ponds.

At closure TML will cap saturated PAG rock and coarse and fine processed rock in the management ponds with non-PAG rock. The non-PAG rock will be below the active water level in the management ponds and will be saturated. Any oxidation products that have accumulated on non-PAG rock surfaces will also be flushed when the rock is placed in the management pond.

3.2 Unsaturated Non-PAG Rock

Non-PAG rock that is not used in the management pond cover will be used to backfill the open pit and used in portions of the embankments and buttresses with approximately 50% remaining unsaturated in

post-closure. Under these conditions, the rock will continually oxidize according to Reaction 1 (see Section 3.1) producing oxidation products that will be dissolved in meteoric water contacting the rock. However, non-PAG rock contains more neutralization potential than acid generating potential and the sulfide is predicted to be consumed prior to the neutralization potential (SRK 2022b) and acidic drainage from exposed non-PAG rock will not occur. The non-PAG rock will provide a continuous source of element load under neutral conditions.

3.3 Overburden

Overburden that is stripped during mining will be mixed with unsaturated waste rock for use in the buttresses and open pit backfill. Overburden has been characterized as having low sulfur content (SRK 2022b) and is classified as non-PAG. The small amount of sulfide in the overburden will oxidize according to Reaction 1 producing oxidation products that will be solubilized by incident precipitation. Like unsaturated waste rock, the overburden will provide a continuous source of element load that is soluble under neutral conditions.

3.4 Open Pit Wall Rock Runoff

Mining of the Tenas Project will result in open pit walls that are exposed to atmospheric oxygen until they are progressively covered with non-PAG rock and/or overburden during the Operation phase with any remaining uncovered open pit walls being covered in the Decommissioning and Reclamation phase. Sulfides that are present in the open pit wall rock will oxidize according to reaction 1 (Section 3.1) producing sulfate, acidity, ferrous iron, and release of trace chalcophile elements. Soluble oxidation products will be flushed from exposed open pit wall surfaces in meteoric water contacting the wall rock.

The open pit will be progressively backfilled with non-PAG rock and/or overburden during operations reducing the exposure of open pit wall to atmospheric oxygen. Oxidation of open pit wall rock that is covered with backfill will be reduced by limiting oxygen ingress.

At closure, two end pit lakes will form in the backfilled open pit. A footwall will exist above the end pit lakes composed mainly of Zone 6 sedimentary rock. Based on the site-specific NPR criterion (2.0), this unit PAG; however, as discussed in Section 2.3.4, the majority of the exposed pit walls will be covered. The end pit lake will be a mixture of wall rock runoff, direct precipitation and runoff from non-PAG backfill.

The pit lake will drain by gravity and mix with the Management Pond before being discharged during closure.

3.5 Processed Coal Stockpile Runoff

Processed coal will be temporarily stored at the Rail Infrastructure area in two stockpiles prior to being transported from the site to Ridley terminals. While the processed coal is stored, it will oxidize but long-term oxidation is not a concern since processed coal will only be stored for short durations prior to being loaded into rail cars. Soluble load from the processed coal stockpiles will be collected in the Rail Infrastructure Sedimentation Pond to allow suspended solids to settle.

4 Source Term Derivation Methods

Consistent with SRK (2022b), source terms using the barrel testing results were developed in two ways: concentrations and load flushing rates. Unsaturated mine rock, overburden and wall rock runoff source terms were expressed as concentrations. Concentrations were estimated by scaling barrel testing results and mixing estimated annual loads in predicted annual volumes of water and evaluating if the predicted concentrations would be limited by secondary mineral precipitation. PAG rock, coarse and fine processed rock and some non-PAG rock will be stored permanently underwater in the management ponds. Solute produced through oxidative weathering once these materials have been exposed will be flushed from rock surfaces when they are placed in the management ponds. The source term for these materials is therefore represented by a flushing term in milligrams per bank cubic metre (mg/bcm) of rock, also estimated using scaled barrel testing results.

Processed rock (e.g., coal and rejects) barrels were not constructed since there was insufficient material available. Source terms for coal and rejects have therefore not been updated. The reader is referred to SRK (2022a) for the coal and reject source terms. The particulate concentrations source term has also not been updated since it is independent of kinetic testing release rates (i.e., it was derived based solid-phase static testing results) and is not included in this report. The reader is referred to SRK (2022a) for details on the derivation methods and results of these source terms.

The following subsections provide the inputs and assumptions for each of the source terms based on the barrel testing results.

4.1 Mine Rock Solute Release Rates

A key input into the source term calculations is the mine rock solute release rates. Barrels were constructed from rock representative of each rock zone and the barrel release rates were used to represent the release rates from individual rock zones. Composite samples for each barrel were prepared from excess sample stored at Bureau Veritas Laboratories in Burnaby, British Columbia. Sample, varying in mass from one to 110 kg were selected for use in the barrels until a minimum mass of 200 kg was achieved. Zones with insufficient sample mass to achieve 200 kg (e.g., Zone 4 PAG and Zone 4 non-PAG) were supplemented with sample from other zones with similar geochemical properties (SRK 2024b).

Leachate sampling from the barrels has been conducted intermittently since October 2019 until present. The source terms only consider samples collected until November 2023. Seven to nine samples have been collected from each barrel during this period. The monitoring results from these sampling events was used to estimate barrel release rates according to the following formula:

$$L_j = C_j * \frac{V}{m} / t \qquad \text{(EQ 1)}$$

Where:

L_j is the load of parameter j expressed in mg/kg/week

C_j is the concentration of parameter j in the leachate sample in mg/L

V is the volume of the sample in L

m is the total mass in the barrel in kg

t is the time between sample events in weeks

The average release rate calculated from each sampling event was used in the source term calculations. As noted in Section 3.1, Barrel 6 began to produce acidic leachate in October 2023. Release rates from this sampling event were not included in the average barrel release rate calculations since the conceptual model for the Project is rock will be managed to minimize acid generation and release rates under acidic conditions are not expected to occur.

As noted above, the barrels were constructed of crushed drill core. This results in the barrel samples having a higher reactive surface area in comparison to rock that will be blasted and used in the pit backfill or construction of the buttresses. Scaling factors were applied to the barrel release rates to account for this difference. Details of the scaling factors that were used are discussed in the following subsections.

4.2 Unsaturated Mine Rock and Overburden

4.2.1 Base Case Source Term

Unsaturated non-PAG rock and overburden will be used as backfill in the open pit as well as in construction of the management pond buttresses. The backfill will become partially saturated as the open pit floods at closure. Unsaturated portions of the backfill will continue to oxidize and produce soluble load that will be mobilized in meteoric water interacting with the mine rock.

Annual unsaturated mine rock concentrations were estimated as follows:

$$C_{j=\frac{L_{j,annual}}{Q_{annual}}} \quad \text{(Eq 2)}$$

Where: C_j is the concentration of constituent j

$L_{j,annual}$ is the annual load of constituent j released from exposed mine rock and/or overburden

Q_{annual} is the annual average flow contacting exposed mine rock and overburden

Source term concentrations using Equation 2 were estimated for the following timeframes:

- Pit Backfill
  - End of East Management Pond (EMP)
  - End of Mining (EOM)
- Buttresses
  - End of North Management Pond (NMP)
  - End of EMP
  - End of West Management Pond (WMP)

These periods were selected to evaluate changes to water quality throughout the life of mine (LOM) at key stages of the mine development. In the source term calculations, mine rock and overburden present in the above timeframes was assumed to be unsaturated and produce soluble load. In reality, a portion of the waste rock will become inundated as the pit is progressively backfilled. This assumption results in a conservative estimate of the pit backfill and buttress drainage water quality.

The mine plan indicates that the buttresses will be constructed using overburden and mine rock sourced from Zones 1 and 4. Table 4-1 provides a summary of the cumulative mine rock and overburden volumes and tonnages associated with each of the model timeframes. Mine rock tonnages were estimated using an assumed density of 2.55 grams per bank cubic centimetre (g/bcc) and a density of 2.0 g/bcc was assumed to estimate overburden tonnages (TML 2024, pers. comm.). The respective barrel release rates were prorated in proportions estimated based on the volumes provided in Table 4-1 to estimate the unit solute release rates for the backfill and buttresses at each of the model timeframes. This rate was multiplied by the total mass at each timeframe to estimate the annual load produced.

As noted in Section 4.1, scaling factors were applied to the barrel release rates to account for testing and operational field differences. A generic scaling factor of 0.2, based on SRK's experience at other coal mines in British Columbia, was applied to account for grain size differences between the barrel tests and mine rock that will be produced during operations. Channelization and temperature scaling factors, which were applied to the HCT release rates (SRK 2022b), were not applied to the barrel release rates. Due to the size of the tests, the barrels will have a higher degree of flushing in comparison to rock stored in the backfill and in the buttresses and additional channelization is expected to occur under operational conditions. It is difficult to quantify the degree of flushing in the barrels and a channelization factor was conservatively not included in the barrel release rate estimates.

The barrels only contain 200 kg of material and will therefore be more susceptible to temperature variations in comparison to the rock and overburden used in the backfill and buttresses which will exhibit internal heating from sulfide oxidation. However, the average temperature of the water samples collected from the barrel tests was approximately 10°C. It is assumed a similar internal temperature will occur in the mine rock backfill and buttresses from oxidation of sulfide minerals and carbonaceous rock and release rates were therefore not corrected for temperature differences.

Table 4-1. Summary of Unsaturated Mine Rock & Overburden Quantities

Facility	Cumulative Volume (bcm)			Cumulative Tonnage (Mt)		
	Mine Rock		Overburden	Mine Rock		Overburden
	Zone 1	Zone 2		Zone 1	Zone 2	
Backfill						
End of EMP	279,370	812,529	500,000	0.7	2.7	1.0
EOM	13,194,743	6,667,067	8,727,775	34	17	17
Buttresses						
End of NMP	706,410	---	2,302,531	1.8	---	4.6
End of EMP	2,043,701	---	5,753,394	5.2	---	12
End of WMP	3,621,260	---	10,666,841	9.2	---	21

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/[Telkwa_backfill_buttress_volume_summary_CAPR002933_mkh_r0.xlsx

The annual scaled release rate was divided by the annual average volume of water contacting unsaturated mine rock (SRK 2024a) using Equation 2 to estimate the annual average constituent concentrations in drainage from unsaturated mine rock and overburden. Predicted water qualities were entered into the publicly available speciation and mass transfer code PHREEQC v.3 (Parkhurst and Appelo 1999), developed by the United States Geological Survey (USGS), to evaluate mineral and gas phases that were supersaturated in solution. The mineral and gas phases included in the model are presented in Table 4-2. Supersaturated mineral phases were allowed to precipitate from solution and

sorption to ferrihydrite was also considered using the default values of Dzombak and Morel (1990). Sorption to ferrihydrite will limit parameters that form oxyanions (e.g., arsenic) and other ligands from remaining in solution.

Table 4-2. Model Equilibrium Phases

Mineral	Empirical Formula	Mineral	Empirical Formula	Mineral	Empirical Formula
Carbon Dioxide	CO_2 (g)	Chalcanthite	$CuSO_4 \cdot 5H_2O$	Calcium Molybdenum Oxide	$CaMoO_4$
Gibbsite	$Al(OH)_3$	Ferrihydrite	$Fe(OH)_3$	Nickel Hydroxide	$Ni(OH)_2$
Otavite	$CdCO_3$	Melanterite	$FeSO_4 \cdot 7H_2O$	Zinc Hydroxide	$Zn(OH)_2$
Brochantite	$Cu_4SO_4(OH)_6$	Anglesite	$PbSO_4$	Smithsonite	$ZnCO_3$
Copper Hydroxide	$Cu(OH)_2$	Birnessite	$MnO_2 \cdot nH_2O$	Goslarite	$ZnSO_4 \cdot 7H_2O$
Malachite	$Cu_2(CO_3)(OH)_2$	Manganite	MnO(OH)	Gypsum	$CaSO_4 \cdot 2H_2O$
Azurite	$Cu_3(CO_3)_2(OH)_2$	Lead Molybdenum Oxide	$PbMoO_4$		

4.2.2 High Case Source Term

To account for variability in the source term inputs, a high case source term was developed. The high case source term was estimated by increasing sulfate concentrations to concentrations that are in equilibrium with gypsum (i.e., sulfate concentrations are assumed to be saturated in solution) under the assumed pH and redox conditions. Equilibrium with gypsum was achieved by incrementally adding anhydrite ($CaSO_4$) to the predicted base case solution (Section 4.2.1) until sulfate concentrations reached steady state. Concentrations of other elements were scaled up in the high source term by preserving the metal sulphate ratios (M/SO_4) in the base case source term. A key assumption in this approach is that elements in the solution are chalcophile which could result in an overprediction of non-chalcophile elements. Mineral saturation was evaluated by equilibrating the high case unsaturated mine rock water quality with the same mineral phases (Table 4-2) as the base case solution.

4.3 Saturated Mine Rock

4.3.1 PAG Rock Flushing Source Term

PAG rock produced during mining of the Tenas deposit will be permanently stored in saturated conditions in the management ponds. Placement of PAG rock in the management ponds will result in flushing of oxidation products accumulating on the surfaces of the PAG following exposure during mining. A unit annual flushing rate, in kilograms per tonne of rock (kg/tonne), was estimated by proportioning scaled barrel solute release rates (Section 4.1) in the relative proportion of each zone to be mined in each year (Table 4-3). The same grain size factor used to estimate loadings from unsaturated waste rock (Section 4.2.1) was applied to estimate the mass flushed from PAG rock.

A key input to the PAG rock flushing source term is the exposure time prior to placement in the management ponds. TCL proposes to have PAG rock including processed rock placed in the management ponds within an average of six months which was used when developing the PAG rock flushing source term. Like the unsaturated mine rock source term, a high case was also developed where PAG mine rock was assumed to be exposed for 12 months.

Table 4-3. Annual PAG Rock Volumes and Relative Proportions

Year	Mine Rock Volume (bcm)								Mine Rock Proportion						
	Zone 1a	Zone 2	Zone 3	Zone 4 (PAG)	Zone 5	Zone 55	Zone 6	Total	Zone 1A	Zone 2	Zone 3	Zone 4 (PAG)	Zone 5	Zone 55	Zone 6
-0.5	---	---	---	77,481	120,526	129,135	---	327,142	---	---	---	0.24	0.37	0.39	---
0	---	101,036	116,673	276,461	270,055	271,264	178,523	1,214,012	---	0.083	0.096	0.23	0.22	0.22	0.15
1	---	179,056	229,804	620,602	320,738	99,933	99,320	1,549,453	---	0.12	0.15	0.4	0.21	0.064	0.064
2	21,889	285,673	321,699	472,335	345,853	151,588	112,489	1,711,526	0.013	0.17	0.19	0.28	0.2	0.089	0.066
3	27,407	155,626	308,582	663,762	353,038	165,727	94,900	1,769,042	0.015	0.088	0.17	0.38	0.2	0.094	0.054
4	130,618	312,373	397,354	613,605	290,367	160,116	75,573	1,980,006	0.066	0.16	0.2	0.31	0.15	0.081	0.038
5	68,844	381,138	593,269	214,295	250,877	182,880	79,710	1,771,013	0.039	0.22	0.33	0.12	0.14	0.1	0.045
6	52,353	327,938	705,510	---	321,128	178,341	175,380	1,760,650	0.03	0.19	0.4	---	0.18	0.1	0.10
7	18,042	198,457	378,872	---	378,932	89,907	66,893	1,131,103	0.016	0.18	0.33	---	0.34	0.079	0.059
8	37,018	388,733	629,396	---	439,200	71,890	151,249	1,717,486	0.022	0.23	0.37	---	0.26	0.042	0.088
9	55,727	316,821	466,150	---	428,117	74,035	97,842	1,438,692	0.039	0.22	0.32	---	0.3	0.051	0.068
10	98,303	381,613	547,361	238,780	386,869	55,623	148,670	1,857,219	0.053	0.21	0.29	0.13	0.21	0.03	0.08
11	76,587	223,829	298,043	569,289	532,297	16,062	116,153	1,832,260	0.042	0.12	0.16	0.31	0.29	0.0088	0.063
12	308,172	257,049	167,938	---	264,424	29,924	119,692	1,147,199	0.27	0.22	0.15	---	0.23	0.026	0.1
13	146,459	198,589	397,430	---	523,609	---	61,069	1,327,156	0.11	0.15	0.3	---	0.39	---	0.046
14	325,128	307,724	365,342	---	495,915	---	95,471	1,589,580	0.2	0.19	0.23	---	0.31	---	0.06
15	201,789	146,756	226,844	---	481,190	---	102,576	1,159,155	0.17	0.13	0.2	---	0.42	---	0.088
16	377,112	302,140	282,975	---	186,028	36,948	55,034	1,240,237	0.3	0.24	0.23	---	0.15	0.03	0.044
17	162,336	261,355	238,266	419,874	434,193	49,875	136,393	1,702,292	0.095	0.15	0.14	0.25	0.26	0.029	0.08
18	55,193	165,578	202,373	386,347	183,975	143,569	69,979	1,207,014	0.046	0.14	0.17	0.32	0.15	0.12	0.058
19	33,669	271,177	390,325	437,687	185,176	101,005	55,193	1,474,232	0.023	0.18	0.26	0.3	0.13	0.069	0.037
20	---	---	---	495,776	188,053	102,575	135,720	922,124	---	---	---	0.54	0.2	0.11	0.15
Total	2,196,646	5,162,661	7,264,206	5,486,294	7,380,560	2,110,397	2,227,829	31,828,593	0.07	0.16	0.23	0.17	0.23	0.07	0.07

Source: P:\01_SITES\Telkwa Coal\1CT027.007_2021 Geochemistry Support\Task 500 - Source Term Memo\Tenas_source_term_rpt_tables_1ct027.007_MKH_r1.xlsx

4.3.2 Non-PAG Rock Flushing Source Term

As PAG material reaches its designed elevation, non-PAG rock will then be placed in lifts above the saturated PAG. Once this lift is completed, overburden is then placed in a maximum of a 3 metre lift to form dry land reclamation. Surface soils will then be placed in a lift thickness of approximately 30 centimetres. The non-PAG rock will be placed in aqueous conditions and the majority of the overburden will be unsaturated. Oxidation products that have accumulated on the non-PAG mine rock following exposure during mining will be flushed from the surfaces as the rock is placed in the management pond.

TML proposes to use non-PAG rock source from Zone 1 in the management pond cover. A unit flushing rate, in kg/tonne, was estimated by scaling the Zone 1 average barrel release rates results to account for differences between testing and operational field conditions. The same scaling factor used to estimate the PAG rock flushing term was applied (i.e., grain size factor). Flushing rates were estimated for six- and 12-month exposure periods.

4.3.3 Flooded non-PAG Rock Backfill

Approximately 50% of the non-PAG rock in the backfill will become flooded in Post-closure. Mass that accumulates in the backfill will be flushed during flooding. As discussed in Section 4.2.1, unsaturated mine rock is not assumed to have a channelization factor and is assumed to have a high leaching efficiency since there is uncertainty in quantifying the degree of channelization in the barrel tests. This provides a conservative estimate of the drainage quality from unsaturated materials, but no mass accumulation will occur using this approach. Therefore, flushing of submerged mass is not accounted for in the source terms.

The water balance model (SRK 2021) indicates there is no hydraulic connection of water stored in the flooded backfill to the management ponds. However, a small volume of the flooded backfill water will report to the groundwater system. Water balancing modelling indicates that the water losses from the flooded backfill represent less than one percent (i.e., 0.4%) of the total flow to the groundwater system. As noted above, there is a high degree of uncertainty in estimating the residual load that will be flushed from the flooded backfill and since the flow is effectively negligible to other flows, a source term was not developed for the flooded non-PAG rock backfill.

4.4 Wall Rock Runoff

Exposed wall rock surfaces will produce oxidative load that will be flushed by meteoric water. An annual pit wall drainage water quality was estimated using equation 2; however, in this instance $L_{j,annual}$ is the annual load of constituent j released from exposed wall rock surfaces and Q_{annual} is the annual average flow contacting the exposed wall rock. TML proposes to progressively backfill the open pit during operations. This will continually change the areas of rock exposed in the pit walls. To evaluate changes to the wall rock runoff composition, source terms were developed for the following time periods, which correspond to backfilling of different areas and volumes placed in the open pit:

- End of placement of PAG rock in the North Management Pond (NMP)
- End of placement of PAG rock in the East Management Pond (EMP)
- End of the Operation Phase (EOM)

The reactive mass of each stratigraphic zone in the open pit walls was estimated by multiplying the exposed surface area of each of the zones in the open pit walls by an assumed depth of fractured rock for each of the above time periods. Surface areas for each time period are provided in Table 4-4. The fractured rock depth was assumed to be two metres for blasted areas and five centimetres for free dig areas and the floor of the pit. A density of 2.55 g/cc was assumed to estimate the reactive mass exposed in the pit walls.

The average release rates from each barrel were prorated in relative proportions calculated based on the exposed surface areas (Table 4-4) to estimate the unit solute release rates for the backfill. As discussed in Section 4.1, barrels tests are not available for processed rock. The approach described in SRK (2022a) was used to represent loadings from exposed coal seams. This rate was multiplied by the total reactive mass in the open pit walls to estimate the annual load produced. The annual load was scaled to field conditions using the grain size differences. Since HCT release rates were used to represent release rates from exposed coal seams, a temperature factor was applied to coal (SRK 2022a). It was assumed that the entire fractured rock zone in the open pit walls would be flushed, and a channelization factor was not included.

The annual scaled release rate was divided by the annual average volume of water contacting wall rock runoff (SRK 2022) to estimate drainage concentrations using equation 2. The annual volume for each time period is presented in Table 4-5. Mineral solubility was evaluated and phases that were identified to be supersaturated in solution were allowed to precipitate or off-gas (for gas phases). Mineral phases that were considered are provided in Table 4-2. Sorption to ferrihydrite was also included when this mineral phase precipitated.

Like the unsaturated mine rock source term, a high case wall rock source term was estimated by forcing the predicted solutions to gypsum saturation through incremental anhydrite addition in PHREEQC. Element sulfate ratios in the base case source term were assumed when calculating concentrations of other constituents. The scaled-up solution was subsequently equilibrated with the mineral phases presented in Table 4-2 and sorption to ferrihydrite was permitted when this mineral phase precipitated.

During operations it is assumed that the pit backfill will be fully oxygenated. Therefore, the wall rock that is below the backfill will also be reactive. A load from the backfilled pit walls was also estimated using the same assumptions as exposed wall rock. The annual load originating from covered walls at the end of EMP and EOM was added to unsaturated mine rock load (Section 4.2). The load was estimated by prorating the scaled barrel loads (and HCT for exposed coal seams) in proportions calculated based on the backfilled pit wall surface areas (Table 4-6).

Table 4-4. Exposed Open Pit Wall Surface Areas (m^2)

Layer	Type	End of NMP	End of EMP	EOM
Zone 1	Blasted Wall	34,151	92,219	15,722
Zone 1a	Blasted Wall	---	3,711	---
Zone 2	Blasted Wall	6,392	22,123	---
Zone 3	Blasted Wall	5,780	33,356	---
Zone 4	Blasted Wall	10,798	47,774	---
Zone 5	Blasted Wall	8,489	25,854	---
Zone 6	Free Dug Wall	356,326	627,457	---
Overburden	Free Dug Wall	81,128	239,685	27,065
Seam C	Free Dug Wall	554	3,197	---
Seam 1U	Free Dug Wall	841	4,412	---
Zone 55	Free Dug Wall	2,697	11,130	---
Seam 1L	Free Dug Wall	1,200	6,944	---

Note: Areas presented in m^2

Table 4-5. Annual Wall Rock Runoff Volumes

Time Period	Volume (m^3/year)
End of NMP	302,720
End of EMP	514,842
EOM	116,847

Table 4-6. Backfilled Open Pit Wall Surface Areas (m^2)

Layer	Type	End of EMP	EOM
Zone 1	Blasted Wall	---	93,749
Zone 1a	Blasted Wall	---	13,191
Zone 2	Blasted Wall	4	9,111
Zone 3	Blasted Wall	54	8,074
Zone 4	Blasted Wall	967	12,457
Zone 5	Blasted Wall	1,088	4,654
Zone 6	Blasted Wall	---	10,331
Zone 7	Blasted Wall	---	36,728
Zone 6	Free Dug Wall	320,672	1,686,406
Overburden	Free Dug Wall	12,000	164,165
Seam C	Free Dug Wall	93	2,515
Seam 1U	Free Dug Wall	233	1,557
Zone 55	Free Dug Wall	1,041	449
Seam 1L	Free Dug Wall	280	3,201
Seam 1	Free Dug Wall	---	1,426

Note: Areas presented in m^2

5 Source Terms

The following sections present the Tenas Project source terms. The source terms do not represent discharge water quality and how the mine rock flushing source terms influence site drainage water quality cannot be quantified until they are carried forward into the site wide water and load balance. Therefore, limited interpretation of the source terms is included in the following sections. Detailed interpretations of the site wide water and load balance model results using these source terms are included in SRK (2024a).

5.1 Unsaturated Mine Rock & Overburden

5.1.1 Pit Backfill Source Term Water Quality

The base case and high case pit backfill source terms for end of EMP and EOM are provided in Table 5-1. The charge imbalance for the base case and high case solutions were less than 10%. This is considered acceptable for a modelled solution that have average inputs from multiple sampling rounds and charge imbalances were not corrected. The pH of solutions is alkaline (8.2 to 8.5) and all modelled constituent concentrations are higher in the high case in comparison to the base case source terms since gypsum was not predicted to be supersaturated in the base case source term and the scaling method (i.e., preserving element/sulfate ratios; see Section 4.2.2) results in constituent concentrations being higher in the high case solutions. Predicted constituent concentrations are higher at the EOM in comparison to the end of EMP source terms because of increased reactive mass in the pit backfill (Table 4-1).

Table 5-1. Pit Backfill Source Term Water Quality

Parameter	Units	Non-PAG Backfill - End of EMP		Non-PAG Backfill - End of EOM	
		Typical	High	Typical	High
Conventional					
pH	s.u.	8.2	8.4	8.3	8.5
% Error	%	-0.3	-0.3	-0.2	-0.2
Alkalinity	mg $CaCO_3$/L	1904	3398	2953	4468
Major Ions					
Calcium	mg/L	53	95	79	119
Magnesium	mg/L	32	57	48	72
Potassium	mg/L	13	23	20	31
Sodium	mg/L	1614	2881	2505	3790
Chloride	mg/L	24	43	37	56
Sulfate	mg/L	1803	3218	2772	4193
Dissolved Elements					
Aluminum	mg/L	0.0045	0.0072	0.0064	0.0089
Antimony	mg/L	0.0029	0.0052	0.0045	0.0069
Arsenic	mg/L	0.0043	0.0078	0.0067	0.01
Barium	mg/L	0.045	0.08	0.069	0.1
Boron	mg/L	0.45	0.8	0.7	1.1
Cadmium	mg/L	0.000095	0.00017	0.00014	0.00021
Chromium	mg/L	0.0018	0.0033	0.0029	0.0043
Cobalt	mg/L	0.015	0.026	0.02	0.03
Copper	mg/L	0.016	0.029	0.025	0.037
Iron	mg/L	0.00012	0.0001	0.00011	0.0001
Lead	mg/L	0.0048	0.0085	0.0074	0.011
Lithium	mg/L	0.14	0.24	0.21	0.32
Manganese	mg/L	0.11	0.19	0.12	0.18
Mercury	mg/L	0.00001	0.000018	0.000016	0.000023
Phosphorus	mg/L	0.026	0.046	0.04	0.06
Molybdenum	mg/L	0.17	0.3	0.26	0.39
Nickel	mg/L	0.029	0.051	0.04	0.061
Selenium	mg/L	0.089	0.16	0.14	0.21
Silica	mg/L	4.6	8.3	7.1	11
Silver	mg/L	0.000074	0.00013	0.00011	0.00017
Strontium	mg/L	0.83	1.5	1.3	1.9
Tin	mg/L	0.00078	0.0014	0.0012	0.0018
Thallium	mg/L	0.000078	0.00014	0.00012	0.00018
Uranium	mg/L	0.019	0.034	0.029	0.044
Vanadium	mg/L	0.004	0.0072	0.0062	0.0095
Zinc	mg/L	0.032	0.058	0.046	0.07

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

5.1.2 Dam/Buttress Source Term Water Quality

The base case and high case dam/buttress source term water quality for end of NMP, end of EMP and end of WMP are provided in Table 5-2. The charge imbalance for the base case and high case solutions were less than 10%. This is considered acceptable for a modelled solution mixing average inputs from multiple HCTs and charge imbalances were not corrected. The pH of solutions is alkaline ranging from 7.6 to 8.3.

The trends in predicted concentrations are like the pit backfill water quality. For example, the modelled constituent concentrations are higher in the high case in comparison to the base case source terms since gypsum was not predicted to be supersaturated in the base case scenario. Constituent concentrations are predicted to increase throughout the LOM because of the reactive mass increasing (Table 4-1).

Table 5-2. Dam/Buttress Source Term Water Quality

Parameter	Units	Dam/Buttress Infiltration - End of NMP		Dam/Buttress Infiltration - End of EMP		Dam/Buttress Infiltration - End of WMP	
		Typical	High	Typical	High	Typical	High
Conventional							
pH	s.u.	7.6	8.2	7.8	8.2	8.0	8.3
% Error	%	-1.5	-1.5	-1.3	-1.4	-1.4	-1.4
Alkalinity	mg $CaCO_3$/L	448	1848	761	2167	1074	2458
Major Ions							
Calcium	mg/L	33	134	50	141	71	163
Magnesium	mg/L	17	69	26	73	37	84
Potassium	mg/L	3.6	15	5.9	17	8.3	19
Sodium	mg/L	334	1380	577	1643	812	1859
Chloride	mg/L	6.5	27	11	31	15	35
Sulfate	mg/L	432	1784	725	2065	1026	2348
Dissolved Elements							
Aluminum	mg/L	0.0017	0.0044	0.0023	0.005	0.0029	0.0055
Antimony	mg/L	0.00064	0.0026	0.0011	0.0031	0.0015	0.0035
Arsenic	mg/L	0.00092	0.0038	0.0015	0.0043	0.0021	0.0049
Barium	mg/L	0.017	0.072	0.028	0.079	0.039	0.09
Boron	mg/L	0.099	0.41	0.17	0.48	0.24	0.55
Cadmium	mg/L	0.000021	0.000089	0.000036	0.0001	0.000051	0.00012
Chromium	mg/L	0.00045	0.0019	0.00076	0.0022	0.0011	0.0025
Cobalt	mg/L	0.0025	0.01	0.0043	0.012	0.0061	0.014
Copper	mg/L	0.01	0.043	0.016	0.046	0.023	0.053
Iron	mg/L	0.00032	0.00012	0.00021	0.00012	0.00017	0.00011
Lead	mg/L	0.001	0.0043	0.0018	0.0051	0.0025	0.0058
Lithium	mg/L	0.028	0.11	0.048	0.14	0.067	0.15
Manganese	mg/L	0.034	0.14	0.052	0.15	0.074	0.17
Mercury	mg/L	0.0000031	0.000013	0.000005	0.000014	0.0000071	0.000016
Phosphorus	mg/L	0.014	0.056	0.021	0.059	0.03	0.069
Molybdenum	mg/L	0.034	0.14	0.058	0.16	0.082	0.19
Nickel	mg/L	0.0055	0.023	0.0093	0.027	0.013	0.03
Selenium	mg/L	0.028	0.12	0.045	0.13	0.065	0.15
Silica	mg/L	2.3	9.6	3.6	10	5.2	12
Silver	mg/L	0.000018	0.000073	0.00003	0.000085	0.000042	0.000096
Strontium	mg/L	0.27	1.1	0.43	1.2	0.61	1.4
Tin	mg/L	0.00019	0.00077	0.00032	0.0009	0.00045	0.001
Thallium	mg/L	0.000018	0.000073	0.00003	0.000085	0.000042	0.000096
Uranium	mg/L	0.0049	0.02	0.0082	0.023	0.012	0.026
Vanadium	mg/L	0.00088	0.0036	0.0015	0.0042	0.0021	0.0048
Zinc	mg/L	0.009	0.037	0.015	0.042	0.021	0.047

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

5.2 Saturated Mine Rock

Saturated rock flushing terms are presented in kg/tonne. The influence of flushing of rock as it is placed in the management ponds cannot be quantified until it is carried forward into the water and load balance. Annual PAG rock flushing rates for the six- and 12-month exposure periods are provided in Table 5-3 and Table 5-4, respectively. The non-PAG rock flushing source terms are provided in Table 5-5, respectively.

Table 5-3. PAG Rock Annual Flushing Source Term – Six Month Average Exposure

Parameter	Units	-0.5	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Conventional																							
Alkalinity	kg CaCO3/tonne	0.005	0.005	0.008	0.006	0.008	0.006	0.003	0.001	0.001	0.001	0.001	0.003	0.006	0.001	0.001	0.001	0.001	0.001	0.005	0.007	0.006	0.011
Major Ions																							
Calcium	kg/tonne	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Magnesium	kg/tonne	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0009	0.001	0.00
Potassium	kg/tonne	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Sodium	kg/tonne	0.009	0.0087	0.01	0.009	0.01	0.011	0.008	0.007	0.007	0.007	0.007	0.009	0.011	0.015	0.01	0.013	0.012	0.015	0.0116	0.01082	0.01	0.012
Chloride	kg/tonne	0.00012	0.00012	0.00014	0.00013	0.00014	0.00014	0.00011	0.0001	0.0001	0.0001	0.0001	0.00012	0.00014	0.00014	0.00011	0.00013	0.00012	0.00014	0.00014	0.00014	0.00013	0.00016
Sulfate	kg/tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.03	0.03	0.04	0.02	0.021	0.02	0.02
Elements																							
Aluminum	kg/tonne	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.00000	0.00000	0.0000	0.00000	0.00000	0.00000	0.000001	0.00000	0.00000	0.00000	0.0000001	0.00000	0.0000008	0.000001	0.000001	0.000002
Antimony	kg/tonne	9.9E-09	0.00000001	1.3E-08	1.1E-08	1.3E-08	1.2E-08	0.00000001	0.0000000	0.0000000	3.7E-09	4.1E-09	7.4E-09	1.2E-08	7.6E-09	5.3E-09	6.7E-09	6.3E-09	8.1E-09	1.1E-08	0.00000001	1.1E-08	1.7E-08
Arsenic	kg/tonne	1.0E-08	0.00000001	0.00000001	1.1E-08	1.3E-08	1.2E-08	0.00000001	0.0000000	0.0000000	3.9E-09	4.2E-09	7.5E-09	1.2E-08	7.7E-09	5.4E-09	6.8E-09	6.5E-09	8.2E-09	1.1E-08	1.2E-08	0.00000001	0.00000002
Barium	kg/tonne	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.000000	0.00000	0.00000	0.0000001	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000001	0.00000	0.0000001	0.00000
Boron	kg/tonne	0.000002	0.000001	0.000002	0.000002	0.000002	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.000002	0.000002	0.000003
Cadmium	kg/tonne	4.3E-10	8.9E-10	7.0E-10	0.0000000	0.0000000	6.2E-10	5.3E-10	0.0000000	5.0E-10	5.9E-10	0.0000000	6.5E-10	0.0000000	0.0000000	0.0000000	6.3E-10	0.0000000	0.0000000	7.4E-10	6.7E-10	5.8E-10	0.0000000
Chromium	kg/tonne	8.8E-09	8.5E-09	1.1E-08	9.2E-09	1.0E-08	0.00000001	0.00000001	0.00000001	0.00000001	5.9E-09	6.2E-09	8.0E-09	1.0E-08	9.8E-09	7.4E-09	8.8E-09	8.4E-09	1.0E-08	1.0E-08	1.0E-08	9.6E-09	1.2E-08
Cobalt	kg/tonne	0.00000	0.0000005	0.00000	0.00000	0.00000	0.00000	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.00000	0.000001	0.000001	0.000001	0.000001	0.00000	0.0000005	0.0000004	0.00000	0.00000
Copper	kg/tonne	0.00000003	0.00000002	0.00000004	0.00000003	0.00000004	0.00000003	0.00000002	0.00000001	0.00000001	0.00000001	0.00000001	0.00000002	0.00000003	0.00000002	0.00000001	0.00000001	0.00000001	0.00000002	2.9E-08	0.00000003	0.00000003	0.00000005
Iron	kg/tonne	0.000001	0.000001	0.000002	0.000002	0.000002	0.000002	0.000001	0.00000	0.00000	0.00000	0.00000	0.000001	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.0000019	0.000002	0.000003
Lead	kg/tonne	1.3E-08	1.3E-08	2.1E-08	1.5E-08	2.0E-08	1.7E-08	8.0E-09	2.1E-09	2.1E-09	2.1E-09	2.2E-09	8.4E-09	1.7E-08	4.0E-09	2.8E-09	3.5E-09	3.3E-09	4.3E-09	1.4E-08	1.8E-08	1.6E-08	2.8E-08
Lithium	kg/tonne	0.0000011	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000011	0.000001	0.000001	0.000001
Manganese	kg/tonne	0.0000	0.00001	0.000	0.000	0.000	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.00000518	0.000	0.000
Mercury	kg/tonne	4.2E-11	3.8E-11	4.5E-11	3.9E-11	4.4E-11	4.0E-11	3.0E-11	2.4E-11	2.5E-11	2.4E-11	2.5E-11	3.0E-11	4.1E-11	2.6E-11	2.6E-11	2.6E-11	2.7E-11	2.5E-11	3.8E-11	4.1E-11	3.8E-11	5.3E-11
Phosphorus	kg/tonne	0.000000	0.000000	0.0000001	0.000000	0.0000001	0.0000001	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000001	0.0000001	0.000000	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001
Molybdenum	kg/tonne	0.00000043	0.0000004	0.00000067	0.00000047	0.00000063	0.00000055	0.00000023	0.00000004	0.00000004	0.00000003	0.00000004	0.00000025	0.00000054	0.00000013	0.00000007	0.00000011	9.9E-08	1.4E-07	4.6E-07	0.0000006	0.00000051	0.00000089
Nickel	kg/tonne	0.00000	0.000001	0.000001	0.0000	0.0000	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.00000054	0.000001	0.0000
Selenium	kg/tonne	0.00000046	0.0000004	0.00000044	0.00000043	0.00000049	0.00000066	0.00000044	0.00000035	0.00000032	0.00000032	0.00000041	0.00000051	0.00000057	0.00000138	0.00000073	0.00000112	0.00000101	0.00000151	0.00000077	0.0000006	0.00000046	0.00000053
Silica	kg/tonne	0.00001	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002
Silver	kg/tonne	4.9E-10	4.4E-10	5.0E-10	4.7E-10	5.1E-10	5.6E-10	4.4E-10	3.8E-10	3.8E-10	3.7E-10	4.0E-10	4.7E-10	5.3E-10	7.6E-10	5.2E-10	6.6E-10	6.3E-10	8.1E-10	5.9E-10	5.4E-10	4.8E-10	5.6E-10
Strontium	kg/tonne	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00002	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001
Tin	kg/tonne	0.0000000	0.0000000	0.00000001	0.0000000	0.00000001	0.00000001	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.0000000	0.00000001
Thallium	kg/tonne	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Uranium	kg/tonne	0.00000006	0.00000005	0.00000008	6.5E-08	8.3E-08	0.00000008	0.00000004	0.00000002	0.00000002	0.00000002	0.00000002	4.8E-08	7.7E-08	7.1E-08	4.0E-08	5.9E-08	5.3E-08	7.9E-08	7.7E-08	0.00000008	7.0E-08	0.00000011
Vanadium	kg/tonne	0.00000002	0.00000002	0.00000002	0.00000002	0.00000003	0.00000003	0.00000002	0.00000002	0.00000002	0.00000002	0.00000002	0.00000002	0.00000003	0.00000004	0.00000003	0.00000003	0.00000003	0.00000004	2.9E-08	0.00000003	2.4E-08	0.00000003
Zinc	kg/tonne	0.00000	0.0000007	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000006	0.000001	0.000001

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

Table 5-4. PAG Rock Annual Flushing Source Term – 12 Month Average Exposure

Parameter	Units	-0.5	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Conventional																							
Alkalinity	kg $CaCO_3$/tonne	0.011	0.01	0.016	0.012	0.015	0.013	0.006	0.001	0.001	0.001	0.001	0.006	0.013	0.002	0.002	0.002	0.002	0.002	0.011	0.013	0.012	0.021
Major Ions																							
Calcium	kg/tonne	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Magnesium	kg/tonne	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.003	0.002	0.0018	0.002	0.001
Potassium	kg/tonne	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Sodium	kg/tonne	0.019	0.0174	0.02	0.019	0.021	0.023	0.017	0.014	0.013	0.013	0.015	0.018	0.021	0.029	0.019	0.025	0.024	0.031	0.0233	0.02164	0.019	0.024
Chloride	kg/tonne	0.00024	0.00024	0.00029	0.00026	0.00029	0.00029	0.00023	0.0002	0.00019	0.00019	0.0002	0.00024	0.00028	0.00027	0.00022	0.00025	0.00024	0.00028	0.00028	0.00028	0.00027	0.00032
Sulfate	kg/tonne	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.07	0.05	0.06	0.06	0.07	0.05	0.042	0.04	0.04
Elements																							
Aluminum	kg/tonne	0.000002	0.000002	0.000003	0.000002	0.000002	0.000002	0.000001	0.00000	0.0000	0.00000	0.00000	0.000001	0.000002	0.00000	0.00000	0.00000	0.0000001	0.00000	0.0000017	0.000002	0.000002	0.000004
Antimony	kg/tonne	2.0E-08	0.00000002	2.7E-08	2.1E-08	2.6E-08	2.4E-08	0.00000001	0.00000001	0.00000001	7.5E-09	8.1E-09	1.5E-08	2.4E-08	1.5E-08	1.1E-08	1.3E-08	1.3E-08	1.6E-08	2.2E-08	0.00000002	2.2E-08	3.4E-08
Arsenic	kg/tonne	2.0E-08	0.00000002	0.00000003	2.1E-08	2.6E-08	2.4E-08	0.00000001	0.00000001	0.00000001	7.7E-09	8.4E-09	1.5E-08	2.4E-08	1.5E-08	1.1E-08	1.4E-08	1.3E-08	1.6E-08	2.2E-08	2.4E-08	0.00000002	0.00000003
Barium	kg/tonne	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000001	0.00000	0.00000	0.0000003	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000002	0.00000	0.0000002	0.00000
Boron	kg/tonne	0.000003	0.000003	0.000004	0.000003	0.000004	0.000004	0.000002	0.000001	0.000001	0.000001	0.000001	0.000002	0.000004	0.000002	0.000002	0.000002	0.000002	0.000002	0.000003	0.000004	0.000003	0.000005
Cadmium	kg/tonne	8.7E-10	1.8E-09	1.4E-09	0.0000000	0.0000000	1.2E-09	1.1E-09	0.0000000	1.0E-09	1.2E-09	0.0000000	1.3E-09	0.0000000	0.0000000	0.0000000	1.3E-09	0.0000000	0.0000000	1.5E-09	1.3E-09	1.2E-09	0.0000000
Chromium	kg/tonne	1.8E-08	1.7E-08	2.1E-08	1.8E-08	2.1E-08	0.00000002	0.00000002	0.00000001	0.00000001	1.2E-08	1.2E-08	1.6E-08	2.0E-08	2.0E-08	1.5E-08	1.8E-08	1.7E-08	2.1E-08	2.0E-08	2.1E-08	1.9E-08	2.5E-08
Cobalt	kg/tonne	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000009	0.0000009	0.000001	0.000001
Copper	kg/tonne	0.00000005	0.00000005	0.00000007	0.00000006	0.00000007	0.00000006	0.00000004	0.00000002	0.00000002	0.00000002	0.00000002	0.00000004	0.00000006	0.00000003	0.00000002	0.00000003	0.00000003	0.00000003	5.7E-08	0.00000006	0.00000006	0.00000009
Iron	kg/tonne	0.000003	0.000003	0.000004	0.000003	0.000004	0.000004	0.000002	0.000001	0.000001	0.000001	0.000001	0.000002	0.000004	0.000002	0.000001	0.000001	0.000001	0.000002	0.000003	0.0000037	0.000003	0.000006
Lead	kg/tonne	2.7E-08	2.6E-08	4.2E-08	3.0E-08	4.0E-08	3.4E-08	1.6E-08	4.2E-09	4.1E-09	4.1E-09	4.4E-09	1.7E-08	3.4E-08	8.1E-09	5.6E-09	7.1E-09	6.7E-09	8.6E-09	2.9E-08	3.5E-08	3.2E-08	5.5E-08
Lithium	kg/tonne	0.0000022	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.0000023	0.000002	0.000002	0.000002
Manganese	kg/tonne	0.00001	0.00001	0.000	0.000	0.000	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.00001037	0.000	0.000
Mercury	kg/tonne	8.4E-11	7.7E-11	9.0E-11	7.7E-11	8.8E-11	8.0E-11	6.0E-11	4.8E-11	5.0E-11	4.8E-11	4.9E-11	6.1E-11	8.2E-11	5.3E-11	5.2E-11	5.2E-11	5.4E-11	5.1E-11	7.6E-11	8.2E-11	7.7E-11	1.1E-10
Phosphorus	kg/tonne	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000002	0.0000001	0.0000001	0.0000001	0.0000002	0.0000001	0.0000001	0.0000001	0.0000001
Molybdenum	kg/tonne	0.00000086	0.0000008	0.00000134	0.00000095	0.00000127	0.00000109	0.00000047	0.00000007	0.00000008	0.00000007	0.00000009	0.0000005	0.00000108	0.00000026	0.00000015	0.00000021	2.0E-07	2.8E-07	9.2E-07	0.0000011	0.00000101	0.00000178
Nickel	kg/tonne	0.000001	0.000001	0.000001	0.0000	0.0000	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.00000109	0.000001	0.0000
Selenium	kg/tonne	0.00000092	0.0000008	0.00000087	0.00000086	0.00000099	0.00000132	0.00000089	0.00000071	0.00000064	0.00000064	0.00000081	0.00000102	0.00000115	0.00000277	0.00000145	0.00000223	0.00000202	0.00000303	0.00000154	0.0000012	0.00000091	0.00000106
Silica	kg/tonne	0.00002	0.00002	0.00003	0.00002	0.00003	0.00003	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.00003	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00003	0.00003	0.00004
Silver	kg/tonne	9.7E-10	8.9E-10	9.9E-10	9.4E-10	1.0E-09	1.1E-09	8.9E-10	7.7E-10	7.5E-10	7.4E-10	8.1E-10	9.3E-10	1.1E-09	1.5E-09	1.0E-09	1.3E-09	1.3E-09	1.6E-09	1.2E-09	1.1E-09	9.7E-10	1.1E-09
Strontium	kg/tonne	0.00003	0.00003	0.00002	0.00002	0.00002	0.00002	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00002	0.00004	0.00003	0.00004	0.00004	0.00004	0.00003	0.00002	0.00002	0.00002
Tin	kg/tonne	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000002	0.00000001	0.00000001	0.00000001	0.00000002	0.00000001	0.00000001	0.00000001	0.00000001
Thallium	kg/tonne	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Uranium	kg/tonne	0.00000012	0.00000011	0.00000017	1.3E-07	1.7E-07	0.00000016	0.00000009	0.00000004	0.00000004	0.00000004	0.00000005	9.6E-08	1.5E-07	1.4E-07	7.9E-08	1.2E-07	1.1E-07	1.6E-07	1.5E-07	0.00000016	1.4E-07	0.00000021
Vanadium	kg/tonne	0.00000005	0.00000004	0.00000005	0.00000005	0.00000005	0.00000006	0.00000004	0.00000004	0.00000004	0.00000004	0.00000004	0.00000005	0.00000005	0.00000008	0.00000005	0.00000007	0.00000006	0.00000008	5.9E-08	0.00000005	4.8E-08	0.00000006
Zinc	kg/tonne	0.000001	0.0000014	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.000001	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000011	0.000001	0.000001

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

Table 5-5. Non-PAG Rock Flushing Source Term

Parameter	Units	Six Month Exposure	Twelve Month Exposure
Conventional			
Alkalinity	kg $CaCO_3$/tonne	0.019	0.0381
Major Ions			
Calcium	kg/tonne	0.00	0.00
Magnesium	kg/tonne	0.0001	0.00
Potassium	kg/tonne	0.00012	0.00024
Sodium	kg/tonne	0.01607	0.03214
Chloride	kg/tonne	0.00022	0.00044
Sulfate	kg/tonne	0.016	0.03
Elements			
Aluminum	kg/tonne	0.0000032	0.000006
Antimony	kg/tonne	2.8E-08	5.6E-08
Arsenic	kg/tonne	2.8E-08	5.6E-08
Barium	kg/tonne	0.0000003	0.000001
Boron	kg/tonne	0.0000044	0.000009
Cadmium	kg/tonne	7.9E-10	1.6E-09
Chromium	kg/tonne	1.8E-08	3.6E-08
Cobalt	kg/tonne	0.00000011	0.00000022
Copper	kg/tonne	7.8E-08	0.00000016
Iron	kg/tonne	0.0000048	0.00001
Lead	kg/tonne	4.9E-08	9.9E-08
Lithium	kg/tonne	0.0000013	0.0000026
Manganese	kg/tonne	0.00000	0.000001
Mercury	kg/tonne	7.3E-11	1.5E-10
Phosphorus	kg/tonne	0.00000011	0.0000002
Molybdenum	kg/tonne	1.6E-06	0.00000324
Nickel	kg/tonne	0.00000024	0.0000005
Selenium	kg/tonne	0.00000069	0.0000014
Silica	kg/tonne	0.000029	0.00006
Silver	kg/tonne	7.1E-10	1.4E-09
Strontium	kg/tonne	0.000006	0.00001
Tin	kg/tonne	0.00000001	0.00000001
Thallium	kg/tonne	0.0000000	0.0000000
Uranium	kg/tonne	1.8E-07	3.7E-07
Vanadium	kg/tonne	3.6E-08	7.1E-08
Zinc	kg/tonne	0.00000024	0.0000005

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5.3 Open Pit Wall Rock Runoff

The base case and high case open pit wall rock runoff source terms for the End of NMP, End of EMP and EOM are provided in Table 5-6. The charge balance in of the wall rock source terms is less than 10%, which is considered reasonable for solutions based on averaging several release rates in the field barrel tests. The pH of solutions was alkaline (7.4 to 8.1) and maximum pit wall runoff concentrations occurred at the end of the EMP since this timeframe represents the maximum exposure of pit wall and has the highest reactive mass (Table 4-6).

Most of the constituents were higher in the high case source term in comparison to the base case. Concentrations of iron were lower in the high case source terms. Iron concentrations are low in both scenarios since it is solubility constrained through ferrihydrite ($Fe(OH)_3$) precipitation. Lower iron concentrations occur in the high case source term since these solutions are more alkaline reducing the ferrihydrite solubility (i.e., more ferrihydrite is predicted to precipitate in the high case scenario).

Table 5-6. Open Pit Wall Rock Runoff Source Terms

Parameter	Units	Open Pit Wall Runoff - End of NMP		Open Pit Wall Runoff - End of EMP		Open Pit Wall Runoff - EOM	
		Typical	High	Typical	High	Typical	High
Conventional							
pH	s.u.	7.4	7.8	7.6	7.8	7.4	8.1
% Error	%	-0.3	-0.3	0.5	0.5	-0.3	-0.3
Alkalinity	mg $CaCO_3$/L	24	837	40	718	27	1662
Major Ions							
Calcium	mg/L	2	58	4	65	0	15
Magnesium	mg/L	2	53	3	61	0	13
Potassium	mg/L	0	7	0	7	0	11
Sodium	mg/L	26.3	906.0	47	856	23	1404
Chloride	mg/L	0.4	12.7	0.7	11.8	0.3	19.2
Sulfate	mg/L	42	1442	81	1469	23	1432
Dissolved Elements							
Aluminum	mg/L	0.0013	0.0024	0.0016	0.0022	0.0014	0.0041
Antimony	mg/L	0.00004	0.00136	0.00007	0.00122	0.00004	0.00246
Arsenic	mg/L	0.00005	0.00167	0.0001	0.002	0.00	0.002
Barium	mg/L	0.0006	0.0193	0.0011	0.0198	0.0005	0.03
Boron	mg/L	0.01	0.21	0.01	0.19	0.01	0.39
Cadmium	mg/L	0.0000	0.00013	0.00001	0.00015	0.0000	0.00007
Chromium	mg/L	0.00003	0.00097	0.00005	0.00089	0.00003	0.00156
Cobalt	mg/L	0.001	0.034	0.0017	0.0306	0.0002	0.0098
Copper	mg/L	0.0001	0.0038	0.0002	0.0035	0.0001	0.0068
Iron	mg/L	0.00047	0.00021	0.00031	0.00024	0.00042	0.00013
Lead	mg/L	0.00006	0.00219	0.0001	0.0019	0.00007	0.00432
Lithium	mg/L	0.003	0.09	0.005	0.09	0.0019	0.12
Manganese	mg/L	0.01	0.43	0.022	0.4	0.0005	0.03
Mercury	mg/L	0.00000	0.000005	0.00000	0.000006	0.00000	0.000006
Phosphorus	mg/L	0.0002	0.007	0.0004	0.0074	0.0002	0.0096
Molybdenum	mg/L	0.0021	0.0725	0.0035	0.0636	0.0023	0.1413
Nickel	mg/L	0.001	0.047	0.0023	0.041	0.0003	0.021
Selenium	mg/L	0.001	0.04	0.002	0.042	0.001	0.06
Silica	mg/L	0.05	1.6	0.1	1.5	0.04	2.5
Silver	mg/L	0.0000012	0.0000425	0.0000023	0.0000411	0.000001	0.000062
Strontium	mg/L	0.02	0.79	0.05	0.82	0.01	0.52
Tin	mg/L	0.00002	0.00062	0.00004	0.00074	0.00001	0.00065
Thallium	mg/L	0.000003	0.000108	0.000008	0.000152	0.000001	0.000062
Uranium	mg/L	0.00024	0.00829	0.0004	0.0075	0.0003	0.0161
Vanadium	mg/L	0.0001	0.0022	0.0001	0.0022	0.0001	0.0031
Zinc	mg/L	0.001	0.049	0.0025	0.0448	0.0003	0.0211

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

6 Summary

SRK (2022a) developed geochemical source terms by scaling HCT testing results to field conditions. A comparison to the scaled HCT and barrel testing results indicated that the release rates of some constituents are higher in the barrels in comparison to the HCT. The geochemical source terms were updated using the barrel release rates. The barrel release rates are considered more appropriate for estimating site drainage water quality because they are more representative of solute release rates under field conditions.

Barrels were constructed using mine rock sample rejects and overburden. Insufficient processed rock (e.g., coal, coarse rejects, etc.) sample precluded barrels being constructed for these materials. Base The following source terms were updated using the barrel testing results:

- Unsaturated non-PAG & overburden
  - Pits backfill
  - Dams/buttresses
- Saturated non-PAG rock
- Saturated PAG rock
- Open pit wall rock runoff

The following source terms were not updated and the SRK (2022a) source terms remain current:

- Processed rock
- Processed coal stockpile runoff
- Particulate concentrations

The above source terms will be carried forward into the site wide water and load balance to evaluate the mixed project discharge water quality. To evaluate uncertainty in the model, both the base case and high case scenarios should be evaluated.

Closure

This report, Updated Water Quality Model Source Terms, was prepared by

Michael Herrell, MSc, PGeo
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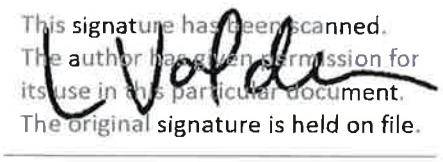
and reviewed by



Laura Volden, MSc, PGeo
Senior Consultant (Geochemistry)

EGBC Permit to Practice Reg. No.: EGBC 1003655

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Tenas Project - Suboxic Evaluation of Non-Acid Generating Mine Rock

August 2, 2024

TELKWA MINING LIMITED

okane

Integrated Mine Closure and Relinquishment Solutions

Tenas Project - Suboxic Evaluation of Non-Acid Generating Mine Rock

1288-221-002

August 2024

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C	Draft	June 28, 2024	J. Paulsen / J. Steeves	J. Robertson / R. Shurniak	Adding Additional Scenarios

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EXECUTIVE SUMMARY

Okane Consultants (Okane) are providing support to evaluate the development of suboxic conditions for the backfill of non-potentially acid generation (NAG) mine rock into the Open Pit for Telkwa Mining Limited (Telkwa) at their proposed Tenas Project in northwest British Columbia. The current scope focuses on placement of NAG mine rock. The objective of the scope was to develop geochemical source terms for the backfilled mine rock that reflect the construction and reclamation schedule, and the resulting hydrological and oxygen conditions of the backfill.

The source terms were developed using a two-dimensional oxygen model to evaluate the size, location, and timing of suboxic (low oxygen concentration) conditions within the NAG backfill. The formation of suboxic conditions limits oxidation rates of sulfide minerals and decreases the loads of constituents of interest released from sulfide oxidation to the receiving environment. The source terms will be used as inputs for the site-wide water quality model that integrates seepage and chemical loads from all mine domains to understand the overarching water quality effects of the Project on the receiving environment. All years presented herein refer to mine plan years.

Three scenarios were chosen to evaluate the development of suboxic conditions. The three scenarios were:

- Scenario #1: Poorly graded till and sandstone mine rock;
- Scenario #2: Well graded till and mine rock mix (60% siltstone, 35% mudstone, and 5% sandstone);
- Scenario #3: Well graded till and mine rock mix (60% siltstone, 35% mudstone, and 5% sandstone) with no internal cover layers.

During the covered time period for all modelled scenarios, two sequential cover surface conditions (grass cover followed by the establishment of mature forest) were used to simulate the maturing of vegetation on the cover system. These surface conditions affected how oxygen and water move into the cover material and underlying NAG backfill. For a five-year period directly after cover placement the simulation used a grass surface; following this five-year period, a forest surface was used for the remainder of the model timeframe.

GoldSim seepage modelling for the NAG backfill demonstrated a significant reduction in stabilized seepage rates between the modelled scenarios. Stabilized seepage rates for Scenarios #2 and #3 were approximately half of the stabilized rates for Scenario #1. The modelling also demonstrated that the NAG backfill will be wetted up after approximately 40 years in Scenario #1 and approximately 80 years in Scenarios #2 and #3 due to differences in material texture in the cover system. Modelling demonstrated that suboxic conditions within Scenario #1 took approximately 15 years to develop and approximately 13 years in Scenarios #2 and #3 once the cover system was placed. Depths to suboxic conditions varied between the scenarios due to differences in oxygen ingress and net percolation. Scenario #1 had a

long-term depth to suboxia of approximately 15 m while Scenarios #2 and #3 had a long-term depth to suboxia of approximately 3 m.

Estimated stored water volumes increase as mine rock is placed during construction and stabilize after approximately 15 years when construction has ended. Similar to seepage results, the stored water volumes stabilize after approximately 40 years for Scenario #1 and 70-80 years for Scenarios #2 and #3. Stored water volumes in the NAG backfill are predicted to be lower in Scenarios #2 and #3 relative to Scenario #1.

Source terms were developed for Scenarios #1, #2, and #3 using a reactive transport modelling approach. Reactive transport modelling was used to simulate the weathering of sulfide and carbonate minerals and resulting concentrations of related dissolved constituents using mechanistic kinetic weathering rates controlled by the geochemical setting of the NAG backfill. For constituents not directly controlled by sulfide oxidation and carbonate dissolution, a constant loading rate scale-up model was used to develop source terms. The geochemical models were calibrated to on-site kinetic barrel tests containing NAG mine rock and subsequently applied to the full-scale NAG backfill geometry.

The geochemical model incorporated changing cover system surface conditions by changing net percolation into the model for each time period (bare mine rock, grass coverage, and forest coverage). The effects of suboxic zones were simulated by limiting pyrite oxidation to depths where oxygen models simulated oxic conditions.

In general, concentrations for modelled parameters were similar between all scenarios. Although it was evident that less pyrite oxidation was occurring in the Scenario #2 and #3 models due to the larger suboxic zones, which resulted in lower mass release of oxidation products, decreased infiltrating water volumes (i.e., less dilution) in these scenarios resulted in similar concentrations as seen in Scenario #1. The primary benefit of the well-graded cover system scenarios is the overall decrease of released load of oxidation products (e.g., selenium and sulfate) from the NAG backfill. Scenarios #2 and #3 consistently had lower chemical loading relative to Scenario #1 resulting in approximately half the mass of oxidation products released from the NAG backfill on an annual basis. Scenarios #2 and #3 had similar chemical loading due to similar lag-times to suboxic zone development and depth to suboxic conditions. Additionally, geochemical source terms of the NAG backfill from the current model were comparable, although generally slightly lower, than source terms initially developed for the backfill (SRK, 2022a). The NAG backfill source terms from this modelling work will be integrated into the site wide load balance model to quantify the effects of the backfill on water quality around the Tenas project.

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1 INTRODUCTION

1.1 Project Description

Telkwa Mining Limited (Telkwa) are proposing to develop the Tenas Project (Project), located approximately 25 km southwest of the town of Smithers in northwest British Columbia (BC) within the Telkwa and Bulkley River watersheds. The Project consists of an open pit, backfill, external stockpiles, water management ponds, control ponds, coal processing plant, and rail infrastructure. Elevation of the Project ranges from 750 to 1,050 meters above sea level (masl), with a median elevation of 800 masl. The Project is within the Ministry of Environment and Climate Change Strategy (MECCS) Zone 8 – Nechako Plateau, close to the border with Zone 9 – Southern Hazelton Mountains (Ahmed and Jackson, 2013). The MECCS hydrological zones are areas of homogeneous hydrologic and geomorphic characteristics.

1.2 Project Objectives and Scope

Okane Consultants (Okane) is providing support to develop source terms for three scenarios of backfill NAG mine rock in lifts using bottom-up construction methodology with overburden covers within the Open Pit provided by Telkwa. The objective of the backfilled design is to limit oxygen and water ingress to minimize the release of potential contaminants of concern such as selenium and sulfate to the receiving environment.

A geochemical model that incorporated both a mechanistic reactive transport model and geochemical scale-up model was developed to simulate long-term water quality of mine rock backfilled into the Open Pit. Seepage water quality results from the geochemical model were developed as source terms to be used in the Tenas site-wide water quality model developed by SRK Consulting (SRK).

1.3 Report Organization

For convenient reference, this report has been subdivided into the following sections:

- Section 2 – Provides pertinent background information for this study;
- Section 3 – Description of modelling processes;
- Section 4 – Modelling results and discussion; and
- Section 5 – Conclusions of the modelling work.

2 BACKGROUND

Source control of contaminants of interest (COIs) is a cutting-edge practice. It demonstrates a significant commitment to minimizing water quality impacts in the region to both regulators and stakeholders. Okane has extensive experience in implementing closure strategies to mine storage facilities, ultimately limiting oxygen ingress and net percolation into the underlying waste material. This working experience has led to development of fully integrated models that link hydrology, oxygen conditions, material properties, mine rock structure and climate to develop source terms for site-wide water quality models.

Okane's experience has shown that there are solutions available to improve source control and water quality, therefore, providing the opportunity to relinquish the site at the end of the mine life versus treating water from the mine rock into perpetuity. Such solutions can include progressive reclamation and the application of oxygen-limiting cover systems which can lead to the development of suboxia within the NAG mine rock storage facilities (MRSFs) to help improve long-term seepage quality by inhibiting the oxidation of sulfide minerals within the SOZ, decreasing the release and production of metal leaching in the lower zones of the MRSF.

Currently for the Project, suboxia is defined as pore gas oxygen concentrations less than 1 vol.%, which results in a dissolved oxygen concentration in pore water of less than 1 mg/L. The NAG mine rock is a large porous mass, which during placement will have oxygen concentration in pore spaces reflecting ambient conditions, or near to ambient conditions. Oxygen within NAG mine rock pore spaces will be depleted because of sulfide (pyrite) oxidation.

2.1 Net Percolation and Oxygen Ingress Classifications

The term 'net percolation' (NP) is used throughout this memo and is defined as presented in Figure 2.1. Precipitation (PPT) that reaches the cover system surface will either be intercepted by vegetation, run off (RO), or infiltrate into the cover system. A portion of the water that infiltrates will be stored in an active zone (ΔS) where water is actively cycled within the soil profile and into the atmosphere. Water stored in the active zone can be evaporated (AE) into the overlying atmosphere or can be removed by plant transpiration (AT); the combination of evaporation and transpiration is referred to as actual evapotranspiration (AET). Water in the cover system can also potentially move laterally as interflow. Water that moves below the active zone and is no longer available to be removed from the system via AET or laterally is defined as NP. NP is infiltrating water expressed as a percentage of average annual precipitation (PPT) that will migrate beyond the active zone because of gravity overcoming the influence of evapotranspiration, resulting in flow of water into the underlying NAG mine rock and overburden cover.

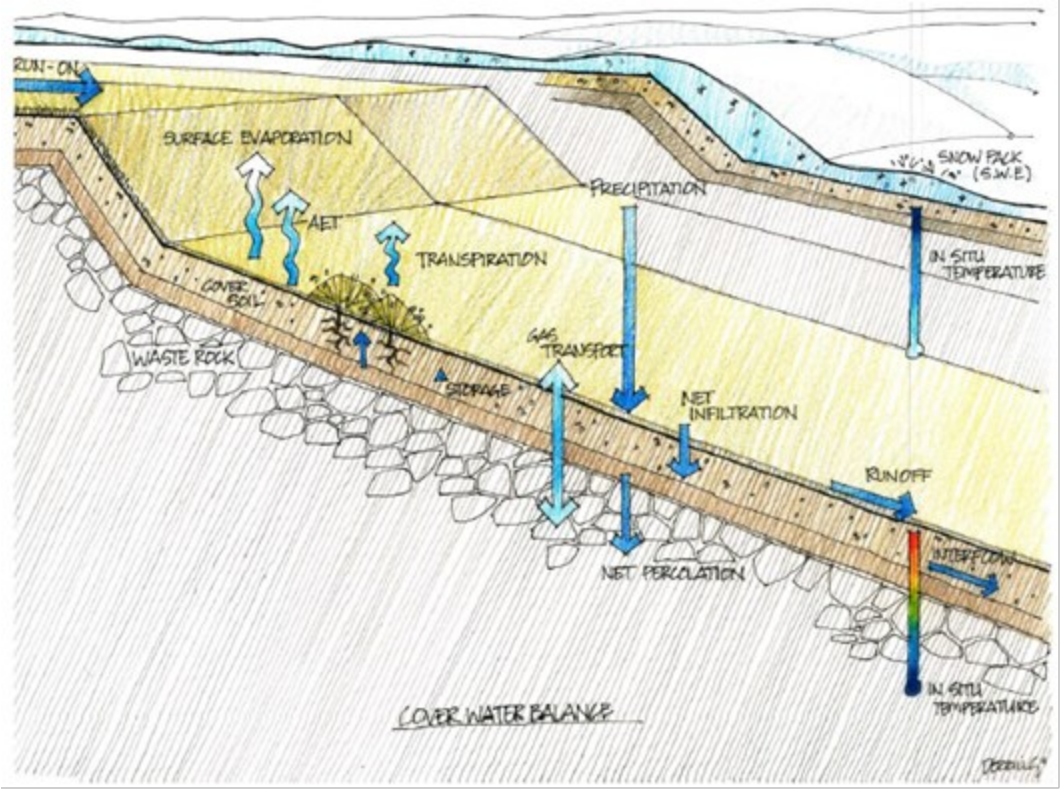

Figure 2.1: Schematic of hydraulic processes that influence performance of a cover system (from INAP, 2017)

As shown by the Project climate data described later in this report, the Project is classified as subarctic (Dfc) using the Köppen-Geiger climate classification (Peel *et al.,* 2007). Based on this classification, the range of cover system performance for the Tenas Project is presented conceptually, as defined in the Global Cover System Design Technical Guidance Document (INAP, 2017), as follows:

- "Very High" NP is greater than 50% PPT;
- "High" NP is between 25% PPT and 50% PPT;
- "Moderate" NP is between 15% PPT and 25% PPT;
- "Low" NP is between 5% PPT and 15% PPT; and
- "Very Low" NP is less than 5% PPT.

Within a single climatic regime, the same range of NP rates may be a result of the influence of differing abilities of a cover system to evapotranspirate water, and to promote runoff and interflow (i.e., lateral flow within the cover system) from the landform. Net percolation rates will also vary from year to year. For example, a high rainfall year (or, more specifically, several successive wetter than average climate

years) may result in a moderate net percolation rate for the year, even for a cover system scenario classified, on average, as having a low net percolation rate.

Cover performance with respect to oxygen (O_2) ingress can also be classified using the Global Cover System Design Technical Guidance Document (INAP, 2017) as follows:

- "Very High" O_2 ingress is greater than 100 mol/m^2/year;
- "High" O_2 ingress is between 50 and 100 mol/m^2/year;
- "Moderate" O_2 ingress is between 10 and 50 mol/m^2/year;
- "Low" O_2 ingress is between 1 and 10 mol/m^2/year; and
- "Very Low" O_2 ingress is less than 1 mol/m^2/year.

Limiting oxygen ingress is often achieved by limiting diffusion or restricting air flow by reducing pressure and/or thermal gradients. Usually, the most effective way to limit oxygen ingress is to create and sustain saturated conditions in a layer within the cover system. O_2 ingress is less challenging to limit in wetter environments where a tension-saturated layer is more easily maintained, and finer-textured material together with the tension saturated conditions will lead to reduced air permeability and therefore, advective gas transport. A similar range of performance exists for O_2 ingress as for NP where rates will vary from year to year. For example, a low rainfall year or several successive drier than average years will reduce the degree of saturation maintained within the cover system and may increase the predicted oxygen ingress rate for the year.

Limiting NP and O_2 ingress are not necessarily mutually beneficial and achieving reductions in either or both is site specific. Depending on available materials for cover system construction, limiting NP may result in less water available to maintain a saturated layer, whereas limiting O_2 ingress may require promoting additional NP. Hence, a technical assessment is required to make decisions on how best to optimize these two aspects to best take advantage of how each facet enhances performance for a particular project.

2.2 Site Specific Attributes

Assessment of the NAG backfill and cover system performance requires analysis of site attributes that constrain design alternatives to achieve the desired performance (INAP, 2017). The following site-specific attributes will be used to define performance of the NAG backfill design at Tenas:

- Climate;
- Hydrogeological setting;

- Materials;
- Vegetation; and,
- Geochemistry.

These key site attributes are described in the following sections based on background data provided by Telkwa.

2.3 Climate

The regional climate is a subarctic climate where winters are cold, averaging around -5°C during the period of November through February with temperatures potentially dropping to -30°C or colder, and summers are warm, with average temperatures greater than 20°C and highs of greater than 30°C are possible. Precipitation occurs as rain during the warmer months, accounting for 60-65% of annual precipitation. Snow accounts for 35-40% of annual precipitation with maximum accumulation of snow occurring in February-March.

The Project falls near the intersection of Dfc (subarctic climate) and Dsc (Mediterranean-influenced subarctic climate) of the Köppen-Geiger climate classification system (Peel *et al.*, 2007) where:

- D – 'continental' where average temperature of the coolest month is < -3 °C, and average temperature of the warmest month is > 10 °C;
- f – 'without dry season' where precipitation is evenly distributed throughout the year;
- s – 'dry summer' where precipitation of the driest month in summer is less than 40 mm and is also less than a third of the precipitation of the wettest month in winter; and
- c – 'cold summer' where one to three months average temperature reach >10 °C but < 22 °C.

2.4 Hydrogeological Setting

The results of historical hydrogeological investigations and *in-situ* testing are presented in Table 2.1. Surficial material is primarily sandy till to silty clay (Piteau, 1997), which is underlain by fractured sedimentary bedrock consisting of mudstones, siltstones, and sandstones (Klohn, 1985; Piteau, 1997; SRK 2018; 2019). *In-situ* hydraulic conductivity of the bedrock ranged from 6.0×10^{-6} m/s to 1.0×10^{-10} m/s.

Using the British Columbia Groundwater Wells Database, a search was completed, and 11 water wells were found in the vicinity of the mining operations. Nine domestic drinking water wells and two commercial water wells were found to be in the area N-NE of the mine site. Four of the wells are just south of the Telkwa River and west of Tenas Creek while the remaining seven (7) wells are east of Goathorn Creek. The range in finished depth of the water wells is 12 to 43 m below ground level (mbgl),

with a range of static head of 5.5 to 39 m below top of casing (btc), and an estimated yield range from 15 to 114 L/min.

Table 2.1 Record of hydrogeological investigations and *in-situ* testing.

Location and Geology	Hydrogeological Instrumentation	Groundwater Flow and Piezometric Surface	*In-Situ* Hydraulic Conductivity (K) and Linear Flow Velocity (V)
Telka Site (Klohn, 1985) Variable thicknesses of glacial till and gravel overlying sequences of sandstones, siltstones, mudstones, and coal. Bedrock dips 15-20 degrees to the east and is structurally dominated by several N-S trending reverse faults and normal faults which trend N-S and EW. Bedrock is of low permeability and contains no stratigraphically definable aquifers. The groundwater table is at or close to ground surface for much of the eastern part of the site. Breccia filled fault zones are expected to be significant conductors of groundwater.	16 piezometers installed (*none of the piezometers are still functional)	23 rural households within 3 km of the mine area obtain their domestic water supplies from groundwater, either by dug wells (2 to 6 m depth) or by drilled wells (less than 50 m depth) Domestic well records indicate that groundwater in the area is at about 12.5 m depth within a gravel layer.	Coefficient of permeability, Coal: 5×10^{-7} to 5×10^{-9} m/s Siltstone, Mudstone Sandstone: 2×10^{-7} to 1×10^{-10} m/s Recharge was estimated as 3% of annual precipitation based on the estimated groundwater flux and a value for hydraulic conductivity derived from the packer tests.
Tenas Pit (Piteau, 1997) Telkwa coal lease is underlain by coal-bearing sedimentary sequence comprising siltstone, sandstone, mudstone, and shale strata of the Lower Cretaceous age Skeena Group (Units 1-4). Economic coal seams in Unit 1 – 120 mm thick sequence of interbedded coal and sedimentary rocks. Faulting is near vertical, one group strikes ~NW/SE and other group strikes ~NE/SW. Few E/W striking faults. Surficial deposits are primarily till ranging from sandy silt to silty clay with minor gravel with range in thickness from less than 3 m to more than 10 m.	4 piezometers within coal seam #1 in 1995 5 piezometers in the major coal seams at three new locations in 1996	NE direction with horizontal hydraulic gradient of ~0.1. Flowing artesian conditions exist in all but 3 piezometers completed in coal seam #1.	K range of 2.1×10^{-8} to 6.0×10^{-6} m/s Average V is 115 m/year but does not consider local fault or fracture zones. V in the range of 10 to 250 m/year may be expected.

Location and Geology	Hydrogeological Instrumentation	Groundwater Flow and Piezometric Surface	*In-Situ* Hydraulic Conductivity (K) and Linear Flow Velocity (V)
Waste Dumps (Piteau, 1997) Waste dump sites underlain by till from 3.75 - 13.5 m thick. Thinnest till blanket is deposited directly on the bedrock surface and thickest till deposit overlies outwash sediments. East side of Tenas pit, thin 6.0 m till overlies permeable sands and gravels. Where overburden is more than 10 m thick, bedrock is overlain by high permeability sand and gravel outwash deposits. The thickest of which (106 m) is in the NW corner of the Tenas waste dump sites where a buried channel (clays, sands, and gravels) exists where the depth to bedrock exceeds 117 m. Bedrock from 4.6 - 117 m consists of either volcanic ash or interbedded sequences of siltstone and mudstone with occasional sandstone.	11 holes drilled at 9 locations	Interpreted to follow topography within surficial sediments between 0.5 - 2.0 m. Depending on location, shallow groundwater flow will either be in a northwesterly or northeasterly direction towards Tenas Creek or Four Creek. At one piezometer nest, strong downward vertical gradients indicative of groundwater recharge conditions exist between upper and lower water-bearing deposits. Due to upland topography of the waste dump sites, groundwater recharge conditions are expected to prevail.	Three single well response tests indicated K of the upper water-bearing till deposit to be in the range of 2.8×10^{-9} to 7.2×10^{-7} m/s. These values are low and thus vertical infiltration rates through this deposit would similarly be expected to be low.
Pit 3 (Piteau, 1997) Bedrock: alternating sequence of siltstone, mudstone, sandstone, and coal with sporadic volcanic tuffs throughout the sequence. Complex series of sub-parallel, N-S trending reverse faults and N-S, and to a lesser extend E-W, trending normal faults. Bedrock overlain by ~10 - 15 m of silty clay till with minor coarse fragments and sand.	5 piezometers installed at 3 locations in Pit 3. At each location, a piezometer was completed across coal seam #2 A second piezometer was installed across coal seam #4 at two locations.	Within coal units, groundwater flow is interpreted to be in a north to northwesterly direction. Horizontal hydraulic gradient of ~0.04. Depth to water ranged from 7.55 - 36.73 mbgs.	From one single well response test, K of coal seam #2 estimated at 4.3×10^{-10} m/s. From two single well response tests, K of coal seam #4 estimated at 8.5×10^{-7} m/s and 3.7×10^{-6} m/s. Average V in coal seams estimated range 20-100 m/year.
Mine rock dumps and sediment ponds (SRK, 2018)	13 sonic drillholes to depths between 9.0 m and 30.8 m upon reaching bedrock or sufficiently high soil density.	Two sonic piezometers were dry, one had water up to ground level and the last had a depth to water of ~14 m.	-

Location and Geology	Hydrogeological Instrumentation	Groundwater Flow and Piezometric Surface	*In-Situ* Hydraulic Conductivity (K) and Linear Flow Velocity (V)
	4 standpipe piezometers were installed for groundwater monitoring in 2017. 8 diamond drillholes with lengths from 70 m to 213.7 m were drilled. 3 of these drillholes had piezometers installed in them.		
Management ponds, sediment ponds, external soil/rock piles and infrastructure pad (SRK, 2019)	12 sonic drillholes were terminated at depths between 10.7 m and 67.1 m upon reaching bedrock. 12 standpipe piezometers were installed for groundwater monitoring in 2018.	The shallowest groundwater levels were approximately 14 mbgs but the piezometric table was located between 20 m and 40 m within the overburden soils.	-

2.5 Materials

Site-specific material characterization and availability are the two main elements for cover system design. Material selection and strategic placement is a key control on cover system performance and is used to provide a means for functions such as vegetation establishment, erosion control, and drainage where required in the cover system design (MEND, 2004).

Surficial deposits (overburden) within the Project Area are primarily till ranging from sandy silt to silty clay with minor gravel (and less than 5% cobbles and boulders) with a range in thickness over the Tenas Project Area from 4 m to 100 m (SRK, 2018). Recent drilling investigations (SRK, 2018; 2019) of the overburden material are in agreement with historical investigations (Klohn, 1985; Piteau, 1997) except for no sand and gravel outwash deposits in the northwest of the project site reported in Piteau (1997) being encountered in current drill holes (SRK, 2018; 2019). The till surface deposits will be excavated in the mining process and stockpiled for later use in the cover systems or direct placed from mining.

The bedrock in the Tenas Open Pit is of the early Cretaceous-aged Skeena Group and consists of alternating sequences of siltstone, mudstone, sandstone, and conglomerates with inter-bedded, bituminous coal seams (SRK, 2018). In Unit 1 a sedimentary sequence from 50 m to 120 m in thickness is interbedded with Coal Seam 1 (Seamas 1A-1F) with individual thicknesses of 1 m to 3 m (SRK, 2018). To access the inter-bedded coal layers, the bedrock will be excavated becoming mine rock to be placed in lifts and covered with the till material.

Particle size distribution (PSD) data was only available for the overburden till material and no information was available for the mine rock. The overburden material can be grouped into two categories based on the PSD data, a poorly-graded till and a well-graded till. Figure 2.2 shows the range of PSDs for each group based on the testing completed by SRK in 2019 (SRK, 2019). Following completion of sample compaction tests, four till samples were assessed for permeability, the results ranged from 1.04×10^{-7} m/s to 1.18×10^{-10} m/s (SRK, 2018).

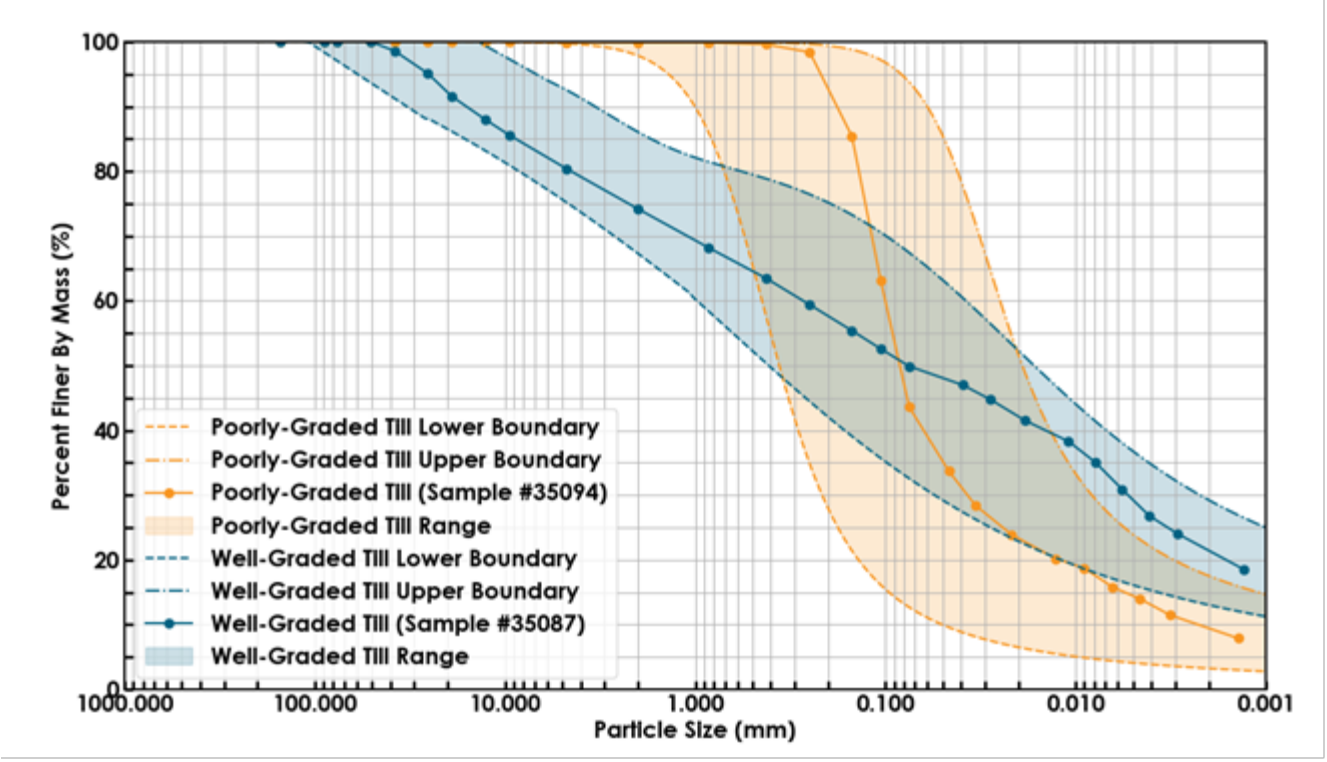

Figure 2.2: Range of PSDs for Poorly-Graded and Well-Graded Till based on SRK (2019).

(adapted from SRK, 2019)

2.6 Vegetation

The Project is located within the Sub-Boreal Spruce (SBS) zone of the biogeoclimatic zones of British Columbia. The dominant coniferous tree species in this zone include hybrid white spruce (hybrid of Engelmann spruce and white spruce), sub-alpine fir, lodgepole pine, and occasionally, black spruce and Douglas-fir (BC Ministry of Forests, 1998). Deciduous species include trembling aspen and paper birch.

2.7 Geochemistry

Non-potentially acid generating mine rock will be used as backfill into the Open Pit. Although sulfide minerals are present (and sulfide oxidation is expected), these materials contain an excess of neutralization potential (at least 2x) relative to the acid potential (AP) and are not expected to generate acidic drainage (Price, 2009). However, sulfide oxidation products will still be generated and transported through the mine rock by contact water. Concentrations of select dissolved trace metals and sulfate will be constrained by secondary mineral precipitation (e.g., gypsum and metal hydroxide phases) and adsorption to iron hydroxides that typically precipitate in circum-neutral mine waters. However, even with these solubility controls, metal loads from pyrite oxidation could still pose a risk to downstream

receptors. A conceptual model of geochemical reactions occurring along a typical flow path within the Tenas NAG mine rock is shown in Figure 2.3.

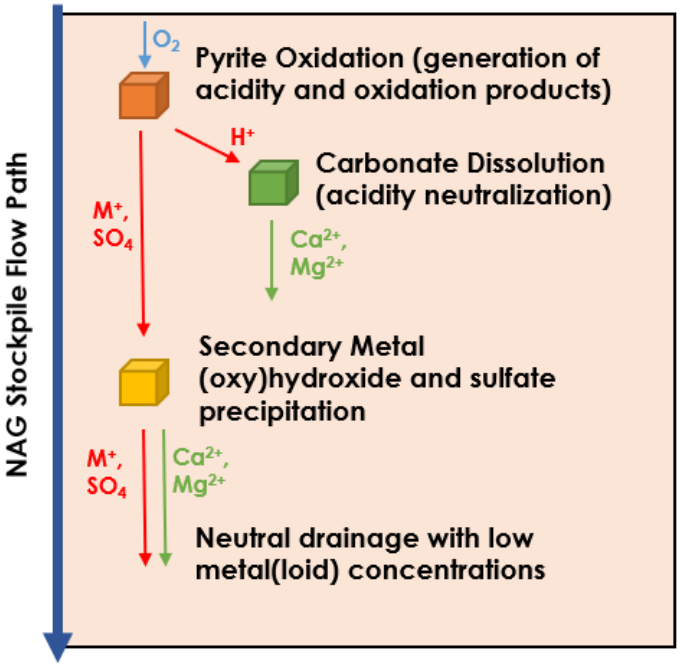

Figure 2.3: Geochemical conceptual model for Tenas NAG mine rock flow path.

Parameters that were elevated above typical crustal concentrations within the Project Area were: arsenic, phosphorus, sulfur, and selenium. Although elevated solid-phase concentrations do not necessarily imply that these species will be mobilized and result in elevated concentrations in contact water, solid-phase metals analysis was completed to flag potential contaminants of concern to evaluate in further geochemical testing.

Current geochemical characterization recommended the use of a neutralization potential ratio (NPR) > 1.60 to classify mine rock as NAG (where, NPR = neutralization potential / acid potential) during verification testing completed during the Operations phase of the Project. For planning and the EAC submission, an NPR cutoff of 2.0 was used to classify mine rock as NAG or PAG, with values > 2.0 considered NAG. This is based on a strong correlation between NP_{XRD} and modified NP following correction for iron carbonates and was developed using calcium and magnesium molar ratios in humidity cell tests (HCTs; SRK, 2022b).

Dolomite-ankerite and calcite are the most abundant carbonate minerals with lesser amounts of siderite in NAG mine rock while PAG mine rock has a higher siderite content. Dolomite-ankerite content ranged from 0.3 to 23.8 wt.% (median = 14.0 wt.%), while calcite ranged from below detection (BD) to 4.4 wt.% (median = 1.4 wt.%). Siderite content ranged from 0.2 to 12.6 wt.% (median = 2.0 wt.%). It is worth noting that siderite does not provide net neutralization to acidity generated from sulfide oxidation. This is because Fe(II) released from siderite dissolution typically oxidizes to Fe(III) which precipitates Fe(III)

hydroxide phases, releasing acidity. Therefore, the bulk of acidity neutralization in the NAG mine rock will come from the dissolution of calcite and dolomite. The primary sulfide mineral in the PAG mine rock is pyrite, which ranges from 0.3 to 2.5 wt.% (median = 0.8 wt.%).

3 DESCRIPTION OF MODELLING PROCESSES

To estimate seepage quantity and quality for the backfilled NAG mine rock in the Open Pit, Okane used the following numerical models and modelling process.

1) ***One-Dimensional (1D) Soil-Plant-Atmosphere (SPA) Models*** using components of the GeoStudio FLOW (Bentley Systems, 2022) modelling suite (namely, SEEP/W and TEMP/W) to simulate the NP rate.

2) ***Two-Dimensional (2D) Oxidation Model*** using the GeoStudio FLOW suite, including SEEP/W, TEMP/W, CTRAW/W, AIR/W, and the Gas Consumption and Exothermic Reactions Add-In Module to evaluate the size and development of suboxic conditions.

3) ***Three-Dimensional (3D) GoldSim Oxidation, Wetting-Up and Draindown Model*** to determine a range for potential seepage and oxygen consumption based on hundreds of realizations of the model, using the GoldSim Monte-Carlo formulation (GoldSim, 2021).

4) The ***Geochemical Model*** using a combination of both a *mechanistic reactive transport model* and a *scale-up geochemical model* to evaluate the evolution of water quality moving through the overburden cover and into the backfilled NAG mine rock.

The source terms from the geochemical model will be provided to SRK to be used in the site-wide water quality model to evaluate the potential effects of key mine facilities on the receiving environment. The following sections describe the numerical models in more detail.

3.1 1D Soil-Plant-Atmosphere Model with GeoStudio SEEP/W and TEMP/W

In combination, SEEP/W and TEMP/W are a 2D finite element model (which can also perform 1D simulations) that predict suction in the material profile in response to climatic forcing (such as evaporation) and lower boundary conditions (such as a water table). A key feature of the software is the ability of the model to predict actual evapotranspiration (AET) based on potential evaporation (PE) and predicted suction, as opposed to the user being required to input these surface flux boundary conditions. The AET rate from the surface material is below the potential rate during prolonged dry periods because the suction, or negative pore water pressure, in the material profile increases as the surface desiccates. In addition, SEEP/W and TEMP/W together form a fully coupled (through the vapour pressure term) heat and mass transfer model, which can predict water vapour movement and the influence of freeze/thaw on hydraulic conditions through reductions in the hydraulic conductivity. The 1D SPA models provide runoff and NP estimates, which are used as inputs in the 2D Oxidation and 3D GoldSim Oxidation, Wetting-Up, and Draindown models.

3.2 2D Oxidation Models

The 2D oxidation modelling was completed using the GeoStudio FLOW suite (SEEP/W, TEMP/W, CTRAN/W, and AIR/W) and the Gas Consumption and Exothermic Reaction Add-In to evaluate the size and development of suboxic zones within the NAG backfill. The models will account for annual material placement and provide estimates of the timing and depth to the suboxic zones, which are used in the 3D GoldSim model, as well as an estimate of cumulative oxygen (O_2) consumption with time, which is used to calibrate and validate the 3D GoldSim results.

3.3 3D GoldSim Oxidation, Wetting-Up and Draindown Model

The 3D model is a wetting-up and drain-down model developed by Okane in GoldSim to simulate the water movement in mine rock based on climate data and material properties. In the model, gravity-driven water flow depends on the NP rate and hydraulic conductivity. The hydraulic conductivity of each layer of mine rock is calculated based on the following formula with measured material properties:

$$k(h) = k_s S_e^l \left[1 - \left(S_e^{\frac{1}{m}}\right)^m\right]^2 \quad (1)$$

where S_e is the effective saturation, k_s is the saturated hydraulic conductivity (LT^{-1}), n and m are van Genuchten's equation parameters, and l is the pore-connectivity parameter. The effective saturation, S_e, within the layer is defined as:

$$S_e = \frac{\theta_w - \theta_{wr}}{\theta_s - \theta_{wr}} \quad (2)$$

where θ_w is the volumetric water content of the layer, θ_{wr} is the residual volumetric water content (L^3/L^3), and θ_s is the saturated volumetric water content (L^3/L^3). The van Genuchten equation parameter m is defined as a function of n as:

$$m = 1 - \frac{1}{n} \quad (3)$$

In the modelling process, hydraulic conductivity is calculated based on the water content of each layer of mine rock. This parameter is then used to calculate the flow rate of water between layers of mine rock. The change in water content due to the placement of new mine rock can also be simulated as part of the hydrogeology model. The Monte-Carlo formulation is used to vary the material properties for each lift of material within an anticipated range to produce a more realistic estimate of overall backfill performance.

The 3D models were extended an additional 50 years to 2150 using stochastic net percolation inputs based on the 1D water balance to ensure that steady state seepage was reached.

3.4 Geochemical Model

The evolution of water quality in the backfilled NAG mine rock was evaluated using a combination of both a mechanistic reactive transport model and a scale-up geochemical model.

The ***Mechanistic Reactive Transport Model*** was constructed with PHREEQC v.3 (Parkhurst and Appelo, 2013) and accounts for geochemical characteristics such as mineralogy, reaction kinetics, transport time, and oxygen conditions of the mine rock. This model incorporates key reactive minerals including sulfides and carbonates, chronology of the NAG mine rock placement, and cover system placement and source control implementation leading to suboxic zone development.

The ***Scale-up Geochemical Model*** was completed to estimate parameters that were not modelled using the Mechanistic Geochemical Model, and generally consist of parameters not directly influenced by sulfide oxidation or carbonate mineral dissolution. Parameter concentrations were calculated based on field barrel leachate quality and scaled-up based on the physicochemical differences between the smaller scale test conditions and expected field conditions of the NAG backfill.

3.5 Model Inputs

3.5.1 Base Case Geometry

The in-pit NAG backfill will be constructed as 120 m wide by 36 m high cells, with a 3 m cover of compacted overburden on the slope of the cell and 1 m of compacted overburden on the plateau of each cell. The cells will be built starting with the face of the slope as a 4 m by 50 m lift / road (1 in Figure 3.1). The overburden and NAG mine rock will be end dumped and compacted in 1.33 m lifts. The second lift will be a 4 m by 39 m lift (2 in Figure 3.1) on top of the first lift, followed by a third lift of 4 m by 28 m (3 in Figure 3.1). The remaining space within the cell will be end dumped as a 12 m high standard dump (4 in Figure 3.1). This process is planned to occur three times per cell, resulting in a 35 m high cell. The last step of each cell is the addition of a 1 m compacted overburden layer, completing the 36 m high cell.

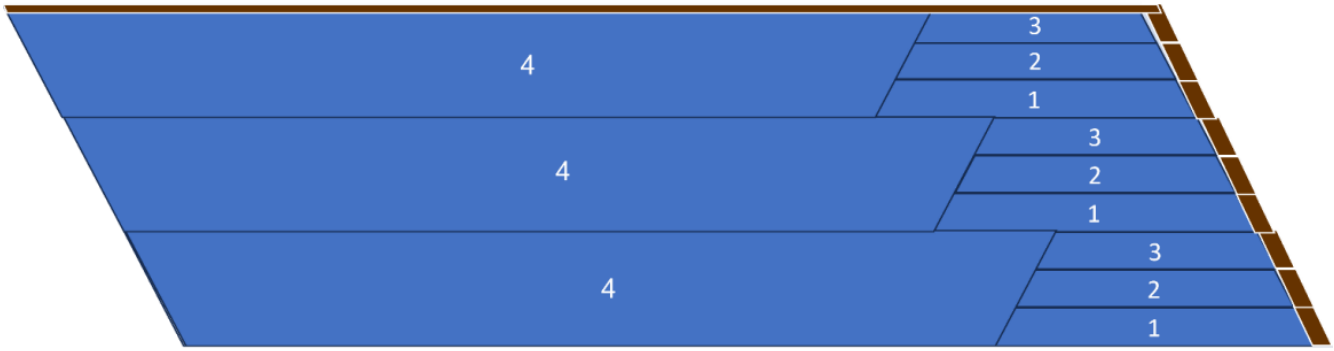

Figure 3.1: Building plan for the cells within the backfilled open pit NAG mine rock landform.

Cells will be stacked and reach an approximate height of three 36 m cells to complete the backfill within the Open Pit, as the bottom and top cells are anticipated to be half height, as shown in Figure 3.2, due to the pit bottom shape and final reclamation goals.

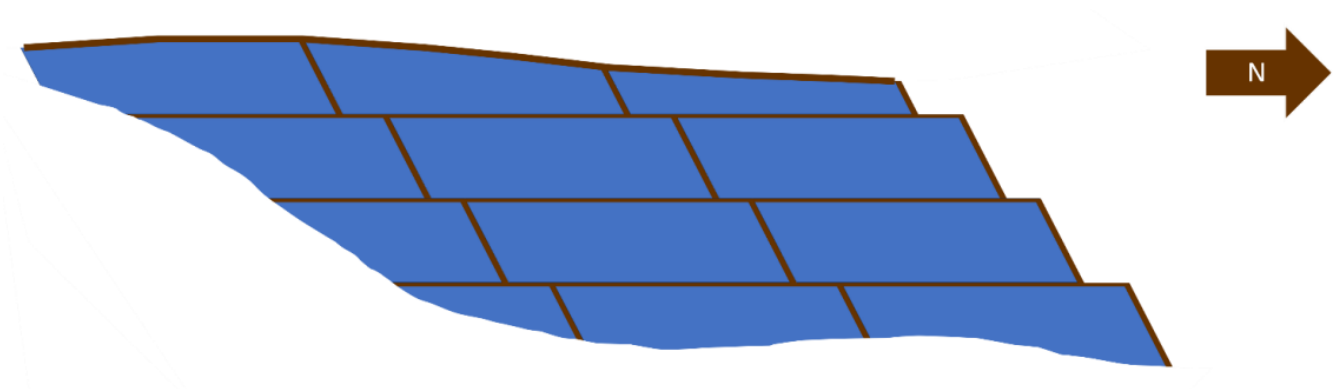

Figure 3.2: Encapsulation plan for NAG in-pit mine rock.

The final cover system on the landform will be 3 m of overburden overlain by approximately 0.3 m of surface soils (topsoil). The 1D models were constructed as 35 m of mine rock with the final cover system at the surface. These models were used to investigate the different material combinations.

A cross-section through the NAG backfill was modelled in 2D to determine the development and extent of the suboxic zone within the backfill. Figure 3.3 shows the approximate location of the cross section while Figure 3.4 shows the 2D geometry that was modelled.

An additional scenario that did not include the internal overburden layers was also modelled. This scenario assumed that the Open Pit would be backfilled following the same procedure as outlined above, but the entire 36 m cell would be composed of mine rock, with only the final cover system being composed of overburden.

Figure 3.3: Plan view of the backfill open pit NAG mine rock showing the strips and approximate location of the projected cross section.

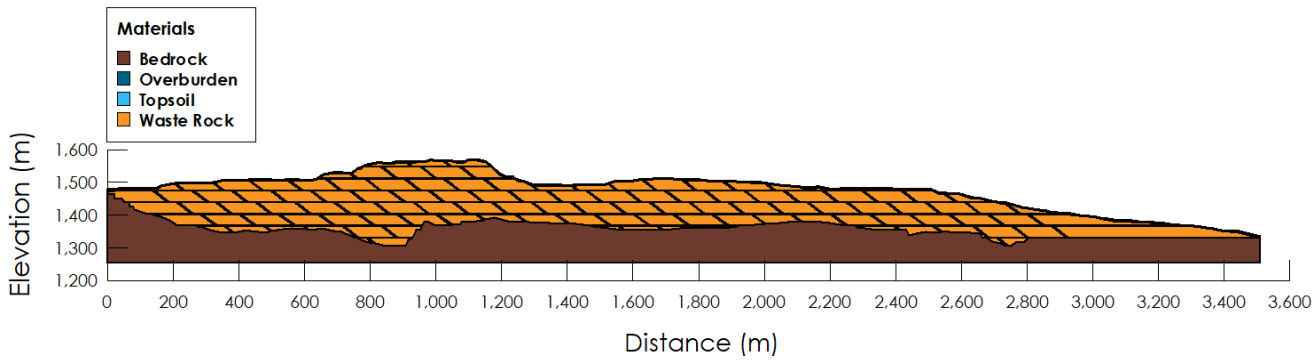

Figure 3.4: Geometry of the project 2D cross section. It should be noted that bedrock refers to bedrock of open pit, waste rock is the NAG mine rock and topsoil includes surface soils.

Within the 3D GoldSim model, the backfilled NAG mine rock was simulated by subdividing its area into 23 main strips, with each strip representing areas with similar timing of cover placement (Figure 3.3). The construction schedule for each strip was assumed based on the filling volumes and timing provided by Telkwa. The following assumptions were made regarding the placement of NAG mine rock for the GoldSim simulations:

- Construction of the NAG backfill is strip dependent, but in general, begins in Year 6 for the main strips and continues until the completion of the Operation phase in Year 21;
- Cover system placement is strip dependent and will be assumed to occur over one year (*e.g.*, cover placement that occurred in Year 8 will be assumed to occur at a uniform rate from January 1 to December 31 of Year 8). Cover system placement is assumed to occur in the year following completion of each strip due to model limitations; and
- Daily NP rate inputs will be derived separately from the 1D GeoStudio model results. In general, daily stochastic inputs will be setup for each day of the year based on the results of the GeoStudio models.

The assumed height of NAG mine rock and overburden in each strip with time, based on the volume of material placed and the surface area of the strip is shown in Figure 3.5. The surface area, total NAG mine rock and overburden volumes, and timing of cover system placement are listed in Table 3.1. For the no internal layers scenario, the internal layer volume was assumed to be NAG mine rock rather than overburden.

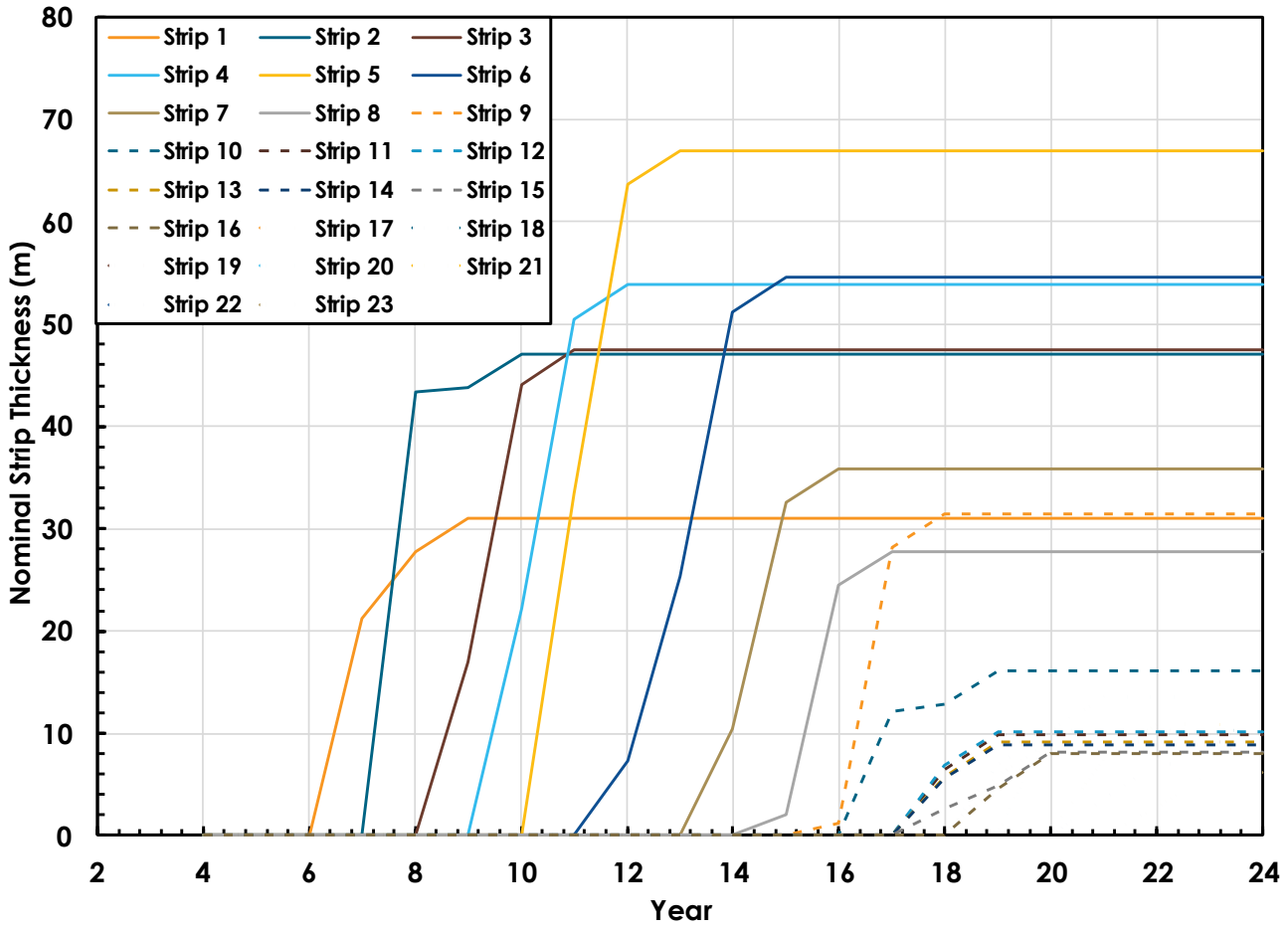

Figure 3.5: Evolution of nominal strip thickness within the GoldSim model for each strip.

Table 3.1: Surface area, volume, and nominal thickness of each strip, along with year of cover system placement.

Strip	Strip Surface Area (m^2)	Mine Rock Volume (m^3)	Internal Layers Overburden Volume (m^3)	Cover System Overburden Volume (m^3)	Total Strip Volume[1] (m^3)	Nominal Thickness (m)	Year of Cover Placement
1	41,897	1,065,383	95,548	71,661	1,232,593	31	Year 8
2	49,774	2,035,361	143,168	107,376	2,285,907	47	Year 9
3	61,199	2,529,237	171,692	128,769	2,829,695	47	Year 10
4	71,013	3,336,530	250,260	150,156	3,736,944	54	Year 11
5	78,079	4,660,016	305,995	183,597	5,149,606	67	Year 12
6	95,072	4,580,978	288,455	173,073	5,042,504	55	Year 14
7	95,482	2,895,869	209,244	156,933	3,262,049	36	Year 15
8	92,182	2,102,945	155,400	116,550	2,374,893	28	Year 16
9	61,588	1,611,409	123,760	92,820	1,827,988	31	Year 17
10	93,728	1,077,586	123,928	92,946	1,294,461	16	Year 18

Strip	Strip Surface Area (m^2)	Mine Rock Volume (m^3)	Internal Layers Overburden Volume (m^3)	Cover System Overburden Volume (m^3)	Total Strip Volume[1] (m^3)	Nominal Thickness (m)	Year of Cover Placement
11	132,059	684,134	173,334	86,667	944,138	10	Year 18
12	100,087	562,842	127,240	95,430	785,515	10	Year 18
13	105,498	486,553	126,556	94,917	708,023	9	Year 18
14	104,842	461,895	126,664	94,998	683,556	9	Year 18
15	105,081	387,746	121,744	91,308	600,798	8	Year 19
16	95,046	343,940	98,832	98,832	541,604	8	Year 19
17	91,078	368,246	96,090	96,090	560,424	8	Year 19
18	87,435	506,810	108,252	81,189	696,251	10	Year 19
19	88,006	412,599	108,160	81,120	601,876	9	Year 19
20	102,696	899,529	155,640	93,384	1,148,551	14	Year 20
21	162,765	1,054,401	184,100	110,460	1,348,963	11	Year 21
22	120,549	336,966	106,156	79,617	522,740	7	Year 21
23	324,682	755,903	157,040	235,560	1,148,505	6	Year 22
Total	*2,359,838*	*33,156,878*	*3,557,258*	*2,613,453*	*39,327,584*	-	-

1 - Includes total NAG mine rock and overburden volumes.

3.5.2 Material Properties

The hydraulic properties or functions required for modelling of overburden and NAG mine rock material are as follows:

- Water retention curve (WRC – volumetric water content versus matric suction): a continuous function relating energy and the state of water, and hence describes the water content of a material as a function of the soil suction, or negative pore-water pressure. It is central to the design of an unsaturated soil system.

- Hydraulic conductivity function (k-function – hydraulic conductivity versus matric suction): a measure of the ability of a soil or rock material to transmit water and is a maximum for saturated soil or rock materials. The saturated hydraulic conductivity (k_{sat}) and unsaturated hydraulic conductivity function are key input parameters to numerical models analyzing hydraulic performance.

For the best results, WRC and k_{sat} should be measured in the laboratory and field for each material of interest. In this case, only particle size distribution (PSD) data was available for the overburden material and no information was available for the NAG mine rock. Two PSDs for the overburden material were used as representative samples for well-graded (sample# 35087) and poorly-graded (sample# 35094) till found in the SRK 2019 field investigations (Figure 2.2).

For the overburden material the WRC (Figure 3.6) and k-function (Figure 3.7) were estimated from the PSD (both well-graded and poorly-graded) using the Fredlund and Xing (1994) pedotransfer functions in SVSOILS™ Software (Plaxis, 2022). The k_{sat} was estimated using Kozeny (1962) with PSD data as the input.

As no lab or field information was available for the NAG mine rock, three proxy materials (mudstone, siltstone, and sandstone) were provided by Okane based on field testing completed at several mine sites. A well-graded mixed material based on core logs consisting of 35% mudstone, 60% siltstone, and 5% sandstone (D. Farmer, 2024, pers. comm.) was also estimated. The WRC and k-functions for the mine rock proxy materials are found in Figure 3.6 and Figure 3.7, respectively.

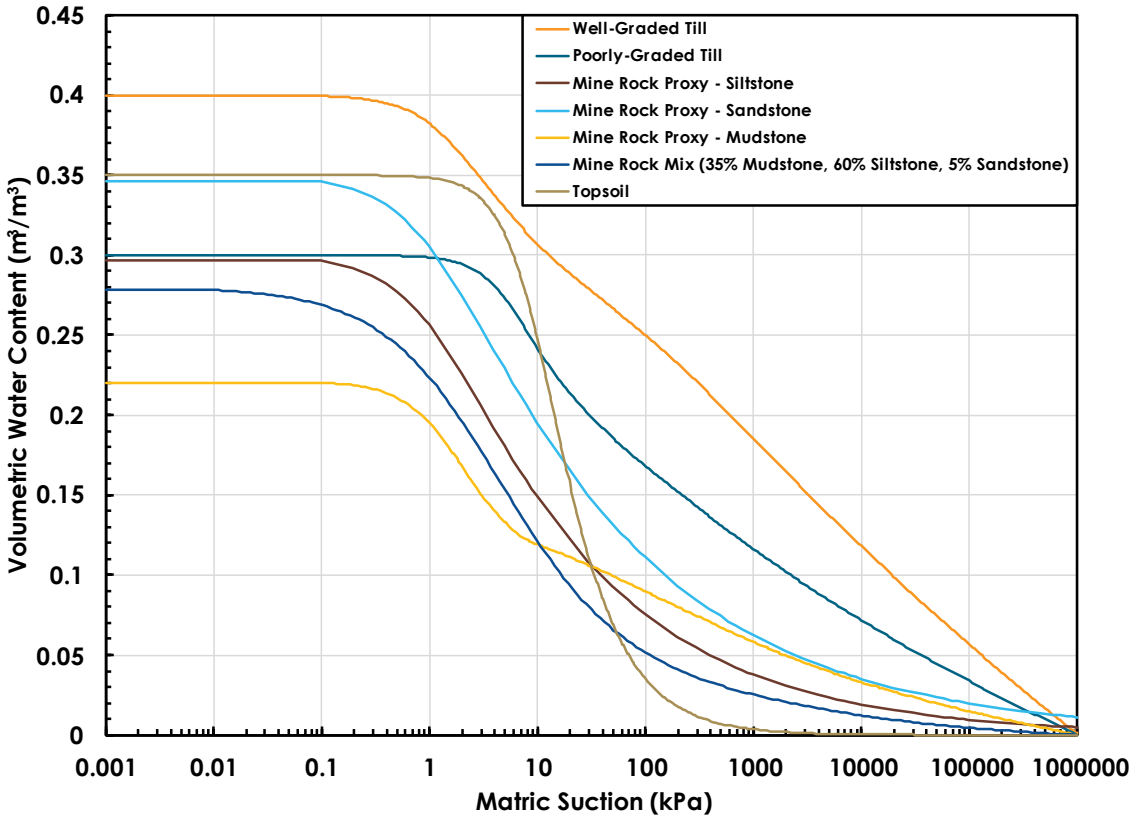

Figure 3.6: Estimated overburden (till) and proxy mine rock water retention curves.

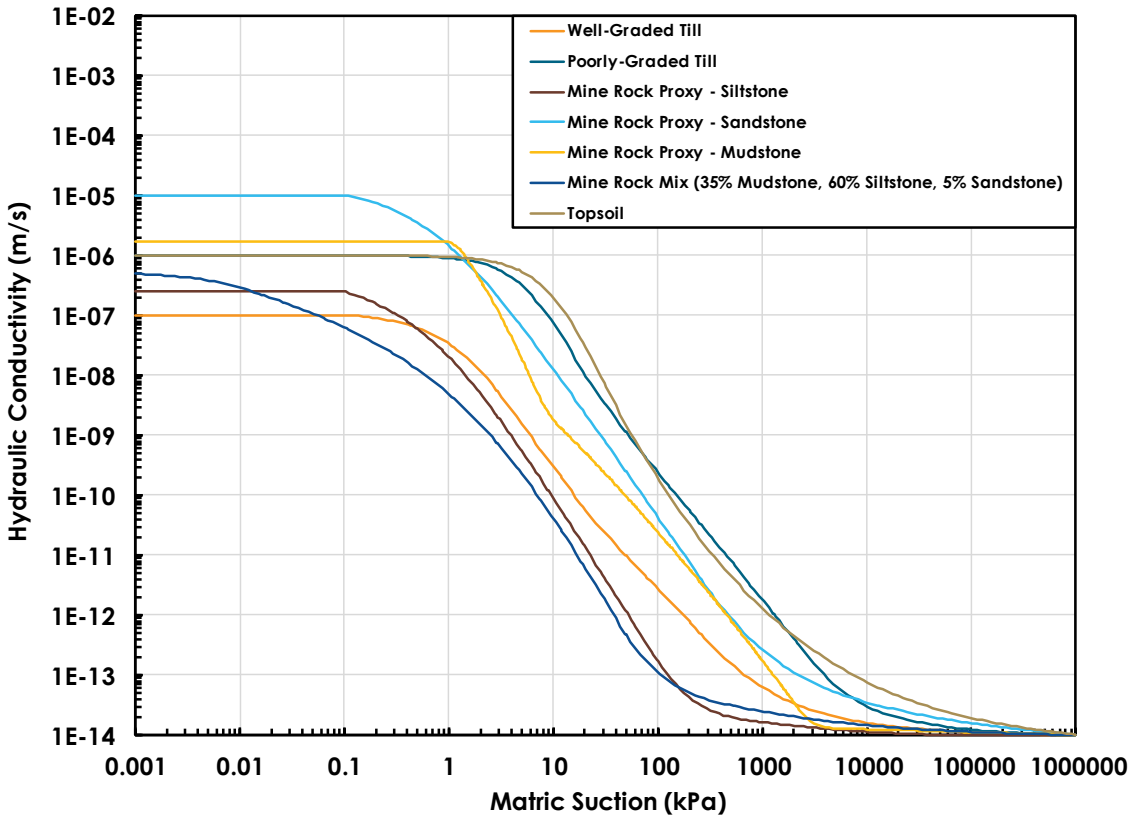

Figure 3.7: Estimated overburden (till) and proxy mine rock k-functions.

3.5.3 Climate Model Inputs

SRK (2022c) developed a project-specific synthetic historical climate database based on transposing regional datasets to the site and adjusting for orographic effects. The historical dataset spans 77 years from 1943 to 2020 and is summarized in Table 3.2.

SRK (2022c) also completed a climate change assessment for the project using the fifth version of the Coupled Model Intercomparison Project (CMIP5) and Representative Concentration Pathway (RCP) 4.5 of the Intergovernmental Panel on Climate Change (IPCC) fifth Assessment Report (AR5) (IPCC, 2014). Monthly rates of changes relative to baseline conditions (1981-2010) were calculated for temperature and precipitation based on the median values of an ensemble of 29 CMIP5 models. Projected climate change effects were evaluated for three consecutive 30-year forecast periods, defined as follows:

- Baseline period from 1981 to 2010 (CMIP5), centred on 1995;
- First forecast period from 2011 to 2040 (CMIP5), centred on 2025;
- Second forecast period from 2041 to 2070 (CMIP5), centred on 2055; and

- Third forecast period from 2071 to 2100 (CMIP5), centred on 2085.

Monthly changes relative to monthly baseline data for RCP4.5 are shown in Table 3.3 for temperature and Table 3.4 for precipitation. A long-term daily dataset (SRK, 2023a) was developed by applying the monthly changes to the average monthly values from the baseline period.

This climate change dataset was used directly as the upper boundary condition in the 1D SPA modelling through the Land-Climate Interaction (LCI) and Surface Energy Balance (SEB) boundary conditions to develop the surface water and energy balance, which was used as the upper boundary conditions in the 2D and 3D models.

Table 3.2 Monthly summary of historical climate database.

Month	Air Temperature (°C)		Precipitation[1] (mm)				Solar Radiation (W/m²)	Relative Humidity (%)	Lake Evaporation (mm)	Wind Speed (m/s)
	Maximum	Minimum	Mean	Rainfall	Snowfall	Total				
January	-5.8	-12.6	-9.2	6.1	53.9	60.0	38	83.6	0	2.0
February	-1.8	-10.4	-6.1	1.0	33.9	34.9	64	79.3	0	1.9
March	2.2	-7.5	-2.7	0.3	26.5	26.8	114	71.2	0	2.0
April	7.4	-3.1	2.1	12.5	19.6	32.2	173	63.3	60	2.2
May	12.9	0.8	6.8	41.5	8.3	49.8	220	61.3	97	2.1
June	16.5	4.7	10.7	68.7	1.2	69.9	224	65.7	108	1.9
July	19.0	6.9	13.0	57.3	0.0	57.3	224	68.8	116	1.7
August	18.6	6.4	12.5	55.2	0.1	55.3	201	72.1	99	1.5
September	13.7	3.1	8.4	63.9	3.5	67.4	134	79.5	50	1.5
October	6.5	-1.4	2.6	42.4	42.0	84.3	73	82.1	0	1.9
November	-0.8	-6.8	-3.8	5.4	67.3	72.7	40	85.9	0	1.9
December	-4.6	-11.2	-7.9	2.1	53.7	55.8	34	85.4	0	2.0
Annual	*7.0*	-2.6	*2.2*	*356.4*	*310.0*	*666.4*	*128*	*74.8*	*529*	*1.9*

(SRK, 2022c)

[1]Total precipitation was updated by SRK (SRK, 2023b) in November 2023 based on analysis against measured data at Tenas Deposit Station. Rainfall and snowfall were calculated by Okane assuming a threshold temperature of 0 °C.

Table 3.3 Monthly average temperature increase from the baseline period for RCP4.5 (in °C).

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
2011-2040	1.25	1.23	1.16	1.13	1.35	1.44	1.35	1.21	1.00	0.97	1.02	0.86	1.2
2041-2070	2.89	2.16	2.42	2.30	2.60	2.51	2.45	2.39	2.11	2.07	2.26	2.48	2.4
2071-2100	3.45	2.79	3.01	3.04	3.14	3.13	3.24	2.99	2.72	2.56	2.85	2.97	3.0

Table 3.4 Monthly average precipitation variation from the baseline period for RCP4.5 (in %) (from SRK, 2022c).

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
2011-2040	5%	7%	6%	0%	14%	2%	1%	-1%	5%	7%	4%	3%	+5%
2041-2070	12%	8%	14%	14%	34%	33%	-5%	0%	10%	12%	11%	12%	+12%
2071-2100	12%	11%	16%	9%	48%	23%	-23%	2%	14%	18%	16%	18%	+15%

3.5.4 Vegetation Model Inputs

Vegetation model inputs were based on the SBS bio-geoclimatic zone. Prior to reclamation, no vegetation was assumed. Once areas are reclaimed, vegetation was simulated to re-establish and grow.

To simulate the vegetation re-establishment the following assumptions were made:

- The year after cover system placement, grasses and shrubs are assumed to establish and grow.
- Grasses and shrubs are assumed to be the predominant vegetation for the first five years following cover system placement.
- Forest species are assumed to be the predominant vegetation after the grasses.

3.5.4.1 Rooting Depth and Distribution

The rooting depth and distribution was described by the work of Jackson *et al.* (1996) using the equation:

$$Y = 1 - \beta d \qquad (4)$$

where Y is the cumulative root fraction (a proportion between 0 and 1) from the soil surface to depth d (cm), and β is the fitted 'extinction coefficient', which Jackson *et al.* (1996) estimates as 0.943 for both grassland and boreal forest biomes. Hence, the same rooting depth and distribution (Figure 3.8) were used to represent both grasses and forest growth.

The maximum rooting depth is approximately 1.2 m, with 95% in the top 0.5 m of the cover system. This is like the root characteristics described in Klinka *et al.* (2000) for tree species in the region.

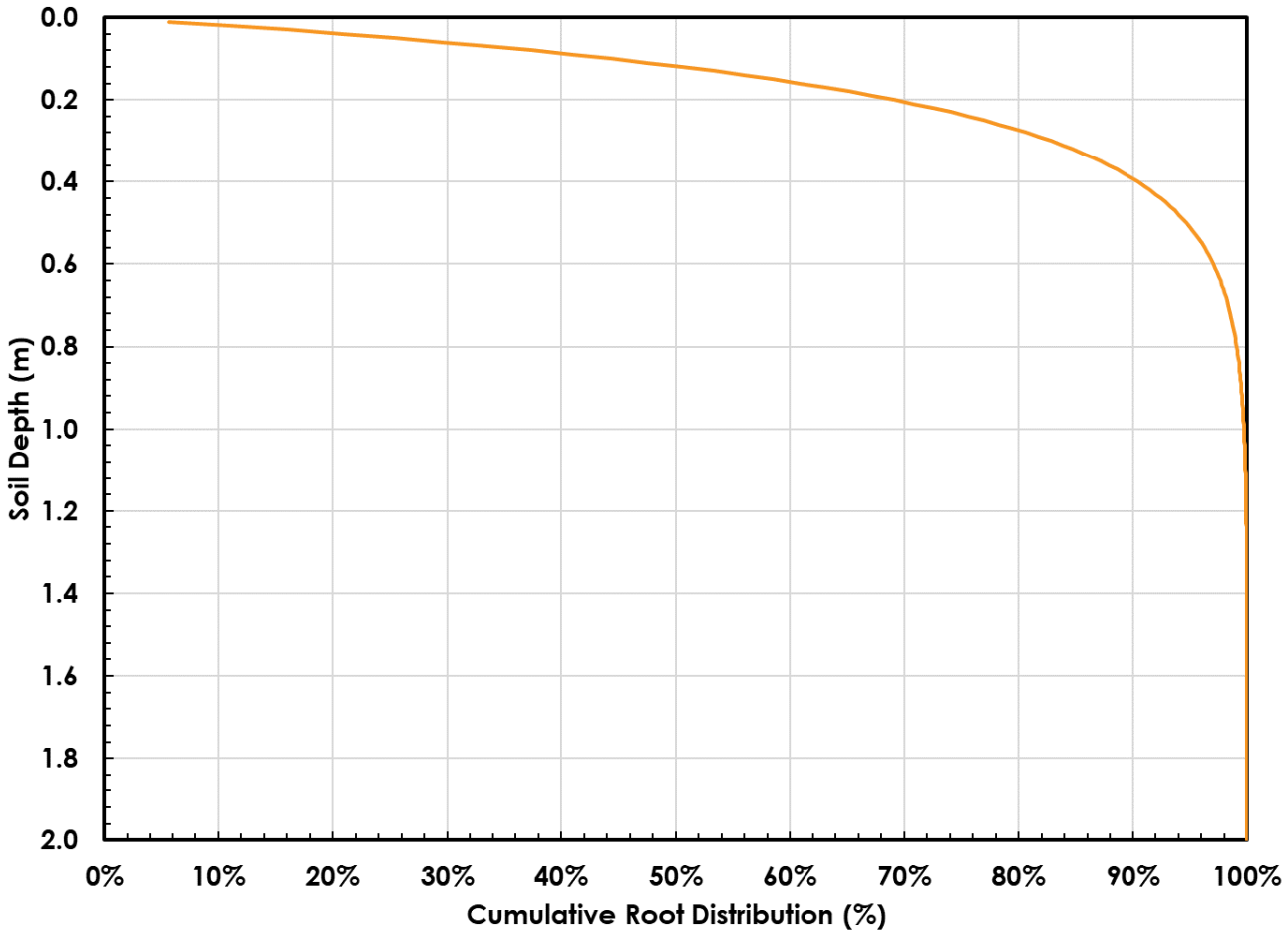

Figure 3.8: Estimated rooting depth and distribution for grasses and forest growth at Tenas Project.

3.5.4.2 Leaf Area Index and Percent Ground Cover

The Leaf Area Index (LAI) for grasses is estimated to be 1.7 with a percent ground cover of 70%. Once forest and understory species establish, LAI is estimated to increase to 2.3 with a percent ground cover of 85%. During the first seven years of vegetation, the LAI was increased annual by 0.3, starting at an LAI of 0.3, to gradually reach the mature forest vegetation LAI of 2.3.

3.5.4.3 Plant Water Limiting Function

Lack of available water and/or high evaporative demands will cause most plants to biologically react by closing stoma, reducing transpiration, and reducing metabolic reactions (Saxton, 1982). Under continued and increasing stress, the plant will reach its permanent wilting point (PWP), at which point transpiration is estimated to cease. The plant water limiting function (PWLF) defines the reduction in transpiration due to increased soil suction conditions. In general, the PWLF is defined to start to reduce at 10 kPa and stop transpiration entirely at a PWP of 1,500 kPa. This function was used to simulate grasses

growing on the cover system. Lopushinsky and Klock (1974) measured the PWLF for conifer species, which produced the PWLF (Figure 3.9). This PWLF was used to simulate forest growth.

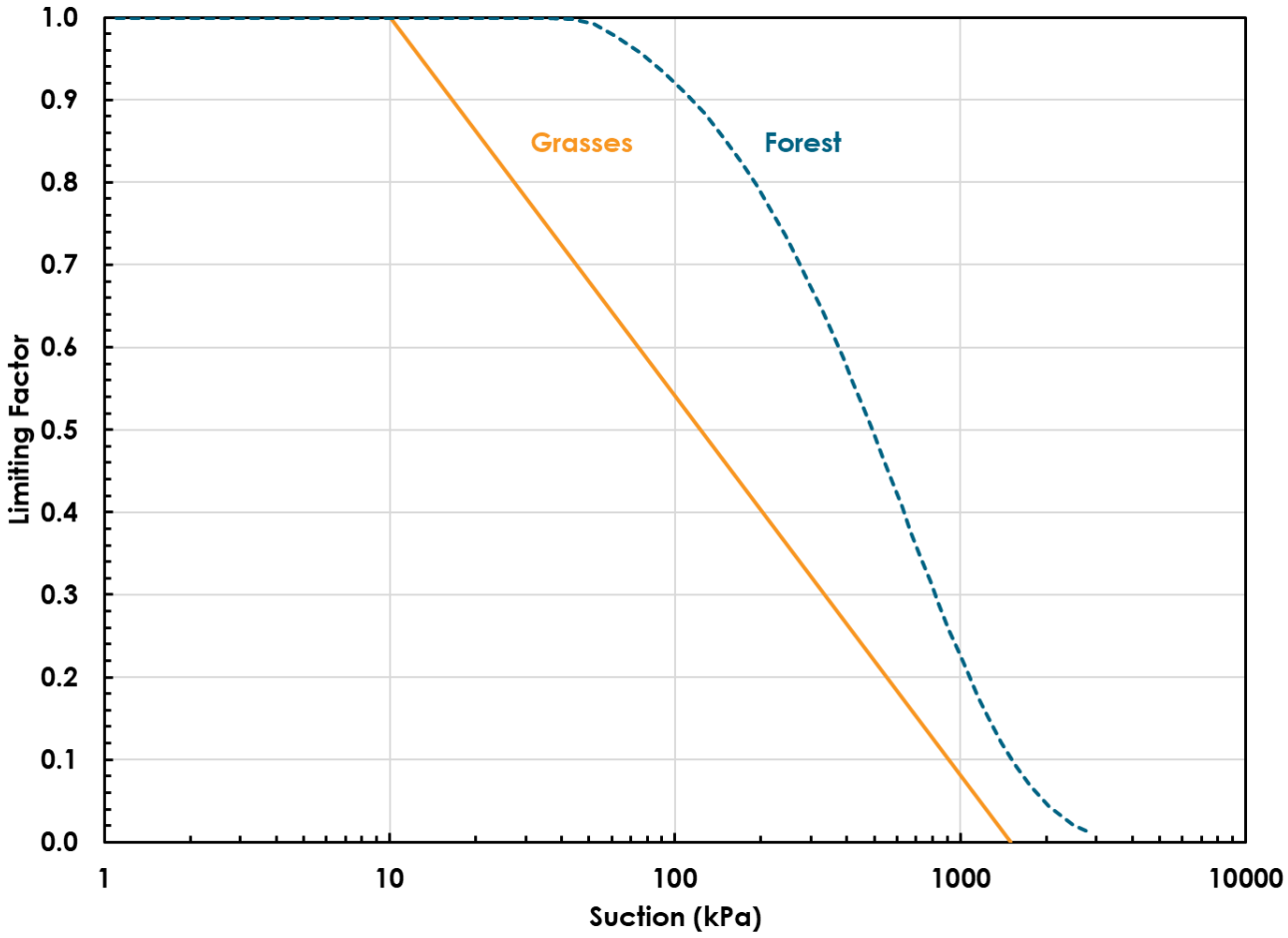

Figure 3.9: PWLFs estimated to simulate grasses and forest growth.

3.5.4.4 Growing Season

To define the growing season, the following assumptions were made:

- The growing season starts once the snowpack is completely melted and mean daily air temperature is above 5°C.
- The growing season ends once the minimum temperature after September 1 drops below 0°C.

3.5.5 Lower Boundary Conditions

The lower boundary condition was assumed to be a unit hydraulic gradient for the 1D simulations. This boundary condition assumes that the movement of water at the depth of the lower boundary is no longer influenced by atmospheric forces and is moving downwards only due to gravity.

3.5.5.1 Initial Conditions

The initial conditions for the 1D SPA model were obtained by running the models twice, using the final conditions of the first simulation as the initial conditions of the second simulation. This is done to remove the subjectivity of the ascribed initial conditions from the model results. The initial conditions of the 2D and 3D models were based on the results of the 1D SPA model.

3.5.6 Geochemical Model

Source terms for the NAG pit backfill were developed using a geochemical model based on the facility specific conceptual model. Source terms were modelled using both mechanistic reactive transport models and geochemical scale-up models. Source terms were developed for three scenarios; two cover system scenarios, a poorly graded till and sandstone mine rock scenario and a well graded till and blended mine rock (60% siltstone, 35% mudstone and 5% sandstone) with internal layers scenario and a third well graded till and blended mine rock (60% siltstone, 35% mudstone and 5% sandstone) without internal layers scenario. Source terms for the NAG pit backfill can be found in Appendix A.

3.5.6.1 Geochemical Model Methodology

Reactive transport models utilized the geochemical code PHREEQC to apply mineralogical kinetics that applicable to NAG mine rock from the Project. The purpose of the reactive transport model was to incorporate mineral kinetics, water flow, and oxygen availability to simulate the evolution of sulfide oxidation rates, metal leaching, and carbonate dissolution simultaneously over a long-term timeframe. Reaction kinetics were calibrated to NAG mine rock barrel tests that are ongoing at the Tenas site (SRK, 2022b). The geochemical scale-up model utilized NAG barrel tests from the Tenas project to calculate loading rates of parameters that are not strongly influenced by sulfide oxidation and carbonate dissolution. Source terms of these parameters were scaled up to conditions representative of the NAG backfill.

Parameters that were modelled via the reactive transport model included pH, alkalinity, SO_4, Al, Ag, As, Ca, Co, Cr, Cd, Cu, Fe, Hg, Mg, Mn, Na, Ni, Pb, Si, Sr, Sn, U, V, Zn, NO_3, NH_3, and NO_2. The mechanistic reactive transport model was developed in two phases:

- ***Phase 1*** – The reactive transport model was developed and calibrated using mineralogical data and barrel test leachate data for representative NAG mine rock.

- ***Phase 2*** – The calibrated reactive transport model for the barrel test was scaled to field conditions by adjusting for the differences in hydrology, temperature, and mass of the reactive particle size fraction (< 6.35 mm in the barrel tests) between the barrel tests and full-scale conditions.

Parameters not incorporated into the reactive transport model were estimated using a geochemical scale-up model. This model was developed by scaling up barrel test production rates by using facility- and site-specific adjustment factors to obtain representative weathering rates. Parameters incorporated in this model included Ba, B, Be, Li, K, P, Si, Sr, Ti, and Zr. Adjustment to full scale conditions was completed by applying scaling factors for reactive particle size, and water contact.

3.5.6.2 Model Development

Reactive transport models were developed for the B1 and B2 barrel tests combined and for the B7 barrel test. The B1 and B2 were combined as these barrels were constructed using the same NAG mine rock samples while the B7 barrel test used different NAG mine rock samples.

Mineralogical analyses for several samples used in the barrel tests reported a single mass for the dolomite-ankerite phase while other samples reported a unique mass for both dolomite and ankerite. Therefore, for modelling purposes it was assumed that if dolomite-ankerite was reported, 50% of this mass was dolomite and the other 50% was ankerite. The reactive mineralogy modelled in the NAG barrel tests is summarized in Table 3.5.

Table 3.5: Summary of reactive minerology in NAG mine rock barrel tests (from SRK, 2022b).

Mineral Name	Unit	B1 and B2	B7	Median NAG Mine Rock
Calcite	wt.%	2.3	0.5	1.4
Siderite	wt.%	7.3	7.8	2.0
Dolomite	wt.%	8.9	8.0	6.9
Ankerite	wt.%	7.9	3.4	0.4
Pyrite	wt.%	4.6	2.0	0.8

Metal leaching was assumed to be predominantly associated with pyrite oxidation. Therefore, metal(loid)s were added to the pyrite mineral phase in PHREEQC based on the molar ratio of respective metals to SO_4 in barrel test leachates (Table 3.6). Divalent cationic metals were assumed to substitute for Fe, while anionic metals were assumed to substitute for S in the pyrite structure. This enabled the release of metals commonly associated with pyrite to be closely coupled to the kinetics of pyrite dissolution in the model.

Table 3.6: Molar composition of pyrite phase used in the reactive transport model.

Parameter	Molar Composition
Fe	0.9999384
Ni	0.0000177
Co	0.0000051
Cu	0.0000044
Pb	0.0000014
Mn	0.000022
Zn	0.0000097
Se	0.000045
As	0.0000013
S	1.99995

Kinetic rate equations were added to the reactive transport model based on published rate law equations and reaction rate coefficients for both the oxidation of sulfide minerals and the dissolution of carbonate phases (Table 3.7). Due to limited kinetic and thermodynamic data associated with ankerite in literature it was assumed that ankerite had the same thermodynamic and kinetic properties as dolomite in the model.

The hydraulic regime of the reactive transport model of the barrel test followed leachate collection events when leachate volumes were measured. Material properties for the reactive particle size fraction (< 6.35 mm) from the water balance modelling were used and assumed a porosity of 0.35 and degree of saturation of 50%, corresponding to a volumetric water content of 0.175 m^3/m^3 in the barrels.

Table 3.7: Kinetic rate equations for minerals included in the reactive transport model.

Mineral	Rate Equation	Rate Constant, k (mol m^{-2} s^{-1})	Effective Rate Constant, k_{eff} (mol m^{-3} s^{-1})	Reference
Pyrite	$Pyrite\ Rate = k\ x \left(\frac{A}{V}\right)\ x\ [H^+]^{-0.11}\ x\ [O_2]^{0.5}\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	1.1×10^{-10}	-	Williamson and Rimstidt, 1994 Xu et al., 1998
Calcite	$Calcite\ Rate = (k_1\ x\ [H^+] + k_2\ x\ [H_2CO_3])\ x \left(\frac{A}{V}\right)\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	$k_1 = 10^{-0.05}$ $k_2 = 10^{-0.05}$	-	Chou et al., 1989
Dolomite	$Dolomite\ Rate = k\ x \left(\frac{A}{V}\right)\ x\ [H^+]^{0.5}\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	$10^{-2.59}$	-	Chou et al., 1989
Ankerite	$Ankerite\ Rate = k\ x \left(\frac{A}{V}\right)\ x\ [H^+]^{0.5}\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	$10^{-2.59}$	-	*
Siderite	$Siderite\ Rate = k_{eff}\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	-	$10^{-9.52}$	Dresel, 1989

*Ankerite kinetic characteristics were assumed to be similar to dolomite.

3.5.6.3 Calibration

The reactive transport model was calibrated by adjusting mineral-specific surface areas or effective rate coefficients (Table 3.8) such that modelled barrel test results were comparable to the median leachate concentration of the barrel tests. A separate model was calibrated for the B1 and B2 barrel tests together and another model was calibrated to the B7 barrel test.

Substantial cation exchange between Na, Ca, and Mg was observed in the barrel tests. Carbonate dissolution releases Ca^{2+} and Mg^{2+} that subsequently exchange for Na^{+} from surface sites of the host rock (likely associated with clay minerals). The resulting leachate from the barrel tests is enriched in Na concentrations. In order to calibrate the reaction rate for carbonate dissolution, Ca and Mg concentrations needed to be back calculated from the Na concentrations in the leachate. It was assumed that all Na was sourced from cation exchange with Ca and Mg. The ratio of Ca/Na exchanged compared to Mg/Na exchanged was calculated based on the ratio of ion exchange coefficients of Ca-Na and Mg-Na exchange pairs (Bruggenwert and Kamphorst, 1982).

Table 3.8: Calibrated values of kinetic rate equation parameters.

Mineral	Calibrated Surface Area/Volume (dm^{-1})		Calibrated Effective Rate Coefficient (mol m^{-3} s^{-1})	
	B1 and B2	B7	B1 and B2	B7
Pyrite	-	-	$10^{-8.585}$	$10^{-8.72}$
Calcite	0.01	0.009	-	-
Dolomite	0.02	0.007	-	-
Ankerite	0.01	0.007	-	-
Siderite	-	-	$10^{-9.523}$	$10^{-9.523}$

Following the calibration of the barrel test scale reactive transport model, there was good agreement between modelled parameter concentrations and measured leachate chemistry from the mine rock barrel tests (Figure 3.10). The average of the calibrated factors for the B1/B2 and B7 models were used in the full-scale reactive transport model.

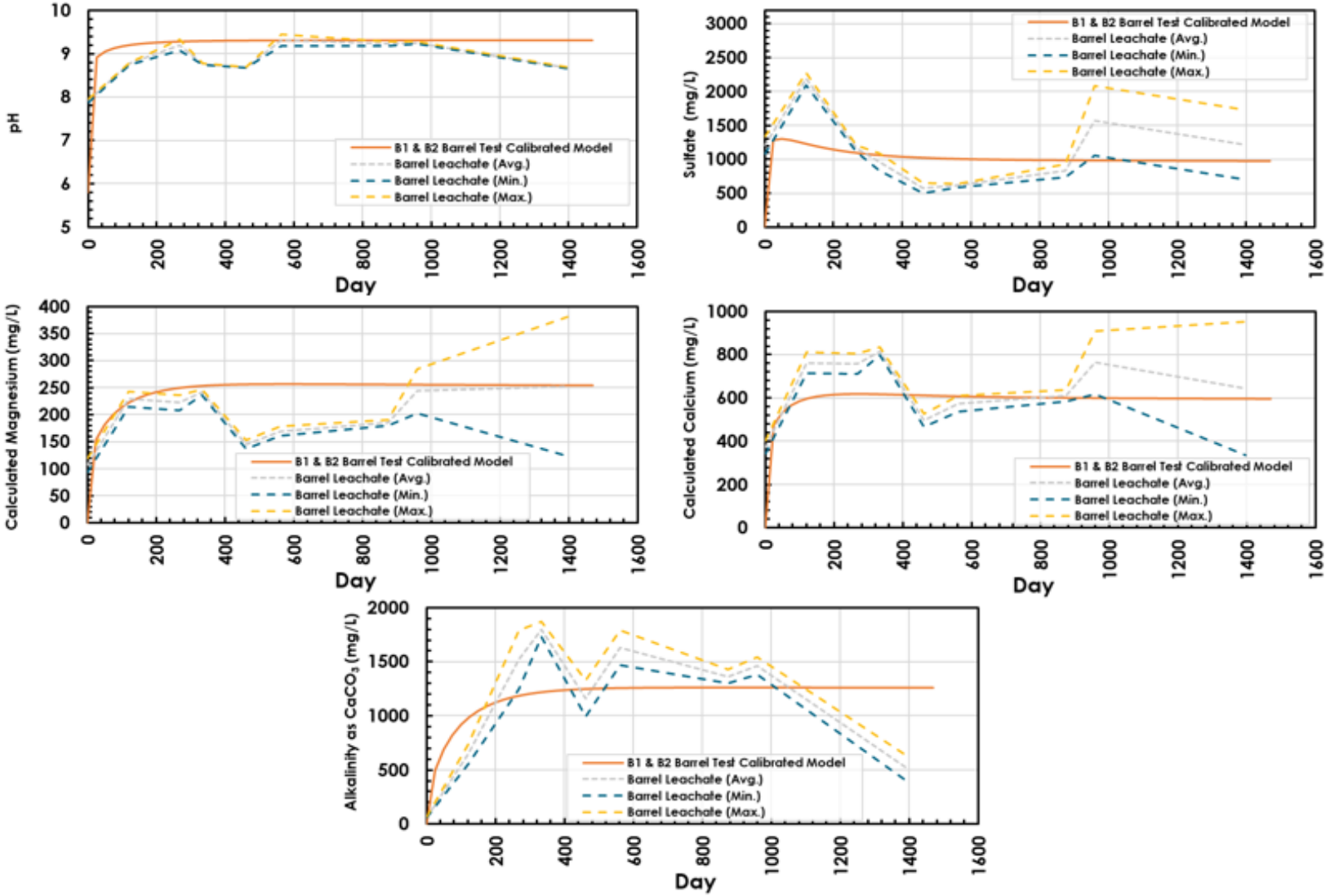

Figure 3.10: Parameter concentrations for the calibrated model versus minimum, maximum, and average B1 and B2 leachate concentrations.

3.5.6.4 Model Scale-Up

Once the geochemical model was calibrated to the field barrel tests, the reactive transport model was scaled up using the nominal height of respective strips (Table 3.1) within the NAG backfill with the final output being stockpile drainage chemistry. GeoStudio oxidation modelling provided stockpile temperature and thickness of both oxic reactive and suboxic non-reactive material. Hydraulic information such as the timing and amount of seepage for the full-scale model was provided by the GoldSim hydrological and seepage models for bare surface and covered conditions.

Temperature Adjustments

The effects of temperature on the literature values for the rate constant of each mineral modelled in the NAG backfill was adjusted using the Arrhenius equation (Equation 4; Gautelier et al., 1999). The temperature adjustment was performed on barrel tests that used an average annual air temperature of 4.9°C. The average internal NAG backfill temperature was estimated to be approximately 3°C based on the GeoStudio oxidation model, and this temperature was used to scale the reaction rates.

$$k_T = k_{25°C}\, x\, A^{\left(\frac{-Ea}{R\Delta T}\right)} \quad (5)$$

Where:

- k_T is the rate constant at temperature, T;
- $k_{25°C}$ is the rate constant at 25°C;
- A is the pre-exponential factor (2.718 s^{-1});
- E_a is the activation energy (kJ);
- R is the molar gas constant (8.314 J K^{-1} mol^{-1}); and
- ΔT is the temperature difference $\left(\frac{1}{T\ (K)} - \frac{1}{298.15\ K}\right)$

The activation energies used for the temperature correction of mineral reaction rates are summarized in Table 3.9. Only pyrite, calcite, and dolomite were adjusted for temperature, while reactivity of siderite was maintained under standard conditions due to a lack of information.

Table 3.9: Activation energies for minerals included in the reactive transport model.

Mineral	Activation Energy (kJ)	Reference
Pyrite	70	Lowson, 1982
Calcite	20.9	Sajwan and Evangelou, 1991
Dolomite	36.1	Herman and White, 1985
Siderite	-	-

3.5.6.5 Reactive Transport Model of the NAG Backfill

Infiltrating Water Chemistry

The chemical signature of the infiltrating water (or net percolation) was assumed to be equal to the water chemistry of a site-specific overburden barrel test because of the use of overburden in the cover system (Table 3.10). Initial NAG backfill porewater was assumed to be similar to the initial water chemistry sampled from the NAG barrel tests. An average from the B1/B2 and B7 tests was used in the full-scale model.

Table 3.10: Reactive transport model infiltrating water and initial NAG backfill porewater composition.

Parameter	Unit	Infiltrating Water Composition	Initial Porewater Composition
pH	-	8.2	7.9
Sulfate (Dissolved)	mg/L	118	1,205
Alkalinity (Total as $CaCO_3$)	mg/L	0.1	106
Chloride (Dissolved)	mg/L	0.25	3.83
Fluoride (Dissolved)	mg/L	0.13	-
Arsenic (Dissolved)	mg/L	0.00078	0.00012
Calcium (Dissolved)	mg/L	45.0	372
Cobalt (Dissolved)	mg/L	0.00016	0.0057
Copper (Dissolved)	mg/L	0.011	0.001
Iron (Dissolved)	mg/L	0.005	0.01
Lead (Dissolved)	mg/L	0.00014	0.0001
Magnesium (Dissolved)	mg/L	26.0	107
Manganese (Dissolved)	mg/L	0.00052	0.034
Nickel (Dissolved)	mg/L	0.00025	0.0074
Potassium (Dissolved)	mg/L	1.6	3.23
Selenium (Dissolved)	mg/L	0.00058	0.11
Sodium (Dissolved)	mg/L	19	512
Zinc (Dissolved)	mg/L	0.0005	0.0043

Parameter	Unit	Infiltrating Water Composition	Initial Porewater Composition
Nitrate (as N)	mg/L	0.44	56.8
Ammonia (Total)	mg/L	0.0088	7.18
Nitrite (as N)	mg/L	0.0039	1.31

Blasting residues from placed mine rock will leach inorganic nitrogen. Initial source terms of N species (NO_3, NO_2, and NH_4) were determined based on the powder factor (0.5 kg/m^3) and proportion of inorganic N produced based on emulsion and ammonium nitrate fuel oil (ANFO) composition (SRK, 2022a). To calculate the mass of residual N in the NAG backfill, the method by Ferguson and Leask (1988) was used and assumed the following:

- 0.9% of N from ANFO and 5.1% of N from the emulsion as available for leaching (Ferguson and Leask, 1988);
- ANFO is 75% ammonium-nitrate and emulsion comprise the remaining 25%; and
- Leachable inorganic N load from explosives will result in:
    - 87% as NO_3-N;
    - 11% as NH_4-N; and
    - 2% as NO_2-N.

Nitrogen species leaching was incorporated into the reactive transport model by using an assumed volumetric water content, the total volume of material placed, and the mass of residual N to calculate an N concentration leaching from the backfill. This methodology was used so that the hydraulic transport time simulated in the reactive transport model could also be applied to N leaching. Nitrogen species concentrations used in the model are shown in Table 3.10.

Mineralogy

The NAG backfill reactive transport models included both reactive primary minerals and secondary minerals. Reactive primary minerals were limited to pyrite, calcite, dolomite, ankerite, and siderite. Additional minerals (e.g., primary silicates) were identified in the geochemical characterization program (SRK, 2022b); however, these minerals were assumed to be kinetically insignificant during the modelled time scale due to the neutral pH of the NAG backfill.

Elevated concentrations of dissolved metals under neutral pH conditions can result in the precipitation of secondary minerals. Secondary mineral precipitation was incorporated into the final reactive transport and geochemical scale-up model results by completing equilibrium modelling on the source terms. Minerals applied in the equilibrium modelling step were generally consistent with those used in the

SRK (2022a) (Table 3.11). Surface adsorption reactions were not included in the model because it was assumed that adsorption was accounted for in the barrel test leachate chemistry, therefore, the pyrite stoichiometric composition used in the model.

Table 3.11: Model equilibrium phases.

Phase	Empirical Formula	Phase	Empirical Formula
Aluminum Hydroxysulfate	$Al_4(OH)_{10}SO_4$	Ferrihydrite	$Fe(OH)_3$
Amorphous Aluminum Hydroxide	$Al(OH)_3$	Goslarite	$ZnSO_4 \cdot 7H_2O$
Azurite	$Cu_3(CO_3)_2(OH)_2$	Gypsum	$CaSO_4 \cdot 2H_2O$
Barite	$BaSO_4$	Lead Molybdenum Oxide	$PbMoO_4$
Birnessite	$MnO_2 \cdot nH_2O$	Malachite	$Cu_2(CO_3)(OH)_2$
Brochantite	$Cu_4SO_4(OH)_6$	Manganite	MnO(OH)
Calcium Molybdenum Oxide	$CaMoO_4$	Melanterite	$FeSO_4 \cdot 7H_2O$
Calcite	$CaCO_3$	Nickel Hydroxide	$Ni(OH)_2$
Chalcanthite	$CuSO_4 \cdot 5H_2O$	Otavite	$CdCO_3$
Carbon Dioxide	$CO_{2(g)}$	Zinc Hydroxide	$Zn(OH)_2$
Copper Hydroxide	$Cu(OH)_2$		

Note: Phases in **BOLD** not included in SRK (2022a).

Flow Transport

Hydrology is an important component of the NAG reactive transport models. The NAG backfill hydrology used results from the GoldSim hydrological and seepage models (Section 3.3). The NAG backfill reactive transport models were split into 23 cells (Figure 3.3), each having different geometries and mine rock storage capacities (Table 3.1).

Material properties of the bulk mine rock in the NAG backfill were included in the full-scale geochemical model but were adjusted to account for only the reactive fraction of the mine rock (assumed to be the -6.35 mm fraction as used in the barrel tests). Flow of water was assumed to be primarily matrix-dominated. Flow calculations for the model assumed the following material properties for the finer fraction:

- Porosity – The porosity of the finer fraction of the NAG backfill was assumed to be 0.4;
- Degree of saturation – The degree of saturation of the finer fraction in NAG backfill at steady-state was 0.61 based on GoldSim modelling; and
- Proportion of reactive mine rock – The -6.35 mm size fraction typically controls the reactivity of mine rock. The NAG backfill was assumed to composed of 20% -6.35 mm particles based on existing material properties.

The adjusted reactive volumetric water content of the facility was calculated to be 0.049 based on these values and was used to determine cell-specific pore volumes in the reactive transport model.

The volume of water entering of the NAG backfill will change once the mine rock is covered. Additionally, this volume will be different based on the cover system scenario modelled. Three hydrological periods were defined in NAG backfill reactive transport models for each of the modelled scenarios, respectively:

1) ***Bare Surface*** – This period represented conditions prior to cover system placement on the cell. During this phase, mine rock is exposed to the atmosphere and infiltration rates are 273 mm/year for the poorly graded till and sandstone scenario (Scenario #1) and 143 mm/year for both the well graded till and mixed mine rock scenario (Scenario #2) and the no internal layers scenario (Scenario #3). The duration of the bare surface period is cell-specific and is dependent on the construction and reclamation schedule.

2) **Covered Grass NP** – This phase represented construction of the closure cover on a cell and occurred for a period of five years as re-vegetation occurs. Once the cover system is placed, both oxygen ingress and NP decrease. Once covered, NP decreases to 197 mm/year in the poorly graded till and sandstone scenario (Scenario #1). Due to differences in runoff between the bare surface and the grass covered surface in the well graded till and mixed mine rock scenarios (Scenarios #2 and #3) NP increased to 148 mm/year.

3) **Covered Forest NP** – This phase represents maturing of vegetation on the constructed cover system and occurred for the remaining model time following the covered grass NP period. As vegetation matures and shifts to forest dominated NP decreases. Covered forest NP was 124 mm/year for the poorly graded till and sandstone scenario (Scenario #1) and 72 mm/year for the well graded till and mixed mine rock scenarios (Scenarios #2 and #3).

Effects of Suboxic Zones

Potential establishment of suboxia within the NAG backfill is a function of limiting re-supply of oxygen from the atmosphere, either laterally across angle of repose slopes of the backfilled mine rock, or vertically across the horizontal surface of the backfilled mine rock. Limiting airflow capacity across the horizontal surfaces can also limit lateral advective gas transport, in the absence of a limitation of the presence of a limitation on airflow capacity on the sloping backfilled surface, depending on the lift height of the backfilled mine rock. Initially, oxygen concentration in the pore-space of the backfilled NAG material will be atmospheric (nominally 20.9% by volume). Sulfide material within the NAG material will consume this oxygen; however, if re-supply of oxygen is limited as discussed previously, then the availability of further sulfide oxidation will be limited, thus creating suboxic conditions within each encapsulated cell. As oxygen decreases, and the geochemical conditions shift from oxic to suboxic, additional biological reactions that are favourable in the absence of oxygen may occur; however, to provide a conservative prediction of the effect of suboxic conditions, these biological reactions were

not included in any modelling. This is a substantively conservative approach given that in suboxic conditions, and provided there is opportunity and hydraulic residence time for denitrification, it is reasonable to postulate that bio-reduction of selenium will also occur (see MEND, 2015). Once suboxic conditions are established, the reactive transport model assumes that pyrite oxidation only occurs in the oxic zone nearer to the surface, while carbonate minerals can still react throughout the entire depth of the cell as their reactivity is not dependent on oxygen availability in the NAG backfill.

Given the geometry of the NAG backfill, and the different cell volumes and placement timing, zones of suboxia will vary based on the location of the cell in the NAG backfill. Cell-specific reactive and suboxic zone thicknesses for all cells were determined from the GeoStudio Oxygen Ingress Model results (Section 4.2). The development of suboxic conditions occurred at depths of roughly 13 m below the cover system in the poorly graded till and sandstone scenario and occurred within the 3.3 m cover system in both the well graded till and mixed mine rock scenarios. In order to remain conservative and capture sulfide oxidation and subsequent reactions occurring in the mine rock mix cover system, a depth to suboxic conditions of 3 m was used in the well graded cover system scenarios. Cell-specific reactive and suboxic zone thicknesses are summarized below in Table 3.12.

Table 3.12: Cell-specific reactive and suboxic zone thicknesses.

Cell	Total Cell Height (m)*	Reactive Zone Thickness (m)		Suboxic Zone Thickness (m)	
		Poorly Graded	Well Graded	Poorly Graded Scenario	Well Graded Scenarios
1	28	13	3	15	25
2	44	13	3	31	41
3	44	13	3	31	41
4	51	13	3	38	48
5	64	13	3	51	61
6	51	13	3	38	48
7	33	13	3	20	30
8	24	13	3	11	21
9	28	13	3	15	25
10	13	13	3	-	10
11	6	6	3	-	3
12	7	7	3	-	4
13	6	6	3	-	3
14	6	6	3	-	3
15	5	5	3	-	2
16	5	5	3	-	2
17	5	5	3	-	2

Cell	Total Cell Height (m)*	Reactive Zone Thickness (m)		Suboxic Zone Thickness (m)	
		Poorly Graded	Well Graded	Poorly Graded Scenario	Well Graded Scenarios
18	7	7	3	-	4
19	6	6	3	-	3
20	10	10	3	-	7
21	8	8	3	-	5
22	4	4	3	-	1
23	3	3	3	-	-

*Not including cover system

Construction Schedule

The construction schedules of the NAG backfill will influence timing of seepage quality. Placement of the cover system will limit oxygen ingress and NP into the NAG backfill as well as the maturing of the cover system vegetation. The construction schedule of both the backfill and cover system was simplified to allow for implementation into the reactive transport model. These simplifications and assumptions were:

- All cells are built instantaneously, and the complete height of the cell was available for reaction once it was placed in the model.
- Cover system placement for the backfill is indicated by the construction schedule provided by Telkwa and detailed in Section 3.5.1.
- Once covered, there will be an instantaneous decrease in NP.
- Once forest vegetation is developed (assumed to be five years after cover construction) there will be an instantaneous decrease in NP.
- Once covered, there will be an approximately 15-year period for suboxic conditions to develop. It was assumed there will be an instantaneous shift to suboxic conditions 15 years after cover construction.

Additional NAG Backfill Reactive Transport Model Assumptions

- Mineralogy was homogeneous throughout the NAG backfill and is defined based on the NAG mine rock barrel tests compositions;
- Mine rock placement in the NAG backfill will include mine rock characterized as the average composition from the mine rock barrel tests;

- Cell-specific annual loads (mg/year) were calculated based on the reactive transport concentration outputs and total annual flow volumes for each cell respectively;
- The timing of seepage from each cell of the reactive transport model was based on wetting-up timing from the GoldSim model. A cell was assumed to be wetted-up when total annual seepage from the GoldSim model was greater or equal to 50% of the steady state total annual seepage for that cell. Prior to a cell being wetted-up, parameter concentrations were set to equal the concentration from Year 0 of the reactive transport model. Seepage rates are negligible during the time the cell is wetting up, and therefore load from the cell is also negligible;
- After an initial wetting-up phase, final concentrations for the NAG backfill were calculated using the total annual loads (mg/year) from each cell divided by the total annual seepage rate (L/year);
- Seasonality was not included in the model. A constant NP based on bare surface, covered grass surface, or covered forest surface was assumed for all cells;
- Cell-specific seepage volumes and concentrations were mixed at the base of the NAG backfill based on the modelled seepage rates from the GoldSim model;
- The performance of the cover system remains constant;
- Parameter concentrations below detection limit were assigned values of the detection limit used in the barrel test leachate chemistry reporting;
- During the bare surface period, seepage and porewater is in equilibrium with the atmosphere ($\log(pO_2) = -0.7$ and $\log(pCO_2) = -3.5$); and
- During the cover period, pore water residing in the suboxic zone is in equilibrium with O_2 concentrations of 0.1% ($\log(pO_2) = -3.0$).

3.5.6.6 Geochemical Scale-Up Model

Parameters that were not included in the reactive transport model were modelled using a geochemical scale-up model. The geochemical scale-up model functioned by:

- Developing average loading rates for parameters not included in the reactive transport models using the leachate data from the B1, B2 and B7 barrel tests; and
- Scaling-up the production rates based on material placement, hydraulic properties, and material properties.

Soluble salts can accumulate before kinetic experiments are initiated and result in rapid flushing of constituents. Potentially due to the age of the weathering experiments or variations in collected water volumes it was not entirely apparent if the B2 and B7 barrel tests had fully flushed stored soluble salts; however, loading rates from the last three samples collected were used.

Similar to the reactive transport model, loading rates derived using the barrel leachate data were scaled up based on differences between the barrel test scale and the full backfill scale. The scale up included two scaling factors: particle size and mine rock contact. Temperature scaling factors were not applied as it was assumed that the average temperature in the barrels will be comparable to the full-scale NAG backfill.

Particle Size Factor

The reactive particle sizes of the NAG backfill were assumed to be limited to the < 6.35 mm portion and assumed to be 20% of the bulk mine rock; therefore, the scaling factor for particle size was set to 0.2. This particle size scaling factor was previously used by SRK (2022a) to scale HCT loading rates to field scale.

Contact Factor

The reactivity of the mine rock will be limited to the < 6.35 mm portion; however, only a portion of the seepage will react with this portion given the likely presence of preferential flow paths. A contact factor of 0.5 was used in previous source term development (SRK, 2022a) and was deemed reasonable for the current model.

Geochemical Scale-Up Model Assumptions

The following assumptions were included in the geochemical scale-up model:

- Cell-specific annual loads (mg/year) were calculated based on the annual mass of mine rock for the cell in the given year and the loading rate of the parameter (mg/kg/year). After an initial wetting-up phase, final concentrations for the NAG backfill were calculated using the total annual loads (mg/year) for all cells divided by the total annual seepage rate (L/year);

- The wetting up period for the backfill was estimated as the period of time prior to total annual seepage volumes equalling roughly 50% of steady state annual seepage volumes (roughly 17 years). Seepage concentrations prior to wetting up were set to concentrations calculated for the first year after wetting up;

- Once a cell was fully constructed and wetted-up, the annual loads were assumed to remain constant and estimated parameter concentrations were only influenced by changes in annual seepage rates;

- The seepage of all cells mixed at the base of the NAG backfill;

- Loading rates remained constant and were not affected by changes in mineralogy or kinetic rates over time; and

- Solubility controls were applied by including the geochemical scale-up modelled parameters in the equilibrium modelling discussed in Section 3.5.6.5.

3.5.7 Nitrogen Sensitivity Scenarios

Two additional model sensitivity scenarios were simulated to assess nitrogen source terms under different blasting loss conditions. A high nitrogen source term scenario was run to simulate a scenario where nitrogen losses from blasting are greater than expected. A low nitrogen source term scenario was run to simulate decreased nitrogen losses from blasting resulting from blast hole liners used as a source mitigation.

Nitrogen source term scenarios were modelled by either increasing or decreasing the residual nitrogen available for leaching as calculated by Ferguson & Leask (1988). This in turn increased or decreased the initial pore-water concentration of nitrogen species applied in PHREEQC for the respective nitrogen scenarios (Table 3.13). All other reactive transport model inputs remained the same as in the Well-Graded with No Internal Layers models. The high nitrogen source term scenario represents an increase of 56.25% residual nitrogen. Blasthole liners are assumed to decrease nitrogen losses by 37.5% in the low nitrogen source term scenario (D. Farmer, personal communication, July 15, 2024).

Table 3.13: Initial nitrogen species concentrations in NAG backfill porewater for nitrogen source term scenarios.

Parameter	Unit	Initial Porewater Composition		
		Well-Graded No Internal Layers Scenario	High Nitrogen Scenario	Low Nitrogen Scenario
Nitrate (as N)	mg/L	65	102	41
Ammonia (Total)	mg/L	8.3	13	5.2
Nitrite (as N)	mg/L	1.5	2.4	0.94

4 MODELLING RESULTS AND DISCUSSION

4.1 Water Balance Results

A landform water balance was completed to develop simplified boundary conditions for the 2D GeoStudio oxidation modelling and the 3D GoldSim modelling. A summary of the 1D water balance for the two material combination scenarios is provided in Table 4.1. The well-graded till and mine rock mix material properties and results were also used for the no internal layers scenario.

Table 4.1: Summary of water balance results for the two material combination scenarios.

Scenario	Total Precipitation (mm)	Rainfall (% of PPT)	Snow (% of PPT)	Actual Evapotranspiration (% of PPT)	Runoff (% of PPT)	Sublimation (% of PPT)	Net Percolation (% of PPT)
PG Till and Sandstone (Bare)	649	61%	39%	32%	2%	24%	42%
PG Till and Sandstone (Grass – 5 years)	616	52%	48%	49%	0%	19%	32%
PG Till and Sandstone (Forest – 73 years)	655	61%	39%	57%	3%	21%	19%
WG Till and Mine Rock Mix (Bare)	649	61%	39%	42%	12%	24%	22%
WG Till and Mine Rock Mix (Grass – 5 years)	616	52%	48%	54%	3%	19%	24%
WG Till and Mine Rock Mix (Forest – 73 years)	655	61%	39%	59%	9%	21%	11%
Mine Rock Mix (Bare)	649	61%	39%	28%	28%	21%	22%*

PG Till – Poorly Graded Till; WG Till – Well Graded Till; PPT – Precipitation

* - Surface net infiltration into the bare Mine Rock Mix

An average year of daily net percolation rates for each time period (bare, grass, and forest) were used as inputs in the 2D GeoStudio models and stochastically in the 3D GoldSim model.

4.2 2D GeoStudio Oxidation Model Results

The predicted development of the suboxic zone within the NAG backfill mine rock within the Open Pit with time for the poorly graded till and sandstone mine rock scenario is shown in Figure 4.1. The suboxic zone development for the well graded till and mine rock mix scenario is shown in Figure 4.2, while the suboxic zone development for the scenario with no internal overburden layers is shown in Figure 4.3. The models indicate that the long-term depths to suboxia are, on average, 13 m for the poorly graded till with sandstone mine rock scenario and 3.3 m for the well graded till with the mine rock mix scenario, as well as the no internal overburden layers scenario. The suboxic zone takes approximately 15 years to form in each strip in the poorly graded till with sandstone mine rock scenario. In both the well graded till with the mine rock mix scenario and the no internal layers scenario (using well graded till and mine rock mx material properties), it took approximately 13 years for the suboxic zone to form in each strip. These results were used to estimate the development of the suboxic zone within the 3D GoldSim model.

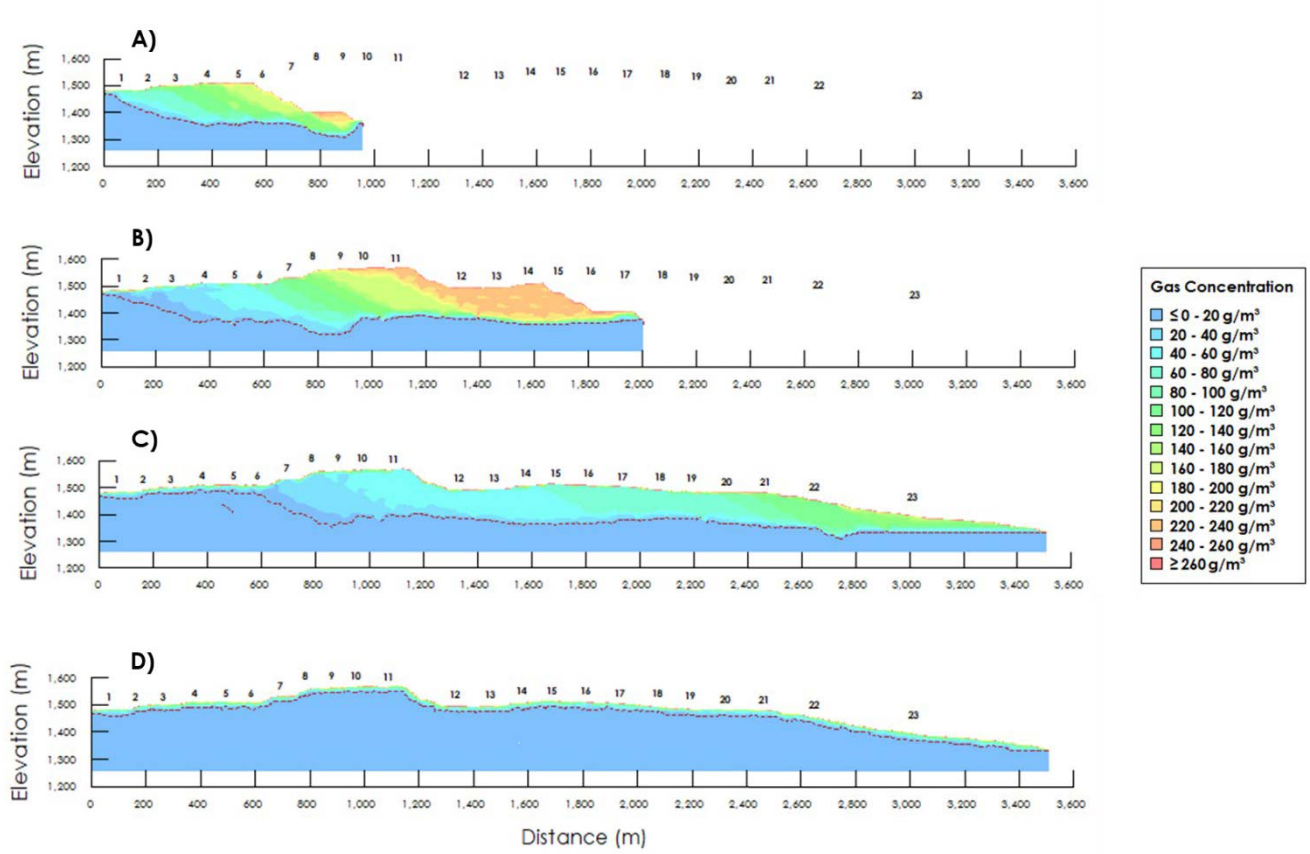

Figure 4.1: Development of suboxic zone for the poorly graded till and sandstone mine rock scenario (outlined by red dashed line in figures, which represents the zone at, or below, an O_2 concentration of 13 g/m³ or 1 vol.%) for the poorly graded till and sandstone mine rock scenario at A) Year 12; B) Year 17; C) Year 23; and d) Year 36/Long Term.

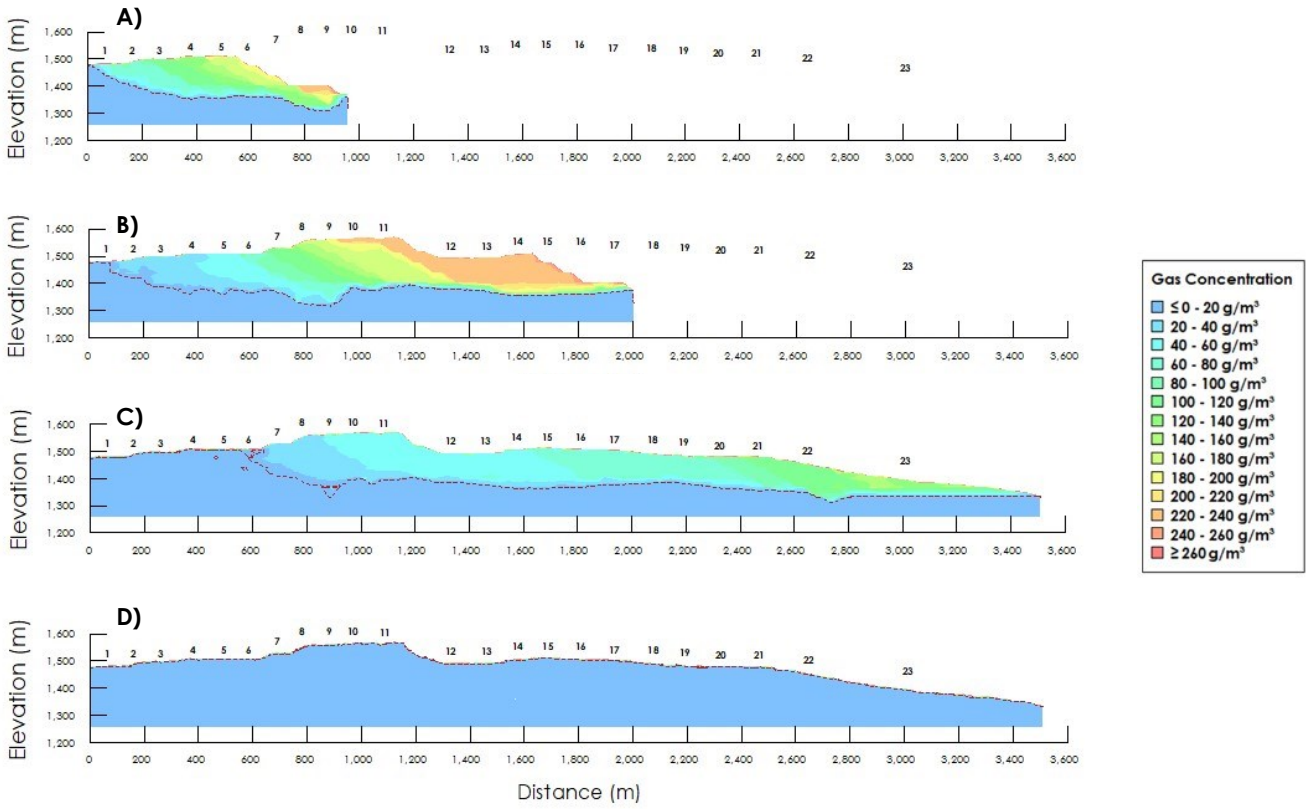

Figure 4.2: Development of suboxic zone (outlined by red dashed line in figures, which represents the zone at, or below, an O_2 concentration of 13 g/m³ or 1 vol.%) for the well graded till and mine rock mix scenario at A) Year 12; B) Year 17; C) Year 23; and d) Year 36/Long Term.

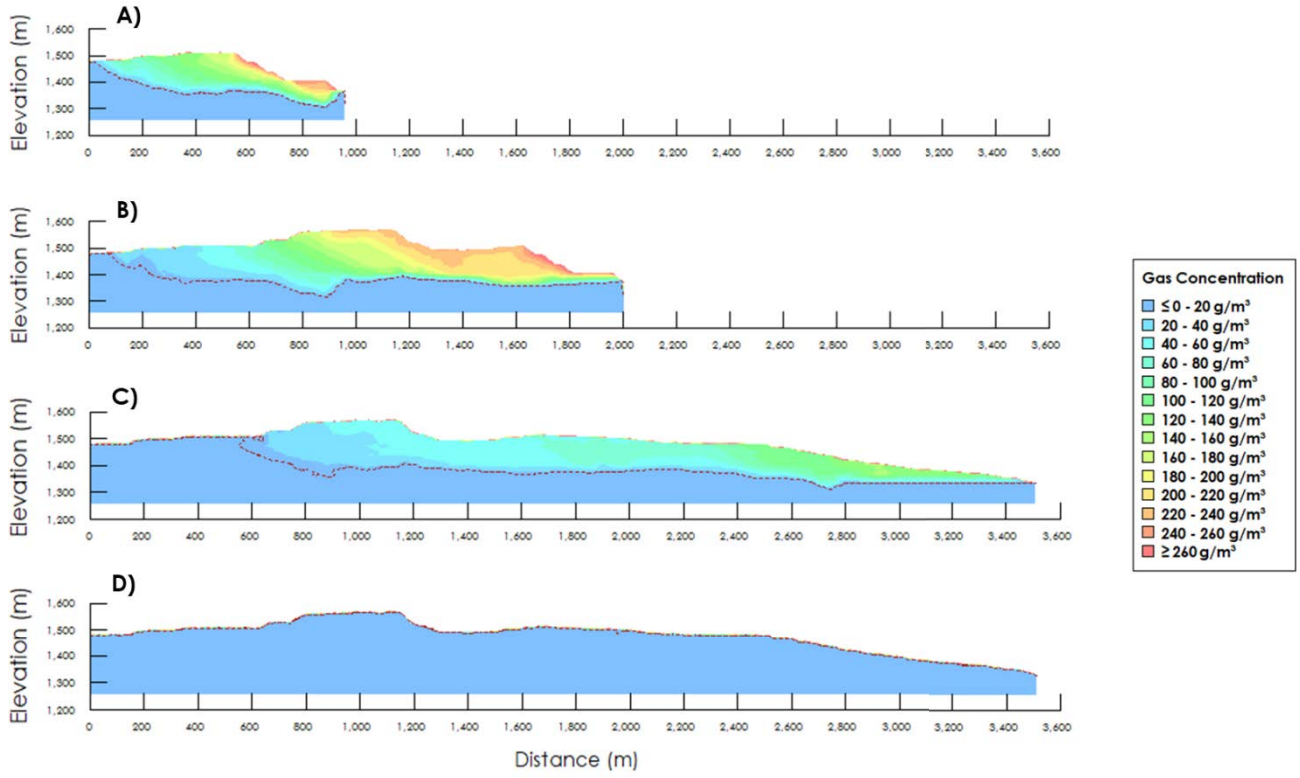

Figure 4.3: Development of suboxic zone (outlined by red dashed line in figures, which represents the zone at, or below, an O_2 concentration of 13 g/m³ or 1 vol.%) for the no internal layers scenario at A) Year 12; B) Year 17; C) Year 23; and d) Year 36/Long Term.

4.3 3D GoldSim Model Results

The 3D GoldSim model was run on calendar time with 2023 representing the first year of placement, or Year 6. The results are therefore presented in calendar time out to 2150, which represents Year 133.

4.3.1 Total Seepage

The total seepage rate of the backfilled NAG mine rock in the Open Pit was simulated in GoldSim for 100 realizations. The mean value, along with the 5th and 95th percentiles of the model results, are plotted in Figure 4.4 for all modelled scenarios. The models predicted long-term stabilized seepage rates from the covered and vegetated backfilled NAG mine rock that were between 31,000 m³/month and 36,000 m³/month for the poorly graded till and sandstone mine rock scenario, and between 14,500 m³/month and 16,000 m³/month for both the well graded till with mine rock mix scenario and the no internal layers scenario. The poorly graded till and sandstone mine rock scenario showed greater variability in monthly seepage rates due to the coarser texture of the material. Prior to cover system placement, the well graded till with mine rock mix scenario differs from the no internal layers scenario

due to the lack of overburden layers, but once the cover system is placed, the two scenarios show almost identical results.

The model results indicate that the backfilled NAG mine rock in the Open Pit will be wetted up, as indicated by the stabilization of the seepage rates, approximately 40 years following completion of construction for the poorly graded till and sandstone mine rock scenario. The finer texture of the material in both the well graded till with mine rock mix scenario and the no internal layers scenario resulted in a longer wetting up period, reaching stabilization approximately 80 years following the completion of construction.

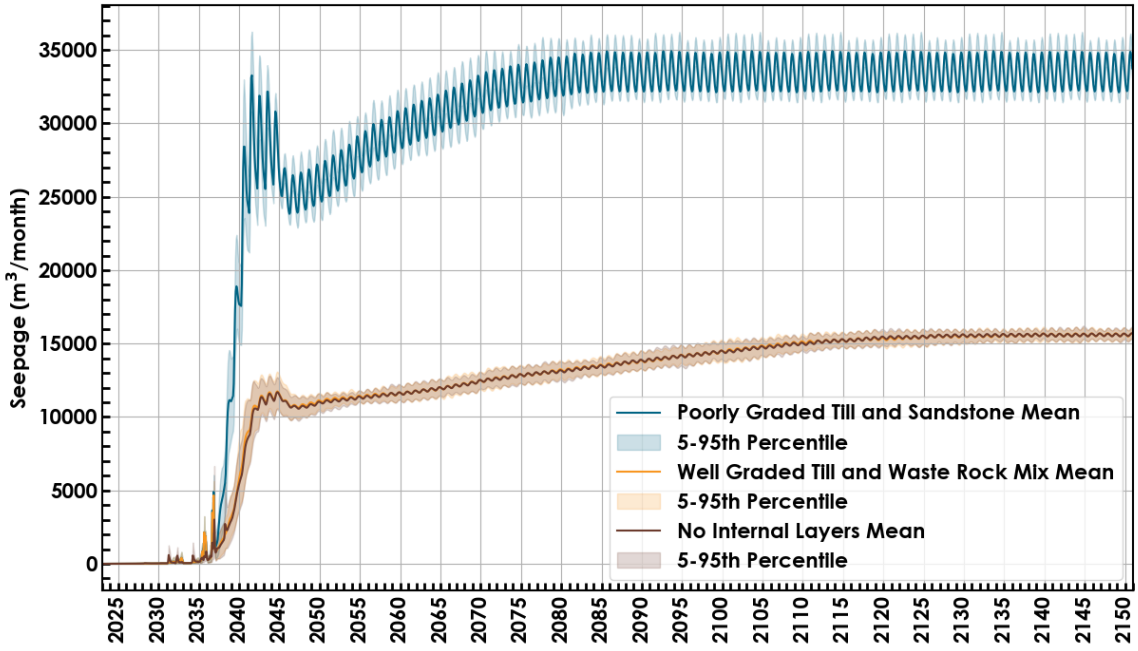

Figure 4.4: Range of seepage rates simulated by the GoldSim model for the backfilled NAG mine rock in the Open Pit for all the scenarios.

4.3.2 Total Storage

The estimated total stored water volume within the backfilled NAG mine rock for the modelled scenarios are shown in Figure 4.5. The modelled water volume increases with mine rock placement during construction before starting to stabilize once construction is complete and the cover system is placed. Similar to the seepage results, the water volume within the backfilled NAG mine rock is estimated to stabilize after approximately 40 years for the poorly graded till and sandstone mine rock scenario and approximately 70-80 years for both the well graded till with mine rock mix scenario and the no internal layers scenario. Once the stored water volume stabilized, very small variations in water volume were predicted, due to the variation in seasonal NP inputs.

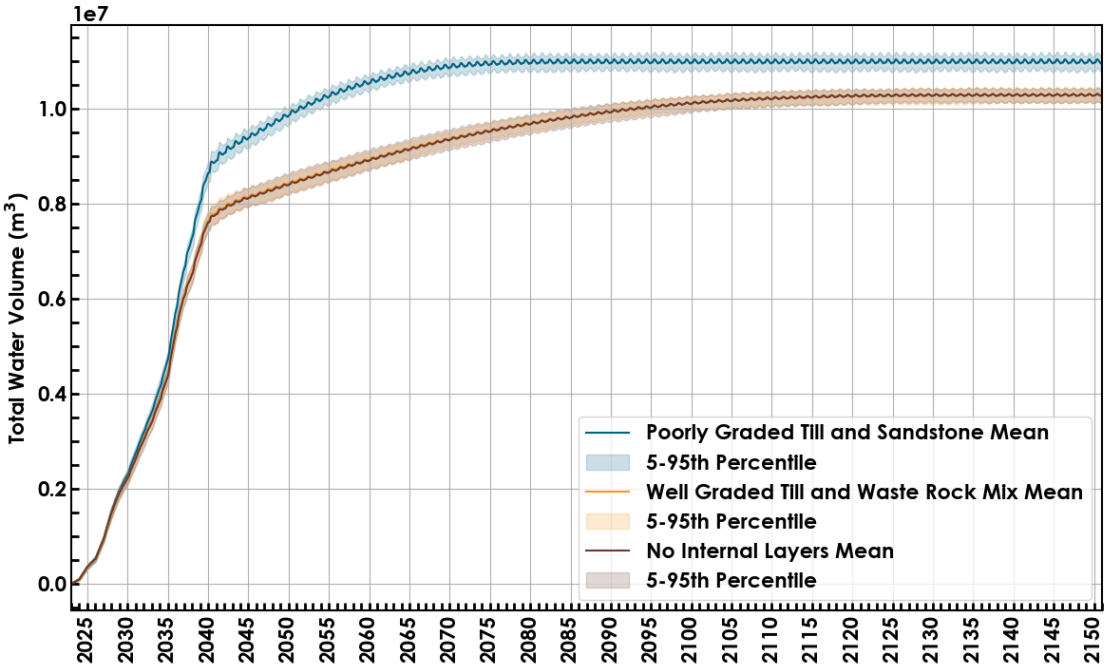

Figure 4.5: Range of total water volume within the backfilled NAG mine rock in the Open Pit simulated by the GoldSim model.

4.3.3 Oxygen Ingress

The range of oxygen ingress from the 3D GoldSim model for all modelled scenarios is presented in Figure 4.6. The well graded till with mine rock mix scenario and the no internal layers scenario both showed a higher long term average oxygen ingress despite having a shallower depth to suboxia. Due to the limitations of the GoldSim model representing each strip as a 1D column, convection is limited to density driven convection (free convection) and oxygen ingress is dominated by diffusion. In this case, with a shallower depth to suboxia, the concentration gradient across the cover system is greater, resulting in a higher diffusive oxygen ingress rate. In the poorly graded till and sandstone mine rock scenario, the depth to suboxia is greater, reducing the concentration gradient across the cover system and lowering the overall diffusive flux. When forced convection (advection) is accounted for, it is likely that the oxygen ingress rate for the poorly graded till and sandstone mine rock scenario would show higher oxygen ingress rates.

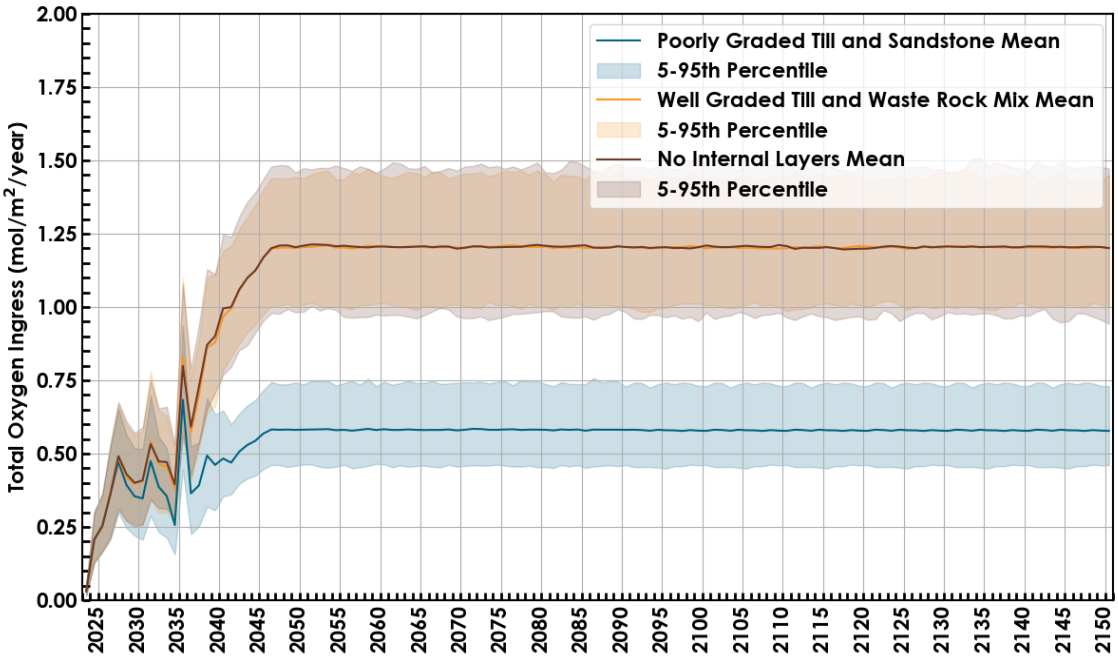

Figure 4.6: Range of oxygen ingress rates simulated by GoldSim for the backfilled NAG mine rock in the Open Pit for all modelled scenarios.

4.4 Geochemical Modelling Results

This section summarizes the results of the geochemical models of the NAG backfill cover scenarios and present a time-series of source terms for the NAG backfill during the bare surface, covered grass surface, and covered forest surface timeframes. Model results of select parameters are presented in Figure 4.7 to Figure 4.11. Tables of source terms and annual loads from the three scenarios of the NAG backfill are provided in Appendix A.

In the three modelled scenarios, the cover system construction decreases NP and limits oxygen ingress into the mine rock within the NAG backfill. Suboxic zones were established in almost half of the cells in the poorly graded till and sandstone mine rock scenario and in all but one cell in the well graded till and mine rock mix scenarios (Section 4.3.3). Sulfide oxidation only occurred in the reactive oxic zones, as a result, loading rates of oxidation products are partly controlled by the amount of suboxic mine rock in the backfill.

In general, concentrations for most modelled parameters were similar between the poorly graded till and sandstone and well graded till and mine rock mix scenarios. While the amount of suboxia increased substantially for the well graded till and mine rock mix scenarios, the volume of water infiltrating the surface of the NAG backfill decreased, resulting is less water available to dilute oxidation products from the limited reactive zone. Despite concentrations remaining similar between the three scenarios, the

annual load exiting the NAG backfill as seepage in both the well graded till and mine rock mix scenarios is roughly half the annual load exiting in the poorly graded till and sandstone scenario.

The onset of seepage from the NAG backfill occurs as cells from the model become fully wetted-up, which begins in approximately 2036. Areas of the backfill that contain smaller thicknesses of mine rock wet up faster than areas with greater thicknesses; therefore, the effects of seepage from thinner cells are observed in the model results faster than the effects from thicker cells. Thicker cells will generally produce poorer water quality than thinner cells because there is a longer pathway for water to accumulate oxidation products (ignoring the effects of suboxic zones).

After the initial wetting-up period and prior to the development of suboxic zones within the models, concentrations of parameters associated with pyrite oxidation (e.g., SO_4, Se, Cu, etc.) generally have an increasing trend. Concentrations stabilize and tend to decrease once suboxic conditions are established. After the onset of seepage, Se concentrations range between 0.03 to 0.07 mg/L, with the onset of lower concentration occurring near the end of the modelled timeframe. Concentrations of Se are trending lower near the end of the modelled timeframe for the well graded till and mine rock mix scenario. Concentrations of SO_4 and Cu are approximately 1,500 mg/L and 0.015 mg/L, respectively, near the end of the modelled timeframes for all three scenarios. Annual loads of parameters related to pyrite oxidation in the well graded till and sandstone scenarios are approximately half of the poorly graded till and mine rock mix scenario. Annual loads are generally similar between the two well graded till and waste rock mix scenarios with the largest differences observed in the last ~20 years of the modelled timeframe.

Nitrate concentrations and loads peak in the initial years that seepage occurs and are controlled by flushing of blast residues that are on the surface of the mine rock. The release of NO_3 (and subsequently NO_2 and NH_4) is spread out over many decades as the transport time is variable in different areas of the backfill depending on the cell thickness.

A slight variation in pH was observed between the modelled scenarios with the well graded till and sandstone scenarios having a slightly higher value. This is likely a result of the longer residence time of water in the suboxic zone of the carbonate-rich mine rock in the well-graded model scenario.

The NAG backfill source terms from the three modelled scenarios are summarized in Table 4.2 and represent the concentrations of parameters at the end of the modelled timeframe (year 2150). The source terms are also compared to source terms developed by SRK (2024). It should be noted that source terms developed by both SRK and Okane utilized NAG field bin data to derive source terms. Differences in source terms are attributed to the implementation of reactive transport modelling and the consideration of changes in net percolation and oxygen ingress into the NAG backfill as a result of the modelled cover systems. In general, the source terms from the current modelling work are lower than the initial SRK source terms. Due to the incorporation of wetting up in the current model, the largest differences in loading rates between both sets of models are observed in the initial 20 years of the model

time frame. Once the modelled loading rates stabilize, mass loads of constituents such as SO_4 and Se range from approximately 50 to 75% lower than the initial SRK loads (Figure 4.12).

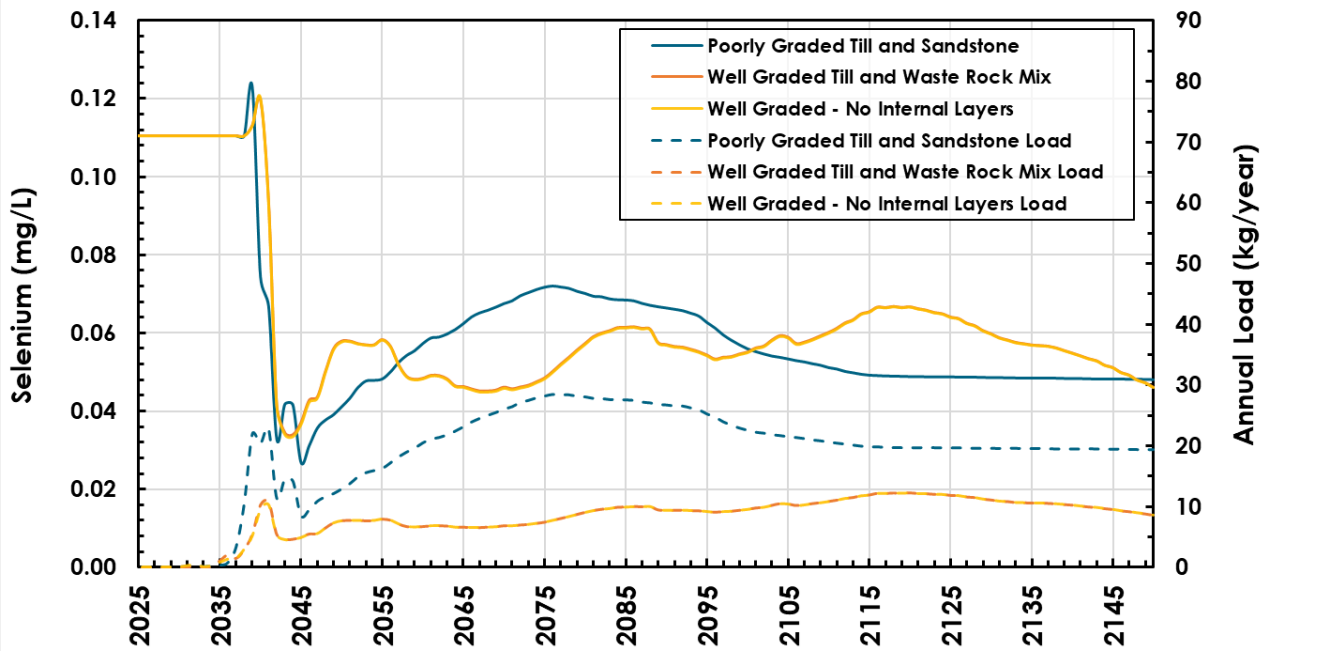

Figure 4.7: Evolution of Se concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

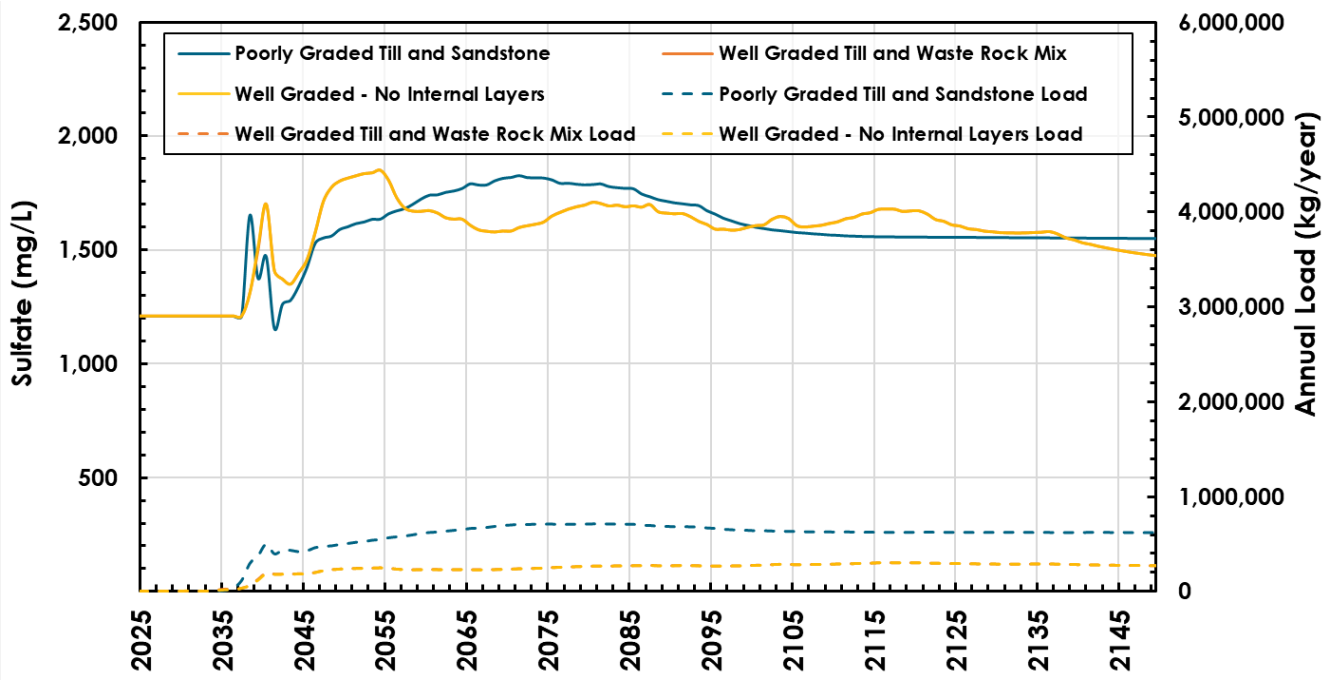

Figure 4.8: Evolution of SO_4 concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

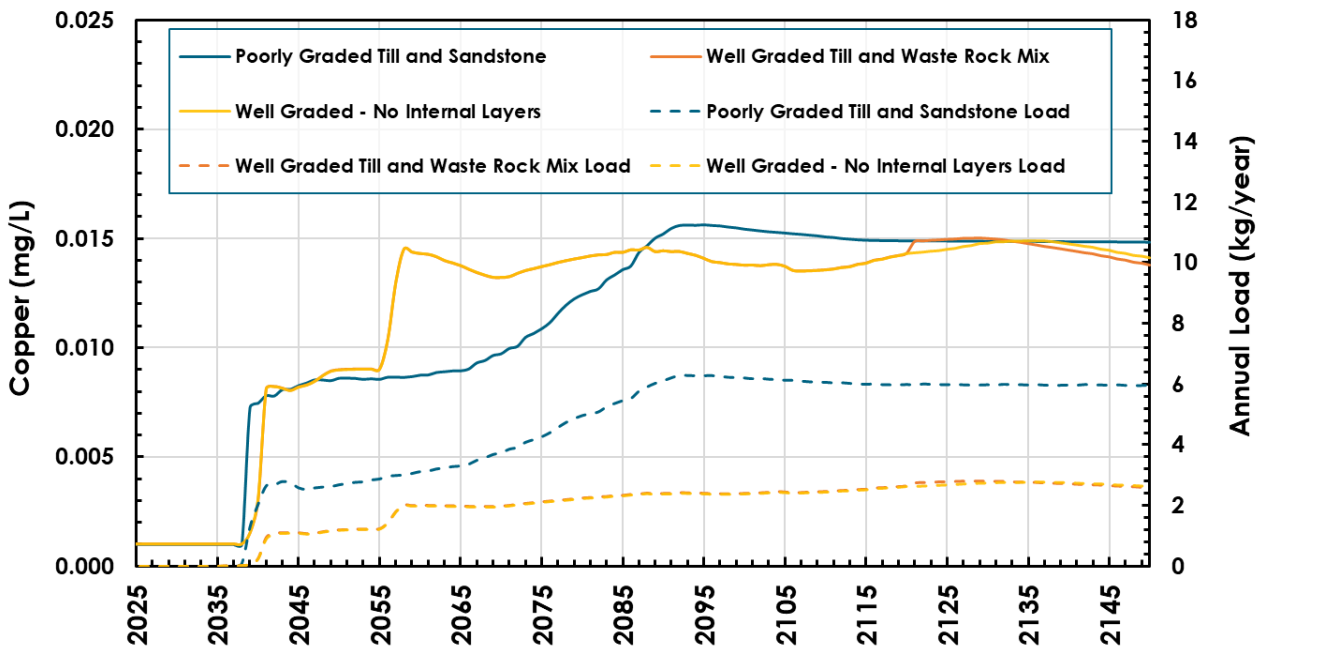

Figure 4.9: Evolution of Cu concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

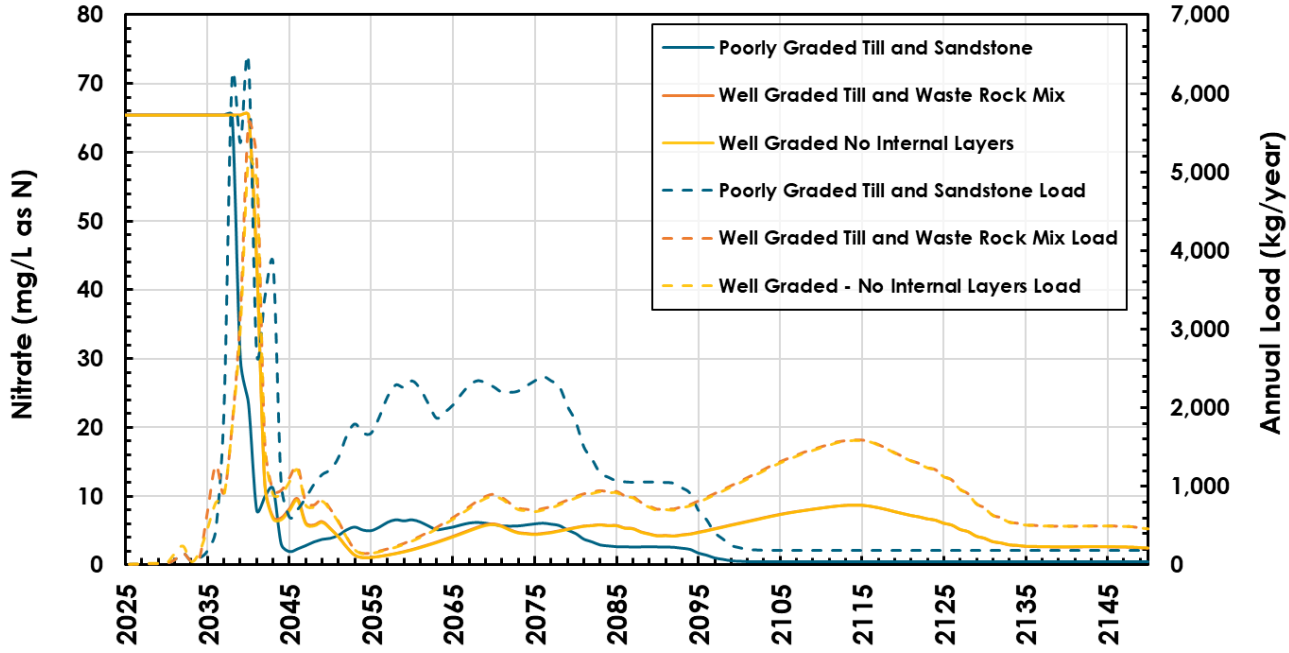

Figure 4.10: Evolution of NO_3 concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

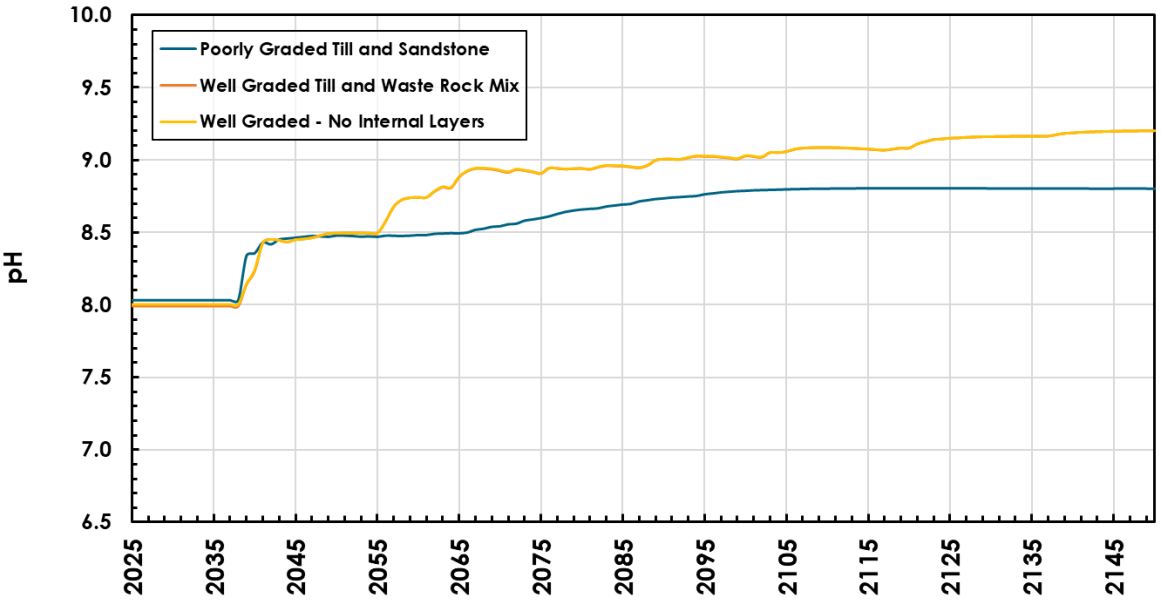

Figure 4.11: Evolution of pH from NAG backfill seepage in the three cover system and mine rock scenarios.

Table 4.2: Comparison of source terms of the NAG backfill from various model scenarios.

Parameter	Well Graded Model Source Term[1]	Well Graded with No Internal Layers Source Term[1]	Poorly Graded Model Source Term[1]	NAG Backfill – 2021-2029		NAG Backfill – 2030-2100	
				NAG Typical[2]	NAG High[2]	NAG Typical[2]	NAG High[2]
pH	9.2	9.2	8.8	8.2	8.4	8.3	8.5
Alkalinity (mg/L as $CaCO_3$)	3,445	3,445	1,947	1,904	3,398	2953	4468
Ca (mg/L)	0.85	0.85	2.6	53	95	79	119
Mg (mg/L)	84	84	54	32	57	48	72
K (mg/L)	24	24	11	13	23	20	31
Na (mg/L)	1,335	1,335	1,083	1,614	2,881	2505	3790
Cl (mg/L)	17	17	7.9	24	43	37	56
SO4 (mg/L)	1,476	1,476	1,550	1,803	3,218	2772	4193
Al (mg/L)	0.27	0.27	0.075	0.0045	0.0072	0.0064	0.0089
Sb (mg/L)	0.0026	0.0026	0.0027	0.0029	0.0052	0.0045	0.0069
As (mg/L)	0.0019	0.0019	0.002	0.0043	0.0078	0.0067	0.01
Ba (mg/L)	0.0034	0.0034	0.0026	0.045	0.08	0.069	0.1
B (mg/L)	0.78	0.78	0.36	0.45	0.8	0.7	1.1
Cd (mg/L)	0.00004	0.00005	0.00004	0.000095	0.00017	0.00014	0.00021
Cr (mg/L)	0.0005	0.0005	0.0005	0.0018	0.0033	0.0029	0.0043
Co (mg/L)	0.0039	0.0039	0.0042	0.015	0.026	0.02	0.03

Parameter	Well Graded Model Source Term[1]	Well Graded with No Internal Layers Source Term[1]	Poorly Graded Model Source Term[1]	NAG Backfill – 2021-2029		NAG Backfill – 2030-2100	
				NAG Typical[2]	NAG High[2]	NAG Typical[2]	NAG High[2]
Cu (mg/L)	0.014	0.014	0.015	0.016	0.029	0.025	0.037
Fe (mg/L)	0.05	0.05	0.05	0.00012	0.0001	0.00011	0.0001
Pb (mg/L)	0.0036	0.0036	0.004	0.0048	0.0085	0.0074	0.011
Li (mg/L)	0.43	0.43	0.2	0.14	0.24	0.21	0.32
Mn (mg/L)	0.016	0.016	0.017	0.11	0.19	0.12	0.18
Hg (mg/L)	0.000005	0.000005	0.000005	0.00001	0.000018	0.000016	0.000023
P (mg/L)	0.27	0.27	0.13	0.026	0.046	0.04	0.06
Mo (mg/L)	0.05	0.05	0.052	0.17	0.3	0.26	0.39
Ni (mg/L)	0.013	0.013	0.014	0.029	0.051	0.04	0.061
Se (mg/L)	0.046	0.046	0.048	0.089	0.16	0.14	0.21
Si (mg/L)	2.8	2.8	1.3	4.6	8.3	7.1	11
Ag (mg/L)	0.000035	0.000035	0.000037	0.000074	0.00013	0.00011	0.00017
Sr (mg/L)	1.4	1.4	0.64	0.83	1.5	1.3	1.9
Sn (mg/L)	0.0005	0.0005	0.0005	0.00078	0.0014	0.0012	0.0018
Tl (mg/L)	0.000036	0.000036	0.000037	0.000078	0.00014	0.00012	0.00018
U (mg/L)	0.016	0.016	0.017	0.019	0.034	0.029	0.044
V (mg/L)	0.005	0.005	0.005	0.004	0.0072	0.0062	0.0095
Zn (mg/L)	0.01	0.01	0.01	0.032	0.058	0.046	0.07

[1] Source term represents the parameter value at the end of the modelled timeframe (year 2150).
[2] Source term from SRK (2024).

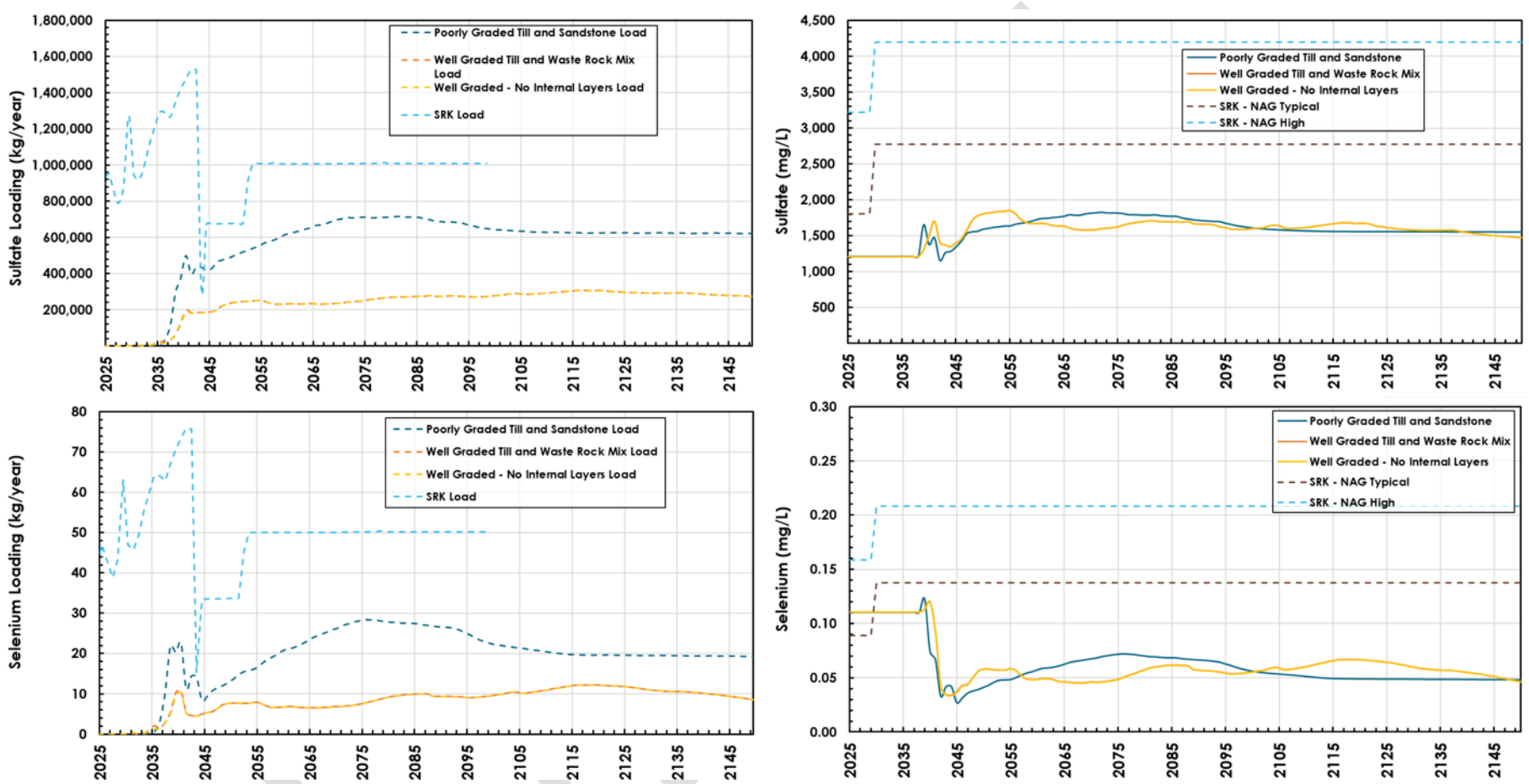

Figure 4.12: Summary of sulfate and selenium NAG backfill source terms and loading rates.

4.4.1 Nitrogen Source Term Scenarios

Nitrogen source terms decreased by 37.5% in the low nitrogen scenario and increased by 56.25% in the high nitrogen scenario throughout the first 15 years of the modelled timeframe as the initial porewater from each cell flushed out (Figure 4.13). Once individual cells began to be fully flushed, there were small variations in the percent change in nitrogen concentrations across sensitivities caused by dilution from cells that had been fully flushed of nitrogen. Overall, the differences in nitrogen source terms were similar to the 37.5% decrease or 56.25% increased applied in the respective sensitivity.

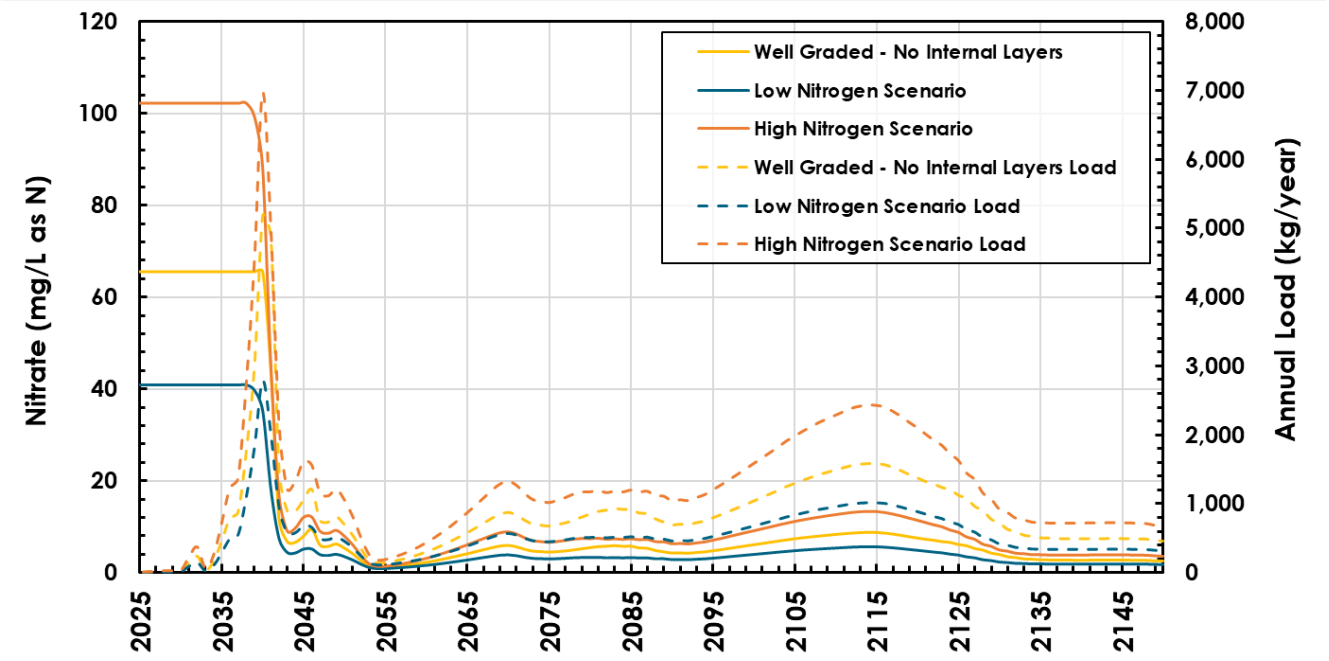

Figure 4.13: Summary of nitrate source terms and loading rates in the well graded – no internal layers scenario and two nitrogen source term scenarios.

5 CONCLUSIONS

The scope of this work was to provide Telkwa support in the development of source terms for three scenarios of backfilled NAG mine rock in lifts using bottom-up construction methodology with overburden covers. The objective of the backfilled design is to limit oxygen and water ingress to minimize the release of potential contaminants of concern such as selenium and sulfate to the receiving environment. Based on the modelling that was completed for this work, the following conclusions are made:

- GoldSim modelling indicates that the backfilled NAG mine rock in the Open Pit will be wetted up approximately 40 years following completion of construction for the poorly graded till and sandstone mine rock scenario. The well graded till with mine rock mix scenario and the no internal layers scenario will be wetted up approximately 80 years following the completion of construction due to the finer texture of material.

- Two-dimensional oxygen models indicate that the long-term depths to suboxia are, on average, 13 m for the poorly graded till and sandstone mine rock scenario and 3.3 m for the well graded till with mine rock mix scenario and the no internal layers scenario. The suboxic zone takes approximately 15 years to form in each strip modelled of the poorly graded till and sandstone mine rock once the cover system has been placed. In both the well graded till with mine rock mix scenario and the no internal layers scenario, the suboxic zone takes approximately 13 years to develop following cover system placement.

- It is likely that the oxygen ingress rate for the poorly graded till and sandstone mine rock scenario would be greater than the well graded till and mine rock mix scenarios.

- In general, concentrations in NAG backfill seepage for most modelled parameters will be similar between the three modelled scenarios.

- The decrease in oxygen ingress and infiltrating water into the NAG backfill for the well graded till and mine rock mix scenarios results in an annual chemical load (mass released per year) decrease of approximately half compared to the poorly graded till and sandstone mine rock scenario.

- As a result, mass loads of dissolved constituents such as selenium and sulfate from the NAG backfill are expected to decrease relative to initial source term and load balance models under the conditions modelled herein.

The NAG backfill source terms from this modelling work will be integrated into the site wide load balance model to quantify the effects of the backfill on water quality around the Tenas project.

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7 CLOSURE

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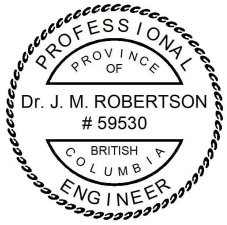

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Appendix A

NAG Backfill Source Terms

Table A1. Source terms of the NAG backfill for the poorly graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	16
2024	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	33
2025	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	57
2026	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	87
2027	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	116
2028	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	195
2029	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	221
2030	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	266
2031	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	961
2032	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,273
2033	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	710
2034	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	1,289
2035	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,755
2036	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	6,758
2037	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	30,026
2038	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	94,634
2039	8.3	1,652	609	12	0.022	0.0029	0.0015	0.0021	0.53	0.00005	21	0.0005	0.0068	0.002	0.05	0.0011	0.29	31	0.038	0.000005	0.056	0.011	0.19	17	0.12	1.9	0.00004	846	0.93	0.00004	0.0005	0.018	0.005	0.01	30	3.8	0.69	178,458
2040	8.4	1,376	625	12	0.023	0.0024	0.0014	0.0023	0.53	0.00005	18	0.0005	0.0044	0.0068	0.05	0.0013	0.29	27	0.023	0.000005	0.046	0.0085	0.19	17	0.074	1.9	0.000033	730	0.93	0.000033	0.0005	0.015	0.005	0.01	23	3.0	0.54	272,969
2041	8.4	1,472	753	9.4	0.028	0.0026	0.0015	0.0023	0.43	0.00005	13	0.0005	0.0041	0.008	0.05	0.0016	0.23	29	0.021	0.000005	0.05	0.0087	0.15	13	0.067	1.6	0.000035	806	0.75	0.000035	0.0005	0.016	0.005	0.01	8.0	1.0	0.18	338,914
2042	8.4	1,156	717	9.2	0.028	0.002	0.0013	0.0026	0.42	0.00005	13	0.0005	0.0024	0.0078	0.05	0.0015	0.23	24	0.011	0.000005	0.039	0.0061	0.15	13	0.033	1.5	0.000028	658	0.74	0.000028	0.0005	0.012	0.005	0.01	9.9	1.3	0.23	343,355
2043	8.5	1,262	782	9.2	0.03	0.0022	0.0014	0.0025	0.42	0.00005	11	0.0005	0.0029	0.0081	0.05	0.0016	0.23	26	0.014	0.000005	0.042	0.0072	0.15	13	0.042	1.5	0.00003	721	0.74	0.00003	0.0005	0.013	0.005	0.01	11	1.4	0.26	345,155
2044	8.5	1,280	797	9.3	0.03	0.0023	0.0014	0.0025	0.43	0.00005	11	0.0005	0.003	0.0082	0.05	0.0019	0.23	26	0.014	0.000005	0.043	0.0078	0.15	13	0.042	1.6	0.000031	733	0.75	0.000031	0.0005	0.014	0.005	0.01	3.0	0.38	0.07	339,203
2045	8.5	1,343	812	10	0.03	0.0024	0.0014	0.0024	0.46	0.00005	11	0.0005	0.0023	0.0083	0.05	0.0021	0.25	27	0.0094	0.000005	0.045	0.0074	0.16	15	0.027	1.7	0.000032	764	0.82	0.000032	0.0005	0.014	0.005	0.01	1.9	0.25	0.045	312,231
2046	8.5	1,424	827	11	0.031	0.0025	0.0015	0.0024	0.48	0.00005	11	0.0005	0.0026	0.0084	0.05	0.0024	0.26	29	0.011	0.000005	0.048	0.0085	0.17	15	0.031	1.8	0.000034	804	0.85	0.000034	0.0005	0.015	0.005	0.01	2.3	0.29	0.054	301,366
2047	8.5	1,529	845	10	0.031	0.0027	0.0017	0.0023	0.48	0.00005	11	0.0005	0.003	0.0085	0.05	0.0027	0.26	31	0.012	0.000005	0.051	0.0096	0.17	15	0.036	1.7	0.000037	855	0.84	0.000037	0.0005	0.016	0.005	0.01	2.8	0.36	0.065	302,616
2048	8.5	1,553	841	10	0.03	0.0027	0.0017	0.0023	0.47	0.00005	11	0.0005	0.0031	0.0085	0.05	0.0028	0.26	31	0.013	0.000005	0.052	0.01	0.17	15	0.038	1.7	0.000037	864	0.83	0.000037	0.0005	0.017	0.005	0.01	3.3	0.42	0.077	305,970
2049	8.5	1,561	834	10	0.03	0.0028	0.0017	0.0023	0.47	0.00005	11	0.0005	0.0032	0.0085	0.05	0.0028	0.26	31	0.013	0.000005	0.053	0.01	0.16	15	0.039	1.7	0.000037	866	0.83	0.000038	0.0005	0.017	0.005	0.01	3.7	0.47	0.086	308,547
2050	8.5	1,590	853	10	0.031	0.0028	0.0018	0.0022	0.46	0.00005	11	0.0005	0.0034	0.0086	0.05	0.003	0.25	32	0.014	0.000005	0.054	0.011	0.16	15	0.041	1.7	0.000038	884	0.82	0.000038	0.0005	0.017	0.005	0.01	3.9	0.49	0.089	311,965
2051	8.5	1,602	853	10	0.031	0.0028	0.0018	0.0022	0.46	0.00005	11	0.0005	0.0036	0.0086	0.05	0.0031	0.25	32	0.015	0.000005	0.054	0.011	0.16	14	0.043	1.7	0.000038	889	0.81	0.000039	0.0005	0.017	0.005	0.01	4.3	0.55	0.099	316,216
2052	8.5	1,616	848	9.9	0.03	0.0028	0.0018	0.0022	0.45	0.00005	11	0.0005	0.0038	0.0086	0.05	0.0032	0.25	32	0.016	0.000005	0.054	0.012	0.16	14	0.046	1.6	0.000039	894	0.79	0.000039	0.0005	0.017	0.005	0.01	5.1	0.65	0.12	321,547
2053	8.5	1,623	839	9.8	0.03	0.0029	0.0019	0.0022	0.45	0.00005	11	0.0005	0.0039	0.0085	0.05	0.0033	0.24	32	0.016	0.000005	0.055	0.012	0.16	14	0.048	1.6	0.000039	895	0.78	0.000039	0.0005	0.017	0.005	0.01	5.5	0.7	0.13	324,989
2054	8.5	1,635	843	9.6	0.03	0.0029	0.0019	0.0022	0.44	0.00005	11	0.0005	0.0039	0.0086	0.05	0.0034	0.24	32	0.016	0.000005	0.055	0.012	0.15	14	0.048	1.6	0.000039	901	0.77	0.000039	0.0005	0.017	0.005	0.01	5.1	0.64	0.12	331,093
2055	8.5	1,636	838	9.4	0.03	0.0029	0.0019	0.0022	0.43	0.00005	11	0.0005	0.0039	0.0085	0.05	0.0034	0.24	32	0.016	0.000005	0.055	0.012	0.15	14	0.048	1.6	0.000039	900	0.76	0.000039	0.0005	0.017	0.005	0.011	5.0	0.63	0.11	335,909
2056	8.5	1,659	855	9.3	0.03	0.0029	0.0019	0.0022	0.42	0.00005	11	0.0005	0.0041	0.0086	0.05	0.0035	0.23	33	0.017	0.000005	0.056	0.013	0.15	13	0.05	1.5	0.00004	915	0.75	0.00004	0.0005	0.018	0.005	0.01	5.5	0.7	0.13	342,067
2057	8.5	1,672	854	9.2	0.03	0.0029	0.002	0.0022	0.42	0.00005	11	0.0005	0.0042	0.0086	0.05	0.0036	0.23	33	0.018	0.000005	0.056	0.013	0.15	13	0.052	1.5	0.00004	920	0.74	0.00004	0.0005	0.018	0.005	0.01	6.2	0.78	0.14	345,301
2058	8.5	1,682	851	9.1	0.03	0.003	0.002	0.0022	0.42	0.00005	11	0.00051	0.0044	0.0086	0.05	0.0037	0.23	33	0.019	0.000005	0.057	0.014	0.15	13	0.054	1.5	0.00004	924	0.73	0.00004	0.0005	0.018	0.005	0.01	6.6	0.83	0.15	348,168
2059	8.5	1,701	857	9.0	0.03	0.003	0.002	0.0022	0.41	0.00005	11	0.00051	0.0045	0.0087	0.05	0.0038	0.23	34	0.019	0.000005	0.057	0.014	0.14	13	0.056	1.5	0.000041	934	0.72	0.000041	0.0005	0.018	0.005	0.01	6.4	0.81	0.15	352,107
2060	8.5	1,724	867	8.9	0.031	0.003	0.0021	0.0021	0.41	0.00005	11	0.00052	0.0046	0.0087	0.05	0.0039	0.22	34	0.02	0.000005	0.058	0.015	0.14	13	0.057	1.5	0.000041	947	0.72	0.000041	0.0005	0.018	0.005	0.01	6.6	0.83	0.15	356,256
2061	8.5	1,741	868	8.9	0.031	0.0031	0.0021	0.0021	0.41	0.00005	11	0.00052	0.0048	0.0088	0.05	0.0041	0.22	34	0.02	0.000005	0.059	0.015	0.14	13	0.059	1.5	0.000042	954	0.71	0.000042	0.0005	0.019	0.005	0.01	6.3	0.79	0.14	358,049
2062	8.5	1,742	886	8.8	0.031	0.0031	0.0022	0.0021	0.4	0.00005	11	0.00052	0.0048	0.0089	0.05	0.0042	0.22	35	0.02	0.000005	0.059	0.015	0.14	13	0.059	1.5	0.000042	959	0.71	0.000042	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	361,103
2063	8.5	1,753	891	8.7	0.031	0.0031	0.0022	0.0021	0.4	0.00005	11	0.00053	0.0049	0.0089	0.05	0.0043	0.22	35	0.02	0.000005	0.059	0.016	0.14	12	0.06	1.5	0.000042	965	0.7	0.000042	0.0005	0.019	0.005	0.01	5.1	0.65	0.12	363,501
2064	8.5	1,759	896	8.6	0.031	0.0031	0.0022	0.0021	0.4	0.00005	11	0.00053	0.005	0.0089	0.05	0.0044	0.22	35	0.021	0.000005	0.059	0.016	0.14	12	0.061	1.4	0.000042	969	0.69	0.000042	0.0005	0.019	0.005	0.01	5.3	0.67	0.12	367,099
2065	8.5	1,770	895	8.6	0.031	0.0031	0.0023	0.0021	0.39	0.00005	11	0.00053	0.0051	0.0089	0.05	0.0045	0.22	35	0.021	0.000005	0.06	0.016	0.14	12	0.062	1.4	0.000042	973	0.69	0.000043	0.0005	0.019	0.005	0.01	5.5	0.7	0.13	369,105
2066	8.5	1,790	909	8.5	0.032	0.0032	0.0023	0.0021	0.39	0.00005	10	0.00054	0.0052	0.009	0.05	0.0046	0.21	36	0.022	0.000005	0.06	0.017	0.14	12	0.064	1.4	0.000043	985	0.69	0.000043	0.0005	0.019	0.005	0.01	5.8	0.74	0.13	371,946
2067	8.5	1,785	952	8.5	0.033	0.0031	0.0023	0.0021	0.39	0.00005	9.5	0.00054	0.0053	0.0093	0.05	0.0047	0.21	36	0.022	0.000005	0.06	0.017	0.14	12	0.065	1.4	0.000043	993	0.68	0.000043	0.0005	0.019	0.005	0.01	6.1	0.77	0.14	374,952
2068	8.5	1,786	969	8.4	0.034	0.0031	0.0023	0.0021	0.38	0.00005	9.2	0.00054	0.0054	0.0094	0.05	0.0047	0.21	37	0.022	0.000005	0.06	0.017	0.13	12	0.066	1.4	0.000043	996	0.67	0.000043	0.0005	0.019	0.005	0.01	6.2	0.78	0.14	378,901
2069	8.5	1,803	1,003	8.3	0.035	0.0032	0.0024	0.0021	0.38	0.00005	8.7	0.00054	0.0055	0.0096	0.05	0.0048	0.21	38	0.023	0.000005	0.061	0.017	0.13	12	0.067	1.4	0.000043	1,012	0.67	0.000043	0.0005	0.019	0.005	0.01	6.1	0.77	0.14	381,313
2070	8.5	1,815	1,013	8.3	0.036	0.0032	0.0024	0.0021	0.38	0.00005	8.6	0.00055	0.0055	0.0097	0.05	0.0049	0.21	38	0.023	0.000005	0.061	0.018	0.13	12	0.068	1.4	0.000043	1,019	0.66	0.000044	0.0005	0.019	0.005	0.01	5.9	0.74	0.14	384,374
2071	8.6	1,818	1,048	8.2	0.037	0.0032	0.0024	0.0021	0.38	0.00005	8.1	0.00055	0.0056	0.01	0.05	0.005	0.21	38	0.023	0.000005	0.061	0.018	0.13	12	0.068	1.4	0.000044	1,028	0.66	0.000044	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	386,328
2072	8.6	1,826	1,060	8.2	0.037	0.0032	0.0025	0.0021	0.37	0.00005	7.9	0.00055	0.0057	0.01	0.05	0.0051	0.2	39	0.024	0.000005	0.061	0.019	0.13	12	0.07	1.4	0.000044	1,034	0.66	0.000044	0.0005	0.019	0.005	0.01	5.6	0.71	0.13	388,982
2073	8.6	1,817	1,116	8.2	0.039	0.0032	0.0025	0.0022	0.37	0.00005	7.2	0.00055	0.0058	0.01	0.05	0.0051	0.2	39	0.024	0.000005	0.061	0.019	0.13	12	0.07	1.4	0.000044	1,043	0.66	0.000044	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	389,390
2074	8.6	1,817	1,139	8.1	0.04	0.0032	0.0025	0.0022	0.37	0.00005	7.0	0.00055	0.0059	0.011	0.05	0.0052	0.2	40	0.024	0.000005	0.061	0.019	0.13	12	0.071	1.4	0.000044	1,047	0.65	0.000044	0.0005	0.019	0.005	0.01	5.8	0.74	0.13	391,164
2075	8.6	1,816	1,167	8.1	0.041	0.0032	0.0025	0.0022	0.37	0.00005	6.7	0.00055	0.0059	0.011	0.05	0.0052	0.2	40	0.024	0.000005	0.061	0.019	0.13	12	0.072	1.4	0.000043	1,052	0.65	0.000044	0.0005	0.019	0.005	0.01	6.0	0.76	0.14	391,961
2076	8.6	1,808	1,202	8.1	0.043	0.0032	0.0025	0.0022	0.37	0.00005	6.3	0.00054	0.0059	0.011	0.05	0.0052	0.2	41	0.025	0.000005	0.061	0.019	0.13	12	0.072	1.3	0.000043	1,056	0.65	0.000043	0.0005	0.019	0.005	0.01	6.1	0.77	0.14	394,086
2077	8.6	1,793	1,254	8.0	0.045	0.0032	0.0025	0.0022	0.37	0.00005	5.9	0.00054	0.0059	0.012	0.05	0.0052	0.2	42	0.025	0.000005	0.06	0.019	0.13	12	0.072	1.3	0.000043	1,060	0.65	0.000043	0.0005	0.019	0.005	0.01	5.9	0.75	0.14	394,666
2078	8.6	1,793	1,299	8.0	0.046	0.0032	0.0025	0.0022	0.37	0.00005	5.5	0.00054	0.0059	0.012	0.05	0.0052	0.2	42	0.024	0.000005	0.06	0.019	0.13	11	0.071	1.3	0.000043	1,070	0.64	0.000043	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	396,324
2079	8.7	1,789	1,333	8.0	0.048	0.0032	0.0025	0.0022	0.37	0.00005	5.3	0.00054	0.0058	0.012	0.05	0.0052	0.2	43	0.024	0.000005	0.06	0.019	0.13	11	0.071	1.3	0.000043	1,074	0.64	0.000043	0.0005	0.019	0.005	0.01	5.1	0.64	0.12	397,336
2080	8.7	1,786	1,355	8.0	0.049	0.0031	0.0025	0.0022	0.36	0.00005	5.1	0.00054	0.0058	0.012	0.05	0.0053	0.2	43	0.024	0.000005	0.06	0.019	0.13	11	0.07	1.3	0.000043	1,077	0.64	0.000043	0.0005	0.019	0.005	0.01	4.6	0.58	0.11	398,998
2081	8.7	1,787	1,371	7.9	0.049	0.0032	0.0025	0.0023	0.36	0.00005	5.0	0.00054	0.0058	0.013	0.05	0.0053	0.2	44	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000043	1,081	0.64	0.000043	0.0005	0.019	0.005	0.01	3.8	0.48	0.086	399,482
2082	8.7	1,790	1,384	7.9	0.05	0.0032	0.0025	0.0023	0.36	0.00005	4.9	0.00054	0.0058	0.013	0.05	0.0054	0.2	44	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000043	1,085	0.64	0.000043	0.0005	0.019	0.005	0.01	3.4	0.43	0.077	400,065
2083	8.7	1,778	1,429	7.9	0.052	0.0031	0.0025	0.0023	0.36	0.00005	4.7	0.00053	0.0058	0.013	0.05	0.0054	0.2	45	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000043	1,089	0.64	0.000043	0.0005	0.019	0.005	0.01	2.9	0.37	0.067	400,547
2084	8.7	1,773	1,453	7.9	0.053	0.0031	0.0025	0.0023	0.36	0.00005	4.5	0.00053	0.0058	0.013	0.05	0.0054	0.2	45	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000042	1,091	0.64	0.000043	0.0005	0.019	0.005	0.01	2.8	0.35	0.064	401,921
2085	8.7	1,770	1,479	7.9	0.054	0.0031	0.0025	0.0023	0.36	0.00005	4.4	0.00053	0.0058	0.014	0.05	0.0054	0.2	46	0.024	0.000005	0.06	0.019	0.13	11	0.068	1.3	0.000042	1,095	0.64	0.000043	0.0005	0.019	0.005	0.01	2.7	0.34	0.061	401,543
2086	8.7	1,769	1,496	7.9	0.054	0.0031	0.0025	0.0023	0.36	0.00005	4.3	0.00053	0.0058	0.014	0.05	0.0054	0.2	46	0.023	0.000005	0.06	0.019	0.13	11	0.068	1.3	0.000042	1,097	0.64	0.000043	0.0005	0.019	0.005	0.01	2.6	0.33	0.06	401,553
2087	8.7	1,746	1,561	7.9	0.057	0.0031	0.0025	0.0023	0.36	0.00005	4.0	0.00052	0.0057	0.014	0.05	0.0053	0.2	47	0.023	0.000005	0.059	0.019	0.13	11	0.068	1.3	0.000042	1,100	0.64	0.000042	0.0005	0.019	0.005	0.01	2.6	0.33	0.06	401,267
2088	8.7	1,734	1,593	7.9	0.059	0.0031	0.0025	0.0024	0.36	0.00005	3.8	0.00052	0.0057	0.015	0.05	0.0053	0.2	47	0.023	0.000005	0.058	0.019	0.13	11	0.067	1.3	0.000042	1,101	0.63	0.000042	0.0005	0.019	0.005	0.01	2.6	0.33	0.06	402,320
2089	8.7	1,721	1,628	7.9	0.06	0.003	0.0025	0.0024	0.36	0.00005	3.7	0.00052	0.0056	0.015	0.05	0.0053	0.2	48	0.023	0.000005	0.058	0.019	0.13	11	0.067	1.3	0.000041	1,102	0.64	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.06	401,001
2090	8.7	1,714	1,647	7.9	0.061	0.003	0.0025	0.0024	0.36	0.00005	3.6	0.00052	0.0056	0.015	0.05	0.0052	0.2	48	0.023	0.000005	0.058	0.019	0.13	11	0.066	1.3	0.000041	1,103	0.64	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.06	401,227
2091	8.7	1,707	1,672	7.9	0.062	0.003	0.0025	0.0024	0.36	0.00005	3.5	0.00051	0.0056	0.015	0.05	0.0052	0.2	49	0.023	0.000005	0.057	0.019	0.13	11	0.066	1.3	0.000041	1,104	0.64	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.06	401,098
2092	8.7	1,703	1,685	7.9	0.063	0.003	0.0025	0.0024	0.36	0.00005	3.5	0.00051	0.0056	0.016	0.05	0.0052	0.2	49	0.023	0.000005	0.057	0.019	0.13	11	0.066	1.3	0.000041	1,105	0.63	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.059	402,800
2093	8.7	1,698	1,703	7.9	0.063	0.003	0.0025	0.0024	0.36	0.00005	3.4	0.00051	0.0055	0.016	0.05	0.0051	0.2	49	0.022	0.000005	0.057	0.018	0.13	11	0.065	1.3	0.000041	1,106	0.63	0.000041	0.0005	0.018	0.005	0.01	2.4	0.31	0.056	402,142
2094	8.8	1,695	1,717	7.9	0.064	0.003	0.0025	0.0024	0.36	0.00005	3.4	0.00051	0.0055	0.016	0.05	0.0051	0.2	50	0.022	0.000005	0.057	0.018	0.13	11	0.064	1.3	0.000041	1,107	0.64	0.000041	0.0005	0.018	0.005	0.01	2.3	0.29	0.052	401,911
2095	8.8	1,672	1,770	7.9	0.066	0.0029	0.0024	0.0025	0.36	0.00005	3.2	0.0005	0.0054	0.016	0.05	0.005	0.2	50	0.022	0.000005	0.056	0.018	0.13	11	0.063	1.3	0.00004	1,108	0.64	0.00004	0.0005	0.018	0.005	0.01	1.7	0.22	0.04	401,364
2096	8.8	1,658	1,797	7.9	0.068	0.0029	0.0024	0.0025	0.36	0.00005	3.1	0.0005	0.0052	0.016	0.05	0.005	0.2	51	0.021	0.000005	0.056	0.018	0.13	11	0.061	1.3	0.00004	1,106	0.63	0.00004	0.0005	0.018	0.005	0.01	1.4	0.18	0.033	402,265
2097	8.8	1,640	1,828	7.9	0.069	0.0029	0.0024	0.0025	0.36	0.00005	3.0	0.0005	0.0051	0.016	0.05	0.0049	0.2	51	0.021	0.000005	0.055	0.017	0.13	11	0.06	1.3	0.000039	1,104	0.64	0.000039	0.0005	0.018	0.005	0.01	1.0	0.13	0.024	401,193
2098	8.8	1,628	1,850	7.9	0.07	0.0029	0.0023	0.0025	0.36	0.00005	2.9	0.0005	0.005	0.016	0.05	0.0048	0.2	51	0.02	0.000005	0.055	0.017	0.13	11	0.058	1.3	0.000039	1,103	0.64	0.000039	0.0005	0.017	0.005	0.01	0.82	0.1	0.019	400,659
2099	8.8	1,616	1,868	7.9	0.071	0.0028	0.0023	0.0025	0.36	0.00005	2.9	0.0005	0.0049	0.015	0.05	0.0047	0.2	52	0.02	0.000005	0.054	0.017	0.13	11	0.057	1.3	0.000039	1,101	0.64	0.000039	0.0005	0.017	0.005	0.01	0.62	0.078	0.014	400,865
2100	8.8	1,608	1,880	7.9	0.072	0.0028	0.0023	0.0026	0.36	0.00005	2.8	0.0005	0.0048	0.015	0.05	0.0047	0.2	52	0.019	0.000005	0.054	0.016	0.13	11	0.056	1.3	0.000038	1,099	0.64	0.000039	0.0005	0.017	0.005	0.01	0.54	0.069	0.012	401,623
2101	8.8	1,600	1,895	7.9	0.072	0.0028	0.0023	0.0026	0.36	0.00005	2.8	0.0005	0.0048	0.015	0.05	0.0046	0.2	52	0.019	0.000005	0.054	0.016	0.13	11	0.055	1.3	0.000038	1,098	0.64	0.000038	0.0005	0.017	0.005	0.01	0.49	0.061	0.011	401,098
2102	8.8	1,594	1,902	7.9	0.073	0.0028	0.0022	0.0026	0.36	0.00005	2.8	0.0005	0.0047	0.015	0.05	0.0046	0.2	52	0.019	0.000005	0.054	0.016	0.13	11	0.055	1.3	0.000038	1,097	0.63	0.000038	0.0005	0.017	0.005	0.01	0.47	0.059	0.011	402,800
2103	8.8	1,588	1,911	7.9	0.073	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0047	0.015	0.05	0.0045	0.2	53	0.019	0.000005	0.053	0.016	0.13	11	0.054	1.3	0.000038	1,096	0.64	0.000038	0.0005	0.017	0.005	0.01	0.46	0.058	0.011	402,142
2104	8.8	1,585	1,917	7.9	0.074	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0047	0.015	0.05	0.0045	0.2	53	0.019	0.000005	0.053	0.016	0.13	11	0.054	1.3	0.000038	1,095	0.64	0.000038	0.0005	0.017	0.005	0.01	0.46	0.058	0.01	401,911
2105	8.8	1,581	1,927	7.9	0.074	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0046	0.015	0.05	0.0045	0.2	53	0.018	0.000005	0.053	0.016	0.13	11	0.053	1.3	0.000038	1,095	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2106	8.8	1,577	1,935	7.9	0.074	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0046	0.015	0.05	0.0044	0.2	53	0.018	0.000005	0.053	0.016	0.13	11	0.053	1.3	0.000038	1,095	0.63	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2107	8.8	1,574	1,939	7.9	0.075	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0046	0.015	0.05	0.0044	0.2	53	0.018	0.000005	0.053	0.015	0.13	11	0.053	1.3	0.000038	1,094	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2108	8.8	1,571	1,946	7.9	0.075	0.0028	0.0022	0.0026	0.36	0.00005	2.6	0.0005	0.0045	0.015	0.05	0.0044	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.052	1.3	0.000038	1,094	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2109	8.8	1,569	1,948	7.9	0.075	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0045	0.015	0.05	0.0043	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.052	1.3	0.000038	1,093	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2110	8.8	1,566	1,951	7.9	0.075	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0044	0.015	0.05	0.0043	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.051	1.3	0.000037	1,092	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623
2111	8.8	1,564	1,955	7.9	0.075	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0044	0.015	0.05	0.0042	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.051	1.3	0.000037	1,092	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,098
2112	8.8	1,562	1,957	7.9	0.076	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0044	0.015	0.05	0.0042	0.2	54	0.017	0.000005	0.053	0.015	0.13	11	0.05	1.3	0.000037	1,091	0.63	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,800
2113	8.8	1,561	1,958	7.9	0.076	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0042	0.2	54	0.017	0.000005	0.053	0.015	0.13	11	0.05	1.3	0.000037	1,091	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,142
2114	8.8	1,560	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.015	0.13	11	0.05	1.3	0.000037	1,091	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,911
2115	8.8	1,559	1,964	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,091	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2116	8.8	1,558	1,965	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,091	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2117	8.8	1,558	1,965	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,090	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2118	8.8	1,557	1,966	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,091	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	400,659
2119	8.8	1,557	1,965	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,090	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	400,865
2120	8.8	1,557	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,623
2121	8.8	1,557	1,963	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,090	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,098
2122	8.8	1,556	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.63	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	402,800
2123	8.8	1,556	1,958	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	402,142
2124	8.8	1,556	1,959	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,911
2125	8.8	1,556	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,364
2126	8.8	1,556	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.63	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	402,265
2127	8.8	1,555	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2128	8.8	1,555	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2129	8.8	1,555	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2130	8.8	1,555	1,956	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623
2131	8.8	1,554	1,958	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,098
2132	8.8	1,554	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,800
2133	8.8	1,554	1,953	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,142
2134	8.8	1,554	1,954	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,911

Table A1. Source terms of the NAG backfill for the poorly graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	8.8	1,554	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2136	8.8	1,553	1,956	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2137	8.8	1,553	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2138	8.8	1,553	1,956	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2139	8.8	1,553	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2140	8.8	1,552	1,951	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623
2141	8.8	1,552	1,953	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,098
2142	8.8	1,552	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,800
2143	8.8	1,552	1,948	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,142
2144	8.8	1,552	1,949	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,911
2145	8.8	1,552	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2146	8.8	1,551	1,951	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2147	8.8	1,551	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2148	8.8	1,551	1,951	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2149	8.8	1,550	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,084	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2150	8.8	1,550	1,947	7.9	0.075	0.0027	0.002	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,083	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623

Table A2. Annual loads of the NAG backfill for the poorly graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	20	1.5	0.19	0.0002	0.000034	0.000019	0.000037	0.0086	0.00000065	0.45	0.0000081	0.000092	0.000016	0.00081	0.0000016	0.0047	0.33	0.00054	0.00	0.00066	0.00012	0.003	0.27	0.0018	0.031	0.00000047	8.5	0.015	0.00000047	0.0000081	0.00021	0.000028	0.00007	1.1	0.13	0.024	16
2024	40	3.1	0.38	0.0004	0.00007	0.00004	0.000076	0.017	0.0000013	0.92	0.000017	0.00019	0.000033	0.0016	0.0000033	0.0096	0.67	0.0011	0.00000016	0.0013	0.00025	0.0061	0.55	0.0036	0.064	0.00000096	17	0.031	0.00000096	0.000016	0.00043	0.000058	0.00014	2.2	0.27	0.05	33
2025	69	5.4	0.67	0.0007	0.00012	0.000069	0.00013	0.03	0.0000023	1.6	0.000029	0.00033	0.000058	0.0029	0.0000058	0.017	1.2	0.0019	0.00000029	0.0023	0.00043	0.011	0.95	0.0063	0.11	0.0000017	30	0.054	0.0000017	0.000029	0.00074	0.0001	0.00025	3.8	0.48	0.086	57
2026	106	8.2	1.0	0.0011	0.00019	0.00011	0.0002	0.046	0.0000035	2.4	0.000044	0.0005	0.000088	0.0044	0.0000088	0.025	1.8	0.0029	0.00000044	0.0036	0.00065	0.016	1.5	0.0097	0.17	0.0000025	46	0.082	0.0000025	0.000044	0.0011	0.00015	0.00038	5.7	0.72	0.13	87
2027	141	11	1.3	0.0014	0.00025	0.00014	0.00027	0.062	0.0000047	3.2	0.000058	0.00067	0.00012	0.0058	0.000012	0.034	2.3	0.0039	0.00000058	0.0047	0.00086	0.022	1.9	0.013	0.22	0.0000034	62	0.11	0.0000034	0.000058	0.0015	0.0002	0.0005	7.6	0.96	0.17	116
2028	236	18	2.3	0.0024	0.00042	0.00024	0.00045	0.1	0.0000078	5.4	0.000098	0.0011	0.0002	0.0098	0.00002	0.057	3.9	0.0066	0.00000098	0.008	0.0015	0.036	3.2	0.022	0.38	0.0000057	103	0.18	0.0000057	0.000098	0.0025	0.00034	0.00084	13	1.6	0.29	195
2029	267	21	2.6	0.0027	0.00047	0.00027	0.00051	0.12	0.0000089	6.1	0.00011	0.0013	0.00022	0.011	0.000022	0.064	4.5	0.0074	0.0000011	0.009	0.0016	0.041	3.7	0.024	0.43	0.0000064	117	0.21	0.0000064	0.00011	0.0029	0.00039	0.00095	14	1.8	0.33	221
2030	321	25	3.1	0.0032	0.00057	0.00032	0.00061	0.14	0.000011	7.4	0.00013	0.0015	0.00027	0.013	0.000027	0.077	5.4	0.0089	0.0000013	0.011	0.002	0.049	4.4	0.029	0.51	0.0000077	141	0.25	0.0000077	0.00013	0.0034	0.00046	0.0011	17	2.2	0.4	266
2031	1,162	91	11	0.012	0.002	0.0012	0.0022	0.51	0.000039	27	0.00048	0.0055	0.00096	0.048	0.000096	0.28	19	0.032	0.0000048	0.039	0.0071	0.18	16	0.11	1.9	0.000028	509	0.9	0.000028	0.00048	0.012	0.0017	0.0041	63	8.0	1.4	961
2032	2,750	214	26	0.028	0.0048	0.0027	0.0052	1.2	0.000091	63	0.0011	0.013	0.0023	0.11	0.00023	0.66	46	0.076	0.000011	0.093	0.017	0.42	38	0.25	4.4	0.000066	1,204	2.1	0.000066	0.0011	0.029	0.004	0.0098	149	19	3.4	2,273
2033	859	67	8.2	0.0086	0.0015	0.00086	0.0016	0.38	0.000028	20	0.00036	0.0041	0.00071	0.036	0.000071	0.21	14	0.024	0.0000036	0.029	0.0053	0.13	12	0.078	1.4	0.000021	376	0.66	0.000021	0.00036	0.0092	0.0012	0.0031	46	5.9	1.1	710
2034	1,559	121	15	0.016	0.0027	0.0016	0.003	0.68	0.000052	36	0.00065	0.0074	0.0013	0.064	0.00013	0.37	26	0.043	0.0000064	0.052	0.0096	0.24	21	0.14	2.5	0.000037	682	1.2	0.000037	0.00064	0.017	0.0023	0.0056	84	11	1.9	1,289
2035	3,332	260	32	0.033	0.0059	0.0033	0.0063	1.5	0.00011	77	0.0014	0.016	0.0028	0.14	0.00028	0.8	56	0.093	0.000014	0.11	0.02	0.51	46	0.3	5.3	0.00008	1,459	2.6	0.00008	0.0014	0.036	0.0048	0.012	180	23	4.1	2,755
2036	8,174	637	78	0.082	0.014	0.0081	0.016	3.6	0.00027	188	0.0034	0.039	0.0068	0.34	0.00068	2.0	137	0.23	0.000034	0.28	0.05	1.3	112	0.75	13	0.0002	3,579	6.3	0.0002	0.0034	0.087	0.012	0.029	442	56	10	6,758
2037	36,319	2,829	349	0.36	0.064	0.036	0.069	16	0.0012	835	0.015	0.17	0.03	1.5	0.003	8.7	607	1.0	0.00015	1.2	0.22	5.6	499	3.3	58	0.00087	15,900	28	0.00087	0.015	0.39	0.053	0.13	1,966	249	45	30,026
2038	114,469	8,916	1,099	1.1	0.2	0.11	0.22	50	0.0038	2,631	0.047	0.54	0.095	4.7	0.0095	28	1,914	3.2	0.00047	3.9	0.7	18	1,572	10	183	0.0027	50,111	88	0.0028	0.047	1.2	0.17	0.41	6,195	783	142	94,634
2039	294,759	108,602	2,074	3.9	0.52	0.27	0.38	95	0.0072	3,692	0.09	1.2	0.35	8.9	0.19	52	5,595	6.7	0.00089	9.9	2.0	33	2,968	22	346	0.0071	151,047	167	0.0071	0.089	3.1	0.43	1.2	5,376	680	124	178,458
2040	375,606	170,679	3,171	6.4	0.66	0.39	0.64	145	0.011	4,853	0.14	1.2	1.9	14	0.37	79	7,282	6.4	0.0014	13	2.3	51	4,538	20	529	0.009	199,379	255	0.009	0.14	4.0	0.54	1.4	6,406	810	147	272,969
2041	498,712	255,334	3,172	9.3	0.88	0.5	0.78	145	0.014	4,424	0.17	1.4	2.7	17	0.54	79	9,903	7.2	0.0017	17	2.9	51	4,539	23	529	0.012	273,283	255	0.012	0.17	5.3	0.72	1.8	2,699	341	62	338,914
2042	396,987	246,288	3,170	9.5	0.7	0.44	0.89	145	0.014	4,317	0.17	0.81	2.7	17	0.51	79	8,082	3.8	0.0017	13	2.1	51	4,537	11	529	0.0095	226,085	255	0.0095	0.17	4.2	0.57	1.4	3,408	431	78	343,355
2043	435,552	270,005	3,171	10	0.77	0.48	0.86	145	0.014	3,874	0.17	0.99	2.8	17	0.57	79	8,919	4.7	0.0017	15	2.5	51	4,538	14	529	0.01	248,909	255	0.01	0.17	4.7	0.63	1.6	3,841	486	88	345,155
2044	434,078	270,470	3,171	10	0.77	0.49	0.84	145	0.014	3,704	0.17	1.0	2.8	17	0.63	79	8,909	4.7	0.0017	15	2.6	51	4,538	14	529	0.01	248,527	255	0.01	0.17	4.6	0.63	1.7	1,031	130	24	339,203
2045	419,201	253,400	3,171	9.5	0.74	0.45	0.76	145	0.013	3,387	0.16	0.72	2.6	16	0.65	79	8,520	2.9	0.0016	14	2.3	51	4,539	8.4	529	0.01	238,585	255	0.01	0.16	4.5	0.61	1.5	607	77	14	312,231
2046	429,085	249,341	3,172	9.2	0.76	0.47	0.71	145	0.012	3,257	0.15	0.8	2.5	15	0.72	79	8,673	3.3	0.0015	14	2.6	51	4,539	9.4	529	0.01	242,238	255	0.01	0.15	4.6	0.62	1.7	703	89	16	301,366
2047	462,700	255,572	3,172	9.3	0.82	0.5	0.69	145	0.012	3,275	0.15	0.91	2.6	15	0.81	79	9,280	3.7	0.0015	16	2.9	51	4,540	11	529	0.011	258,595	255	0.011	0.15	4.9	0.67	1.9	851	108	20	302,616
2048	475,079	257,244	3,172	9.3	0.84	0.52	0.69	145	0.012	3,367	0.15	0.96	2.6	15	0.85	80	9,496	4.0	0.0015	16	3.1	51	4,540	12	529	0.011	264,392	255	0.011	0.15	5.1	0.69	2.0	1,024	129	24	305,970
2049	481,735	257,436	3,172	9.3	0.85	0.53	0.69	145	0.012	3,453	0.15	1.	2.6	15	0.87	80	9,605	4.1	0.0015	16	3.2	51	4,541	12	529	0.012	267,313	255	0.012	0.15	5.1	0.7	2.0	1,149	145	26	308,547
2050	495,931	266,156	3,173	9.6	0.87	0.55	0.7	145	0.013	3,386	0.16	1.1	2.7	16	0.93	80	9,905	4.4	0.0016	17	3.4	51	4,541	13	529	0.012	275,624	255	0.012	0.16	5.3	0.72	2.2	1,211	153	28	311,965
2051	506,546	269,609	3,173	9.7	0.89	0.57	0.7	145	0.013	3,451	0.16	1.1	2.7	16	0.98	80	10,108	4.7	0.0016	17	3.6	51	4,541	14	529	0.012	281,043	255	0.012	0.16	5.4	0.73	2.3	1,365	173	31	316,216
2052	519,492	272,711	3,173	9.8	0.92	0.59	0.71	145	0.013	3,560	0.16	1.2	2.8	16	1.0	80	10,331	5.1	0.0016	17	3.8	51	4,541	15	529	0.012	287,399	255	0.012	0.16	5.5	0.75	2.4	1,641	208	38	321,547
2053	527,425	272,692	3,173	9.8	0.93	0.61	0.72	145	0.013	3,677	0.16	1.3	2.8	16	1.1	80	10,460	5.3	0.0016	18	4.0	51	4,541	16	529	0.013	290,813	255	0.013	0.16	5.6	0.76	2.5	1,793	227	41	324,989
2054	541,271	279,264	3,173	10.0	0.95	0.62	0.73	145	0.013	3,726	0.17	1.3	2.8	17	1.1	80	10,735	5.4	0.0017	18	4.1	51	4,541	16	529	0.013	298,374	255	0.013	0.17	5.8	0.78	2.6	1,681	212	39	331,093
2055	549,412	281,438	3,173	10	0.97	0.64	0.74	145	0.013	3,827	0.17	1.3	2.9	17	1.1	80	10,886	5.5	0.0017	18	4.2	51	4,541	16	529	0.013	302,375	255	0.013	0.17	5.9	0.79	2.7	1,677	212	39	335,909
2056	567,386	292,614	3,173	10	1.0	0.66	0.75	145	0.014	3,782	0.17	1.4	3.0	17	1.2	80	11,257	5.8	0.0017	19	4.4	51	4,541	17	529	0.014	312,895	255	0.014	0.17	6.1	0.82	2.8	1,883	238	43	342,067
2057	577,274	295,022	3,173	10	1.0	0.68	0.75	145	0.014	3,843	0.17	1.5	3.0	17	1.2	80	11,440	6.2	0.0017	19	4.6	51	4,541	18	529	0.014	317,753	255	0.014	0.17	6.2	0.83	2.9	2,140	271	49	345,301
2058	585,688	296,388	3,173	11	1.0	0.7	0.76	145	0.014	3,914	0.18	1.5	3.0	17	1.3	80	11,577	6.4	0.0017	20	4.8	51	4,541	19	529	0.014	321,759	255	0.014	0.17	6.3	0.85	3.0	2,290	289	53	348,168
2059	599,004	301,717	3,173	11	1.1	0.72	0.76	145	0.014	3,937	0.18	1.6	3.1	18	1.3	80	11,834	6.7	0.0018	20	5.0	51	4,541	20	529	0.014	328,850	255	0.014	0.18	6.4	0.87	3.1	2,259	286	52	352,107
2060	614,185	309,045	3,173	11	1.1	0.74	0.76	145	0.014	3,924	0.18	1.7	3.1	18	1.4	80	12,138	7.0	0.0018	21	5.2	51	4,542	20	529	0.015	337,224	255	0.015	0.18	6.6	0.89	3.3	2,342	296	54	356,256
2061	623,220	310,786	3,173	11	1.1	0.77	0.76	145	0.014	3,961	0.19	1.7	3.1	18	1.5	80	12,296	7.2	0.0018	21	5.4	51	4,542	21	529	0.015	341,621	255	0.015	0.18	6.7	0.9	3.4	2,238	283	51	358,049
2062	629,113	320,078	3,174	11	1.1	0.78	0.77	145	0.014	3,848	0.19	1.7	3.2	18	1.5	80	12,494	7.3	0.0018	21	5.6	51	4,542	21	529	0.015	346,334	255	0.015	0.18	6.7	0.91	3.5	2,049	259	47	361,103
2063	637,217	323,857	3,174	11	1.1	0.8	0.78	145	0.015	3,851	0.19	1.8	3.2	18	1.6	80	12,682	7.4	0.0018	21	5.8	51	4,542	22	529	0.015	350,709	255	0.015	0.18	6.8	0.92	3.6	1,868	236	43	363,501
2064	645,763	328,913	3,174	12	1.1	0.82	0.78	145	0.015	3,857	0.19	1.8	3.3	18	1.6	80	12,901	7.6	0.0018	22	5.9	51	4,542	22	529	0.015	355,546	255	0.016	0.18	6.9	0.93	3.7	1,941	245	45	367,099
2065	653,279	330,460	3,174	12	1.2	0.84	0.78	145	0.015	3,897	0.2	1.9	3.3	18	1.7	80	13,064	7.9	0.0018	22	6.1	51	4,542	23	529	0.016	359,150	255	0.016	0.18	7.0	0.94	3.8	2,035	257	47	369,105
2066	665,895	338,047	3,174	12	1.2	0.86	0.79	145	0.015	3,846	0.2	2.0	3.4	19	1.7	80	13,365	8.1	0.0019	22	6.3	51	4,543	24	529	0.016	366,415	255	0.016	0.19	7.1	0.96	3.9	2,170	274	50	371,946
2067	669,364	357,055	3,174	13	1.2	0.87	0.8	145	0.015	3,559	0.2	2.0	3.5	19	1.7	80	13,668	8.3	0.0019	23	6.4	51	4,543	24	529	0.016	372,203	255	0.016	0.19	7.1	0.97	4.0	2,287	289	53	374,952
2068	676,528	366,985	3,174	13	1.2	0.89	0.81	145	0.015	3,489	0.2	2.0	3.6	19	1.8	80	13,925	8.5	0.0019	23	6.5	51	4,543	25	529	0.016	377,499	255	0.016	0.19	7.2	0.98	4.1	2,343	296	54	378,901
2069	687,621	382,571	3,174	13	1.2	0.9	0.81	145	0.015	3,316	0.21	2.1	3.7	19	1.8	80	14,316	8.7	0.0019	23	6.7	51	4,543	25	529	0.016	385,850	255	0.017	0.19	7.3	0.99	4.2	2,318	293	53	381,313
2070	697,446	389,524	3,174	14	1.2	0.92	0.82	145	0.015	3,294	0.21	2.1	3.7	19	1.9	80	14,580	8.9	0.0019	23	6.8	51	4,543	26	529	0.017	391,677	255	0.017	0.19	7.4	1.0	4.3	2,264	286	52	384,374
2071	702,460	404,872	3,174	14	1.2	0.94	0.83	145	0.016	3,122	0.21	2.2	3.9	19	1.9	80	14,860	9.0	0.0019	24	7.0	51	4,543	26	529	0.017	397,261	255	0.017	0.19	7.5	1.0	4.4	2,197	278	51	386,328
2072	710,321	412,321	3,175	14	1.3	0.96	0.83	145	0.016	3,088	0.21	2.2	3.9	19	2.0	80	15,089	9.2	0.0019	24	7.2	51	4,543	27	529	0.017	402,363	255	0.017	0.19	7.6	1.0	4.5	2,195	278	50	388,982
2073	707,678	434,637	3,175	15	1.2	0.97	0.84	145	0.016	2,815	0.21	2.3	4.1	19	2.0	80	15,360	9.4	0.0019	24	7.3	51	4,544	27	529	0.017	405,978	255	0.017	0.19	7.6	1.0	4.6	2,213	280	51	389,390
2074	710,667	445,575	3,175	16	1.3	0.98	0.85	145	0.016	2,728	0.21	2.3	4.2	20	2.0	80	15,593	9.5	0.002	24	7.4	51	4,544	28	530	0.017	409,588	255	0.017	0.2	7.6	1.0	4.6	2,280	288	52	391,164
2075	711,723	457,301	3,175	16	1.3	0.98	0.85	145	0.016	2,620	0.21	2.3	4.3	20	2.0	80	15,849	9.6	0.002	24	7.5	51	4,544	28	530	0.017	412,422	255	0.017	0.2	7.6	1.0	4.7	2,342	296	54	391,961
2076	712,311	473,534	3,175	17	1.3	0.99	0.86	145	0.016	2,496	0.21	2.3	4.4	20	2.1	80	16,115	9.7	0.002	24	7.5	51	4,544	28	530	0.017	416,076	255	0.017	0.2	7.6	1.0	4.7	2,398	303	55	394,086
2077	707,438	494,792	3,175	18	1.2	0.99	0.87	145	0.016	2,312	0.21	2.3	4.6	20	2.1	80	16,390	9.7	0.002	24	7.5	51	4,544	28	530	0.017	418,346	255	0.017	0.2	7.6	1.0	4.7	2,343	296	54	394,666
2078	710,609	514,944	3,175	18	1.3	1.	0.88	145	0.016	2,183	0.21	2.3	4.7	20	2.1	80	16,746	9.7	0.002	24	7.5	51	4,545	28	530	0.017	423,948	255	0.017	0.2	7.6	1.0	4.7	2,271	287	52	396,324
2079	710,676	529,490	3,175	19	1.3	1.	0.89	145	0.016	2,093	0.21	2.3	4.9	20	2.1	80	17,035	9.6	0.002	24	7.6	51	4,545	28	530	0.017	426,858	255	0.017	0.2	7.6	1.0	4.7	2,020	255	46	397,336
2080	712,491	540,563	3,175	19	1.3	1.0	0.9	145	0.016	2,041	0.21	2.3	5.0	20	2.1	80	17,272	9.6	0.002	24	7.6	51	4,545	28	530	0.017	429,881	255	0.017	0.2	7.6	1.0	4.8	1,826	231	42	398,998
2081	713,835	547,810	3,176	20	1.3	1.0	0.9	145	0.016	2,003	0.21	2.3	5.0	20	2.1	80	17,466	9.5	0.002	24	7.7	51	4,545	28	530	0.017	431,880	255	0.017	0.2	7.6	1.0	4.8	1,502	190	35	399,482
2082	716,077	553,651	3,176	20	1.3	1.0	0.9	145	0.016	1,977	0.22	2.3	5.1	20	2.1	80	17,644	9.5	0.002	24	7.7	51	4,545	28	530	0.017	433,991	255	0.017	0.2	7.6	1.0	4.8	1,347	170	31	400,065
2083	712,212	572,301	3,176	21	1.3	1.0	0.91	145	0.016	1,868	0.21	2.3	5.2	20	2.2	80	17,882	9.5	0.002	24	7.7	51	4,545	28	530	0.017	436,075	255	0.017	0.2	7.6	1.0	4.8	1,166	147	27	400,547
2084	712,767	584,072	3,176	21	1.3	1.0	0.92	145	0.016	1,819	0.21	2.3	5.4	20	2.2	80	18,123	9.5	0.002	24	7.7	51	4,545	28	530	0.017	438,657	255	0.017	0.2	7.6	1.0	4.9	1,115	141	26	401,921
2085	710,811	593,882	3,176	22	1.3	1.0	0.92	145	0.016	1,763	0.21	2.3	5.5	20	2.2	80	18,323	9.4	0.002	24	7.8	51	4,545	27	530	0.017	439,649	255	0.017	0.2	7.6	1.0	4.9	1,067	135	25	401,543
2086	710,147	600,804	3,176	22	1.3	1.0	0.92	145	0.016	1,728	0.21	2.3	5.5	20	2.2	80	18,494	9.4	0.002	24	7.7	51	4,546	27	530	0.017	440,624	255	0.017	0.2	7.6	1.0	4.9	1,057	134	24	401,553
2087	700,533	626,419	3,176	23	1.2	1.0	0.94	145	0.016	1,598	0.21	2.3	5.8	20	2.1	80	18,766	9.3	0.002	24	7.7	51	4,546	27	530	0.017	441,555	255	0.017	0.2	7.5	1.0	4.8	1,051	133	24	401,267
2088	697,502	640,694	3,176	24	1.2	1.0	0.95	145	0.016	1,545	0.21	2.3	5.9	20	2.1	80	18,989	9.3	0.002	23	7.6	51	4,546	27	530	0.017	443,035	255	0.017	0.2	7.4	1.0	4.8	1,055	133	24	402,320
2089	690,123	652,790	3,176	24	1.2	1.0	0.95	145	0.016	1,479	0.21	2.3	6.0	20	2.1	80	19,138	9.2	0.002	23	7.5	51	4,546	27	530	0.017	442,064	255	0.017	0.2	7.4	1.	4.7	1,054	133	24	401,001
2090	687,743	660,781	3,176	24	1.2	1.0	0.96	145	0.016	1,449	0.21	2.3	6.1	20	2.1	80	19,281	9.2	0.002	23	7.5	51	4,546	27	530	0.016	442,513	255	0.017	0.2	7.3	0.99	4.7	1,054	133	24	401,227
2091	684,634	670,516	3,176	25	1.2	1.	0.96	145	0.016	1,411	0.21	2.2	6.2	20	2.1	80	19,472	9.1	0.002	23	7.5	51	4,546	27	530	0.016	442,973	255	0.016	0.2	7.3	0.99	4.7	1,048	133	24	401,098
2092	685,888	678,557	3,176	25	1.2	1.	0.97	145	0.016	1,397	0.21	2.2	6.3	20	2.1	80	19,672	9.1	0.002	23	7.5	51	4,546	26	530	0.016	445,054	255	0.016	0.2	7.3	0.99	4.7	1,038	131	24	402,800
2093	682,917	684,848	3,176	25	1.2	0.99	0.97	145	0.016	1,369	0.21	2.2	6.3	20	2.1	80	19,826	9.0	0.002	23	7.4	51	4,546	26	530	0.016	444,809	255	0.016	0.2	7.3	0.99	4.6	980	124	23	402,142
2094	681,159	690,162	3,177	26	1.2	0.99	0.98	145	0.016	1,348	0.2	2.2	6.3	20	2.1	80	19,971	8.9	0.002	23	7.3	51	4,546	26	530	0.016	444,956	255	0.016	0.2	7.3	0.98	4.6	909	115	21	401,911
2095	671,241	710,213	3,177	27	1.2	0.97	0.99	145	0.016	1,274	0.2	2.1	6.3	20	2.0	80	20,167	8.7	0.002	23	7.2	51	4,546	25	530	0.016	444,510	255	0.016	0.2	7.2	0.97	4.5	696	88	16	401,364
2096	666,795	723,032	3,177	27	1.2	0.97	1.0	145	0.016	1,240	0.2	2.1	6.3	20	2.0	80	20,371	8.5	0.002	22	7.1	51	4,546	25	530	0.016	444,986	255	0.016	0.2	7.1	0.96	4.5	576	73	13	402,265
2097	657,837	733,381	3,177	28	1.2	0.95	1.0	145	0.016	1,197	0.2	2.1	6.2	20	2.0	80	20,489	8.3	0.002	22	6.9	51	4,546	24	530	0.016	442,877	255	0.016	0.2	7.0	0.95	4.4	411	52	9.5	401,193
2098	652,273	741,179	3,177	28	1.2	0.94	1.0	145	0.016	1,169	0.2	2.0	6.2	20	1.9	80	20,624	8.1	0.002	22	6.8	51	4,547	23	530	0.016	441,807	255	0.016	0.2	7.0	0.94	4.3	329	42	7.6	400,659
2099	647,798	748,976	3,177	29	1.1	0.92	1.0	145	0.016	1,147	0.2	2.0	6.2	20	1.9	80	20,750	7.9	0.002	22	6.7	51	4,547	23	530	0.016	441,232	255	0.016	0.2	6.9	0.94	4.2	248	31	5.7	400,865
2100	645,730	755,011	3,177	29	1.1	0.91	1.0	145	0.016	1,135	0.2	1.9	6.2	20	1.9	80	20,887	7.8	0.002	22	6.6	51	4,547	22	530	0.015	441,384	255	0.016	0.2	6.9	0.93	4.2	218	28	5.0	401,623
2101	641,637	760,241	3,177	29	1.1	0.9	1.0	145	0.016	1,116	0.2	1.9	6.2	20	1.8	80	20,974	7.7	0.002	22	6.5	51	4,547	22	530	0.015	440,486	255	0.015	0.2	6.9	0.93	4.1	195	25	4.5	401,098
2102	642,144	766,206	3,177	29	1.1	0.9	1.0	145	0.016	1,112	0.2	1.9	6.2	20	1.8	80	21,122	7.6	0.002	22	6.5	51	4,547	22	530	0.015	441,791	255	0.015	0.2	6.9	0.93	4.1	189	24	4.3	402,800
2103	638,762	768,332	3,177	29	1.1	0.89	1.0	145	0.016	1,101	0.2	1.9	6.2	20	1.8	80	21,156	7.5	0.002	21	6.4	51	4,547	22	530	0.015	440,627	255	0.015	0.2	6.8	0.92	4.0	184	23	4.2	402,142
2104	637,029	770,544	3,177	30	1.1	0.89	1.0	145	0.016	1,093	0.2	1.9	6.1	20	1.8	80	21,202	7.5	0.002	21	6.4	51	4,547	22	530	0.015	440,213	255	0.015	0.2	6.8	0.92	4.0	183	23	4.2	401,911
2105	634,436	773,348	3,177	30	1.1	0.88	1.0	145	0.016	1,082	0.2	1.9	6.1	20	1.8	80	21,261	7.4	0.002	21	6.3	51	4,547	21	530	0.015	439,533	255	0.015	0.2	6.8	0.92	4.0	183	23	4.2	401,364
2106	634,252	778,182	3,177	30	1.1	0.88	1.1	145	0.016	1,076	0.2	1.8	6.1	20	1.8	80	21,388	7.4	0.002	21	6.3	51	4,547	21	530	0.015	440,320	255	0.015	0.2	6.8	0.92	4.0	183	23	4.2	402,265
2107	631,558	777,713	3,177	30	1.1	0.87	1.0	145	0.016	1,069	0.2	1.8	6.1	20	1.8	80	21,379	7.3	0.002	21	6.2	51	4,547	21	530	0.015	438,946	255	0.015	0.2	6.7	0.91	3.9	182	23	4.2	401,193
2108	629,475	779,602	3,177	30	1.1	0.87	1.1	145	0.016	1,060	0.2	1.8	6.1	20	1.7	80	21,435	7.2	0.002	21	6.1	51	4,547	21	530	0.015	438,281	255	0.015	0.2	6.7	0.91	3.9	182	23	4.2	400,659
2109	628,837	780,965	3,177	30	1.1	0.86	1.1	145	0.016	1,058	0.2	1.8	6.1	20	1.7	80	21,484	7.2	0.002	21	6.1	51	4,547	21	530	0.015	438,226	255	0.015	0.2	6.7	0.91	3.9	182	23	4.2	400,865
2110	628,942	783,406	3,177	30	1.1	0.86	1.1	145	0.016	1,057	0.2	1.8	6.1	20	1.7	80	21,576	7.1	0.002	21	6.0	51	4,547	21	530	0.015	438,653	255	0.015	0.2	6.7	0.91	3.8	182	23	4.2	401,623
2111	627,438	784,267	3,177	30	1.1	0.85	1.1	145	0.016	1,051	0.2	1.8	6.0	20	1.7	80	21,607	7.1	0.002	21	6.0	51	4,547	20	530	0.015	438,079	255	0.015	0.2	6.7	0.91	3.8	182	23	4.2	401,098
2112	629,133	788,360	3,177	30	1.1	0.85	1.1	145	0.016	1,053	0.2	1.8	6.0	20	1.7	80	21,747	7.0	0.002	21	5.9	51	4,547	20	530	0.015	439,576	255	0.015	0.2	6.7	0.91	3.8	183	23	4.2	402,800
2113	627,623	787,273	3,177	30	1.1	0.84	1.1	145	0.016	1,051	0.2	1.7	6.0	20	1.7	80	21,735	7.0	0.002	21	5.9	51	4,547	20	530	0.015	438,616	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	402,142
2114	626,780	788,067	3,177	30	1.1	0.84	1.1	145	0.016	1,047	0.2	1.7	6.0	20	1.7	80	21,771	6.9	0.002	21	5.8	51	4,547	20	530	0.015	438,324	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	401,911
2115	625,566	788,198	3,177	30	1.1	0.83	1.1	145	0.016	1,043	0.2	1.7	6.0	20	1.7	80	21,780	6.9	0.002	21	5.8	51	4,547	20	530	0.015	437,767	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,364
2116	626,770	790,411	3,177	31	1.1	0.84	1.1	145	0.016	1,044	0.2	1.7	6.0	20	1.7	80	21,843	6.9	0.002	21	5.8	51	4,547	20	530	0.015	438,711	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	402,265
2117	624,858	788,305	3,177	30	1.1	0.83	1.1	145	0.016	1,041	0.2	1.7	6.0	20	1.6	80	21,788	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,421	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,193
2118	623,986	787,695	3,177	30	1.1	0.83	1.1	145	0.016	1,039	0.2	1.7	6.0	20	1.6	80	21,770	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,918	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	400,659
2119	624,107	787,540	3,177	30	1.1	0.83	1.1	145	0.016	1,041	0.2	1.7	6.0	20	1.6	80	21,769	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,943	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	400,865
2120	625,207	787,703	3,177	30	1.1	0.83	1.1	145	0.016	1,045	0.2	1.7	6.0	20	1.6	80	21,784	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,448	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,623
2121	624,349	787,235	3,177	30	1.1	0.83	1.1	145	0.016	1,043	0.2	1.7	6.0	20	1.6	80	21,766	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,996	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,098
2122	626,837	789,528	3,177	31	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,836	6.8	0.002	21	5.8	51	4,547	20	530	0.015	438,569	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	402,800
2123	625,773	787,515	3,177	30	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,784	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,691	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	402,142
2124	625,374	787,183	3,177	30	1.1	0.83	1.1	145	0.016	1,048	0.2	1.7	6.0	20	1.6	80	21,773	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,440	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	401,911
2125	624,482	786,753	3,177	30	1.1	0.83	1.1	145	0.016	1,045	0.2	1.7	6.0	20	1.6	80	21,754	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,965	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,364
2126	625,764	788,681	3,177	30	1.1	0.83	1.1	145	0.016	1,047	0.2	1.7	6.0	20	1.6	80	21,804	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,906	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	402,265
2127	623,976	786,379	3,177	30	1.1	0.83	1.1	145	0.016	1,045	0.2	1.7	6.0	20	1.6	80	21,742	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,659	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,193
2128	623,065	785,732	3,177	30	1.1	0.83	1.1	145	0.016	1,042	0.2	1.7	6.0	20	1.6	80	21,721	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,117	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	400,659
2129	623,185	785,535	3,177	30	1.1	0.83	1.1	145	0.016	1,044	0.2	1.7	6.0	20	1.6	80	21,717	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,141	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	400,865
2130	624,323	785,735	3,177	30	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,732	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,685	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,623
2131	623,467	785,230	3,177	30	1.1	0.83	1.1	145	0.016	1,046	0.2	1.7	6.0	20	1.6	80	21,713	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,194	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,098
2132	625,992	787,555	3,177	30	1.1	0.83	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,783	6.8	0.002	21	5.7	51	4,547	20	530	0.015	437,803	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	402,800
2133	624,888	785,504	3,177	30	1.1	0.83	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,731	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,887	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,142
2134	624,530	785,214	3,177	30	1.1	0.83	1.1	145	0.016	1,051	0.2	1.7	6.0	20	1.6	80	21,720	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,676	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	401,911

Table A2. Annual loads of the NAG backfill for the poorly graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	623,599	784,746	3,177	30	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,701	6.8	0.002	21	5.7	51	4,547	19	530	0.015	436,162	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,364
2136	624,879	786,710	3,177	30	1.1	0.83	1.1	145	0.016	1,050	0.2	1.7	6.0	20	1.6	80	21,751	6.8	0.002	21	5.7	51	4,547	20	530	0.015	437,142	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,265
2137	623,093	784,413	3,177	30	1.1	0.83	1.1	145	0.016	1,048	0.2	1.7	6.0	20	1.6	80	21,688	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,856	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,193
2138	622,223	783,769	3,177	30	1.1	0.82	1.1	145	0.016	1,046	0.2	1.7	6.0	20	1.6	80	21,667	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,356	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,659
2139	622,343	783,571	3,177	30	1.1	0.82	1.1	145	0.016	1,047	0.2	1.7	6.0	20	1.6	80	21,664	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,380	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,865
2140	623,439	783,727	3,177	30	1.1	0.83	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,678	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,922	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,623
2141	622,625	783,264	3,177	30	1.1	0.82	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,660	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,432	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,098
2142	625,105	785,541	3,177	30	1.1	0.83	1.1	145	0.016	1,056	0.2	1.7	6.0	20	1.6	80	21,729	6.8	0.002	21	5.7	51	4,547	19	530	0.015	436,998	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,800
2143	624,044	783,533	3,177	30	1.1	0.83	1.1	145	0.016	1,056	0.2	1.7	6.0	20	1.6	80	21,677	6.7	0.002	21	5.7	51	4,547	19	530	0.015	436,123	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,142
2144	623,645	783,204	3,177	30	1.1	0.83	1.1	145	0.016	1,055	0.2	1.7	6.0	20	1.6	80	21,666	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,873	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	401,911
2145	622,716	782,740	3,177	30	1.1	0.82	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,647	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,399	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,364
2146	623,994	784,699	3,177	30	1.1	0.83	1.1	145	0.016	1,054	0.2	1.7	6.0	20	1.6	80	21,697	6.7	0.002	21	5.7	51	4,547	19	530	0.015	436,337	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,265
2147	622,211	782,407	3,177	30	1.1	0.82	1.1	145	0.016	1,051	0.2	1.7	6.0	20	1.6	80	21,635	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,094	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,193
2148	621,342	781,766	3,177	30	1.1	0.82	1.1	145	0.016	1,049	0.2	1.7	5.9	20	1.6	80	21,614	6.7	0.002	21	5.7	51	4,547	19	530	0.015	434,555	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,659
2149	621,461	781,567	3,177	30	1.1	0.82	1.1	145	0.016	1,051	0.2	1.7	5.9	20	1.6	80	21,611	6.7	0.002	21	5.7	51	4,547	19	530	0.015	434,578	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,865
2150	622,596	781,759	3,177	30	1.1	0.82	1.1	145	0.016	1,055	0.2	1.7	6.0	20	1.6	80	21,625	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,118	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,623

Table A3. Source terms of the NAG backfill for the well graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	16
2024	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	33
2025	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	57
2026	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	87
2027	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	116
2028	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	195
2029	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	221
2030	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	266
2031	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	961
2032	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,273
2033	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	710
2034	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	1,284
2035	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	10,477
2036	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	19,356
2037	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	14,018
2038	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	27,168
2039	8.1	1,311	237	27	0.015	0.0023	0.0013	0.0023	1.2	0.00005	31	0.0005	0.006	0.0012	0.05	0.00032	0.68	23	0.035	0.000005	0.044	0.0082	0.44	39	0.11	4.6	0.000031	601	2.2	0.000032	0.0005	0.014	0.005	0.01	65	3.8	0.69	48,784
2040	8.2	1,499	470	27	0.018	0.0026	0.0015	0.0022	1.2	0.00005	32	0.0005	0.0065	0.0017	0.05	0.00084	0.68	28	0.037	0.000005	0.05	0.01	0.44	39	0.12	4.6	0.000036	735	2.2	0.000036	0.0005	0.016	0.005	0.01	65	3.0	0.54	85,906
2041	8.4	1,703	762	27	0.027	0.003	0.0016	0.0021	1.2	0.00005	14	0.00051	0.0055	0.0058	0.05	0.0017	0.69	33	0.029	0.000005	0.057	0.011	0.44	39	0.094	4.6	0.000041	909	2.2	0.000041	0.0005	0.018	0.005	0.01	44	1.0	0.18	116,049
2042	8.5	1,409	792	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005	0.003	0.0082	0.05	0.002	0.6	28	0.014	0.000005	0.047	0.008	0.39	34	0.042	4.0	0.000034	788	1.9	0.000034	0.0005	0.015	0.005	0.01	12	1.3	0.23	131,728
2043	8.4	1,372	778	23	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.0005	0.0027	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.37	33	0.034	3.9	0.000033	768	1.9	0.000033	0.0005	0.015	0.005	0.01	6.9	1.4	0.26	135,614
2044	8.4	1,350	755	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	12	0.0005	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.034	3.8	0.000032	752	1.8	0.000032	0.0005	0.014	0.005	0.01	6.9	0.38	0.07	137,918
2045	8.5	1,400	788	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	3.9	0.000034	783	1.9	0.000034	0.0005	0.015	0.005	0.01	8.2	0.25	0.045	134,843
2046	8.5	1,458	800	24	0.029	0.0026	0.0016	0.0023	1.1	0.00005	12	0.0005	0.0032	0.0083	0.05	0.0023	0.61	29	0.014	0.000005	0.049	0.009	0.39	35	0.043	4.1	0.000035	811	2.0	0.000035	0.0005	0.016	0.005	0.01	9.7	0.29	0.054	129,640
2047	8.5	1,576	822	25	0.03	0.0028	0.0017	0.0022	1.1	0.00005	12	0.0005	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.39	35	0.044	4.1	0.000038	869	2.0	0.000038	0.0005	0.017	0.005	0.01	6.2	0.36	0.065	128,811
2048	8.5	1,713	861	24	0.03	0.003	0.0019	0.0022	1.1	0.00005	11	0.00051	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041	939	2.0	0.000041	0.0005	0.018	0.005	0.01	5.8	0.42	0.077	130,391
2049	8.5	1,776	893	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.00053	0.0045	0.0089	0.05	0.0038	0.6	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043	975	1.9	0.000043	0.0005	0.019	0.005	0.01	6.3	0.47	0.086	131,655
2050	8.5	1,804	902	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00054	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043	989	1.9	0.000043	0.0005	0.019	0.005	0.01	5.3	0.49	0.089	133,193
2051	8.5	1,817	903	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00055	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	3.9	0.000044	995	1.9	0.000044	0.0005	0.019	0.005	0.01	4.1	0.55	0.099	134,254
2052	8.5	1,827	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.062	0.016	0.37	34	0.057	3.9	0.000044	1,000	1.9	0.000044	0.0005	0.02	0.005	0.01	2.6	0.65	0.12	135,292
2053	8.5	1,837	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.37	34	0.057	3.9	0.000044	1,004	1.9	0.000044	0.0005	0.02	0.005	0.01	1.4	0.7	0.13	135,311
2054	8.5	1,840	903	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044	1,006	1.9	0.000044	0.0005	0.02	0.005	0.01	1.1	0.64	0.12	135,939
2055	8.5	1,851	902	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.00056	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044	1,010	1.9	0.000045	0.0005	0.02	0.005	0.011	1.1	0.63	0.11	136,744
2056	8.6	1,807	1,101	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.00054	0.0049	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043	1,036	1.9	0.000043	0.0005	0.019	0.005	0.01	1.3	0.7	0.13	137,789
2057	8.7	1,730	1,420	23	0.052	0.003	0.0022	0.0023	1.1	0.00005	4.7	0.00052	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041	1,070	1.8	0.000042	0.0005	0.018	0.005	0.01	1.5	0.78	0.14	138,099
2058	8.7	1,684	1,602	23	0.059	0.003	0.0021	0.0024	1.0	0.00005	3.8	0.00051	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004	1,088	1.8	0.00004	0.0005	0.018	0.005	0.01	1.7	0.83	0.15	138,393
2059	8.7	1,671	1,663	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004	1,094	1.8	0.00004	0.0005	0.018	0.005	0.01	2.0	0.81	0.15	138,657
2060	8.7	1,670	1,675	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004	1,096	1.8	0.00004	0.0005	0.018	0.005	0.01	2.3	0.83	0.15	139,741
2061	8.7	1,673	1,672	23	0.062	0.003	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	32	0.049	3.8	0.00004	1,097	1.8	0.00004	0.0005	0.018	0.005	0.01	2.6	0.79	0.14	140,084
2062	8.8	1,663	1,742	23	0.07	0.0029	0.002	0.0025	1.0	0.00005	3.1	0.0005	0.0041	0.014	0.05	0.0037	0.56	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004	1,107	1.8	0.00004	0.0005	0.018	0.005	0.01	3.0	0.72	0.13	140,942
2063	8.8	1,642	1,814	22	0.077	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005	0.004	0.014	0.05	0.0036	0.56	45	0.017	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,113	1.8	0.000039	0.0005	0.018	0.005	0.01	3.3	0.65	0.12	141,850
2064	8.8	1,636	1,828	22	0.076	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005	0.004	0.014	0.05	0.0036	0.56	45	0.017	0.000005	0.055	0.013	0.35	32	0.046	3.7	0.000039	1,113	1.8	0.000039	0.0005	0.017	0.005	0.01	3.8	0.67	0.12	143,090
2065	8.9	1,636	1,899	22	0.094	0.0029	0.0019	0.0026	1.0	0.00005	2.4	0.0005	0.004	0.014	0.05	0.0035	0.55	46	0.016	0.000005	0.055	0.013	0.35	32	0.046	3.7	0.000039	1,128	1.8	0.000039	0.0005	0.017	0.005	0.01	4.2	0.7	0.13	143,729
2066	8.9	1,609	1,986	22	0.11	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.0005	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.046	3.7	0.000039	1,134	1.8	0.000039	0.0005	0.017	0.005	0.01	4.6	0.74	0.13	144,914
2067	8.9	1,589	2,043	22	0.11	0.0028	0.0019	0.0027	0.99	0.00005	2.0	0.0005	0.0039	0.013	0.05	0.0033	0.54	47	0.016	0.000005	0.053	0.012	0.35	31	0.045	3.6	0.000038	1,137	1.7	0.000038	0.0005	0.017	0.005	0.01	5.1	0.77	0.14	146,084
2068	8.9	1,583	2,073	22	0.11	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038	1,140	1.7	0.000038	0.0005	0.017	0.005	0.01	5.5	0.78	0.14	147,667
2069	8.9	1,580	2,092	21	0.11	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038	1,141	1.7	0.000038	0.0005	0.017	0.005	0.01	5.9	0.77	0.14	148,435
2070	8.9	1,584	2,093	21	0.11	0.0028	0.0019	0.0027	0.97	0.00005	2.0	0.0005	0.0039	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.046	3.5	0.000038	1,143	1.7	0.000038	0.0005	0.017	0.005	0.01	6.0	0.74	0.14	149,714
2071	8.9	1,584	2,095	21	0.1	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.0005	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.046	3.5	0.000038	1,143	1.7	0.000038	0.0005	0.017	0.005	0.01	5.7	0.72	0.13	150,869
2072	8.9	1,600	2,101	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.0005	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.046	3.5	0.000038	1,151	1.7	0.000038	0.0005	0.017	0.005	0.01	5.1	0.71	0.13	152,259
2073	8.9	1,607	2,096	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.0005	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038	1,154	1.7	0.000039	0.0005	0.017	0.005	0.01	4.7	0.72	0.13	152,620
2074	8.9	1,614	2,086	21	0.11	0.0028	0.0019	0.0026	0.95	0.00005	2.0	0.0005	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.013	0.33	30	0.047	3.5	0.000039	1,155	1.7	0.000039	0.0005	0.017	0.005	0.01	4.6	0.74	0.13	153,555
2075	8.9	1,623	2,076	21	0.1	0.0029	0.0019	0.0026	0.94	0.00005	2.1	0.0005	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	29	0.048	3.4	0.000039	1,157	1.7	0.000039	0.0005	0.017	0.005	0.01	4.5	0.76	0.14	154,302
2076	8.9	1,650	2,086	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	2.0	0.0005	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.056	0.013	0.33	29	0.05	3.4	0.000039	1,171	1.6	0.00004	0.0005	0.018	0.005	0.01	4.6	0.77	0.14	155,300
2077	8.9	1,666	2,081	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.0005	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004	1,177	1.6	0.00004	0.0005	0.018	0.005	0.01	4.8	0.75	0.14	155,642
2078	8.9	1,680	2,074	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.00051	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.057	0.014	0.32	29	0.054	3.4	0.00004	1,182	1.6	0.00004	0.0005	0.018	0.005	0.01	5.0	0.72	0.13	156,520
2079	8.9	1,691	2,082	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051	0.0046	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.056	3.4	0.00004	1,188	1.6	0.000041	0.0005	0.018	0.005	0.01	5.2	0.64	0.12	157,526
2080	8.9	1,698	2,093	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051	0.0047	0.014	0.05	0.0041	0.5	50	0.02	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.000041	1,194	1.6	0.000041	0.0005	0.018	0.005	0.01	5.5	0.58	0.11	158,727
2081	8.9	1,711	2,092	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.00051	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.058	0.015	0.32	29	0.059	3.3	0.000041	1,199	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.48	0.086	159,076
2082	9.0	1,705	2,128	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.00051	0.0049	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.06	3.3	0.000041	1,204	1.6	0.000041	0.0005	0.018	0.005	0.01	5.8	0.43	0.077	160,041
2083	9.0	1,694	2,167	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.00051	0.0049	0.014	0.05	0.0043	0.5	52	0.021	0.000005	0.057	0.016	0.32	28	0.061	3.3	0.000041	1,207	1.6	0.000041	0.0005	0.018	0.005	0.01	5.9	0.37	0.067	160,609
2084	9.0	1,698	2,182	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.00051	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.000041	1,212	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.35	0.064	161,869
2085	9.0	1,691	2,202	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.00051	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.00004	1,212	1.6	0.000041	0.0005	0.018	0.005	0.01	5.8	0.34	0.061	162,127
2086	9.0	1,695	2,209	19	0.12	0.003	0.0023	0.0026	0.89	0.00005	1.9	0.00051	0.0051	0.014	0.05	0.0045	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.062	3.3	0.000041	1,215	1.6	0.000041	0.0005	0.018	0.005	0.01	5.4	0.33	0.06	163,022
2087	8.9	1,689	2,222	19	0.11	0.003	0.0022	0.0026	0.89	0.00005	1.9	0.00051	0.005	0.014	0.05	0.0044	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.00004	1,215	1.6	0.000041	0.0005	0.018	0.005	0.01	5.3	0.33	0.06	163,716
2088	9.0	1,701	2,235	19	0.12	0.003	0.0023	0.0026	0.88	0.00005	1.8	0.00051	0.005	0.015	0.05	0.0045	0.48	54	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.000041	1,222	1.6	0.000041	0.0005	0.018	0.005	0.01	4.8	0.33	0.06	164,817
2089	9.0	1,669	2,282	19	0.13	0.0029	0.0022	0.0027	0.88	0.00005	1.7	0.0005	0.0047	0.014	0.05	0.0042	0.48	54	0.02	0.000005	0.056	0.015	0.31	28	0.057	3.2	0.00004	1,217	1.5	0.00004	0.0005	0.018	0.005	0.01	4.5	0.33	0.06	165,016
2090	9.0	1,663	2,315	19	0.14	0.0029	0.0022	0.0027	0.88	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	54	0.02	0.000005	0.056	0.015	0.31	27	0.057	3.2	0.00004	1,221	1.5	0.00004	0.0005	0.018	0.005	0.01	4.3	0.33	0.06	165,702
2091	9.0	1,660	2,331	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	55	0.019	0.000005	0.056	0.015	0.3	27	0.057	3.2	0.00004	1,223	1.5	0.00004	0.0005	0.018	0.005	0.01	4.3	0.33	0.06	166,524
2092	9.0	1,661	2,347	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.47	55	0.019	0.000005	0.056	0.015	0.3	27	0.056	3.2	0.00004	1,226	1.5	0.00004	0.0005	0.018	0.005	0.01	4.2	0.33	0.059	167,829
2093	9.0	1,647	2,387	19	0.14	0.0029	0.0021	0.0027	0.86	0.00005	1.5	0.0005	0.0046	0.014	0.05	0.0041	0.47	56	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.1	0.000039	1,227	1.5	0.00004	0.0005	0.018	0.005	0.01	4.4	0.31	0.056	168,420
2094	9.0	1,626	2,437	19	0.15	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.0005	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.055	3.1	0.000039	1,228	1.5	0.000039	0.0005	0.017	0.005	0.01	4.5	0.29	0.052	169,379
2095	9.0	1,612	2,454	19	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.0005	0.0045	0.014	0.05	0.0039	0.47	57	0.019	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000039	1,224	1.5	0.000039	0.0005	0.017	0.005	0.01	4.8	0.22	0.04	170,071
2096	9.0	1,592	2,483	19	0.15	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.47	57	0.018	0.000005	0.054	0.014	0.3	27	0.053	3.1	0.000038	1,221	1.5	0.000038	0.0005	0.017	0.005	0.01	5.0	0.18	0.033	171,166
2097	9.0	1,592	2,489	19	0.14	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.46	58	0.018	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000038	1,221	1.5	0.000038	0.0005	0.017	0.005	0.01	5.3	0.13	0.024	171,387
2098	9.0	1,587	2,506	18	0.14	0.0028	0.002	0.0028	0.84	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.46	58	0.018	0.000005	0.053	0.014	0.29	26	0.054	3.1	0.000038	1,222	1.5	0.000038	0.0005	0.017	0.005	0.01	5.6	0.1	0.019	172,099
2099	9.0	1,590	2,507	18	0.14	0.0028	0.002	0.0028	0.84	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.46	58	0.019	0.000005	0.054	0.014	0.29	26	0.055	3.1	0.000038	1,223	1.5	0.000038	0.0005	0.017	0.005	0.01	5.8	0.078	0.014	172,718
2100	9.0	1,600	2,529	18	0.15	0.0028	0.002	0.0028	0.84	0.00005	1.4	0.0005	0.0045	0.014	0.05	0.0038	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.055	3.1	0.000038	1,232	1.5	0.000038	0.0005	0.017	0.005	0.01	6.1	0.069	0.012	173,742
2101	9.0	1,608	2,531	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0045	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.0	0.000038	1,235	1.5	0.000039	0.0005	0.017	0.005	0.01	6.3	0.061	0.011	174,656
2102	9.0	1,611	2,539	18	0.14	0.0028	0.0021	0.0028	0.83	0.00005	1.5	0.0005	0.0046	0.014	0.05	0.0039	0.45	60	0.019	0.000005	0.054	0.014	0.29	26	0.057	3.0	0.000039	1,238	1.5	0.000039	0.0005	0.017	0.005	0.01	6.6	0.059	0.011	175,434
2103	9.1	1,636	2,555	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.058	3.0	0.000039	1,252	1.5	0.000039	0.0005	0.017	0.005	0.01	6.9	0.058	0.011	176,132
2104	9.1	1,648	2,563	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,259	1.4	0.00004	0.0005	0.018	0.005	0.01	7.1	0.058	0.01	177,487
2105	9.1	1,639	2,581	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,258	1.4	0.000039	0.0005	0.018	0.005	0.01	7.4	0.057	0.01	177,786
2106	9.1	1,608	2,628	18	0.17	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.0005	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.057	3.0	0.000038	1,253	1.4	0.000039	0.0005	0.017	0.005	0.01	7.6	0.057	0.01	178,442
2107	9.1	1,602	2,658	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.0005	0.0046	0.014	0.05	0.0038	0.44	62	0.02	0.000005	0.054	0.014	0.28	25	0.058	3.0	0.000038	1,256	1.4	0.000039	0.0005	0.017	0.005	0.01	7.8	0.057	0.01	179,251
2108	9.1	1,606	2,681	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.058	2.9	0.000038	1,262	1.4	0.000039	0.0005	0.017	0.005	0.01	8.0	0.057	0.01	180,376
2109	9.1	1,609	2,699	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.059	2.9	0.000038	1,267	1.4	0.000039	0.0005	0.017	0.005	0.01	8.1	0.057	0.01	180,436
2110	9.1	1,618	2,714	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000039	1,273	1.4	0.000039	0.0005	0.017	0.005	0.01	8.3	0.057	0.01	181,010
2111	9.1	1,624	2,726	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.061	2.9	0.000039	1,278	1.4	0.000039	0.0005	0.017	0.005	0.01	8.5	0.057	0.01	181,411
2112	9.1	1,638	2,736	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.063	2.9	0.000039	1,286	1.4	0.000039	0.0005	0.017	0.005	0.01	8.6	0.057	0.01	182,128
2113	9.1	1,644	2,743	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005	0.005	0.014	0.05	0.0042	0.44	66	0.022	0.000005	0.055	0.016	0.28	25	0.063	2.9	0.000039	1,290	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	0.057	0.01	182,005
2114	9.1	1,659	2,749	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,297	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	0.057	0.01	182,253
2115	9.1	1,665	2,755	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,300	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	0.057	0.01	182,451
2116	9.1	1,679	2,756	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004	1,307	1.4	0.00004	0.0005	0.018	0.005	0.01	8.6	0.057	0.01	183,471
2117	9.1	1,681	2,759	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.00051	0.0053	0.014	0.05	0.0045	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.066	2.9	0.00004	1,308	1.4	0.00004	0.0005	0.018	0.005	0.01	8.3	0.057	0.01	183,498
2118	9.1	1,680	2,784	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004	1,312	1.4	0.00004	0.0005	0.018	0.005	0.011	8.1	0.057	0.01	183,749
2119	9.1	1,670	2,817	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,314	1.4	0.00004	0.0005	0.018	0.005	0.011	7.8	0.057	0.01	183,758
2120	9.1	1,673	2,830	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,317	1.4	0.00004	0.0005	0.018	0.005	0.011	7.5	0.057	0.01	184,333
2121	9.1	1,673	2,864	17	0.19	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004	1,324	1.4	0.00004	0.0005	0.018	0.005	0.011	7.2	0.057	0.01	184,127
2122	9.1	1,658	2,906	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.056	0.017	0.27	25	0.066	2.9	0.00004	1,326	1.4	0.00004	0.0005	0.018	0.005	0.011	7.0	0.057	0.01	184,511
2123	9.1	1,635	2,962	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.7	0.057	0.01	184,738
2124	9.1	1,627	2,985	17	0.22	0.0029	0.0023	0.003	0.78	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	6.5	0.057	0.01	185,454
2125	9.2	1,611	3,022	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000039	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.1	0.057	0.01	185,444
2126	9.2	1,606	3,037	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	24	0.064	2.9	0.000038	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	5.8	0.057	0.01	185,945
2127	9.2	1,594	3,068	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.9	0.000038	1,327	1.4	0.000038	0.0005	0.017	0.005	0.01	5.2	0.057	0.01	186,004
2128	9.2	1,591	3,085	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.8	0.000038	1,328	1.4	0.000038	0.0005	0.017	0.005	0.01	4.8	0.057	0.01	186,369
2129	9.2	1,583	3,109	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.9	0.000038	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	4.2	0.057	0.01	185,968
2130	9.2	1,580	3,121	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005	0.005	0.015	0.05	0.0045	0.43	75	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	3.9	0.057	0.01	186,144
2131	9.2	1,577	3,142	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.0005	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038	1,331	1.4	0.000038	0.0005	0.017	0.005	0.01	3.4	0.057	0.01	186,102
2132	9.2	1,576	3,151	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.98	0.0005	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.8	0.000038	1,332	1.4	0.000038	0.0005	0.017	0.005	0.01	3.2	0.057	0.01	186,692
2133	9.2	1,575	3,168	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038	1,334	1.4	0.000038	0.0005	0.017	0.005	0.01	2.9	0.057	0.01	186,155
2134	9.2	1,576	3,174	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,335	1.4	0.000038	0.0005	0.017	0.005	0.01	2.8	0.057	0.01	186,362

Table A3. Source terms of the NAG backfill for the well graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
-	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,577	3,187	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,338	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.057	0.01	186,587
2136	9.2	1,578	3,192	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,339	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.057	0.01	187,193
2137	9.2	1,581	3,204	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.057	0.01	186,724
2138	9.2	1,570	3,233	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.0005	0.0048	0.015	0.05	0.0044	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.057	0.01	186,796
2139	9.2	1,553	3,271	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.0005	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.052	0.016	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.017	0.005	0.01	2.6	0.057	0.01	187,060
2140	9.2	1,545	3,291	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.0005	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,517
2141	9.2	1,532	3,320	17	0.25	0.0027	0.0022	0.0033	0.78	0.00005	0.9	0.0005	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	186,898
2142	9.2	1,525	3,335	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.0005	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	186,889
2143	9.2	1,516	3,353	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,340	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,035
2144	9.2	1,509	3,369	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,551
2145	9.2	1,502	3,386	17	0.26	0.0026	0.0021	0.0033	0.78	0.00005	0.87	0.0005	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,020
2146	9.2	1,496	3,399	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.87	0.0005	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,082
2147	9.2	1,490	3,412	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,212
2148	9.2	1,485	3,424	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0041	0.014	0.05	0.0037	0.42	84	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,667
2149	9.2	1,480	3,436	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.0005	0.004	0.014	0.05	0.0037	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.047	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.5	0.057	0.01	187,030
2150	9.2	1,476	3,445	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.0005	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000036	0.0005	0.016	0.005	0.01	2.4	0.057	0.01	186,985

Table A4. Annual loads of the NAG backfill for the well graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year
2023	20	1.5	0.44	0.00019	0.000034	0.000019	0.000037	0.02	0.00000065	0.45	0.0000081	0.000092
2024	40	3.1	0.9	0.00038	0.00007	0.00004	0.000076	0.041	0.0000013	0.92	0.000017	0.00019
2025	69	5.4	1.6	0.00067	0.00012	0.000069	0.00013	0.072	0.0000023	1.6	0.000029	0.00033
2026	106	8.2	2.4	0.001	0.00019	0.00011	0.0002	0.11	0.0000035	2.4	0.000044	0.0005
2027	141	11	3.2	0.0013	0.00025	0.00014	0.00027	0.15	0.0000047	3.2	0.000058	0.00067
2028	236	18	5.3	0.0023	0.00042	0.00024	0.00045	0.24	0.0000078	5.4	0.000098	0.0011
2029	267	21	6.0	0.0026	0.00047	0.00027	0.00051	0.28	0.0000089	6.1	0.00011	0.0013
2030	321	25	7.3	0.0031	0.00057	0.00032	0.00062	0.33	0.000011	7.4	0.00013	0.0015
2031	1,162	91	26	0.011	0.002	0.0012	0.0022	1.2	0.000039	27	0.00048	0.0055
2032	2,750	214	62	0.026	0.0048	0.0027	0.0053	2.8	0.000091	63	0.0011	0.013
2033	858	67	19	0.0082	0.0015	0.00086	0.0016	0.89	0.000028	20	0.00036	0.0041
2034	1,554	121	35	0.015	0.0027	0.0015	0.003	1.6	0.000051	36	0.00064	0.0074
2035	12,672	987	286	0.12	0.022	0.013	0.024	13	0.00042	291	0.0052	0.06
2036	23,413	1,824	529	0.22	0.041	0.023	0.045	24	0.00078	538	0.0097	0.11
2037	16,957	1,321	383	0.16	0.03	0.017	0.033	17	0.00056	390	0.007	0.08
2038	32,863	2,560	742	0.32	0.058	0.033	0.063	34	0.0011	755	0.014	0.16
2039	63,961	11,571	1,332	0.72	0.11	0.062	0.11	61	0.002	1,527	0.024	0.29
2040	128,782	40,409	2,348	1.5	0.23	0.13	0.19	107	0.0034	2,749	0.043	0.56
2041	197,654	88,386	3,173	3.1	0.35	0.19	0.25	145	0.0047	1,619	0.059	0.64
2042	185,591	104,355	3,172	3.9	0.33	0.19	0.31	145	0.0053	1,539	0.066	0.4
2043	186,076	105,488	3,171	3.9	0.33	0.2	0.33	145	0.0054	1,615	0.068	0.36
2044	186,190	104,188	3,171	3.9	0.33	0.2	0.33	145	0.0055	1,717	0.069	0.36
2045	188,820	106,262	3,172	3.9	0.33	0.2	0.32	145	0.0054	1,585	0.068	0.38
2046	188,964	103,720	3,172	3.8	0.33	0.2	0.3	145	0.0052	1,515	0.065	0.41
2047	203,032	105,866	3,173	3.8	0.36	0.22	0.29	145	0.0052	1,496	0.065	0.45
2048	223,360	112,202	3,173	4.0	0.39	0.25	0.28	145	0.0052	1,458	0.067	0.53
2049	233,846	117,629	3,174	4.1	0.41	0.27	0.28	145	0.0053	1,404	0.07	0.59
2050	240,268	120,082	3,174	4.2	0.42	0.29	0.28	145	0.0053	1,409	0.072	0.63
2051	243,939	121,288	3,174	4.2	0.43	0.3	0.28	145	0.0054	1,421	0.073	0.65
2052	247,218	122,306	3,174	4.3	0.44	0.31	0.28	145	0.0054	1,435	0.074	0.66
2053	248,540	122,377	3,174	4.3	0.44	0.31	0.28	145	0.0054	1,438	0.075	0.66
2054	250,169	122,780	3,174	4.3	0.44	0.31	0.29	145	0.0055	1,450	0.075	0.67
2055	253,168	123,343	3,174	4.3	0.45	0.32	0.29	145	0.0055	1,467	0.076	0.68
2056	249,012	151,733	3,175	5.3	0.44	0.32	0.3	145	0.0055	1,021	0.075	0.67
2057	238,870	196,129	3,175	7.1	0.42	0.3	0.32	145	0.0055	643	0.072	0.61
2058	233,012	221,733	3,176	8.2	0.41	0.28	0.33	145	0.0056	520	0.07	0.58
2059	231,696	230,559	3,176	8.6	0.41	0.28	0.34	145	0.0056	488	0.07	0.57
2060	233,410	234,067	3,176	8.7	0.41	0.28	0.34	145	0.0056	486	0.07	0.57
2061	234,402	234,276	3,176	8.7	0.41	0.28	0.34	145	0.0056	489	0.07	0.58
2062	234,343	245,464	3,176	9.9	0.41	0.28	0.35	145	0.0057	436	0.071	0.58
2063	232,890	257,359	3,176	11	0.41	0.28	0.36	145	0.0057	398	0.071	0.57
2064	234,081	261,497	3,176	11	0.41	0.28	0.36	145	0.0057	402	0.072	0.57
2065	235,155	272,984	3,176	14	0.41	0.28	0.37	145	0.0058	339	0.072	0.57
2066	233,224	287,755	3,177	16	0.41	0.28	0.38	145	0.0058	303	0.073	0.57
2067	232,156	298,507	3,177	17	0.41	0.28	0.39	145	0.0059	288	0.073	0.56
2068	233,756	306,039	3,177	17	0.41	0.28	0.4	145	0.0059	287	0.074	0.57
2069	234,467	310,511	3,177	17	0.41	0.28	0.4	145	0.006	288	0.075	0.57
2070	237,133	313,382	3,177	16	0.42	0.28	0.4	145	0.006	297	0.075	0.58
2071	238,917	316,056	3,177	16	0.42	0.28	0.4	145	0.0061	305	0.076	0.58
2072	243,538	319,835	3,177	17	0.43	0.28	0.41	145	0.0061	297	0.076	0.58
2073	245,306	319,891	3,177	17	0.43	0.29	0.41	145	0.0061	303	0.077	0.59
2074	247,823	320,362	3,177	16	0.44	0.29	0.41	145	0.0062	312	0.077	0.6
2075	250,494	320,300	3,177	16	0.44	0.3	0.41	145	0.0062	322	0.078	0.62
2076	256,213	323,939	3,177	18	0.45	0.31	0.41	145	0.0062	304	0.078	0.64
2077	259,315	323,891	3,177	18	0.46	0.31	0.4	145	0.0063	308	0.078	0.67
2078	262,984	324,669	3,177	17	0.46	0.32	0.4	145	0.0063	314	0.079	0.69
2079	266,345	327,890	3,177	18	0.47	0.33	0.41	145	0.0063	314	0.08	0.72
2080	269,535	332,232	3,177	18	0.48	0.34	0.41	145	0.0064	315	0.081	0.75
2081	272,116	332,708	3,177	18	0.48	0.35	0.41	145	0.0064	320	0.082	0.77
2082	272,869	340,630	3,177	19	0.48	0.35	0.41	145	0.0064	308	0.082	0.78
2083	272,120	348,104	3,177	19	0.48	0.35	0.42	145	0.0065	299	0.082	0.79
2084	274,821	353,230	3,178	19	0.48	0.36	0.42	145	0.0065	301	0.083	0.81
2085	274,109	357,053	3,178	19	0.48	0.36	0.42	145	0.0065	299	0.082	0.81
2086	276,257	360,164	3,178	19	0.49	0.37	0.43	145	0.0066	304	0.083	0.82
2087	276,500	363,696	3,178	19	0.49	0.37	0.43	145	0.0066	306	0.083	0.82
2088	280,271	368,398	3,178	20	0.49	0.37	0.43	145	0.0066	299	0.084	0.83
2089	275,396	376,485	3,178	22	0.49	0.36	0.44	145	0.0066	274	0.083	0.78
2090	275,529	383,534	3,178	23	0.49	0.36	0.45	145	0.0067	268	0.083	0.78
2091	276,362	388,183	3,178	23	0.49	0.36	0.45	145	0.0067	268	0.084	0.78
2092	278,748	393,879	3,178	23	0.49	0.36	0.45	145	0.0067	270	0.084	0.79
2093	277,320	402,001	3,178	24	0.49	0.36	0.46	145	0.0068	260	0.085	0.78
2094	275,444	412,709	3,178	25	0.49	0.36	0.47	145	0.0068	252	0.085	0.77
2095	274,222	417,353	3,178	25	0.48	0.35	0.47	145	0.0068	251	0.085	0.76
2096	272,497	424,921	3,178	25	0.48	0.35	0.48	145	0.0069	249	0.086	0.75
2097	272,865	426,547	3,178	25	0.48	0.35	0.48	145	0.0069	252	0.086	0.75
2098	273,173	431,194	3,178	25	0.48	0.35	0.49	145	0.0069	253	0.086	0.76
2099	274,674	432,953	3,179	24	0.48	0.35	0.49	145	0.0069	257	0.087	0.77
2100	278,005	439,464	3,179	26	0.49	0.36	0.49	145	0.007	248	0.087	0.78
2101	280,794	442,036	3,179	26	0.5	0.36	0.49	145	0.007	252	0.088	0.79
2102	282,642	445,462	3,179	25	0.5	0.36	0.5	145	0.0071	255	0.088	0.8
2103	288,151	450,051	3,179	28	0.51	0.37	0.49	145	0.0071	243	0.089	0.83
2104	292,516	454,953	3,179	28	0.52	0.38	0.5	145	0.0071	245	0.089	0.85
2105	291,427	458,777	3,179	29	0.51	0.37	0.5	145	0.0071	241	0.089	0.84
2106	286,935	468,857	3,179	31	0.51	0.37	0.51	145	0.0072	230	0.09	0.82
2107	287,106	476,395	3,179	32	0.51	0.37	0.52	145	0.0072	226	0.09	0.83
2108	289,593	483,606	3,179	32	0.51	0.37	0.52	145	0.0073	225	0.091	0.84
2109	290,357	486,978	3,179	32	0.51	0.38	0.52	145	0.0073	224	0.091	0.85
2110	292,783	491,206	3,180	32	0.52	0.38	0.52	145	0.0073	224	0.091	0.87
2111	294,684	494,473	3,180	32	0.52	0.39	0.52	145	0.0073	225	0.091	0.88
2112	298,326	498,249	3,180	32	0.53	0.39	0.52	145	0.0073	226	0.092	0.91
2113	299,198	499,295	3,180	32	0.53	0.4	0.52	145	0.0073	227	0.092	0.92
2114	302,322	500,942	3,180	32	0.53	0.4	0.52	145	0.0073	229	0.092	0.94
2115	303,689	502,579	3,180	31	0.54	0.41	0.52	145	0.0073	230	0.092	0.95
2116	308,102	505,590	3,180	31	0.54	0.42	0.52	145	0.0074	234	0.093	0.98
2117	308,423	506,215	3,180	31	0.54	0.42	0.52	145	0.0074	235	0.093	0.98
2118	308,662	511,484	3,180	32	0.54	0.42	0.52	145	0.0074	231	0.093	0.99
2119	306,858	517,555	3,180	32	0.54	0.42	0.53	145	0.0074	226	0.092	0.98
2120	308,297	521,571	3,180	32	0.54	0.43	0.53	145	0.0074	226	0.093	0.99
2121	308,008	527,340	3,181	36	0.54	0.43	0.53	145	0.0074	213	0.093	0.99
2122	305,993	536,189	3,181	37	0.54	0.43	0.54	145	0.0074	206	0.093	0.98
2123	301,991	547,268	3,181	39	0.53	0.43	0.55	145	0.0074	198	0.093	0.98
2124	301,714	553,653	3,181	40	0.53	0.43	0.56	145	0.0075	196	0.093	0.98
2125	298,732	560,394	3,181	41	0.53	0.43	0.56	145	0.0075	192	0.093	0.97
2126	298,628	564,660	3,181	41	0.53	0.43	0.57	145	0.0075	191	0.094	0.97
2127	296,453	570,679	3,181	42	0.52	0.43	0.57	145	0.0075	188	0.094	0.96
2128	296,420	574,930	3,181	42	0.52	0.43	0.57	145	0.0075	187	0.094	0.95
2129	294,443	578,211	3,181	43	0.52	0.42	0.58	145	0.0075	185	0.094	0.94
2130	294,182	580,975	3,181	43	0.52	0.42	0.58	145	0.0075	184	0.094	0.93
2131	293,409	584,696	3,181	43	0.52	0.42	0.58	145	0.0075	182	0.094	0.92
2132	294,171	588,305	3,182	43	0.52	0.42	0.58	145	0.0075	183	0.094	0.91
2133	293,194	589,740	3,182	43	0.52	0.42	0.58	145	0.0075	181	0.094	0.9
2134	293,631	591,512	3,182	43	0.52	0.42	0.58	145	0.0075	181	0.094	0.9

Model Year	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag
	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year
2023	0.000016	0.00081	0.0000016	0.011	0.33	0.00054	0.00	0.00066	0.00012	0.007	0.63	0.0018	0.073	0.00000047
2024	0.000033	0.0016	0.0000033	0.023	0.67	0.0011	0.00000016	0.0013	0.00025	0.014	1.3	0.0036	0.15	0.00000096
2025	0.000058	0.0029	0.0000058	0.039	1.2	0.0019	0.00000029	0.0023	0.00043	0.025	2.2	0.0063	0.26	0.0000017
2026	0.000088	0.0044	0.0000088	0.06	1.8	0.0029	0.00000044	0.0036	0.00065	0.038	3.4	0.0097	0.4	0.0000025
2027	0.00012	0.0058	0.000012	0.08	2.3	0.0039	0.00000058	0.0047	0.00086	0.051	4.5	0.013	0.53	0.0000034
2028	0.0002	0.0098	0.00002	0.13	4.0	0.0066	0.00000098	0.008	0.0015	0.085	7.6	0.022	0.89	0.0000057
2029	0.00022	0.011	0.000022	0.15	4.5	0.0074	0.0000011	0.009	0.0016	0.097	8.6	0.024	1.0	0.0000064
2030	0.00027	0.013	0.000027	0.18	5.4	0.0089	0.0000013	0.011	0.002	0.12	10	0.029	1.2	0.0000077
2031	0.00097	0.048	0.000096	0.66	19	0.032	0.0000048	0.039	0.0071	0.42	38	0.11	4.4	0.000028
2032	0.0023	0.11	0.00023	1.6	46	0.076	0.000011	0.093	0.017	0.99	89	0.25	10	0.000066
2033	0.00071	0.035	0.000071	0.49	14	0.024	0.0000035	0.029	0.0053	0.31	28	0.078	3.2	0.000021
2034	0.0013	0.064	0.00013	0.88	26	0.043	0.0000064	0.052	0.0095	0.56	50	0.14	5.8	0.000037
2035	0.011	0.52	0.0011	7.2	212	0.35	0.000052	0.43	0.078	4.6	409	1.2	48	0.0003
2036	0.019	0.97	0.0019	13	391	0.65	0.000097	0.79	0.14	8.5	756	2.1	88	0.00056
2037	0.014	0.7	0.0014	9.6	283	0.47	0.00007	0.57	0.1	6.1	548	1.5	64	0.00041
2038	0.027	1.4	0.0027	19	549	0.91	0.00014	1.1	0.2	12	1,062	3.0	124	0.00079
2039	0.059	2.4	0.015	33	1,111	1.7	0.00024	2.2	0.4	21	1,907	5.5	222	0.0015
2040	0.15	4.3	0.073	59	2,362	3.2	0.00043	4.3	0.87	38	3,360	10	392	0.0031
2041	0.67	5.8	0.2	80	3,854	3.4	0.00058	6.7	1.2	51	4,542	11	529	0.0047
2042	1.1	6.6	0.26	79	3,722	1.8	0.00066	6.2	1.1	51	4,539	5.5	529	0.0045
2043	1.1	6.8	0.27	79	3,734	1.6	0.00068	6.3	1.0	51	4,539	4.7	529	0.0045
2044	1.1	6.9	0.27	79	3,726	1.6	0.00069	6.3	1.0	51	4,539	4.7	529	0.0045
2045	1.1	6.7	0.28	79	3,791	1.7	0.00067	6.4	1.1	51	4,539	5.0	529	0.0045
2046	1.1	6.5	0.3	79	3,787	1.8	0.00065	6.4	1.2	51	4,540	5.5	529	0.0045
2047	1.1	6.4	0.37	80	4,033	1.9	0.00064	6.8	1.4	51	4,541	5.6	529	0.0049
2048	1.1	6.5	0.45	80	4,420	2.2	0.00065	7.5	1.7	51	4,542	6.5	529	0.0054
2049	1.2	6.6	0.51	80	4,637	2.5	0.00066	7.9	1.9	51	4,543	7.4	529	0.0056
2050	1.2	6.7	0.55	80	4,757	2.6	0.00067	8.1	2.0	51	4,543	7.7	529	0.0058
2051	1.2	6.7	0.58	80	4,821	2.7	0.00067	8.2	2.1	51	4,543	7.8	529	0.0058
2052	1.2	6.8	0.61	80	4,882	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059
2053	1.2	6.8	0.62	80	4,905	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006
2054	1.2	6.8	0.63	80	4,934	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006
2055	1.2	6.8	0.65	80	4,987	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061
2056	1.4	6.9	0.63	80	5,237	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006
2057	1.8	6.9	0.58	80	5,612	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057
2058	2.0	6.9	0.54	80	5,863	2.3	0.00069	7.8	1.9	51	4,545	6.8	530	0.0056
2059	2.0	6.9	0.53	80	5,977	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0055
2060	2.0	7.0	0.53	80	6,061	2.3	0.0007	7.9	1.9	51	4,545	6.8	530	0.0056
2061	2.0	7.0	0.53	80	6,088	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056
2062	2.0	7.0	0.53	80	6,206	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056
2063	2.0	7.1	0.51	80	6,350	2.3	0.00071	7.8	1.9	51	4,546	6.8	530	0.0056
2064	2.0	7.2	0.51	80	6,432	2.4	0.00072	7.9	1.8	51	4,546	6.6	530	0.0056
2065	2.0	7.2	0.51	80	6,587	2.4	0.00072	7.9	1.8	51	4,546	6.6	530	0.0056
2066	2.0	7.2	0.49	80	6,742	2.4	0.00072	7.8	1.8	51	4,546	6.6	530	0.0056
2067	2.0	7.3	0.49	80	6,877	2.4	0.00073	7.8	1.8	51	4,546	6.6	530	0.0056
2068	2.0	7.4	0.48	80	7,031	2.4	0.00074	7.9	1.8	51	4,546	6.7	530	0.0056
2069	2.0	7.4	0.48	80	7,136	2.4	0.00074	7.9	1.7	51	4,547	6.7	530	0.0056
2070	2.0	7.5	0.49	80	7,238	2.4	0.00075	8.0	1.8	51	4,547	6.9	530	0.0057
2071	2.0	7.5	0.49	80	7,328	2.4	0.00075	8.0	1.8	51	4,547	6.9	530	0.0057
2072	2.0	7.6	0.5	80	7,448	2.4	0.00076	8.2	1.8	51	4,547	7.0	530	0.0058
2073	2.1	7.6	0.51	80	7,488	2.5	0.00076	8.3	1.9	51	4,547	7.1	530	0.0059
2074	2.1	7.7	0.53	80	7,532	2.5	0.00077	8.3	1.9	51	4,547	7.3	530	0.0059
2075	2.1	7.7	0.54	80	7,577	2.6	0.00077	8.4	2.0	51	4,547	7.5	530	0.006
2076	2.1	7.8	0.56	80	7,698	2.7	0.00078	8.6	2.1	51	4,547	7.8	530	0.0061
2077	2.2	7.8	0.58	80	7,746	2.8	0.00078	8.7	2.1	51	4,547	8.1	530	0.0062
2078	2.2	7.8	0.61	80	7,807	2.9	0.00078	8.9	2.2	51	4,547	8.4	530	0.0063
2079	2.2	7.9	0.63	80	7,896	3.0	0.00079	9.0	2.3	51	4,547	8.8	530	0.0064
2080	2.2	7.9	0.65	80	8,005	3.1	0.00079	9.1	2.4	51	4,547	9.1	530	0.0065
2081	2.3	8.0	0.67	80	8,059	3.2	0.0008	9.2	2.5	51	4,548	9.4	530	0.0065
2082	2.3	8.0	0.68	80	8,173	3.3	0.0008	9.2	2.5	51	4,548	9.6	530	0.0065
2083	2.3	8.0	0.69	80	8,273	3.3	0.0008	9.2	2.5	51	4,548	9.7	530	0.0065
2084	2.3	8.1	0.71	80	8,405	3.4	0.00081	9.2	2.6	51	4,548	9.9	530	0.0066
2085	2.3	8.1	0.71	80	8,478	3.4	0.00081	9.2	2.6	51	4,548	10.0	530	0.0066
2086	2.4	8.2	0.73	80	8,584	3.4	0.00082	9.3	2.6	51	4,548	10	530	0.0066
2087	2.4	8.2	0.72	80	8,675	3.4	0.00082	9.3	2.6	51	4,548	10	530	0.0066
2088	2.4	8.2	0.74	80	8,822	3.4	0.00082	9.4	2.7	51	4,548	10	530	0.0067
2089	2.4	8.3	0.7	80	8,871	3.2	0.00083	9.3	2.5	51	4,548	9.5	530	0.0066
2090	2.4	8.3	0.7	80	9,001	3.2	0.00083	9.3	2.5	51	4,549	9.4	530	0.0066
2091	2.4	8.3	0.7	80	9,122	3.2	0.00083	9.3	2.5	51	4,549	9.4	530	0.0066
2092	2.4	8.4	0.7	80	9,285	3.2	0.00084	9.4	2.5	51	4,549	9.5	530	0.0067
2093	2.4	8.4	0.69	80	9,409	3.2	0.00084	9.3	2.5	51	4,549	9.4	530	0.0066
2094	2.4	8.5	0.69	80	9,573	3.2	0.00085	9.3	2.5	51	4,549	9.3	530	0.0066
2095	2.4	8.5	0.67	80	9,662	3.2	0.00085	9.2	2.4	51	4,549	9.2	530	0.0066
2096	2.4	8.6	0.66	80	9,796	3.1	0.00086	9.2	2.4	51	4,549	9.1	530	0.0065
2097	2.4	8.6	0.66	80	9,863	3.1	0.00086	9.2	2.4	51	4,549	9.2	530	0.0065
2098	2.4	8.6	0.65	80	9,992	3.2	0.00086	9.2	2.4	51	4,549	9.3	530	0.0065
2099	2.4	8.6	0.66	80	10,074	3.2	0.00086	9.2	2.4	51	4,549	9.4	530	0.0066
2100	2.4	8.7	0.66	80	10,262	3.3	0.00087	9.4	2.4	51	4,549	9.6	530	0.0067
2101	2.4	8.7	0.68	80	10,370	3.3	0.00087	9.5	2.5	51	4,549	9.8	530	0.0067
2102	2.4	8.8	0.68	80	10,504	3.4	0.00088	9.5	2.5	51	4,550	9.9	530	0.0068
2103	2.4	8.8	0.7	80	10,666	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069
2104	2.5	8.9	0.72	80	10,855	3.6	0.00089	9.8	2.7	51	4,550	11	530	0.007
2105	2.4	8.9	0.71	80	10,899	3.6	0.00089	9.8	2.6	51	4,550	10	530	0.007
2106	2.4	8.9	0.68	80	10,998	3.5	0.00089	9.7	2.5	51	4,550	10	530	0.0069
2107	2.4	9.0	0.69	80	11,130	3.5	0.0009	9.7	2.6	51	4,550	10	530	0.0069
2108	2.4	9.0	0.7	80	11,329	3.6	0.0009	9.7	2.6	51	4,550	11	530	0.0069
2109	2.4	9.0	0.71	80	11,430	3.6	0.0009	9.8	2.6	51	4,551	11	530	0.0069
2110	2.5	9.1	0.72	80	11,588	3.7	0.00091	9.9	2.7	51	4,551	11	530	0.007
2111	2.5	9.1	0.73	80	11,708	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007
2112	2.5	9.1	0.75	80	11,875	3.9	0.00091	10	2.8	51	4,551	11	530	0.0071
2113	2.5	9.1	0.76	80	11,944	3.9	0.00091	10	2.8	51	4,551	12	530	0.0072
2114	2.5	9.1	0.78	80	12,058	4.0	0.00091	10	2.9	51	4,551	12	530	0.0072
2115	2.5	9.1	0.79	80	12,147	4.1	0.00091	10	3.0	51	4,551	12	530	0.0073
2116	2.6	9.2	0.82	80	12,297	4.2	0.00092	10	3.0	51	4,552	12	530	0.0074
2117	2.6	9.2	0.82	80	12,347	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074
2118	2.6	9.2	0.83	80	12,450	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074
2119	2.6	9.2	0.83	80	12,546	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073
2120	2.6	9.2	0.85	80	12,669	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074
2121	2.6	9.2	0.85	80	12,779	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074
2122	2.7	9.2	0.85	80	12,896	4.1	0.00092	10	3.1	51	4,552	12	531	0.0073
2123	2.7	9.2	0.85	80	13,042	4.1	0.00092	10	3.1	51	4,553	12	531	0.0072
2124	2.7	9.3	0.85	80	13,181	4.1	0.00093	10	3.1	51	4,553	12	531	0.0072
2125	2.7	9.3	0.85	80	13,306	4.1	0.00093	10	3.1	51	4,553	12	531	0.0071
2126	2.7	9.3	0.85	80	13,410	4.0	0.00093	10	3.1	51	4,553	12	531	0.0071
2127	2.7	9.3	0.85	80	13,548	4.0	0.00093	10.0	3.1	51	4,553	12	531	0.0071
2128	2.7	9.3	0.85	80	13,678	3.9	0.00093	10.0	3.1	51	4,553	12	531	0.0071
2129	2.7	9.3	0.85	80	13,781	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.007
2130	2.8	9.3	0.84	80	13,879	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007
2131	2.8	9.3	0.84	80	14,009	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007
2132	2.8	9.3	0.84	80	14,131	3.7	0.00093	9.9	3.0	51	4,553	11	531	0.007
2133	2.8	9.3	0.83	80	14,216	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007
2134	2.8	9.3	0.83	80	14,294	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007

Model Year	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	8.5	0.035	0.00000047	0.0000081	0.00021	0.000028	0.00007	1.1	0.13	0.024	16
2024	17	0.072	0.00000096	0.000016	0.00043	0.000058	0.00014	2.2	0.27	0.05	33
2025	30	0.13	0.0000017	0.000029	0.00074	0.0001	0.00025	3.8	0.48	0.086	57
2026	46	0.19	0.0000025	0.000044	0.0011	0.00015	0.00038	5.7	0.72	0.13	87
2027	61	0.26	0.0000034	0.000058	0.0015	0.0002	0.0005	7.6	0.96	0.17	116
2028	103	0.43	0.0000057	0.000098	0.0025	0.00034	0.00084	13	1.6	0.29	195
2029	117	0.49	0.0000064	0.00011	0.0029	0.00039	0.00095	14	1.8	0.33	221
2030	140	0.58	0.0000077	0.00013	0.0034	0.00046	0.0011	17	2.2	0.4	266
2031	508	2.1	0.000028	0.00048	0.012	0.0017	0.0041	63	8.0	1.4	961
2032	1,201	5.0	0.000066	0.0011	0.029	0.004	0.0098	149	19	3.4	2,273
2033	375	1.6	0.000021	0.00035	0.0092	0.0012	0.0031	46	5.9	1.1	710
2034	679	2.8	0.000037	0.00064	0.017	0.0022	0.0055	84	11	1.9	1,284
2035	5,534	23	0.0003	0.0052	0.14	0.018	0.045	686	87	16	10,477
2036	10,225	42	0.00056	0.0097	0.25	0.034	0.084	1,267	160	29	19,356
2037	7,405	31	0.00041	0.007	0.18	0.025	0.061	918	116	21	14,018
2038	14,352	60	0.00079	0.014	0.35	0.048	0.12	1,778	225	41	27,168
2039	29,310	107	0.0015	0.024	0.68	0.092	0.23	3,194	186	34	48,784
2040	63,111	189	0.0031	0.043	1.4	0.19	0.51	5,626	255	46	85,906
2041	105,502	255	0.0048	0.058	2.1	0.29	0.76	5,144	117	21	116,049
2042	103,736	255	0.0045	0.066	2.0	0.27	0.68	1,545	165	30	131,728
2043	104,118	255	0.0045	0.068	2.0	0.27	0.68	942	191	35	135,614
2044	103,774	255	0.0045	0.069	2.0	0.27	0.68	947	53	9.6	137,918
2045	105,535	255	0.0045	0.067	2.0	0.27	0.69	1,107	33	6.0	134,843
2046	105,107	255	0.0045	0.065	2.0	0.27	0.75	1,252	38	6.9	129,640
2047	111,892	255	0.0049	0.064	2.2	0.29	0.88	792	46	8.3	128,811
2048	122,389	255	0.0054	0.065	2.4	0.32	1.0	762	55	10	130,391
2049	128,307	255	0.0056	0.066	2.5	0.34	1.2	833	62	11	131,655
2050	131,710	255	0.0058	0.067	2.6	0.35	1.3	710	65	12	133,193
2051	133,609	255	0.0059	0.067	2.6	0.35	1.3	552	73	13	134,254
2052	135,278	255	0.0059	0.068	2.6	0.36	1.4	353	87	16	135,292
2053	135,880	255	0.006	0.068	2.7	0.36	1.4	193	94	17	135,311
2054	136,687	255	0.006	0.068	2.7	0.36	1.4	145	87	16	135,939
2055	138,125	255	0.0061	0.068	2.7	0.37	1.5	151	86	16	136,744
2056	142,694	255	0.006	0.069	2.7	0.36	1.4	174	96	17	137,789
2057	147,766	255	0.0057	0.069	2.6	0.35	1.3	202	108	20	138,099
2058	150,502	255	0.0056	0.069	2.5	0.34	1.2	234	115	21	138,393
2059	151,719	255	0.0056	0.069	2.5	0.33	1.2	271	112	20	138,657
2060	153,184	255	0.0056	0.07	2.5	0.34	1.2	316	116	21	139,741
2061	153,658	255	0.0056	0.07	2.5	0.34	1.2	364	111	20	140,084
2062	156,036	255	0.0056	0.07	2.5	0.34	1.2	417	101	18	140,942
2063	157,837	255	0.0056	0.071	2.5	0.34	1.2	474	92	17	141,850
2064	159,202	255	0.0056	0.072	2.5	0.34	1.2	537	96	17	143,090
2065	162,126	255	0.0057	0.072	2.5	0.34	1.2	600	100	18	143,729
2066	164,332	255	0.0056	0.072	2.5	0.34	1.1	669	107	19	144,914
2067	166,053	255	0.0056	0.073	2.5	0.34	1.1	741	113	20	146,084
2068	168,266	255	0.0056	0.074	2.5	0.34	1.1	813	115	21	147,667
2069	169,423	255	0.0056	0.074	2.5	0.34	1.1	871	114	21	148,435
2070	171,153	255	0.0057	0.075	2.5	0.34	1.1	897	112	20	149,714
2071	172,459	255	0.0057	0.075	2.6	0.35	1.1	857	108	20	150,869
2072	175,311	255	0.0059	0.076	2.6	0.35	1.2	780	109	20	152,259
2073	176,093	255	0.0059	0.076	2.6	0.35	1.2	721	110	20	152,620
2074	177,310	255	0.006	0.077	2.6	0.36	1.2	707	113	21	153,555
2075	178,481	255	0.006	0.077	2.7	0.36	1.3	694	117	21	154,302
2076	181,840	255	0.0062	0.078	2.7	0.37	1.3	716	119	22	155,300
2077	183,222	255	0.0062	0.078	2.8	0.37	1.3	741	117	21	155,642
2078	185,022	255	0.0063	0.078	2.8	0.38	1.4	781	113	21	156,520
2079	187,204	255	0.0064	0.079	2.8	0.39	1.5	824	101	18	157,526
2080	189,520	255	0.0065	0.079	2.9	0.39	1.5	867	92	17	158,727
2081	190,764	255	0.0065	0.08	2.9	0.39	1.5	903	76	14	159,076
2082	192,737	255	0.0066	0.08	2.9	0.39	1.6	921	68	12	160,041
2083	193,919	255	0.0066	0.08	2.9	0.39	1.6	944	59	11	160,609
2084	196,136	255	0.0066	0.081	2.9	0.4	1.6	930	57	10	161,869
2085	196,531	255	0.0066	0.081	2.9	0.4	1.6	934	54	9.9	162,127
2086	198,072	255	0.0067	0.082	2.9	0.4	1.7	880	54	9.9	163,022
2087	198,833	255	0.0066	0.082	3.0	0.4	1.7	869	54	9.9	163,716
2088	201,439	255	0.0067	0.082	3.0	0.41	1.7	795	55	9.9	164,817
2089	200,891	255	0.0066	0.083	2.9	0.4	1.6	749	55	10.0	165,016
2090	202,339	255	0.0066	0.083	2.9	0.4	1.6	707	55	10	165,702
2091	203,575	255	0.0066	0.083	3.0	0.4	1.6	718	55	10	166,524
2092	205,708	255	0.0067	0.084	3.0	0.4	1.6	711	55	9.9	167,829
2093	206,668	255	0.0067	0.084	3.0	0.4	1.6	740	52	9.4	168,420
2094	207,930	256	0.0066	0.085	2.9	0.4	1.6	767	48	8.8	169,379
2095	208,234	255	0.0066	0.085	2.9	0.4	1.5	812	37	6.8	170,071
2096	208,909	256	0.0066	0.086	2.9	0.39	1.5	859	31	5.6	171,166
2097	209,332	256	0.0066	0.086	2.9	0.39	1.5	907	22	4.0	171,387
2098	210,288	256	0.0066	0.086	2.9	0.39	1.5	956	18	3.2	172,099
2099	211,252	256	0.0066	0.086	2.9	0.4	1.5	1,007	14	2.5	172,718
2100	213,999	256	0.0067	0.087	3.0	0.4	1.5	1,058	12	2.2	173,742
2101	215,717	256	0.0068	0.087	3.0	0.41	1.6	1,109	11	2.0	174,656
2102	217,135	256	0.0068	0.088	3.0	0.41	1.6	1,160	10	1.9	175,434
2103	220,517	256	0.0069	0.088	3.1	0.42	1.6	1,212	10	1.9	176,132
2104	223,385	256	0.007	0.089	3.1	0.42	1.7	1,267	10	1.9	177,487
2105	223,655	256	0.007	0.089	3.1	0.42	1.7	1,312	10	1.9	177,786
2106	223,642	256	0.0069	0.089	3.1	0.41	1.6	1,355	10	1.9	178,442
2107	225,211	256	0.0069	0.09	3.1	0.42	1.6	1,395	10	1.9	179,251
2108	227,670	256	0.007	0.09	3.1	0.42	1.6	1,436	10	1.9	180,376
2109	228,630	256	0.007	0.09	3.1	0.42	1.7	1,467	10	1.9	180,436
2110	230,462	256	0.007	0.091	3.1	0.42	1.7	1,501	10	1.9	181,010
2111	231,880	256	0.0071	0.091	3.1	0.43	1.7	1,533	10	1.9	181,411
2112	234,181	256	0.0072	0.091	3.2	0.43	1.8	1,565	10	1.9	182,128
2113	234,714	256	0.0072	0.091	3.2	0.43	1.8	1,582	10	1.9	182,005
2114	236,364	256	0.0073	0.091	3.2	0.44	1.8	1,590	10	1.9	182,253
2115	237,222	256	0.0073	0.091	3.2	0.44	1.9	1,587	10	1.9	182,451
2116	239,741	256	0.0074	0.092	3.3	0.45	1.9	1,571	11	1.9	183,471
2117	239,941	256	0.0074	0.092	3.3	0.45	1.9	1,531	11	1.9	183,498
2118	241,079	256	0.0074	0.092	3.3	0.45	1.9	1,485	11	1.9	183,749
2119	241,440	256	0.0074	0.092	3.3	0.44	1.9	1,428	11	1.9	183,758
2120	242,804	256	0.0074	0.092	3.3	0.45	2.0	1,379	11	1.9	184,333
2121	243,803	256	0.0074	0.092	3.3	0.45	2.0	1,327	11	1.9	184,127
2122	244,643	256	0.0074	0.092	3.3	0.44	2.0	1,292	11	1.9	184,511
2123	245,018	256	0.0073	0.092	3.2	0.44	2.0	1,239	11	1.9	184,738
2124	246,078	256	0.0073	0.093	3.2	0.44	2.0	1,210	11	1.9	185,454
2125	245,973	256	0.0072	0.093	3.2	0.43	2.0	1,126	11	1.9	185,444
2126	246,694	256	0.0072	0.093	3.2	0.43	2.0	1,080	11	1.9	185,945
2127	246,772	256	0.0071	0.093	3.2	0.43	1.9	963	11	1.9	186,004
2128	247,498	256	0.0071	0.093	3.2	0.43	1.9	904	11	1.9	186,369
2129	247,096	256	0.0071	0.093	3.1	0.43	1.9	777	11	1.9	185,968
2130	247,423	256	0.0071	0.093	3.1	0.43	1.9	725	11	1.9	186,144
2131	247,684	256	0.0071	0.093	3.1	0.42	1.9	631	11	1.9	186,102
2132	248,637	256	0.0071	0.093	3.1	0.43	1.9	600	11	1.9	186,692
2133	248,350	256	0.007	0.093	3.1	0.42	1.9	544	11	1.9	186,155
2134	248,793	256	0.0071	0.093	3.1	0.42	1.9	529	11	1.9	186,362

Table A4. Annual loads of the NAG backfill for the well graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	294,248	594,560	3,182	43	0.52	0.42	0.59	145	0.0075	181	0.094	0.9	2.8	9.3	0.83	80	14,424	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	249,560	256	0.0071	0.093	3.1	0.43	1.9	506	11	1.9	186,587
2136	295,465	597,538	3,182	43	0.52	0.42	0.59	145	0.0075	181	0.094	0.9	2.8	9.4	0.83	80	14,530	3.7	0.00094	9.9	3.0	51	4,554	11	531	0.0071	250,632	256	0.0071	0.094	3.2	0.43	1.9	503	11	2.0	187,193
2137	295,267	598,264	3,182	43	0.52	0.42	0.59	145	0.0075	180	0.094	0.89	2.8	9.3	0.83	80	14,607	3.6	0.00093	9.9	3.0	51	4,554	11	531	0.0071	250,546	256	0.0071	0.093	3.2	0.43	1.9	494	11	1.9	186,724
2138	293,288	603,873	3,182	45	0.52	0.41	0.59	145	0.0075	176	0.094	0.89	2.8	9.3	0.82	80	14,678	3.6	0.00093	9.9	2.9	51	4,554	10	531	0.007	250,755	256	0.007	0.093	3.1	0.42	1.9	493	11	2.0	186,796
2139	290,505	611,856	3,182	46	0.51	0.41	0.6	145	0.0075	172	0.094	0.88	2.8	9.4	0.81	80	14,802	3.6	0.00094	9.8	2.9	51	4,554	10	531	0.0069	251,035	256	0.007	0.094	3.1	0.42	1.8	492	11	2.0	187,060
2140	289,638	617,098	3,182	47	0.51	0.41	0.61	145	0.0075	171	0.094	0.87	2.8	9.4	0.8	80	14,924	3.5	0.00094	9.7	2.9	51	4,554	10	531	0.0069	251,572	256	0.007	0.094	3.1	0.42	1.8	492	11	2.0	187,517
2141	286,309	620,463	3,182	48	0.5	0.4	0.61	145	0.0075	167	0.094	0.86	2.8	9.3	0.79	80	14,989	3.5	0.00093	9.6	2.8	51	4,555	10	531	0.0068	250,649	256	0.0069	0.093	3.1	0.41	1.8	492	11	2.0	186,898
2142	285,025	623,257	3,182	48	0.5	0.4	0.61	145	0.0075	166	0.094	0.84	2.7	9.3	0.78	80	15,070	3.4	0.00093	9.6	2.8	51	4,554	10.0	531	0.0068	250,525	256	0.0068	0.093	3.0	0.41	1.8	492	11	2.0	186,889
2143	283,564	627,204	3,182	48	0.5	0.4	0.62	145	0.0075	165	0.094	0.84	2.7	9.4	0.77	80	15,161	3.4	0.00094	9.5	2.8	51	4,554	9.9	531	0.0068	250,553	256	0.0068	0.094	3.0	0.41	1.7	493	11	2.0	187,035
2144	283,034	631,917	3,182	49	0.5	0.39	0.62	145	0.0075	164	0.094	0.82	2.7	9.4	0.75	80	15,311	3.3	0.00094	9.5	2.7	51	4,555	9.7	531	0.0068	251,094	256	0.0068	0.094	3.0	0.41	1.7	495	11	2.0	187,551
2145	280,847	633,211	3,183	49	0.5	0.39	0.62	145	0.0075	163	0.094	0.81	2.7	9.4	0.74	80	15,352	3.3	0.00094	9.5	2.7	51	4,555	9.6	531	0.0067	250,270	256	0.0068	0.094	3.0	0.41	1.7	493	11	2.0	187,020
2146	279,837	635,834	3,182	49	0.49	0.38	0.63	145	0.0075	162	0.094	0.79	2.7	9.4	0.72	80	15,458	3.2	0.00094	9.4	2.6	51	4,555	9.3	531	0.0067	250,203	256	0.0067	0.094	3.0	0.4	1.6	492	11	2.0	187,082
2147	278,890	638,693	3,183	49	0.49	0.38	0.63	145	0.0075	161	0.094	0.78	2.7	9.4	0.72	80	15,545	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,228	256	0.0067	0.094	3.0	0.4	1.6	488	11	2.0	187,212
2148	278,629	642,477	3,183	50	0.49	0.37	0.64	145	0.0076	161	0.094	0.76	2.7	9.4	0.7	80	15,681	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,723	256	0.0067	0.094	3.0	0.4	1.6	485	11	2.0	187,667
2149	276,730	642,673	3,183	50	0.49	0.37	0.64	145	0.0075	159	0.094	0.75	2.7	9.4	0.69	80	15,708	3.0	0.00094	9.3	2.5	51	4,555	8.8	531	0.0066	249,798	256	0.0067	0.094	3.0	0.4	1.6	469	11	2.0	187,030
2150	275,915	644,201	3,183	50	0.49	0.36	0.64	145	0.0075	159	0.094	0.73	2.6	9.3	0.67	80	15,786	3.0	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,606	256	0.0066	0.093	2.9	0.4	1.5	458	11	2.0	186,985

Table A5. Source terms of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	24
2024	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	44
2025	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	80
2026	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	125
2027	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	158
2028	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	289
2029	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	270
2030	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	348
2031	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,236
2032	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	3,634
2033	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	620
2034	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,492
2035	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	7,085
2036	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	12,083
2037	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	13,464
2038	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	26,952
2039	8.1	1,310	236	29	0.015	0.0023	0.0013	0.0023	1.3	0.00005	31	0.0005	0.0059	0.004	0.05	0.00032	0.72	23	0.035	0.000005	0.044	0.0082	0.46	41	0.11	4.8	0.000031	600	2.3	0.000031	0.0005	0.014	0.005	0.01	65	8.3	1.5	45,912
2040	8.2	1,513	481	29	0.018	0.0027	0.0015	0.0022	1.3	0.00005	31	0.0005	0.0065	0.004	0.05	0.00088	0.72	28	0.037	0.000005	0.051	0.01	0.46	41	0.12	4.8	0.000035	744	2.3	0.000036	0.0005	0.016	0.005	0.01	65	8.3	1.5	79,056
2041	8.4	1,702	763	29	0.027	0.003	0.0016	0.0022	1.3	0.00005	14	0.00051	0.0055	0.0059	0.05	0.0017	0.72	33	0.029	0.000005	0.057	0.011	0.46	41	0.093	4.8	0.000036	909	2.3	0.000041	0.0005	0.018	0.005	0.01	44	5.5	1.0	110,907
2042	8.5	1,410	794	25	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005	0.003	0.0082	0.05	0.002	0.62	28	0.014	0.000005	0.047	0.008	0.39	35	0.041	4.1	0.000034	788	2.0	0.000034	0.0005	0.015	0.005	0.01	12	1.5	0.26	128,839
2043	8.4	1,372	781	24	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.0005	0.0026	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.38	34	0.034	4.0	0.000033	768	1.9	0.000033	0.0005	0.015	0.005	0.01	6.7	0.84	0.15	133,866
2044	8.4	1,350	759	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	12	0.0005	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.033	3.9	0.000032	753	1.9	0.000032	0.0005	0.014	0.005	0.01	6.5	0.83	0.15	136,575
2045	8.5	1,399	790	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	4.0	0.000034	783	1.9	0.000034	0.0005	0.015	0.005	0.01	7.9	1.	0.18	133,758
2046	8.5	1,457	802	25	0.029	0.0026	0.0016	0.0023	1.1	0.00005	12	0.0005	0.0032	0.0083	0.05	0.0023	0.62	29	0.014	0.000005	0.049	0.009	0.39	35	0.042	4.1	0.000035	811	2.0	0.000035	0.0005	0.016	0.005	0.01	9.4	1.2	0.21	128,763
2047	8.5	1,577	824	25	0.03	0.0028	0.0017	0.0022	1.1	0.00005	12	0.0005	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.4	35	0.043	4.1	0.000038	870	2.0	0.000038	0.0005	0.017	0.005	0.01	5.9	0.75	0.14	128,089
2048	8.5	1,714	862	24	0.03	0.003	0.0019	0.0022	1.1	0.00005	11	0.00051	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041	939	2.0	0.000041	0.0005	0.018	0.005	0.01	5.6	0.71	0.13	129,793
2049	8.5	1,776	894	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.00053	0.0045	0.0089	0.05	0.0038	0.61	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043	975	1.9	0.000043	0.0005	0.019	0.005	0.01	6.2	0.78	0.14	131,172
2050	8.5	1,804	902	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00054	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043	989	1.9	0.000043	0.0005	0.019	0.005	0.01	5.2	0.66	0.12	132,811
2051	8.5	1,817	904	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00055	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	4.0	0.000044	995	1.9	0.000044	0.0005	0.019	0.005	0.01	4.0	0.51	0.093	133,964
2052	8.5	1,827	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044	1,000	1.9	0.000044	0.0005	0.02	0.005	0.01	2.6	0.33	0.059	135,076
2053	8.5	1,837	905	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044	1,004	1.9	0.000044	0.0005	0.02	0.005	0.01	1.4	0.18	0.032	135,145
2054	8.5	1,841	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044	1,006	1.9	0.000044	0.0005	0.02	0.005	0.01	1.0	0.13	0.024	135,795
2055	8.5	1,852	903	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.00056	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044	1,011	1.9	0.000045	0.0005	0.02	0.005	0.011	1.1	0.13	0.024	136,601
2056	8.6	1,808	1,102	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.00054	0.0048	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043	1,036	1.9	0.000043	0.0005	0.019	0.005	0.01	1.2	0.15	0.028	137,639
2057	8.7	1,730	1,422	23	0.052	0.0031	0.0022	0.0023	1.1	0.00005	4.6	0.00052	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041	1,071	1.9	0.000042	0.0005	0.018	0.005	0.01	1.4	0.18	0.032	137,940
2058	8.7	1,684	1,604	23	0.059	0.003	0.0021	0.0024	1.1	0.00005	3.7	0.00051	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004	1,088	1.8	0.00004	0.0005	0.018	0.005	0.01	1.6	0.2	0.037	138,218
2059	8.7	1,672	1,665	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004	1,095	1.8	0.00004	0.0005	0.018	0.005	0.01	1.9	0.24	0.043	138,460
2060	8.7	1,671	1,678	23	0.063	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004	1,097	1.8	0.00004	0.0005	0.018	0.005	0.01	2.2	0.27	0.05	139,518
2061	8.7	1,674	1,676	23	0.062	0.003	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.014	0.36	33	0.049	3.8	0.00004	1,098	1.8	0.00004	0.0005	0.018	0.005	0.01	2.5	0.31	0.057	139,838
2062	8.8	1,663	1,745	23	0.071	0.0029	0.002	0.0025	1.0	0.00005	3.1	0.0005	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004	1,108	1.8	0.00004	0.0005	0.018	0.005	0.01	2.8	0.36	0.065	140,676
2063	8.8	1,642	1,818	22	0.078	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,114	1.8	0.000039	0.0005	0.018	0.005	0.01	3.2	0.41	0.074	141,568
2064	8.8	1,637	1,831	22	0.077	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.046	3.7	0.000039	1,114	1.8	0.000039	0.0005	0.017	0.005	0.01	3.6	0.46	0.083	142,789
2065	8.9	1,636	1,903	22	0.095	0.0029	0.0019	0.0026	1.0	0.00005	2.3	0.0005	0.004	0.014	0.05	0.0035	0.56	46	0.016	0.000005	0.055	0.013	0.35	32	0.046	3.7	0.000039	1,129	1.8	0.000039	0.0005	0.017	0.005	0.01	4.0	0.51	0.093	143,409
2066	8.9	1,609	1,989	22	0.11	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.0005	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.045	3.7	0.000039	1,135	1.8	0.000039	0.0005	0.017	0.005	0.01	4.5	0.57	0.1	144,573
2067	8.9	1,589	2,048	22	0.11	0.0028	0.0019	0.0027	1.	0.00005	2.0	0.0005	0.0039	0.013	0.05	0.0033	0.55	47	0.016	0.000005	0.053	0.012	0.35	31	0.045	3.6	0.000038	1,138	1.8	0.000038	0.0005	0.017	0.005	0.01	4.9	0.62	0.11	145,722
2068	8.9	1,583	2,077	22	0.11	0.0028	0.0019	0.0027	0.99	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038	1,140	1.7	0.000038	0.0005	0.017	0.005	0.01	5.3	0.68	0.12	147,284
2069	8.9	1,580	2,097	21	0.11	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038	1,142	1.7	0.000038	0.0005	0.017	0.005	0.01	5.7	0.72	0.13	148,041
2070	8.9	1,584	2,098	21	0.11	0.0028	0.0019	0.0027	0.97	0.00005	2.0	0.0005	0.0038	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.046	3.5	0.000038	1,144	1.7	0.000038	0.0005	0.017	0.005	0.01	5.8	0.74	0.13	149,328
2071	8.9	1,584	2,100	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.0005	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.045	3.5	0.000038	1,144	1.7	0.000038	0.0005	0.017	0.005	0.01	5.5	0.7	0.13	150,505
2072	8.9	1,599	2,104	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.046	3.5	0.000038	1,152	1.7	0.000038	0.0005	0.017	0.005	0.01	5.0	0.63	0.12	151,916
2073	8.9	1,607	2,100	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.0005	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.046	3.5	0.000038	1,154	1.7	0.000039	0.0005	0.017	0.005	0.01	4.6	0.58	0.11	152,292
2074	8.9	1,614	2,090	21	0.11	0.0028	0.0019	0.0026	0.95	0.00005	2.0	0.0005	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000039	1,155	1.7	0.000039	0.0005	0.017	0.005	0.01	4.5	0.57	0.1	153,237
2075	8.9	1,623	2,079	21	0.1	0.0029	0.0019	0.0026	0.94	0.00005	2.1	0.0005	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	30	0.048	3.4	0.000039	1,157	1.7	0.000039	0.0005	0.017	0.005	0.01	4.4	0.55	0.1	153,995
2076	8.9	1,649	2,089	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	2.0	0.0005	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.056	0.013	0.33	29	0.05	3.4	0.000039	1,171	1.6	0.00004	0.0005	0.018	0.005	0.01	4.5	0.57	0.1	155,005
2077	8.9	1,665	2,084	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.0005	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004	1,177	1.6	0.00004	0.0005	0.018	0.005	0.01	4.6	0.59	0.11	155,356
2078	8.9	1,680	2,077	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.00051	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.057	0.014	0.32	29	0.054	3.4	0.00004	1,182	1.6	0.00004	0.0005	0.018	0.005	0.01	4.9	0.62	0.11	156,236
2079	8.9	1,690	2,084	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051	0.0046	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.055	3.4	0.00004	1,189	1.6	0.000041	0.0005	0.018	0.005	0.01	5.1	0.65	0.12	157,251
2080	8.9	1,698	2,096	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051	0.0047	0.014	0.05	0.0041	0.5	50	0.02	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.000041	1,194	1.6	0.000041	0.0005	0.018	0.005	0.01	5.4	0.68	0.12	158,470
2081	8.9	1,710	2,094	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.00051	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.058	0.015	0.32	29	0.059	3.3	0.000041	1,200	1.6	0.000041	0.0005	0.018	0.005	0.01	5.6	0.71	0.13	158,838
2082	9.0	1,705	2,131	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.00051	0.0049	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.06	3.3	0.000041	1,205	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.72	0.13	159,814
2083	9.0	1,694	2,170	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.00051	0.0049	0.014	0.05	0.0043	0.5	52	0.021	0.000005	0.057	0.016	0.32	28	0.06	3.3	0.000041	1,208	1.6	0.000041	0.0005	0.018	0.005	0.01	5.8	0.73	0.13	160,383
2084	9.0	1,698	2,185	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.00051	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.000041	1,212	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.72	0.13	161,637
2085	9.0	1,691	2,205	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.00051	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.00004	1,213	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.72	0.13	161,890
2086	9.0	1,695	2,213	20	0.12	0.003	0.0023	0.0026	0.89	0.00005	1.9	0.00051	0.0051	0.015	0.05	0.0045	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.000041	1,216	1.6	0.000041	0.0005	0.018	0.005	0.01	5.3	0.67	0.12	162,778
2087	8.9	1,689	2,225	19	0.12	0.003	0.0022	0.0026	0.89	0.00005	1.9	0.00051	0.005	0.014	0.05	0.0044	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.00004	1,215	1.6	0.000041	0.0005	0.018	0.005	0.01	5.2	0.66	0.12	163,470
2088	9.0	1,701	2,239	19	0.12	0.003	0.0023	0.0026	0.88	0.00005	1.8	0.00051	0.005	0.015	0.05	0.0045	0.48	54	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.000041	1,223	1.6	0.000041	0.0005	0.018	0.005	0.01	4.7	0.6	0.11	164,570
2089	9.0	1,669	2,284	19	0.13	0.0029	0.0022	0.0027	0.88	0.00005	1.7	0.0005	0.0047	0.014	0.05	0.0042	0.48	54	0.02	0.000005	0.056	0.015	0.31	28	0.057	3.2	0.00004	1,218	1.6	0.00004	0.0005	0.018	0.005	0.01	4.4	0.56	0.1	164,772
2090	9.0	1,663	2,317	19	0.14	0.0029	0.0022	0.0027	0.88	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	54	0.019	0.000005	0.056	0.015	0.31	27	0.057	3.2	0.00004	1,222	1.5	0.00004	0.0005	0.018	0.005	0.01	4.2	0.53	0.096	165,462
2091	9.0	1,660	2,334	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	55	0.019	0.000005	0.056	0.015	0.31	27	0.056	3.2	0.00004	1,223	1.5	0.00004	0.0005	0.018	0.005	0.01	4.2	0.53	0.097	166,285
2092	9.0	1,661	2,350	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	55	0.019	0.000005	0.056	0.015	0.3	27	0.056	3.2	0.00004	1,226	1.5	0.00004	0.0005	0.018	0.005	0.01	4.1	0.52	0.095	167,587
2093	9.0	1,647	2,390	19	0.14	0.0029	0.0021	0.0027	0.86	0.00005	1.5	0.0005	0.0046	0.014	0.05	0.0041	0.47	56	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.2	0.000039	1,228	1.5	0.00004	0.0005	0.018	0.005	0.01	4.3	0.54	0.099	168,175
2094	9.0	1,626	2,440	19	0.15	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.0005	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.055	3.1	0.000039	1,228	1.5	0.000039	0.0005	0.017	0.005	0.01	4.4	0.56	0.1	169,130
2095	9.0	1,612	2,458	19	0.15	0.0028	0.0021	0.0028	0.86	0.00005	1.5	0.0005	0.0045	0.014	0.05	0.0039	0.47	57	0.019	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000039	1,225	1.5	0.000039	0.0005	0.017	0.005	0.01	4.7	0.59	0.11	169,816
2096	9.0	1,592	2,486	19	0.15	0.0028	0.002	0.0028	0.85	0.00005	1.4	0.0005	0.0044	0.014	0.05	0.0038	0.47	57	0.018	0.000005	0.054	0.014	0.3	27	0.053	3.1	0.000038	1,221	1.5	0.000038	0.0005	0.017	0.005	0.01	4.9	0.62	0.11	170,905
2097	9.0	1,592	2,493	19	0.15	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.47	58	0.018	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000038	1,222	1.5	0.000038	0.0005	0.017	0.005	0.01	5.2	0.66	0.12	171,124
2098	9.0	1,588	2,509	18	0.14	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.46	58	0.018	0.000005	0.053	0.014	0.3	26	0.054	3.1	0.000038	1,223	1.5	0.000038	0.0005	0.017	0.005	0.01	5.5	0.69	0.13	171,837
2099	9.0	1,591	2,511	18	0.14	0.0028	0.002	0.0028	0.84	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.46	58	0.019	0.000005	0.054	0.014	0.29	26	0.054	3.1	0.000038	1,224	1.5	0.000038	0.0005	0.017	0.005	0.01	5.7	0.73	0.13	172,453
2100	9.0	1,600	2,533	18	0.15	0.0028	0.002	0.0028	0.84	0.00005	1.4	0.0005	0.0045	0.014	0.05	0.0038	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.055	3.1	0.000038	1,233	1.5	0.000038	0.0005	0.017	0.005	0.01	6.0	0.76	0.14	173,472
2101	9.0	1,608	2,535	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0045	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.0	0.000038	1,236	1.5	0.000039	0.0005	0.017	0.005	0.01	6.3	0.79	0.14	174,383
2102	9.0	1,611	2,543	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0046	0.014	0.05	0.0039	0.45	60	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.0	0.000039	1,238	1.5	0.000039	0.0005	0.017	0.005	0.01	6.5	0.82	0.15	175,164
2103	9.1	1,636	2,558	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.058	3.0	0.000039	1,252	1.5	0.000039	0.0005	0.017	0.005	0.01	6.8	0.86	0.16	175,863
2104	9.1	1,648	2,566	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,259	1.4	0.00004	0.0005	0.018	0.005	0.01	7.1	0.89	0.16	177,220
2105	9.1	1,638	2,583	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,258	1.4	0.000039	0.0005	0.017	0.005	0.01	7.3	0.92	0.17	177,533
2106	9.1	1,607	2,630	18	0.17	0.0028	0.0021	0.0029	0.82	0.00005	1.3	0.0005	0.0046	0.014	0.05	0.0038	0.45	62	0.019	0.000005	0.054	0.014	0.28	26	0.057	3.0	0.000038	1,254	1.4	0.000039	0.0005	0.017	0.005	0.01	7.5	0.95	0.17	178,211
2107	9.1	1,601	2,660	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.0005	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.057	3.0	0.000038	1,257	1.4	0.000039	0.0005	0.017	0.005	0.01	7.7	0.98	0.18	179,040
2108	9.1	1,605	2,683	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.058	2.9	0.000038	1,262	1.4	0.000039	0.0005	0.017	0.005	0.01	7.9	1.	0.18	180,178
2109	9.1	1,608	2,701	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.059	2.9	0.000038	1,267	1.4	0.000039	0.0005	0.017	0.005	0.01	8.1	1.0	0.19	180,248
2110	9.1	1,617	2,716	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000039	1,273	1.4	0.000039	0.0005	0.017	0.005	0.01	8.2	1.0	0.19	180,830
2111	9.1	1,624	2,728	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.061	2.9	0.000039	1,278	1.4	0.000039	0.0005	0.017	0.005	0.01	8.4	1.1	0.19	181,243
2112	9.1	1,637	2,738	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.062	2.9	0.000039	1,286	1.4	0.000039	0.0005	0.017	0.005	0.01	8.5	1.1	0.2	181,975
2113	9.1	1,643	2,745	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005	0.005	0.014	0.05	0.0042	0.44	66	0.022	0.000005	0.055	0.016	0.28	25	0.063	2.9	0.000039	1,290	1.4	0.00004	0.0005	0.018	0.005	0.01	8.6	1.1	0.2	181,870
2114	9.1	1,659	2,750	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,297	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	1.1	0.2	182,135
2115	9.1	1,664	2,756	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,301	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	1.1	0.2	182,344
2116	9.1	1,679	2,757	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004	1,307	1.4	0.00004	0.0005	0.018	0.005	0.01	8.5	1.1	0.2	183,370
2117	9.1	1,681	2,760	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.00051	0.0053	0.014	0.05	0.0045	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.066	2.9	0.00004	1,308	1.4	0.00004	0.0005	0.018	0.005	0.01	8.3	1.1	0.19	183,400
2118	9.1	1,680	2,785	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004	1,312	1.4	0.00004	0.0005	0.018	0.005	0.011	8.1	1.0	0.19	183,657
2119	9.1	1,670	2,818	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004	1,314	1.4	0.00004	0.0005	0.018	0.005	0.011	7.7	0.98	0.18	183,671
2120	9.1	1,673	2,831	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,318	1.4	0.00004	0.0005	0.018	0.005	0.011	7.5	0.94	0.17	184,250
2121	9.1	1,673	2,865	17	0.19	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004	1,324	1.4	0.00004	0.0005	0.018	0.005	0.011	7.2	0.91	0.17	184,044
2122	9.1	1,658	2,907	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004	1,326	1.4	0.00004	0.0005	0.018	0.005	0.011	7.0	0.88	0.16	184,430
2123	9.1	1,635	2,964	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.7	0.85	0.15	184,660
2124	9.1	1,627	2,986	17	0.22	0.0029	0.0023	0.003	0.78	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	6.5	0.82	0.15	185,381
2125	9.2	1,611	3,023	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000039	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.1	0.77	0.14	185,380
2126	9.2	1,606	3,038	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	24	0.064	2.9	0.000038	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	5.8	0.73	0.13	185,890
2127	9.2	1,594	3,069	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.9	0.000038	1,327	1.4	0.000038	0.0005	0.017	0.005	0.01	5.2	0.65	0.12	185,957
2128	9.2	1,590	3,086	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.8	0.000038	1,328	1.4	0.000038	0.0005	0.017	0.005	0.01	4.8	0.61	0.11	186,328
2129	9.2	1,583	3,110	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.9	0.000038	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	4.2	0.53	0.096	185,930
2130	9.2	1,580	3,122	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005	0.005	0.015	0.05	0.0045	0.43	75	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	3.9	0.49	0.089	186,107
2131	9.2	1,576	3,143	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.0005	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038	1,331	1.4	0.000038	0.0005	0.017	0.005	0.01	3.4	0.43	0.078	186,064
2132	9.2	1,575	3,152	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.98	0.0005	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.8	0.000038	1,332	1.4	0.000038	0.0005	0.017	0.005	0.01	3.2	0.4	0.074	186,657
2133	9.2	1,575	3,169	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038	1,334	1.4	0.000038	0.0005	0.017	0.005	0.01	2.9	0.37	0.067	186,125
2134	9.2	1,575	3,175	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,335	1.4	0.000038	0.0005	0.017	0.005	0.01	2.8	0.36	0.065	186,338

Table A5. Source terms of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,577	3,187	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,338	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.34	0.062	186,569
2136	9.2	1,578	3,193	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,339	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.34	0.062	187,180
2137	9.2	1,581	3,204	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.33	0.061	186,716
2138	9.2	1,570	3,233	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.0005	0.0047	0.015	0.05	0.0044	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.33	0.061	186,790
2139	9.2	1,553	3,271	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.0005	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.052	0.016	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.017	0.005	0.01	2.6	0.33	0.06	187,056
2140	9.2	1,545	3,291	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.0005	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	187,514
2141	9.2	1,532	3,320	17	0.25	0.0027	0.0022	0.0033	0.78	0.00005	0.9	0.0005	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	186,895
2142	9.2	1,525	3,335	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.0005	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	186,886
2143	9.2	1,516	3,354	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,340	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	187,034
2144	9.2	1,509	3,370	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	187,551
2145	9.2	1,502	3,386	17	0.26	0.0026	0.0021	0.0033	0.78	0.00005	0.87	0.0005	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	187,019
2146	9.2	1,496	3,399	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.87	0.0005	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	187,081
2147	9.2	1,490	3,412	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	187,212
2148	9.2	1,485	3,424	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0041	0.014	0.05	0.0037	0.42	84	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.059	187,667
2149	9.2	1,480	3,436	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.0005	0.004	0.014	0.05	0.0037	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.047	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.5	0.32	0.058	187,030
2150	9.2	1,476	3,445	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.0005	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000036	0.0005	0.016	0.005	0.01	2.4	0.31	0.056	186,985

Table A6. Annual loads of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	29	2.3	0.69	0.00029	0.000052	0.000029	0.000056	0.032	0.0000012	0.67	0.000024	0.00014	0.000097	0.0012	0.0000024	0.017	0.49	0.00081	0.00000012	0.00098	0.00018	0.011	0.99	0.0027	0.12	0.0000007	13	0.056	0.0000007	0.000007	0.00031	0.00012	0.00024	1.6	0.2	0.036	24
2024	53	4.1	1.3	0.00052	0.000094	0.000053	0.0001	0.057	0.0000022	1.2	0.000044	0.00025	0.00018	0.0022	0.0000044	0.031	0.89	0.0015	0.00000022	0.0018	0.00033	0.02	1.8	0.0048	0.21	0.0000013	23	0.1	0.0000013	0.000013	0.00057	0.00022	0.00044	2.9	0.36	0.066	44
2025	97	7.6	2.3	0.00096	0.00017	0.000097	0.00019	0.11	0.000004	2.2	0.00008	0.00046	0.00032	0.004	0.0000081	0.058	1.6	0.0027	0.0000004	0.0033	0.0006	0.037	3.3	0.0089	0.38	0.0000023	42	0.18	0.0000023	0.000023	0.001	0.0004	0.0008	5.3	0.67	0.12	80
2026	152	12	3.6	0.0015	0.00027	0.00015	0.00029	0.16	0.0000063	3.5	0.00013	0.00072	0.0005	0.0063	0.000013	0.09	2.5	0.0042	0.00000063	0.0051	0.00093	0.057	5.1	0.014	0.6	0.0000036	66	0.29	0.0000036	0.000036	0.0016	0.00063	0.0013	8.2	1.0	0.19	125
2027	191	15	4.5	0.0019	0.00034	0.00019	0.00037	0.21	0.0000079	4.4	0.00016	0.0009	0.00063	0.0079	0.000016	0.11	3.2	0.0053	0.00000079	0.0064	0.0012	0.072	6.5	0.017	0.75	0.0000046	83	0.36	0.0000046	0.000046	0.002	0.00079	0.0016	10	1.3	0.24	158
2028	349	27	8.2	0.0034	0.00062	0.00035	0.00067	0.38	0.000014	8.0	0.00029	0.0017	0.0012	0.014	0.000029	0.21	5.8	0.0097	0.0000014	0.012	0.0021	0.13	12	0.032	1.4	0.0000084	152	0.66	0.0000084	0.000084	0.0037	0.0014	0.0029	19	2.4	0.43	289
2029	326	25	7.7	0.0032	0.00057	0.00032	0.00063	0.35	0.000013	7.5	0.00027	0.0015	0.0011	0.013	0.000027	0.19	5.5	0.0091	0.0000013	0.011	0.002	0.12	11	0.03	1.3	0.0000078	142	0.62	0.0000078	0.000078	0.0035	0.0013	0.0027	18	2.2	0.41	270
2030	421	33	9.9	0.0041	0.00074	0.00042	0.00081	0.45	0.000017	9.7	0.00035	0.002	0.0014	0.017	0.000035	0.25	7.0	0.012	0.0000017	0.014	0.0026	0.16	14	0.038	1.7	0.00001	184	0.8	0.00001	0.0001	0.0045	0.0017	0.0035	23	2.9	0.52	348
2031	2,705	211	64	0.027	0.0048	0.0027	0.0052	2.9	0.00011	62	0.0022	0.013	0.0089	0.11	0.00022	1.6	45	0.075	0.000011	0.091	0.017	1.0	91	0.25	11	0.000065	1,181	5.1	0.000065	0.00065	0.029	0.011	0.022	146	19	3.4	2,236
2032	4,396	343	104	0.043	0.0078	0.0044	0.0084	4.7	0.00018	101	0.0036	0.021	0.015	0.18	0.00036	2.6	73	0.12	0.000018	0.15	0.027	1.7	149	0.4	17	0.00011	1,919	8.3	0.00011	0.0011	0.047	0.018	0.036	238	30	5.5	3,634
2033	750	58	18	0.0074	0.0013	0.00075	0.0014	0.81	0.000031	17	0.00062	0.0035	0.0025	0.031	0.000062	0.44	13	0.021	0.0000031	0.025	0.0046	0.28	25	0.068	3.0	0.000018	327	1.4	0.000018	0.00018	0.008	0.0031	0.0062	41	5.1	0.93	620
2034	3,014	235	71	0.03	0.0053	0.003	0.0058	3.3	0.00012	69	0.0025	0.014	0.01	0.12	0.00025	1.8	50	0.084	0.000012	0.1	0.019	1.1	102	0.28	12	0.000072	1,316	5.7	0.000072	0.00072	0.032	0.012	0.025	163	21	3.8	2,492
2035	8,570	669	202	0.084	0.015	0.0085	0.016	9.3	0.00035	197	0.0071	0.041	0.028	0.35	0.00071	5.1	143	0.24	0.000035	0.29	0.053	3.2	290	0.78	34	0.00021	3,742	16	0.00021	0.0021	0.092	0.035	0.071	464	59	11	7,085
2036	14,615	1,141	345	0.14	0.026	0.015	0.028	16	0.0006	336	0.012	0.069	0.048	0.6	0.0012	8.7	244	0.41	0.00006	0.49	0.09	5.5	494	1.3	58	0.00035	6,382	28	0.00035	0.0035	0.16	0.06	0.12	791	100	18	12,083
2037	16,286	1,271	385	0.16	0.029	0.016	0.031	18	0.00067	374	0.013	0.077	0.054	0.67	0.0014	9.6	272	0.45	0.000067	0.55	0.1	6.2	551	1.5	64	0.00039	7,112	31	0.00039	0.0039	0.17	0.067	0.13	881	111	20	13,464
2038	32,601	2,544	770	0.32	0.057	0.032	0.063	35	0.0013	749	0.027	0.15	0.11	1.3	0.0027	19	545	0.91	0.00013	1.1	0.2	12	1,102	3.0	128	0.00078	14,236	62	0.00078	0.0078	0.35	0.13	0.27	1,764	223	41	26,952
2039	60,149	10,833	1,312	0.69	0.11	0.059	0.11	60	0.0023	1,436	0.046	0.27	0.18	2.3	0.014	33	1,044	1.6	0.00023	2.0	0.38	21	1,878	5.2	219	0.0014	27,549	105	0.0014	0.014	0.64	0.23	0.46	3,006	380	69	45,912
2040	119,581	38,041	2,261	1.4	0.21	0.12	0.17	103	0.004	2,436	0.079	0.52	0.32	4.0	0.07	57	2,201	2.9	0.0004	4.0	0.81	36	3,235	9.5	377	0.0028	58,833	182	0.0029	0.029	1.3	0.4	0.79	5,177	655	119	79,056
2041	188,787	84,647	3,173	3.0	0.33	0.18	0.24	145	0.0055	1,541	0.11	0.61	0.65	5.5	0.19	80	3,682	3.2	0.00055	6.4	1.2	51	4,542	10	529	0.004	100,813	255	0.0045	0.045	2.0	0.55	1.1	4,861	615	112	110,907
2042	181,599	102,301	3,172	3.8	0.32	0.19	0.31	145	0.0064	1,499	0.13	0.39	1.1	6.4	0.25	79	3,643	1.8	0.00064	6.1	1.0	51	4,539	5.3	529	0.0044	101,547	255	0.0044	0.044	1.9	0.64	1.3	1,485	188	34	128,839
2043	183,623	104,498	3,172	3.9	0.32	0.19	0.32	145	0.0067	1,583	0.13	0.35	1.1	6.7	0.27	79	3,687	1.5	0.00067	6.2	1.0	51	4,539	4.5	529	0.0044	102,842	255	0.0044	0.044	2.0	0.67	1.3	894	113	21	133,866
2044	184,376	103,656	3,171	3.9	0.33	0.2	0.33	145	0.0068	1,686	0.14	0.35	1.1	6.8	0.27	79	3,693	1.5	0.00068	6.2	1.0	51	4,539	4.6	529	0.0044	102,878	255	0.0044	0.044	2.0	0.68	1.4	893	113	21	136,575
2045	187,168	105,697	3,172	3.9	0.33	0.2	0.32	145	0.0067	1,564	0.13	0.37	1.1	6.7	0.27	79	3,760	1.6	0.00067	6.3	1.1	51	4,539	4.9	529	0.0045	104,694	255	0.0045	0.045	2.0	0.67	1.3	1,055	133	24	133,758
2046	187,633	103,314	3,172	3.8	0.33	0.2	0.3	145	0.0064	1,497	0.13	0.41	1.1	6.4	0.3	79	3,762	1.8	0.00064	6.3	1.2	51	4,540	5.4	529	0.0045	104,445	255	0.0045	0.045	2.0	0.64	1.3	1,204	152	28	128,763
2047	202,021	105,599	3,173	3.8	0.36	0.22	0.29	145	0.0064	1,480	0.13	0.44	1.1	6.4	0.37	80	4,014	1.9	0.00064	6.8	1.4	51	4,541	5.5	529	0.0048	111,397	255	0.0049	0.049	2.2	0.64	1.3	760	96	17	128,089
2048	222,427	111,893	3,173	4.0	0.39	0.25	0.28	145	0.0065	1,447	0.13	0.52	1.1	6.5	0.45	80	4,403	2.2	0.00065	7.5	1.6	51	4,542	6.5	529	0.0053	121,916	255	0.0054	0.053	2.4	0.65	1.3	733	93	17	129,793
2049	232,948	117,236	3,174	4.1	0.41	0.27	0.28	145	0.0066	1,398	0.13	0.59	1.2	6.6	0.5	80	4,619	2.5	0.00066	7.8	1.9	51	4,542	7.3	529	0.0056	127,828	255	0.0056	0.056	2.5	0.66	1.3	808	102	19	131,172
2050	239,538	119,755	3,174	4.2	0.42	0.29	0.28	145	0.0066	1,405	0.13	0.63	1.2	6.6	0.55	80	4,743	2.6	0.00066	8.1	2.0	51	4,543	7.7	529	0.0057	131,320	255	0.0058	0.058	2.6	0.66	1.3	693	88	16	132,811
2051	243,385	121,046	3,174	4.2	0.43	0.3	0.28	145	0.0067	1,417	0.13	0.65	1.2	6.7	0.58	80	4,810	2.7	0.00067	8.2	2.1	51	4,543	7.7	529	0.0058	133,315	255	0.0058	0.059	2.6	0.67	1.3	542	68	12	133,964
2052	246,811	122,148	3,174	4.3	0.44	0.3	0.28	145	0.0068	1,432	0.14	0.65	1.2	6.8	0.61	80	4,874	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059	135,071	255	0.0059	0.059	2.6	0.68	1.4	348	44	8.0	135,076
2053	248,249	122,284	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,435	0.14	0.66	1.2	6.8	0.62	80	4,899	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.0059	135,740	255	0.006	0.06	2.7	0.68	1.4	190	24	4.4	135,145
2054	249,944	122,730	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,447	0.14	0.66	1.2	6.8	0.63	80	4,930	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006	136,583	255	0.006	0.06	2.7	0.68	1.4	140	18	3.2	135,795
2055	252,972	123,320	3,174	4.3	0.45	0.32	0.29	145	0.0068	1,463	0.14	0.68	1.2	6.8	0.65	80	4,984	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061	138,036	255	0.0061	0.061	2.7	0.68	1.5	145	18	3.3	136,601
2056	248,809	151,733	3,175	5.3	0.44	0.31	0.3	145	0.0069	1,018	0.14	0.67	1.4	6.9	0.63	80	5,234	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006	142,607	255	0.006	0.06	2.7	0.69	1.4	166	21	3.8	137,639
2057	238,664	196,137	3,175	7.1	0.42	0.3	0.32	145	0.0069	641	0.14	0.61	1.8	6.9	0.58	80	5,609	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057	147,678	255	0.0057	0.057	2.5	0.69	1.4	192	24	4.4	137,940
2058	232,800	221,757	3,176	8.2	0.41	0.28	0.33	145	0.0069	518	0.14	0.58	2.0	6.9	0.54	80	5,859	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0056	150,409	255	0.0056	0.056	2.5	0.69	1.4	223	28	5.1	138,218
2059	231,450	230,578	3,176	8.6	0.41	0.28	0.34	145	0.0069	486	0.14	0.57	2.0	6.9	0.53	80	5,973	2.3	0.00069	7.8	1.9	51	4,545	6.6	530	0.0055	151,614	255	0.0056	0.056	2.5	0.69	1.4	259	33	5.9	138,460
2060	233,135	234,084	3,176	8.7	0.41	0.28	0.34	145	0.007	484	0.14	0.57	2.0	7.0	0.53	80	6,057	2.3	0.0007	7.8	1.9	51	4,545	6.7	530	0.0056	153,080	255	0.0056	0.056	2.5	0.7	1.4	301	38	6.9	139,518
2061	234,102	234,298	3,176	8.7	0.41	0.28	0.34	145	0.007	487	0.14	0.58	2.0	7.0	0.53	80	6,083	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056	153,528	255	0.0056	0.056	2.5	0.7	1.4	348	44	8.0	139,838
2062	233,972	245,423	3,176	10.0	0.41	0.28	0.35	145	0.007	432	0.14	0.58	2.0	7.0	0.53	80	6,199	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056	155,869	255	0.0056	0.056	2.5	0.7	1.4	400	51	9.2	140,676
2063	232,497	257,328	3,176	11	0.41	0.28	0.36	145	0.0071	394	0.14	0.57	2.0	7.1	0.51	80	6,343	2.3	0.00071	7.8	1.8	51	4,546	6.8	530	0.0056	157,664	255	0.0056	0.056	2.5	0.71	1.4	456	58	10	141,568
2064	233,675	261,461	3,176	11	0.41	0.28	0.36	145	0.0071	397	0.14	0.57	2.0	7.1	0.51	80	6,425	2.4	0.00071	7.9	1.8	51	4,546	6.6	530	0.0056	159,010	255	0.0056	0.056	2.5	0.71	1.4	517	65	12	142,789
2065	234,617	272,850	3,176	14	0.41	0.28	0.37	145	0.0072	336	0.14	0.57	2.0	7.2	0.5	80	6,577	2.4	0.00072	7.9	1.8	51	4,546	6.6	530	0.0056	161,866	255	0.0056	0.056	2.5	0.72	1.4	580	73	13	143,409
2066	232,662	287,614	3,176	16	0.41	0.28	0.38	145	0.0072	300	0.14	0.56	2.0	7.2	0.49	80	6,732	2.3	0.00072	7.8	1.8	51	4,546	6.6	530	0.0056	164,062	255	0.0056	0.056	2.5	0.72	1.4	647	82	15	144,573
2067	231,552	298,380	3,177	17	0.41	0.27	0.39	145	0.0073	285	0.15	0.56	2.0	7.3	0.49	80	6,866	2.3	0.00073	7.8	1.8	51	4,546	6.5	530	0.0055	165,759	255	0.0056	0.056	2.5	0.73	1.5	717	91	16	145,722
2068	233,135	305,923	3,177	17	0.41	0.28	0.39	145	0.0074	284	0.15	0.56	2.0	7.4	0.48	80	7,020	2.4	0.00074	7.8	1.7	51	4,546	6.6	530	0.0056	167,962	255	0.0056	0.056	2.5	0.74	1.5	788	100	18	147,284
2069	233,831	310,413	3,177	17	0.41	0.27	0.4	145	0.0074	285	0.15	0.56	2.0	7.4	0.48	80	7,125	2.4	0.00074	7.9	1.7	51	4,546	6.7	530	0.0056	169,122	255	0.0056	0.056	2.5	0.74	1.5	846	107	19	148,041
2070	236,506	313,306	3,177	16	0.42	0.28	0.4	145	0.0075	293	0.15	0.57	2.0	7.5	0.48	80	7,227	2.4	0.00075	8.0	1.8	51	4,547	6.8	530	0.0057	170,877	255	0.0057	0.057	2.5	0.75	1.5	872	110	20	149,328
2071	238,355	316,001	3,177	16	0.42	0.28	0.4	145	0.0075	301	0.15	0.57	2.0	7.5	0.49	80	7,318	2.4	0.00075	8.0	1.8	51	4,547	6.8	530	0.0057	172,193	255	0.0057	0.057	2.5	0.75	1.5	835	106	19	150,505
2072	242,928	319,691	3,177	17	0.43	0.28	0.41	145	0.0076	295	0.15	0.58	2.0	7.6	0.5	80	7,437	2.4	0.00076	8.2	1.8	51	4,547	7.0	530	0.0058	175,007	255	0.0058	0.058	2.6	0.76	1.5	760	96	17	151,916
2073	244,733	319,752	3,177	17	0.43	0.29	0.41	145	0.0076	301	0.15	0.59	2.1	7.6	0.51	80	7,478	2.5	0.00076	8.2	1.9	51	4,547	7.1	530	0.0059	175,806	255	0.0059	0.059	2.6	0.76	1.5	702	89	16	152,292
2074	247,278	320,249	3,177	16	0.44	0.29	0.41	145	0.0077	310	0.15	0.6	2.1	7.7	0.53	80	7,522	2.5	0.00077	8.3	1.9	51	4,547	7.2	530	0.0059	177,050	255	0.0059	0.059	2.6	0.77	1.5	688	87	16	153,237
2075	249,980	320,217	3,177	16	0.44	0.3	0.41	145	0.0077	319	0.15	0.62	2.1	7.7	0.54	80	7,568	2.6	0.00077	8.4	2.0	51	4,547	7.4	530	0.006	178,234	255	0.006	0.06	2.7	0.77	1.5	675	85	16	153,995
2076	255,619	323,744	3,177	18	0.45	0.31	0.41	145	0.0078	302	0.16	0.64	2.1	7.8	0.56	80	7,687	2.7	0.00078	8.6	2.0	51	4,547	7.7	530	0.0061	181,527	255	0.0062	0.061	2.7	0.78	1.6	698	88	16	155,005
2077	258,731	323,701	3,177	18	0.46	0.31	0.4	145	0.0078	306	0.16	0.66	2.2	7.8	0.58	80	7,735	2.8	0.00078	8.7	2.1	51	4,547	8.0	530	0.0062	182,917	255	0.0062	0.062	2.8	0.78	1.6	722	91	17	155,356
2078	262,398	324,502	3,177	17	0.46	0.32	0.4	145	0.0078	312	0.16	0.69	2.2	7.8	0.61	80	7,796	2.9	0.00078	8.8	2.2	51	4,547	8.4	530	0.0063	184,733	255	0.0063	0.063	2.8	0.78	1.6	763	96	18	156,236
2079	265,770	327,742	3,177	18	0.47	0.33	0.41	145	0.0079	312	0.16	0.72	2.2	7.9	0.63	80	7,886	3.0	0.00079	8.9	2.3	51	4,547	8.7	530	0.0064	186,924	255	0.0064	0.064	2.8	0.79	1.6	806	102	19	157,251
2080	269,002	332,121	3,177	18	0.47	0.34	0.41	145	0.0079	313	0.16	0.74	2.2	7.9	0.65	80	7,995	3.1	0.00079	9.1	2.4	51	4,547	9.0	530	0.0064	189,260	255	0.0065	0.065	2.9	0.79	1.6	850	108	20	158,470
2081	271,645	332,624	3,177	18	0.48	0.34	0.41	145	0.0079	318	0.16	0.77	2.3	7.9	0.67	80	8,050	3.2	0.00079	9.1	2.4	51	4,548	9.3	530	0.0065	190,543	255	0.0065	0.065	2.9	0.79	1.6	888	112	20	158,838
2082	272,418	340,563	3,177	19	0.48	0.35	0.41	145	0.008	307	0.16	0.78	2.3	8.0	0.68	80	8,165	3.3	0.0008	9.2	2.5	51	4,548	9.6	530	0.0065	192,527	255	0.0066	0.066	2.9	0.8	1.6	907	115	21	159,814
2083	271,705	348,063	3,178	19	0.48	0.35	0.42	145	0.008	297	0.16	0.79	2.3	8.0	0.69	80	8,265	3.3	0.0008	9.1	2.5	51	4,548	9.7	530	0.0065	193,727	255	0.0065	0.065	2.9	0.8	1.6	930	118	21	160,383
2084	274,395	353,193	3,178	19	0.48	0.36	0.42	145	0.0081	299	0.16	0.81	2.3	8.1	0.71	80	8,398	3.4	0.00081	9.2	2.6	51	4,548	9.9	530	0.0066	195,937	255	0.0066	0.066	2.9	0.81	1.6	915	116	21	161,637
2085	273,707	357,031	3,178	19	0.48	0.36	0.42	145	0.0081	297	0.16	0.81	2.3	8.1	0.71	80	8,471	3.4	0.00081	9.2	2.6	51	4,548	9.9	530	0.0066	196,356	255	0.0066	0.066	2.9	0.81	1.6	918	116	21	161,890
2086	275,893	360,180	3,178	19	0.49	0.37	0.43	145	0.0081	302	0.16	0.82	2.4	8.1	0.73	80	8,578	3.4	0.00081	9.3	2.6	51	4,548	10	530	0.0066	197,906	255	0.0066	0.066	2.9	0.81	1.7	864	109	20	162,778
2087	276,149	363,720	3,178	19	0.49	0.37	0.43	145	0.0082	304	0.16	0.82	2.4	8.2	0.72	80	8,669	3.4	0.00082	9.3	2.6	51	4,548	10.0	530	0.0066	198,681	255	0.0066	0.066	2.9	0.82	1.7	853	108	20	163,470
2088	279,900	368,389	3,178	20	0.49	0.37	0.43	145	0.0082	297	0.16	0.83	2.4	8.2	0.74	80	8,815	3.4	0.00082	9.4	2.7	51	4,548	10	530	0.0067	201,269	255	0.0067	0.067	3.0	0.82	1.7	779	98	18	164,570
2089	274,989	376,389	3,178	22	0.48	0.36	0.44	145	0.0082	273	0.16	0.78	2.4	8.2	0.7	80	8,863	3.2	0.00082	9.3	2.5	51	4,548	9.5	530	0.0066	200,693	255	0.0066	0.066	2.9	0.82	1.6	733	93	17	164,772
2090	275,131	383,442	3,178	23	0.49	0.36	0.44	145	0.0083	267	0.17	0.78	2.4	8.3	0.7	80	8,993	3.2	0.00083	9.3	2.5	51	4,548	9.4	530	0.0066	202,145	255	0.0066	0.066	2.9	0.83	1.7	692	87	16	165,462
2091	275,967	388,093	3,178	23	0.49	0.36	0.45	145	0.0083	267	0.17	0.78	2.4	8.3	0.7	80	9,115	3.2	0.00083	9.3	2.5	51	4,549	9.4	530	0.0066	203,383	255	0.0066	0.066	2.9	0.83	1.7	702	89	16	166,285
2092	278,346	393,814	3,178	23	0.49	0.36	0.45	145	0.0084	268	0.17	0.78	2.4	8.4	0.7	80	9,278	3.2	0.00084	9.4	2.5	51	4,549	9.4	530	0.0067	205,512	255	0.0067	0.067	3.0	0.84	1.7	695	88	16	167,587
2093	276,900	401,954	3,178	24	0.49	0.36	0.46	145	0.0084	259	0.17	0.78	2.4	8.4	0.69	80	9,401	3.2	0.00084	9.3	2.5	51	4,549	9.4	530	0.0066	206,468	255	0.0067	0.067	3.0	0.84	1.7	724	92	17	168,175
2094	275,023	412,661	3,178	25	0.48	0.36	0.47	145	0.0085	250	0.17	0.77	2.4	8.5	0.69	80	9,565	3.2	0.00085	9.3	2.5	51	4,549	9.3	530	0.0066	207,726	256	0.0066	0.066	2.9	0.85	1.7	750	95	17	169,130
2095	273,812	417,324	3,178	25	0.48	0.35	0.47	145	0.0085	250	0.17	0.76	2.4	8.5	0.67	80	9,655	3.2	0.00085	9.2	2.4	51	4,549	9.2	530	0.0066	208,059	256	0.0066	0.066	2.9	0.85	1.7	795	101	18	169,816
2096	272,115	424,905	3,178	25	0.48	0.35	0.48	145	0.0085	248	0.17	0.75	2.4	8.5	0.65	80	9,789	3.1	0.00085	9.2	2.4	51	4,549	9.1	530	0.0065	208,727	256	0.0065	0.065	2.9	0.85	1.7	841	106	19	170,905
2097	272,498	426,544	3,178	25	0.48	0.35	0.48	145	0.0086	250	0.17	0.75	2.4	8.6	0.66	80	9,856	3.1	0.00086	9.2	2.4	51	4,549	9.2	530	0.0065	209,165	256	0.0066	0.066	2.9	0.86	1.7	890	112	20	171,124
2098	272,808	431,208	3,178	25	0.48	0.35	0.49	145	0.0086	251	0.17	0.76	2.4	8.6	0.65	80	9,986	3.2	0.00086	9.2	2.4	51	4,549	9.2	530	0.0065	210,139	256	0.0066	0.066	2.9	0.86	1.7	939	119	22	171,837
2099	274,304	432,960	3,179	24	0.48	0.35	0.49	145	0.0086	255	0.17	0.77	2.4	8.6	0.66	80	10,068	3.2	0.00086	9.2	2.4	51	4,549	9.4	530	0.0066	211,100	256	0.0066	0.066	2.9	0.86	1.7	990	125	23	172,453
2100	277,589	439,421	3,179	26	0.49	0.36	0.49	145	0.0087	247	0.17	0.77	2.4	8.7	0.66	80	10,254	3.3	0.00087	9.3	2.4	51	4,549	9.5	530	0.0066	213,804	256	0.0067	0.067	3.0	0.87	1.7	1,040	131	24	173,472
2101	280,374	441,975	3,179	26	0.49	0.36	0.49	145	0.0087	250	0.17	0.79	2.4	8.7	0.68	80	10,363	3.3	0.00087	9.4	2.5	51	4,549	9.8	530	0.0067	215,520	256	0.0067	0.067	3.0	0.87	1.7	1,091	138	25	174,383
2102	282,224	445,407	3,179	26	0.5	0.36	0.49	145	0.0088	253	0.18	0.8	2.4	8.8	0.68	80	10,497	3.4	0.00088	9.5	2.5	51	4,550	9.9	530	0.0068	216,923	256	0.0068	0.068	3.0	0.88	1.8	1,143	144	26	175,164
2103	287,623	449,892	3,179	28	0.51	0.37	0.49	145	0.0088	242	0.18	0.82	2.4	8.8	0.7	80	10,656	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069	220,250	256	0.0069	0.069	3.1	0.88	1.8	1,194	151	27	175,863
2104	291,969	454,781	3,179	28	0.51	0.38	0.5	145	0.0089	244	0.18	0.84	2.5	8.9	0.71	80	10,844	3.6	0.00089	9.8	2.6	51	4,550	10	530	0.007	223,102	256	0.007	0.07	3.1	0.89	1.8	1,249	158	29	177,220
2105	290,870	458,603	3,179	29	0.51	0.37	0.5	145	0.0089	240	0.18	0.84	2.4	8.9	0.71	80	10,888	3.6	0.00089	9.8	2.6	51	4,550	10	530	0.007	223,372	256	0.007	0.07	3.1	0.89	1.8	1,295	164	30	177,533
2106	286,439	468,714	3,179	31	0.5	0.37	0.51	145	0.0089	229	0.18	0.82	2.4	8.9	0.68	80	10,989	3.5	0.00089	9.6	2.5	51	4,550	10	530	0.0069	223,388	256	0.0069	0.069	3.1	0.89	1.8	1,340	169	31	178,211
2107	286,625	476,247	3,179	32	0.51	0.37	0.52	145	0.009	225	0.18	0.82	2.4	9.0	0.68	80	11,121	3.5	0.0009	9.6	2.6	51	4,550	10	530	0.0069	224,964	256	0.0069	0.069	3.1	0.9	1.8	1,381	175	32	179,040
2108	289,132	483,491	3,179	32	0.51	0.37	0.52	145	0.009	225	0.18	0.84	2.4	9.0	0.69	80	11,321	3.6	0.0009	9.7	2.6	51	4,550	10	530	0.0069	227,439	256	0.007	0.07	3.1	0.9	1.8	1,423	180	33	180,178
2109	289,892	486,885	3,180	32	0.51	0.38	0.52	145	0.009	223	0.18	0.85	2.4	9.0	0.7	80	11,421	3.6	0.0009	9.8	2.6	51	4,551	11	530	0.0069	228,392	256	0.007	0.07	3.1	0.9	1.8	1,455	184	33	180,248
2110	292,330	491,134	3,180	32	0.52	0.38	0.52	145	0.009	224	0.18	0.87	2.5	9.0	0.71	80	11,579	3.7	0.0009	9.8	2.7	51	4,551	11	530	0.007	230,233	256	0.007	0.07	3.1	0.9	1.8	1,490	188	34	180,830
2111	294,267	494,413	3,180	32	0.52	0.39	0.52	145	0.0091	224	0.18	0.88	2.5	9.1	0.73	80	11,700	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007	231,683	256	0.0071	0.071	3.1	0.91	1.8	1,522	192	35	181,243
2112	297,967	498,213	3,180	32	0.53	0.39	0.52	145	0.0091	226	0.18	0.91	2.5	9.1	0.75	80	11,869	3.9	0.00091	10	2.8	51	4,551	11	530	0.0071	234,020	256	0.0072	0.072	3.2	0.91	1.8	1,555	197	36	181,975
2113	298,885	499,270	3,180	32	0.53	0.4	0.52	145	0.0091	226	0.18	0.92	2.5	9.1	0.76	80	11,939	3.9	0.00091	10	2.8	51	4,551	12	530	0.0071	234,576	256	0.0072	0.072	3.2	0.91	1.8	1,573	199	36	181,870
2114	302,071	500,944	3,180	32	0.53	0.4	0.52	145	0.0091	228	0.18	0.94	2.5	9.1	0.78	80	12,054	4.0	0.00091	10	2.9	51	4,551	12	530	0.0072	236,266	256	0.0073	0.073	3.2	0.91	1.8	1,583	200	36	182,135
2115	303,494	502,577	3,180	31	0.54	0.41	0.52	145	0.0091	229	0.18	0.95	2.5	9.1	0.79	80	12,144	4.0	0.00091	10	3.0	51	4,551	12	530	0.0073	237,139	256	0.0073	0.073	3.2	0.91	1.9	1,580	200	36	182,344
2116	307,951	505,605	3,180	31	0.54	0.42	0.52	145	0.0092	233	0.18	0.98	2.6	9.2	0.82	80	12,295	4.1	0.00092	10	3.0	51	4,552	12	530	0.0074	239,683	256	0.0074	0.074	3.3	0.92	1.9	1,564	198	36	183,370
2117	308,296	506,240	3,180	31	0.54	0.42	0.52	145	0.0092	234	0.18	0.98	2.6	9.2	0.82	80	12,345	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	239,888	256	0.0074	0.074	3.3	0.92	1.9	1,525	193	35	183,400
2118	308,543	511,520	3,180	32	0.54	0.42	0.52	145	0.0092	230	0.18	0.98	2.6	9.2	0.83	80	12,448	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	241,031	256	0.0074	0.074	3.3	0.92	1.9	1,479	187	34	183,657
2119	306,750	517,586	3,180	32	0.54	0.42	0.53	145	0.0092	225	0.18	0.98	2.6	9.2	0.83	80	12,544	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073	241,399	256	0.0074	0.074	3.3	0.92	1.9	1,422	180	33	183,671
2120	308,195	521,611	3,181	32	0.54	0.43	0.53	145	0.0092	225	0.18	0.99	2.6	9.2	0.85	80	12,667	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	242,768	256	0.0074	0.074	3.3	0.92	2.0	1,374	174	32	184,250
2121	307,851	527,324	3,181	36	0.54	0.43	0.53	145	0.0092	213	0.18	0.99	2.6	9.2	0.85	80	12,776	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	243,730	256	0.0074	0.074	3.3	0.92	2.0	1,321	167	30	184,044
2122	305,840	536,155	3,181	37	0.54	0.43	0.54	145	0.0092	206	0.18	0.98	2.7	9.2	0.85	80	12,893	4.1	0.00092	10	3.1	51	4,552	12	530	0.0073	244,572	256	0.0073	0.074	3.3	0.92	2.0	1,286	163	30	184,430
2123	301,845	547,239	3,181	39	0.53	0.43	0.55	145	0.0092	197	0.18	0.98	2.7	9.2	0.85	80	13,039	4.1	0.00092	10	3.1	51	4,552	12	531	0.0072	244,932	256	0.0073	0.073	3.2	0.92	2.0	1,234	156	28	184,660
2124	301,559	553,620	3,181	40	0.53	0.43	0.56	145	0.0093	196	0.19	0.98	2.7	9.3	0.85	80	13,178	4.1	0.00093	10	3.1	51	4,553	12	531	0.0072	246,000	256	0.0073	0.073	3.2	0.93	2.0	1,206	152	28	185,381
2125	298,592	560,386	3,181	41	0.53	0.43	0.56	145	0.0093	192	0.19	0.97	2.7	9.3	0.85	80	13,303	4.1	0.00093	10	3.1	51	4,553	12	531	0.0071	245,888	256	0.0072	0.072	3.2	0.93	2.0	1,122	142	26	185,380
2126	298,503	564,642	3,181	41	0.53	0.43	0.57	145	0.0093	191	0.19	0.97	2.7	9.3	0.85	80	13,407	4.0	0.00093	10	3.1	51	4,553	12	531	0.0071	246,639	256	0.0072	0.072	3.2	0.93	2.0	1,077	136	25	185,890
2127	296,322	570,664	3,181	42	0.52	0.43	0.57	145	0.0093	188	0.19	0.96	2.7	9.3	0.85	80	13,546	4.0	0.00093	10.0	3.1	51	4,553	12	531	0.0071	246,709	256	0.0071	0.071	3.2	0.93	1.9	959	121	22	185,957
2128	296,317	574,933	3,181	42	0.52	0.43	0.57	145	0.0093	187	0.19	0.95	2.7	9.3	0.85	80	13,676	3.9	0.00093	10.0	3.1	51	4,553	12	531	0.0071	247,443	256	0.0071	0.071	3.2	0.93	1.9	901	114	21	186,328
2129	294,327	578,205	3,181	43	0.52	0.42	0.58	145	0.0093	184	0.19	0.94	2.7	9.3	0.84	80	13,779	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.007	247,045	256	0.0071	0.071	3.1	0.93	1.9	775	98	18	185,930
2130	294,049	580,970	3,181	43	0.52	0.42	0.58	145	0.0093	184	0.19	0.93	2.8	9.3	0.84	80	13,877	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007	247,374	256	0.0071	0.071	3.1	0.93	1.9	723	91	17	186,107
2131	293,274	584,707	3,182	43	0.52	0.42	0.58	145	0.0093	182	0.19	0.92	2.8	9.3	0.84	80	14,007	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007	247,614	256	0.0071	0.071	3.1	0.93	1.9	628	79	14	186,064
2132	294,059	588,305	3,182	43	0.52	0.42	0.58	145	0.0093	183	0.19	0.91	2.8	9.3	0.84	80	14,129	3.7	0.00093	9.9	3.0	51	4,553	11	531	0.007	248,590	256	0.0071	0.071	3.1	0.93	1.9	597	76	14	186,657
2133	293,090	589,755	3,182	43	0.52	0.42	0.58	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,215	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	248,290	256	0.007	0.07	3.1	0.93	1.9	542	69	12	186,125
2134	293,519	591,529	3,182	43	0.52	0.42	0.58	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,293	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	248,761	256	0.0071	0.071	3.1	0.93	1.9	528	67	12	186,338

Table A6. Annual loads of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	294,182	594,578	3,182	43	0.52	0.42	0.59	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,422	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	249,536	256	0.0071	0.071	3.1	0.93	1.9	505	64	12	186,569
2136	295,407	597,572	3,182	43	0.52	0.42	0.59	145	0.0094	181	0.19	0.9	2.8	9.4	0.83	80	14,529	3.7	0.00094	9.9	3.0	51	4,554	11	531	0.0071	250,615	256	0.0071	0.071	3.2	0.94	1.9	502	63	12	187,180
2137	295,235	598,275	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.83	80	14,606	3.6	0.00093	9.9	3.0	51	4,554	11	531	0.0071	250,535	256	0.0071	0.071	3.2	0.93	1.9	493	62	11	186,716
2138	293,260	603,891	3,182	45	0.52	0.41	0.59	145	0.0093	176	0.19	0.89	2.8	9.3	0.82	80	14,678	3.6	0.00093	9.9	2.9	51	4,554	10	531	0.007	250,747	256	0.007	0.071	3.1	0.93	1.9	492	62	11	186,790
2139	290,498	611,880	3,182	46	0.51	0.41	0.6	145	0.0094	172	0.19	0.88	2.8	9.4	0.81	80	14,802	3.6	0.00094	9.8	2.9	51	4,554	10	531	0.0069	251,030	256	0.007	0.07	3.1	0.94	1.9	491	62	11	187,056
2140	289,615	617,108	3,182	47	0.51	0.41	0.61	145	0.0094	171	0.19	0.87	2.8	9.4	0.8	80	14,924	3.5	0.00094	9.7	2.9	51	4,554	10	531	0.0069	251,587	256	0.007	0.07	3.1	0.94	1.9	492	62	11	187,514
2141	286,304	620,491	3,182	48	0.5	0.4	0.61	145	0.0093	167	0.19	0.86	2.8	9.3	0.79	80	14,988	3.5	0.00093	9.6	2.8	51	4,554	10	531	0.0068	250,645	256	0.0069	0.069	3.1	0.93	1.9	491	62	11	186,895
2142	285,021	623,285	3,182	48	0.5	0.4	0.61	145	0.0093	166	0.19	0.84	2.7	9.3	0.78	80	15,070	3.4	0.00093	9.6	2.8	51	4,554	10.0	531	0.0068	250,521	256	0.0068	0.069	3.0	0.93	1.9	492	62	11	186,886
2143	283,562	627,217	3,182	48	0.5	0.4	0.62	145	0.0094	165	0.19	0.84	2.7	9.4	0.77	80	15,161	3.4	0.00094	9.5	2.8	51	4,555	9.9	531	0.0068	250,550	256	0.0068	0.068	3.0	0.94	1.9	493	62	11	187,034
2144	283,033	631,952	3,182	49	0.5	0.39	0.62	145	0.0094	164	0.19	0.82	2.7	9.4	0.75	80	15,311	3.3	0.00094	9.5	2.7	51	4,555	9.7	531	0.0068	251,111	256	0.0068	0.068	3.0	0.94	1.9	494	63	11	187,551
2145	280,846	633,246	3,183	49	0.5	0.39	0.62	145	0.0094	163	0.19	0.81	2.7	9.4	0.74	80	15,352	3.3	0.00094	9.5	2.7	51	4,555	9.6	531	0.0067	250,287	256	0.0068	0.068	3.0	0.94	1.9	493	62	11	187,019
2146	279,836	635,870	3,182	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.79	2.7	9.4	0.72	80	15,458	3.2	0.00094	9.4	2.6	51	4,555	9.3	531	0.0067	250,202	256	0.0067	0.067	3.0	0.94	1.9	492	62	11	187,081
2147	278,890	638,712	3,183	49	0.49	0.38	0.63	145	0.0094	161	0.19	0.78	2.7	9.4	0.72	80	15,545	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,228	256	0.0067	0.067	3.0	0.94	1.9	488	62	11	187,212
2148	278,629	642,514	3,183	50	0.49	0.37	0.64	145	0.0094	161	0.19	0.76	2.7	9.4	0.7	80	15,681	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,723	256	0.0067	0.067	3.0	0.94	1.9	485	61	11	187,667
2149	276,730	642,692	3,183	50	0.49	0.37	0.64	145	0.0094	160	0.19	0.75	2.7	9.4	0.69	80	15,708	3.0	0.00094	9.3	2.5	51	4,555	8.8	531	0.0066	249,797	256	0.0067	0.067	3.0	0.94	1.9	469	59	11	187,030
2150	275,915	644,238	3,183	50	0.49	0.36	0.64	145	0.0093	159	0.19	0.73	2.6	9.3	0.67	80	15,786	3.0	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,625	256	0.0066	0.066	2.9	0.93	1.9	458	58	11	186,985

Table A7. Source terms of the NAG backfill for the low nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	24
2024	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	44
2025	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	80
2026	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	125
2027	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	158
2028	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	289
2029	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	270
2030	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	348
2031	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	2,236
2032	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	3,634
2033	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	620
2034	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	2,492
2035	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	7,085
2036	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	12,083
2037	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	13,464
2038	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	26,952
2039	8.3	1,301	139	29	0.021	0.0023	0.0013	0.0023	1.3	0.00005	31	0.001	0.0058	0.004	0.05	0.00032	0.72	23	0.034	0.000005	0.044	0.008	0.46	41	0.11	4.8	0.000031	606	2.3	0.000031	0.00031	0.014	0.005	0.01	40	5.0	0.91	45,912
2040	8.3	1,464	246	29	0.018	0.0026	0.0014	0.0022	1.3	0.00005	29	0.001	0.0057	0.004	0.05	0.00082	0.72	27	0.032	0.000005	0.049	0.009	0.46	41	0.1	4.8	0.000035	728	2.3	0.000035	0.00035	0.016	0.005	0.01	35	4.5	0.81	79,056
2041	8.4	1,507	382	29	0.028	0.0027	0.0015	0.0023	1.3	0.00005	13	0.001	0.0042	0.0081	0.05	0.0017	0.72	30	0.021	0.000005	0.051	0.0089	0.46	41	0.067	4.8	0.000036	823	2.3	0.000036	0.00036	0.016	0.005	0.01	18	2.3	0.42	110,907
2042	8.5	1,408	398	25	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001	0.003	0.0082	0.05	0.002	0.62	28	0.014	0.000005	0.047	0.008	0.39	35	0.042	4.1	0.000034	788	2.0	0.000034	0.00034	0.015	0.005	0.01	7.3	0.93	0.17	128,839
2043	8.4	1,371	392	24	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.001	0.0026	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.38	34	0.034	4.0	0.000033	769	1.9	0.000033	0.00033	0.015	0.005	0.01	4.3	0.55	0.099	133,866
2044	8.4	1,350	381	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	12	0.001	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.033	3.9	0.000032	754	1.9	0.000032	0.00032	0.014	0.005	0.01	4.2	0.54	0.098	136,575
2045	8.5	1,399	396	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	4.0	0.000034	783	1.9	0.000034	0.00034	0.015	0.005	0.01	5.1	0.64	0.12	133,758
2046	8.5	1,450	402	25	0.03	0.0026	0.0016	0.0023	1.1	0.00005	12	0.001	0.003	0.0083	0.05	0.0023	0.62	29	0.013	0.000005	0.049	0.0089	0.39	35	0.04	4.1	0.000035	809	2.0	0.000035	0.00035	0.015	0.005	0.01	5.1	0.64	0.12	128,763
2047	8.5	1,577	414	25	0.03	0.0028	0.0017	0.0023	1.1	0.00005	11	0.001	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.4	35	0.043	4.1	0.000038	870	2.0	0.000038	0.00038	0.017	0.005	0.01	3.9	0.49	0.089	128,089
2048	8.5	1,714	432	24	0.031	0.003	0.0019	0.0022	1.1	0.00005	11	0.001	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041	940	2.0	0.000041	0.00041	0.018	0.005	0.01	3.7	0.47	0.085	129,793
2049	8.5	1,775	447	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.001	0.0045	0.0089	0.05	0.0038	0.61	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043	974	1.9	0.000043	0.00043	0.019	0.005	0.01	3.9	0.5	0.09	131,172
2050	8.5	1,803	451	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043	989	1.9	0.000043	0.00043	0.019	0.005	0.01	3.4	0.43	0.079	132,811
2051	8.5	1,816	452	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	4.0	0.000044	995	1.9	0.000044	0.00044	0.019	0.005	0.01	2.7	0.34	0.062	133,964
2052	8.5	1,827	452	23	0.032	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.057	3.9	0.000044	1,000	1.9	0.000044	0.00044	0.02	0.005	0.01	1.8	0.22	0.041	135,076
2053	8.5	1,837	453	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044	1,004	1.9	0.000044	0.00044	0.02	0.005	0.01	1.0	0.13	0.024	135,145
2054	8.5	1,841	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044	1,006	1.9	0.000044	0.00044	0.02	0.005	0.01	0.81	0.1	0.02	135,795
2055	8.5	1,852	452	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.001	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044	1,011	1.9	0.000045	0.00045	0.02	0.005	0.011	0.83	0.1	0.02	136,601
2056	8.6	1,808	551	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.001	0.0048	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043	1,036	1.9	0.000043	0.00043	0.019	0.005	0.01	0.92	0.12	0.021	137,639
2057	8.7	1,730	711	23	0.052	0.0031	0.0022	0.0023	1.1	0.00005	4.6	0.001	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041	1,071	1.9	0.000042	0.00042	0.018	0.005	0.01	1.0	0.13	0.024	137,940
2058	8.7	1,684	803	23	0.059	0.003	0.0021	0.0024	1.1	0.00005	3.7	0.001	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004	1,088	1.8	0.00004	0.00041	0.018	0.005	0.01	1.2	0.15	0.027	138,218
2059	8.7	1,672	833	23	0.063	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004	1,095	1.8	0.00004	0.0004	0.018	0.005	0.01	1.3	0.17	0.031	138,460
2060	8.7	1,671	840	23	0.063	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004	1,098	1.8	0.00004	0.0004	0.018	0.005	0.01	1.5	0.19	0.035	139,518
2061	8.7	1,674	839	23	0.063	0.003	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.014	0.36	33	0.049	3.8	0.00004	1,098	1.8	0.00004	0.0004	0.018	0.005	0.01	1.7	0.22	0.04	139,838
2062	8.8	1,663	873	23	0.073	0.0029	0.002	0.0025	1.0	0.00005	3.0	0.001	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004	1,108	1.8	0.00004	0.0004	0.018	0.005	0.01	1.9	0.25	0.045	140,676
2063	8.8	1,642	909	22	0.08	0.0029	0.002	0.0025	1.0	0.00005	2.7	0.001	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,114	1.8	0.000039	0.00039	0.018	0.005	0.01	2.2	0.28	0.05	141,568
2064	8.8	1,636	916	22	0.079	0.0029	0.002	0.0025	1.0	0.00005	2.7	0.001	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,114	1.8	0.000039	0.00039	0.017	0.005	0.01	2.4	0.31	0.056	142,789
2065	8.9	1,636	951	22	0.096	0.0029	0.0019	0.0026	1.0	0.00005	2.3	0.001	0.004	0.014	0.05	0.0035	0.56	46	0.016	0.000005	0.055	0.013	0.35	32	0.048	3.7	0.000039	1,129	1.8	0.000039	0.00039	0.017	0.005	0.01	2.7	0.34	0.062	143,409
2066	8.9	1,609	995	22	0.11	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.001	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.048	3.7	0.000039	1,135	1.8	0.000039	0.00039	0.017	0.005	0.01	3.0	0.37	0.068	144,573
2067	8.9	1,588	1,024	22	0.12	0.0028	0.0019	0.0027	1.	0.00005	1.9	0.001	0.0039	0.013	0.05	0.0033	0.55	47	0.016	0.000005	0.053	0.012	0.35	31	0.047	3.6	0.000038	1,137	1.8	0.000038	0.00038	0.017	0.005	0.01	3.2	0.41	0.074	145,722
2068	9.0	1,582	1,039	22	0.12	0.0028	0.0019	0.0027	0.99	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038	1,140	1.7	0.000038	0.00038	0.017	0.005	0.01	3.5	0.44	0.08	147,284
2069	8.9	1,579	1,049	21	0.12	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038	1,142	1.7	0.000038	0.00038	0.017	0.005	0.01	3.7	0.47	0.086	148,041
2070	8.9	1,583	1,050	21	0.11	0.0028	0.0019	0.0027	0.97	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.048	3.5	0.000038	1,144	1.7	0.000038	0.00038	0.017	0.005	0.01	3.8	0.48	0.088	149,328
2071	8.9	1,583	1,051	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.001	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.047	3.5	0.000038	1,144	1.7	0.000038	0.00038	0.017	0.005	0.01	3.6	0.46	0.083	150,505
2072	8.9	1,599	1,053	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038	1,152	1.7	0.000038	0.00038	0.017	0.005	0.01	3.3	0.42	0.076	151,916
2073	8.9	1,607	1,050	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.001	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038	1,155	1.7	0.000039	0.00039	0.017	0.005	0.01	3.0	0.38	0.07	152,292
2074	8.9	1,613	1,046	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.001	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.013	0.33	30	0.048	3.5	0.000039	1,155	1.7	0.000039	0.00039	0.017	0.005	0.01	3.0	0.37	0.068	153,237
2075	8.9	1,623	1,040	21	0.11	0.0029	0.0019	0.0026	0.94	0.00005	2.0	0.001	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	30	0.049	3.4	0.000039	1,158	1.7	0.000039	0.00039	0.017	0.005	0.01	2.9	0.37	0.067	153,995
2076	8.9	1,649	1,044	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	1.9	0.001	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.055	0.013	0.33	29	0.05	3.4	0.000039	1,171	1.6	0.00004	0.0004	0.018	0.005	0.01	3.0	0.38	0.068	155,005
2077	8.9	1,665	1,042	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.001	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004	1,177	1.6	0.00004	0.0004	0.018	0.005	0.01	3.1	0.39	0.07	155,356
2078	8.9	1,678	1,039	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.001	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.056	0.014	0.32	29	0.054	3.4	0.00004	1,182	1.6	0.00004	0.0004	0.018	0.005	0.01	3.2	0.4	0.073	156,236
2079	8.9	1,688	1,042	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001	0.0045	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.055	3.4	0.00004	1,188	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.41	0.074	157,251
2080	8.9	1,694	1,048	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001	0.0046	0.014	0.05	0.0041	0.5	50	0.019	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.000041	1,193	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.41	0.074	158,470
2081	8.9	1,705	1,047	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.001	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.057	0.015	0.32	29	0.058	3.3	0.000041	1,198	1.6	0.000041	0.00041	0.018	0.005	0.01	3.3	0.41	0.075	158,838
2082	9.0	1,698	1,066	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.001	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.015	0.32	28	0.058	3.3	0.000041	1,202	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.4	0.073	159,814
2083	9.0	1,686	1,086	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.8	0.001	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.059	3.3	0.000041	1,205	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.41	0.074	160,383
2084	9.0	1,688	1,093	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.001	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.000041	1,208	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.4	0.072	161,637
2085	9.0	1,681	1,104	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.001	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004	1,209	1.6	0.00004	0.0004	0.018	0.005	0.01	3.2	0.41	0.074	161,890
2086	9.0	1,685	1,107	20	0.12	0.003	0.0022	0.0026	0.89	0.00005	1.8	0.001	0.005	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.000041	1,212	1.6	0.00004	0.00041	0.018	0.005	0.01	3.1	0.4	0.072	162,778
2087	9.0	1,679	1,114	19	0.12	0.003	0.0022	0.0026	0.89	0.00005	1.8	0.001	0.0049	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.2	0.00004	1,211	1.6	0.00004	0.0004	0.018	0.005	0.01	3.1	0.4	0.072	163,470
2088	9.0	1,691	1,120	19	0.12	0.003	0.0023	0.0026	0.88	0.00005	1.8	0.001	0.0049	0.015	0.05	0.0044	0.48	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.2	0.000041	1,219	1.6	0.000041	0.00041	0.018	0.005	0.01	3.0	0.37	0.068	164,570
2089	9.0	1,688	1,142	19	0.13	0.003	0.0022	0.0027	0.88	0.00005	1.7	0.001	0.0049	0.015	0.05	0.0044	0.48	54	0.02	0.000005	0.057	0.016	0.31	28	0.059	3.2	0.00004	1,226	1.6	0.000041	0.00041	0.018	0.005	0.01	3.0	0.37	0.068	164,772
2090	9.0	1,679	1,158	19	0.14	0.003	0.0022	0.0027	0.88	0.00005	1.6	0.001	0.0049	0.015	0.05	0.0044	0.48	55	0.02	0.000005	0.057	0.016	0.31	27	0.059	3.2	0.00004	1,229	1.5	0.00004	0.0004	0.018	0.005	0.01	2.8	0.35	0.064	165,462
2091	9.0	1,674	1,167	19	0.14	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001	0.0048	0.015	0.05	0.0043	0.48	55	0.02	0.000005	0.056	0.016	0.31	27	0.058	3.2	0.00004	1,230	1.5	0.00004	0.0004	0.018	0.005	0.01	2.8	0.35	0.064	166,285
2092	9.0	1,674	1,175	19	0.14	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001	0.0048	0.015	0.05	0.0043	0.48	56	0.02	0.000005	0.056	0.016	0.3	27	0.058	3.2	0.00004	1,232	1.5	0.00004	0.0004	0.018	0.005	0.01	2.8	0.35	0.063	167,587
2093	9.0	1,659	1,195	19	0.14	0.0029	0.0022	0.0027	0.86	0.00005	1.5	0.001	0.0048	0.014	0.05	0.0043	0.47	56	0.02	0.000005	0.056	0.015	0.3	27	0.058	3.2	0.000039	1,233	1.5	0.00004	0.0004	0.018	0.005	0.01	2.9	0.36	0.066	168,175
2094	9.0	1,636	1,221	19	0.15	0.0029	0.0022	0.0028	0.86	0.00005	1.5	0.001	0.0047	0.014	0.05	0.0042	0.47	57	0.02	0.000005	0.055	0.015	0.3	27	0.057	3.1	0.000039	1,233	1.5	0.000039	0.00039	0.017	0.005	0.01	2.9	0.37	0.067	169,130
2095	9.0	1,622	1,230	19	0.15	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.001	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.1	0.000039	1,230	1.5	0.000039	0.00039	0.017	0.005	0.01	3.1	0.39	0.071	169,816
2096	9.0	1,600	1,244	19	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.4	0.001	0.0045	0.014	0.05	0.004	0.47	57	0.019	0.000005	0.054	0.015	0.3	27	0.055	3.1	0.000038	1,225	1.5	0.000038	0.00038	0.017	0.005	0.01	3.2	0.41	0.074	170,905
2097	9.0	1,599	1,248	19	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.4	0.001	0.0045	0.014	0.05	0.004	0.47	58	0.019	0.000005	0.054	0.015	0.3	27	0.056	3.1	0.000038	1,226	1.5	0.000038	0.00038	0.017	0.005	0.01	3.4	0.43	0.078	171,124
2098	9.0	1,593	1,256	18	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.4	0.001	0.0045	0.014	0.05	0.0039	0.46	58	0.019	0.000005	0.054	0.014	0.3	26	0.056	3.1	0.000038	1,226	1.5	0.000038	0.00038	0.017	0.005	0.01	3.6	0.45	0.082	171,837
2099	9.0	1,595	1,257	18	0.14	0.0028	0.0021	0.0028	0.84	0.00005	1.5	0.001	0.0046	0.014	0.05	0.004	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.1	0.000038	1,227	1.5	0.000038	0.00038	0.017	0.005	0.01	3.7	0.47	0.086	172,453
2100	9.0	1,603	1,268	18	0.15	0.0028	0.0021	0.0028	0.84	0.00005	1.4	0.001	0.0046	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.057	3.1	0.000038	1,234	1.5	0.000039	0.00039	0.017	0.005	0.01	3.9	0.49	0.09	173,472
2101	9.0	1,610	1,269	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.001	0.0046	0.014	0.05	0.004	0.46	60	0.019	0.000005	0.054	0.015	0.29	26	0.057	3.0	0.000038	1,238	1.5	0.000039	0.00039	0.017	0.005	0.01	4.1	0.51	0.093	174,383
2102	9.0	1,612	1,273	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.001	0.0046	0.014	0.05	0.004	0.45	60	0.02	0.000005	0.054	0.015	0.29	26	0.058	3.0	0.000039	1,240	1.5	0.000039	0.00039	0.017	0.005	0.01	4.2	0.54	0.097	175,164
2103	9.1	1,636	1,280	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.001	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,253	1.5	0.000039	0.00039	0.017	0.005	0.01	4.4	0.56	0.101	175,863
2104	9.1	1,648	1,284	18	0.16	0.0029	0.0022	0.0028	0.82	0.00005	1.4	0.001	0.0048	0.014	0.05	0.0041	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039	1,259	1.4	0.00004	0.0004	0.018	0.005	0.01	4.6	0.58	0.105	177,220
2105	9.1	1,638	1,292	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.3	0.001	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039	1,258	1.4	0.000039	0.00039	0.017	0.005	0.01	4.7	0.6	0.108	177,533
2106	9.1	1,606	1,315	18	0.17	0.0028	0.0021	0.0029	0.82	0.00005	1.3	0.001	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	26	0.058	3.0	0.000038	1,253	1.4	0.000039	0.00039	0.017	0.005	0.01	4.9	0.61	0.112	178,211
2107	9.1	1,600	1,330	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.001	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.058	3.0	0.000038	1,256	1.4	0.000039	0.00038	0.017	0.005	0.01	5.0	0.63	0.114	179,040
2108	9.1	1,603	1,342	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.001	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.059	2.9	0.000038	1,262	1.4	0.000039	0.00039	0.017	0.005	0.01	5.1	0.64	0.117	180,178
2109	9.1	1,607	1,351	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.001	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000038	1,266	1.4	0.000039	0.00039	0.017	0.005	0.01	5.2	0.66	0.119	180,248
2110	9.1	1,615	1,358	18	0.18	0.0028	0.0021	0.0029	0.8	0.00005	1.2	0.001	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.061	2.9	0.000039	1,272	1.4	0.000039	0.00039	0.017	0.005	0.01	5.3	0.67	0.122	180,830
2111	9.1	1,622	1,364	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.001	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.062	2.9	0.000039	1,278	1.4	0.000039	0.00039	0.017	0.005	0.01	5.4	0.68	0.124	181,243
2112	9.1	1,636	1,369	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.001	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.063	2.9	0.000039	1,285	1.4	0.000039	0.00039	0.017	0.005	0.01	5.5	0.69	0.13	181,975
2113	9.1	1,642	1,373	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.001	0.005	0.014	0.05	0.0042	0.44	66	0.022	0.000005	0.055	0.016	0.28	25	0.064	2.9	0.000039	1,289	1.4	0.00004	0.00039	0.018	0.005	0.01	5.6	0.7	0.13	181,870
2114	9.1	1,657	1,375	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.001	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,296	1.4	0.00004	0.0004	0.018	0.005	0.01	5.6	0.71	0.13	182,135
2115	9.1	1,663	1,378	17	0.17	0.0029	0.0023	0.0029	0.8	0.00005	1.3	0.001	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.066	2.9	0.00004	1,300	1.4	0.00004	0.0004	0.018	0.005	0.01	5.6	0.7	0.13	182,344
2116	9.1	1,678	1,379	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.001	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,306	1.4	0.00004	0.0004	0.018	0.005	0.01	5.5	0.69	0.13	183,370
2117	9.1	1,671	1,392	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0053	0.014	0.05	0.0045	0.43	67	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,308	1.4	0.00004	0.0004	0.018	0.005	0.01	5.3	0.68	0.12	183,400
2118	9.1	1,667	1,407	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,312	1.4	0.00004	0.0004	0.018	0.005	0.011	5.2	0.66	0.12	183,657
2119	9.1	1,664	1,415	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,314	1.4	0.00004	0.0004	0.018	0.005	0.011	5.0	0.63	0.11	183,671
2120	9.1	1,663	1,425	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,317	1.4	0.00004	0.0004	0.018	0.005	0.011	4.8	0.61	0.11	184,250
2121	9.1	1,656	1,451	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.001	0.0054	0.014	0.05	0.0046	0.43	70	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,325	1.4	0.00004	0.0004	0.018	0.005	0.011	4.6	0.58	0.106	184,044
2122	9.1	1,633	1,480	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.055	0.017	0.28	25	0.066	2.9	0.00004	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	4.4	0.56	0.101	184,430
2123	9.1	1,623	1,492	17	0.22	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	4.2	0.54	0.098	184,660
2124	9.2	1,607	1,511	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.001	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.065	2.9	0.000039	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	4.0	0.5	0.091	185,381
2125	9.2	1,601	1,519	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.001	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000039	1,325	1.4	0.000039	0.00038	0.017	0.005	0.011	3.8	0.48	0.087	185,380
2126	9.2	1,589	1,533	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.01	0.001	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.063	2.9	0.000038	1,324	1.4	0.000038	0.00038	0.017	0.005	0.01	3.4	0.43	0.077	185,890
2127	9.2	1,585	1,541	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.	0.001	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.062	2.9	0.000038	1,325	1.4	0.000038	0.00038	0.017	0.005	0.01	3.2	0.4	0.073	185,957
2128	9.2	1,576	1,555	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.8	0.000038	1,326	1.4	0.000038	0.00038	0.017	0.005	0.01	2.7	0.35	0.063	186,328
2129	9.2	1,576	1,560	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	2.6	0.32	0.059	185,930
2130	9.2	1,568	1,571	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	2.2	0.28	0.052	186,107
2131	9.2	1,571	1,576	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	2.1	0.27	0.049	186,064
2132	9.2	1,566	1,585	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	2.0	0.25	0.045	186,657
2133	9.2	1,570	1,589	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.9	0.000038	1,333	1.4	0.000038	0.00038	0.017	0.005	0.01	1.9	0.24	0.044	186,125
2134	9.2	1,568	1,595	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0048	0.015	0.05	0.0044	0.43	77	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,334	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.042	186,338

Table A7. Source terms of the NAG backfill for the low nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,573	1,597	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,337	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.042	186,569
2136	9.2	1,572	1,603	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0047	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,338	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.041	187,180
2137	9.2	1,578	1,606	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.96	0.001	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,341	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.041	186,716
2138	9.2	1,565	1,622	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.001	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.041	186,790
2139	9.2	1,549	1,640	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.001	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.017	0.005	0.01	1.8	0.23	0.041	187,056
2140	9.2	1,541	1,650	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.001	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.016	0.005	0.01	1.8	0.23	0.041	187,514
2141	9.2	1,529	1,664	17	0.26	0.0027	0.0022	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.016	0.005	0.01	1.8	0.23	0.042	186,895
2142	9.2	1,523	1,670	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,340	1.4	0.000037	0.00037	0.016	0.005	0.01	1.8	0.23	0.042	186,886
2143	9.2	1,512	1,682	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.001	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,034
2144	9.2	1,507	1,687	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.87	0.001	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,551
2145	9.2	1,498	1,697	17	0.26	0.0026	0.0021	0.0034	0.78	0.00005	0.87	0.001	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,338	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,019
2146	9.2	1,494	1,702	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,081
2147	9.2	1,487	1,710	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0041	0.014	0.05	0.0037	0.43	83	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000036	1,336	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.041	187,212
2148	9.2	1,483	1,714	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.004	0.014	0.05	0.0037	0.42	84	0.016	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000035	1,336	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.041	187,667
2149	9.2	1,477	1,721	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000036	0.00036	0.016	0.005	0.01	1.7	0.22	0.04	187,030
2150	9.2	1,474	1,724	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0035	0.43	85	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000035	0.00035	0.016	0.005	0.01	1.7	0.21	0.039	186,985

Table A8. Annual loads of the NAG backfill for the low nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	29	1.8	0.69	0.00041	0.000052	0.000029	0.000057	0.032	0.0000012	0.67	0.000024	0.00014	0.000097	0.0012	0.0000024	0.017	0.49	0.00081	0.00000012	0.00098	0.00018	0.011	0.99	0.0027	0.12	0.0000007	13	0.056	0.0000007	0.000007	0.00031	0.00012	0.00024	0.99	0.13	0.023	24
2024	53	3.2	1.3	0.00074	0.000094	0.000053	0.0001	0.057	0.0000022	1.2	0.000044	0.00025	0.00018	0.0022	0.0000044	0.031	0.89	0.0015	0.00000022	0.0018	0.00033	0.02	1.8	0.0048	0.21	0.0000013	24	0.1	0.0000013	0.000013	0.00057	0.00022	0.00044	1.8	0.23	0.041	44
2025	97	5.9	2.3	0.0014	0.00017	0.000097	0.00019	0.11	0.000004	2.2	0.00008	0.00046	0.00032	0.004	0.0000081	0.058	1.6	0.0027	0.0000004	0.0033	0.0006	0.037	3.3	0.0089	0.38	0.0000023	43	0.18	0.0000023	0.000023	0.001	0.0004	0.0008	3.3	0.42	0.076	80
2026	152	9.1	3.6	0.0021	0.00027	0.00015	0.00029	0.16	0.0000063	3.5	0.00013	0.00072	0.0005	0.0063	0.000013	0.09	2.5	0.0042	0.00000063	0.0051	0.00093	0.057	5.1	0.014	0.6	0.0000036	68	0.29	0.0000036	0.000036	0.0016	0.00063	0.0013	5.1	0.65	0.12	125
2027	191	11	4.5	0.0027	0.00034	0.00019	0.00037	0.21	0.0000079	4.4	0.00016	0.0009	0.00063	0.0079	0.000016	0.11	3.2	0.0053	0.00000079	0.0064	0.0012	0.072	6.5	0.017	0.75	0.0000046	85	0.36	0.0000046	0.000046	0.002	0.00079	0.0016	6.5	0.82	0.15	158
2028	349	21	8.2	0.0048	0.00062	0.00035	0.00068	0.38	0.000014	8.0	0.00029	0.0017	0.0012	0.014	0.000029	0.21	5.8	0.0097	0.0000014	0.012	0.0021	0.13	12	0.032	1.4	0.0000084	156	0.66	0.0000084	0.000084	0.0037	0.0014	0.0029	12	1.5	0.27	289
2029	326	20	7.7	0.0045	0.00057	0.00032	0.00063	0.35	0.000013	7.5	0.00027	0.0015	0.0011	0.013	0.000027	0.19	5.5	0.0091	0.0000013	0.011	0.002	0.12	11	0.03	1.3	0.0000078	146	0.62	0.0000078	0.000078	0.0035	0.0013	0.0027	11	1.4	0.25	270
2030	421	25	9.9	0.0058	0.00074	0.00042	0.00081	0.45	0.000017	9.7	0.00035	0.002	0.0014	0.017	0.000035	0.25	7.0	0.012	0.0000017	0.014	0.0026	0.16	14	0.038	1.7	0.00001	188	0.8	0.00001	0.0001	0.0045	0.0017	0.0035	14	1.8	0.33	348
2031	2,705	163	64	0.038	0.0048	0.0027	0.0052	2.9	0.00011	62	0.0022	0.013	0.0089	0.11	0.00022	1.6	45	0.075	0.000011	0.091	0.017	1.0	91	0.25	11	0.000065	1,208	5.1	0.000065	0.00065	0.029	0.011	0.022	92	12	2.1	2,236
2032	4,396	264	104	0.061	0.0078	0.0044	0.0085	4.7	0.00018	101	0.0036	0.021	0.015	0.18	0.00036	2.6	73	0.12	0.000018	0.15	0.027	1.7	149	0.4	17	0.00011	1,962	8.3	0.00011	0.0011	0.047	0.018	0.036	149	19	3.4	3,634
2033	750	45	18	0.01	0.0013	0.00075	0.0015	0.81	0.000031	17	0.00062	0.0035	0.0025	0.031	0.000062	0.44	13	0.021	0.0000031	0.025	0.0046	0.28	25	0.068	3.0	0.000018	335	1.4	0.000018	0.00018	0.008	0.0031	0.0062	25	3.2	0.58	620
2034	3,015	181	71	0.042	0.0053	0.003	0.0058	3.3	0.00012	69	0.0025	0.014	0.01	0.12	0.00025	1.8	50	0.084	0.000012	0.1	0.019	1.1	102	0.28	12	0.000072	1,346	5.7	0.000072	0.00072	0.032	0.012	0.025	102	13	2.3	2,492
2035	8,570	516	202	0.12	0.015	0.0085	0.017	9.3	0.00035	197	0.0071	0.041	0.028	0.35	0.00071	5.1	143	0.24	0.000035	0.29	0.053	3.2	290	0.78	34	0.00021	3,825	16	0.00021	0.0021	0.092	0.035	0.071	290	37	6.7	7,085
2036	14,616	879	345	0.2	0.026	0.015	0.028	16	0.0006	336	0.012	0.069	0.048	0.6	0.0012	8.7	244	0.41	0.00006	0.49	0.09	5.5	494	1.3	58	0.00035	6,524	28	0.00035	0.0035	0.16	0.06	0.12	494	63	11	12,083
2037	16,287	980	385	0.23	0.029	0.016	0.032	18	0.00067	374	0.013	0.077	0.054	0.67	0.0014	9.6	272	0.45	0.000067	0.55	0.1	6.2	551	1.5	64	0.00039	7,270	31	0.00039	0.0039	0.17	0.067	0.13	551	70	13	13,464
2038	32,604	1,961	770	0.45	0.057	0.032	0.063	35	0.0013	749	0.027	0.15	0.11	1.3	0.0027	19	545	0.91	0.00013	1.1	0.2	12	1,102	3.0	128	0.00078	14,553	62	0.00078	0.0078	0.35	0.13	0.27	1,103	139	25	26,952
2039	59,745	6,372	1,312	0.94	0.11	0.058	0.11	60	0.0023	1,423	0.046	0.27	0.18	2.3	0.015	33	1,035	1.5	0.00023	2.0	0.37	21	1,878	5.0	219	0.0014	27,828	105	0.0014	0.014	0.64	0.23	0.46	1,824	231	42	45,912
2040	115,715	19,463	2,260	1.5	0.2	0.11	0.18	103	0.004	2,290	0.079	0.45	0.32	4.0	0.065	57	2,115	2.5	0.0004	3.9	0.71	36	3,235	8.2	377	0.0028	57,514	182	0.0028	0.028	1.2	0.4	0.79	2,790	353	64	79,056
2041	167,182	42,337	3,172	3.1	0.29	0.16	0.25	145	0.0055	1,440	0.11	0.46	0.9	5.5	0.18	79	3,299	2.4	0.00055	5.6	0.98	51	4,540	7.5	529	0.004	91,316	255	0.004	0.04	1.8	0.55	1.1	2,013	255	46	110,907
2042	181,431	51,233	3,172	3.8	0.32	0.19	0.31	145	0.0064	1,494	0.13	0.39	1.1	6.4	0.25	79	3,643	1.8	0.00064	6.1	1.0	51	4,539	5.4	529	0.0044	101,510	255	0.0044	0.044	1.9	0.64	1.3	946	120	22	128,839
2043	183,557	52,414	3,172	3.9	0.32	0.19	0.32	145	0.0067	1,574	0.13	0.35	1.1	6.7	0.27	79	3,688	1.5	0.00067	6.2	1.0	51	4,539	4.6	529	0.0044	102,890	255	0.0044	0.044	2.0	0.67	1.3	579	73	13	133,866
2044	184,376	52,092	3,171	3.9	0.33	0.2	0.33	145	0.0068	1,671	0.14	0.35	1.1	6.8	0.27	79	3,693	1.5	0.00068	6.2	1.0	51	4,539	4.6	529	0.0044	103,017	255	0.0044	0.044	2.0	0.68	1.4	579	73	13	136,575
2045	187,155	52,976	3,172	3.9	0.33	0.2	0.32	145	0.0067	1,557	0.13	0.37	1.1	6.7	0.27	79	3,757	1.6	0.00067	6.3	1.1	51	4,539	4.9	529	0.0045	104,762	255	0.0045	0.045	2.0	0.67	1.3	679	86	16	133,758
2046	186,745	51,799	3,172	3.8	0.33	0.2	0.3	145	0.0064	1,486	0.13	0.39	1.1	6.4	0.3	79	3,742	1.7	0.00064	6.3	1.1	51	4,540	5.1	529	0.0045	104,136	255	0.0045	0.045	2.0	0.64	1.3	655	83	15	128,763
2047	201,983	52,985	3,173	3.8	0.36	0.22	0.29	145	0.0064	1,470	0.13	0.44	1.1	6.4	0.37	80	4,015	1.9	0.00064	6.8	1.4	51	4,541	5.6	529	0.0048	111,476	255	0.0049	0.049	2.2	0.64	1.3	495	63	11	128,089
2048	222,414	56,058	3,173	4.0	0.39	0.25	0.28	145	0.0065	1,442	0.13	0.52	1.1	6.5	0.45	80	4,401	2.2	0.00065	7.5	1.6	51	4,542	6.5	529	0.0053	121,971	255	0.0054	0.053	2.4	0.65	1.3	479	61	11	129,793
2049	232,882	58,638	3,174	4.1	0.41	0.27	0.28	145	0.0066	1,397	0.13	0.59	1.2	6.6	0.5	80	4,615	2.5	0.00066	7.8	1.9	51	4,542	7.3	529	0.0056	127,814	255	0.0056	0.056	2.5	0.66	1.3	516	65	12	131,172
2050	239,485	59,886	3,174	4.2	0.42	0.29	0.28	145	0.0066	1,404	0.13	0.63	1.2	6.6	0.55	80	4,741	2.6	0.00066	8.1	2.0	51	4,543	7.7	529	0.0057	131,300	255	0.0058	0.058	2.6	0.66	1.3	454	57	10	132,811
2051	243,278	60,526	3,174	4.2	0.43	0.3	0.28	145	0.0067	1,417	0.13	0.65	1.2	6.7	0.58	80	4,811	2.7	0.00067	8.2	2.1	51	4,543	7.8	529	0.0058	133,263	255	0.0058	0.059	2.6	0.67	1.3	360	46	8.3	133,964
2052	246,757	61,084	3,174	4.3	0.44	0.3	0.28	145	0.0068	1,431	0.14	0.65	1.2	6.8	0.61	80	4,875	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059	135,046	255	0.0059	0.059	2.6	0.68	1.4	239	30	5.5	135,076
2053	248,235	61,157	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,435	0.14	0.66	1.2	6.8	0.62	80	4,900	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.0059	135,740	255	0.006	0.06	2.7	0.68	1.4	141	18	3.2	135,145
2054	249,944	61,387	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,446	0.14	0.66	1.2	6.8	0.63	80	4,930	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006	136,596	255	0.006	0.06	2.7	0.68	1.4	111	14	2.7	135,795
2055	252,972	61,688	3,174	4.3	0.45	0.32	0.29	145	0.0068	1,462	0.14	0.68	1.2	6.8	0.65	80	4,984	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061	138,049	255	0.0061	0.061	2.7	0.68	1.5	113	14	2.7	136,601
2056	248,809	75,905	3,175	5.4	0.44	0.31	0.3	145	0.0069	1,017	0.14	0.67	1.4	6.9	0.63	80	5,234	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006	142,635	255	0.006	0.06	2.7	0.69	1.4	127	16	2.9	137,639
2057	238,664	98,121	3,175	7.1	0.42	0.3	0.32	145	0.0069	641	0.14	0.61	1.8	6.9	0.58	80	5,609	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057	147,692	255	0.0057	0.057	2.5	0.69	1.4	143	18	3.3	137,940
2058	232,800	110,938	3,176	8.2	0.41	0.28	0.33	145	0.0069	518	0.14	0.58	2.0	6.9	0.54	80	5,859	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0056	150,436	255	0.0056	0.056	2.5	0.69	1.4	162	21	3.7	138,218
2059	231,450	115,350	3,176	8.7	0.41	0.28	0.34	145	0.0069	480	0.14	0.57	2.0	6.9	0.53	80	5,973	2.3	0.00069	7.8	1.9	51	4,545	6.6	530	0.0055	151,656	255	0.0056	0.056	2.5	0.69	1.4	185	23	4.2	138,460
2060	233,135	117,134	3,176	8.8	0.41	0.28	0.34	145	0.007	483	0.14	0.57	2.0	7.0	0.53	80	6,057	2.3	0.0007	7.8	1.9	51	4,545	6.7	530	0.0056	153,122	255	0.0056	0.056	2.5	0.7	1.4	212	27	4.9	139,518
2061	234,102	117,262	3,176	8.7	0.41	0.28	0.34	145	0.007	486	0.14	0.58	2.0	7.0	0.53	80	6,083	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056	153,584	255	0.0056	0.056	2.5	0.7	1.4	240	30	5.5	139,838
2062	233,972	122,782	3,176	10	0.41	0.28	0.35	145	0.007	425	0.14	0.58	2.0	7.0	0.53	80	6,199	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056	155,911	255	0.0056	0.056	2.5	0.7	1.4	273	35	6.3	140,676
2063	232,497	128,745	3,176	11	0.41	0.28	0.36	145	0.0071	387	0.14	0.57	2.0	7.1	0.51	80	6,343	2.3	0.00071	7.8	1.8	51	4,546	6.8	530	0.0056	157,707	255	0.0056	0.056	2.5	0.71	1.4	308	39	7.1	141,568
2064	233,632	130,824	3,176	11	0.41	0.28	0.36	145	0.0071	389	0.14	0.57	2.0	7.1	0.51	80	6,425	2.4	0.00071	7.9	1.8	51	4,546	6.9	530	0.0056	159,053	255	0.0056	0.056	2.5	0.71	1.4	346	44	8.0	142,789
2065	234,574	136,451	3,176	14	0.41	0.28	0.37	145	0.0072	335	0.14	0.57	2.0	7.2	0.5	80	6,576	2.4	0.00072	7.9	1.8	51	4,546	6.9	530	0.0056	161,851	255	0.0056	0.056	2.5	0.72	1.4	385	49	8.9	143,409
2066	232,619	143,839	3,176	16	0.41	0.28	0.38	145	0.0072	299	0.14	0.56	2.0	7.2	0.49	80	6,730	2.3	0.00072	7.8	1.8	51	4,546	6.9	530	0.0056	164,047	255	0.0056	0.056	2.5	0.72	1.4	427	54	9.8	144,573
2067	231,421	149,219	3,177	17	0.41	0.27	0.39	145	0.0073	283	0.15	0.56	2.0	7.3	0.49	80	6,867	2.3	0.00073	7.8	1.8	51	4,546	6.9	530	0.0055	165,715	255	0.0056	0.056	2.5	0.73	1.5	471	60	11	145,722
2068	232,988	153,013	3,177	17	0.41	0.28	0.4	145	0.0074	281	0.15	0.56	2.0	7.4	0.48	80	7,020	2.4	0.00074	7.8	1.8	51	4,546	7.0	530	0.0056	167,918	255	0.0056	0.056	2.5	0.74	1.5	516	65	12	147,284
2069	233,683	155,281	3,177	17	0.41	0.28	0.4	145	0.0074	282	0.15	0.56	2.0	7.4	0.48	80	7,126	2.4	0.00074	7.9	1.8	51	4,546	7.0	530	0.0056	169,093	255	0.0056	0.056	2.5	0.74	1.5	552	70	13	148,041
2070	236,372	156,735	3,177	17	0.42	0.28	0.4	145	0.0075	289	0.15	0.57	2.0	7.5	0.48	80	7,228	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057	170,847	255	0.0057	0.057	2.5	0.75	1.5	569	72	13	149,328
2071	238,235	158,106	3,177	16	0.42	0.28	0.4	145	0.0075	296	0.15	0.57	2.0	7.5	0.49	80	7,319	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057	172,193	255	0.0057	0.057	2.5	0.75	1.5	545	69	13	150,505
2072	242,837	159,906	3,177	17	0.43	0.29	0.41	145	0.0076	292	0.15	0.58	2.0	7.6	0.5	80	7,437	2.4	0.00076	8.2	1.8	51	4,547	7.1	530	0.0058	174,992	255	0.0058	0.058	2.6	0.76	1.5	499	63	11	151,916
2073	244,688	159,952	3,177	17	0.43	0.29	0.41	145	0.0076	297	0.15	0.59	2.1	7.6	0.51	80	7,477	2.5	0.00076	8.2	1.9	51	4,547	7.2	530	0.0059	175,821	255	0.0059	0.059	2.6	0.76	1.5	463	59	11	152,292
2074	247,186	160,209	3,177	17	0.44	0.29	0.41	145	0.0077	305	0.15	0.6	2.1	7.7	0.53	80	7,523	2.5	0.00077	8.3	1.9	51	4,547	7.3	530	0.0059	177,034	255	0.0059	0.059	2.6	0.77	1.5	454	57	10	153,237
2075	249,903	160,201	3,177	16	0.44	0.3	0.41	145	0.0077	314	0.15	0.62	2.1	7.7	0.54	80	7,568	2.6	0.00077	8.4	2.0	51	4,547	7.5	530	0.006	178,249	255	0.006	0.06	2.7	0.77	1.5	447	56	10	153,995
2076	255,542	161,888	3,177	18	0.45	0.31	0.41	145	0.0078	302	0.16	0.64	2.1	7.8	0.56	80	7,686	2.7	0.00078	8.6	2.0	51	4,547	7.8	530	0.0061	181,511	255	0.0062	0.061	2.7	0.78	1.6	461	58	11	155,005
2077	258,668	161,866	3,177	18	0.46	0.32	0.4	145	0.0078	305	0.16	0.66	2.2	7.8	0.58	80	7,734	2.8	0.00078	8.7	2.1	51	4,547	8.1	530	0.0062	182,886	255	0.0062	0.062	2.8	0.78	1.6	476	60	11	155,356
2078	262,211	162,267	3,177	18	0.46	0.32	0.4	145	0.0078	311	0.16	0.69	2.2	7.8	0.61	80	7,796	2.9	0.00078	8.8	2.2	51	4,547	8.4	530	0.0063	184,639	255	0.0063	0.063	2.8	0.78	1.6	496	63	11	156,236
2079	265,455	163,902	3,177	18	0.47	0.33	0.41	145	0.0079	311	0.16	0.71	2.2	7.9	0.63	80	7,884	3.0	0.00079	8.9	2.3	51	4,547	8.7	530	0.0064	186,782	255	0.0064	0.064	2.8	0.79	1.6	509	64	12	157,251
2080	268,416	166,108	3,177	18	0.47	0.34	0.41	145	0.0079	311	0.16	0.74	2.3	7.9	0.65	80	7,990	3.1	0.00079	9.0	2.4	51	4,547	9.0	530	0.0064	189,023	255	0.0064	0.065	2.9	0.79	1.6	510	64	12	158,470
2081	270,883	166,367	3,177	18	0.48	0.35	0.41	145	0.0079	316	0.16	0.76	2.3	7.9	0.67	80	8,041	3.1	0.00079	9.1	2.4	51	4,548	9.2	530	0.0065	190,209	255	0.0065	0.065	2.9	0.79	1.6	518	65	12	158,838
2082	271,299	170,361	3,177	19	0.48	0.35	0.41	145	0.008	304	0.16	0.77	2.3	8.0	0.68	80	8,150	3.2	0.0008	9.1	2.5	51	4,548	9.3	530	0.0065	192,048	255	0.0065	0.065	2.9	0.8	1.6	505	64	12	159,814
2083	270,406	174,128	3,178	20	0.48	0.35	0.42	145	0.008	294	0.16	0.78	2.3	8.0	0.69	80	8,248	3.2	0.0008	9.1	2.5	51	4,548	9.4	530	0.0065	193,181	255	0.0065	0.065	2.9	0.8	1.6	514	65	12	160,383
2084	272,860	176,718	3,178	20	0.48	0.36	0.42	145	0.0081	295	0.16	0.79	2.3	8.1	0.7	80	8,376	3.3	0.00081	9.2	2.6	51	4,548	9.6	530	0.0066	195,290	255	0.0066	0.066	2.9	0.81	1.6	510	64	12	161,637
2085	272,104	178,645	3,178	20	0.48	0.36	0.43	145	0.0081	293	0.16	0.79	2.3	8.1	0.7	80	8,448	3.3	0.00081	9.2	2.6	51	4,548	9.7	530	0.0066	195,692	255	0.0065	0.065	2.9	0.81	1.6	520	66	12	161,890
2086	274,233	180,244	3,178	20	0.48	0.37	0.43	145	0.0081	296	0.16	0.81	2.4	8.1	0.72	80	8,554	3.3	0.00081	9.2	2.6	51	4,548	9.8	530	0.0066	197,239	255	0.0066	0.066	2.9	0.81	1.6	510	64	12	162,778
2087	274,498	182,023	3,178	19	0.48	0.37	0.43	145	0.0082	298	0.16	0.8	2.4	8.2	0.72	80	8,645	3.3	0.00082	9.2	2.6	51	4,548	9.8	530	0.0066	198,011	255	0.0066	0.066	2.9	0.82	1.6	514	65	12	163,470
2088	278,287	184,335	3,178	20	0.49	0.37	0.43	145	0.0082	293	0.16	0.81	2.4	8.2	0.73	80	8,791	3.4	0.00082	9.4	2.6	51	4,548	9.9	530	0.0067	200,610	255	0.0067	0.067	3.0	0.82	1.7	488	62	11	164,570
2089	278,103	188,088	3,178	22	0.49	0.37	0.44	145	0.0082	274	0.16	0.81	2.4	8.2	0.72	80	8,913	3.3	0.00082	9.4	2.6	51	4,548	9.8	530	0.0066	202,044	255	0.0067	0.067	3.0	0.82	1.7	486	61	11	164,772
2090	277,811	191,638	3,178	23	0.49	0.37	0.44	145	0.0083	268	0.17	0.81	2.4	8.3	0.73	80	9,038	3.3	0.00083	9.4	2.6	51	4,549	9.7	530	0.0066	203,304	255	0.0067	0.067	3.0	0.83	1.7	459	58	11	165,462
2091	278,428	193,988	3,178	23	0.49	0.37	0.45	145	0.0083	267	0.17	0.81	2.4	8.3	0.72	80	9,159	3.3	0.00083	9.4	2.6	51	4,549	9.7	530	0.0066	204,448	255	0.0067	0.067	3.0	0.83	1.7	466	59	11	166,285
2092	280,491	196,915	3,178	23	0.49	0.37	0.45	145	0.0084	268	0.17	0.81	2.4	8.4	0.73	80	9,318	3.3	0.00084	9.4	2.6	51	4,549	9.8	530	0.0067	206,468	255	0.0068	0.067	3.0	0.84	1.7	462	58	11	167,587
2093	278,918	201,019	3,178	24	0.49	0.37	0.46	145	0.0084	258	0.17	0.8	2.4	8.4	0.72	80	9,439	3.3	0.00084	9.4	2.6	51	4,549	9.7	530	0.0066	207,376	256	0.0067	0.067	3.0	0.84	1.7	480	61	11	168,175
2094	276,748	206,424	3,178	25	0.49	0.37	0.47	145	0.0085	249	0.17	0.8	2.4	8.5	0.71	80	9,600	3.3	0.00085	9.3	2.6	51	4,549	9.7	530	0.0066	208,538	256	0.0067	0.067	3.0	0.85	1.7	496	63	11	169,130
2095	275,408	208,789	3,178	25	0.49	0.36	0.47	145	0.0085	248	0.17	0.79	2.4	8.5	0.7	80	9,687	3.3	0.00085	9.3	2.5	51	4,549	9.6	530	0.0066	208,823	256	0.0066	0.066	2.9	0.85	1.7	524	66	12	169,816
2096	273,448	212,623	3,178	26	0.48	0.36	0.48	145	0.0085	246	0.17	0.77	2.4	8.5	0.68	80	9,817	3.2	0.00085	9.2	2.5	51	4,549	9.4	530	0.0065	209,393	256	0.0066	0.066	2.9	0.85	1.7	553	70	13	170,905
2097	273,679	213,477	3,178	26	0.48	0.36	0.48	145	0.0086	247	0.17	0.78	2.4	8.6	0.68	80	9,883	3.2	0.00086	9.2	2.5	51	4,549	9.5	530	0.0065	209,764	256	0.0066	0.066	2.9	0.86	1.7	583	74	13	171,124
2098	273,719	215,844	3,179	25	0.48	0.36	0.49	145	0.0086	248	0.17	0.78	2.4	8.6	0.68	80	10,008	3.3	0.00086	9.2	2.5	51	4,549	9.6	530	0.0065	210,638	256	0.0066	0.066	2.9	0.86	1.7	614	78	14	171,837
2099	275,097	216,739	3,179	25	0.49	0.36	0.49	145	0.0086	252	0.17	0.79	2.4	8.6	0.68	80	10,088	3.3	0.00086	9.3	2.5	51	4,549	10	530	0.0066	211,548	256	0.0066	0.066	2.9	0.86	1.7	646	82	15	172,453
2100	278,144	219,910	3,179	26	0.49	0.36	0.49	145	0.0087	245	0.17	0.79	2.4	8.7	0.68	80	10,271	3.3	0.00087	9.4	2.5	51	4,549	10	530	0.0066	214,133	256	0.0067	0.067	3.0	0.87	1.7	677	86	16	173,472
2101	280,827	221,205	3,179	26	0.5	0.37	0.49	145	0.0087	248	0.17	0.81	2.4	8.7	0.69	80	10,378	3.4	0.00087	9.5	2.6	51	4,549	10	530	0.0067	215,799	256	0.0067	0.068	3.0	0.87	1.7	709	90	16	174,383
2102	282,435	222,914	3,179	26	0.5	0.37	0.49	145	0.0088	250	0.18	0.81	2.4	8.8	0.69	80	10,510	3.4	0.00088	9.5	2.6	51	4,550	10	530	0.0068	217,116	256	0.0068	0.068	3.0	0.88	1.8	741	94	17	175,164
2103	287,764	225,069	3,179	28	0.51	0.38	0.49	145	0.0088	242	0.18	0.84	2.4	8.8	0.71	80	10,667	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069	220,356	256	0.0069	0.069	3.1	0.88	1.8	774	98	18	175,863
2104	291,969	227,497	3,179	28	0.51	0.38	0.5	145	0.0089	244	0.18	0.85	2.5	8.9	0.72	80	10,854	3.6	0.00089	9.8	2.7	51	4,550	11	530	0.007	223,119	256	0.007	0.07	3.1	0.89	1.8	808	102	19	177,220
2105	290,746	229,390	3,179	29	0.51	0.38	0.5	145	0.0089	240	0.18	0.85	2.4	8.9	0.71	80	10,899	3.6	0.00089	9.8	2.6	51	4,550	11	530	0.007	223,336	256	0.007	0.07	3.1	0.89	1.8	837	106	19	177,533
2106	286,225	234,419	3,179	31	0.5	0.37	0.51	145	0.0089	229	0.18	0.82	2.4	8.9	0.68	80	10,998	3.5	0.00089	9.6	2.5	51	4,550	10	530	0.0069	223,299	256	0.0069	0.069	3.1	0.89	1.8	865	109	20	178,211
2107	286,393	238,177	3,179	32	0.5	0.37	0.52	145	0.009	225	0.18	0.83	2.4	9.0	0.69	80	11,130	3.5	0.0009	9.6	2.6	51	4,550	10	530	0.0069	224,857	256	0.0069	0.069	3.1	0.9	1.8	890	113	20	179,040
2108	288,844	241,781	3,179	32	0.51	0.38	0.52	145	0.009	224	0.18	0.84	2.4	9.0	0.7	80	11,329	3.6	0.0009	9.7	2.6	51	4,550	11	530	0.0069	227,313	256	0.0069	0.069	3.1	0.9	1.8	917	116	21	180,178
2109	289,604	243,478	3,180	32	0.51	0.38	0.52	145	0.009	223	0.18	0.85	2.4	9.0	0.7	80	11,430	3.6	0.0009	9.7	2.6	51	4,551	11	530	0.0069	228,265	256	0.007	0.07	3.1	0.9	1.8	937	118	22	180,248
2110	292,022	245,603	3,180	32	0.51	0.38	0.52	145	0.009	223	0.18	0.87	2.5	9.0	0.72	80	11,588	3.7	0.0009	9.8	2.7	51	4,551	11	530	0.007	230,088	256	0.007	0.07	3.1	0.9	1.8	958	121	22	180,830
2111	293,958	247,234	3,180	32	0.52	0.39	0.52	145	0.0091	224	0.18	0.88	2.5	9.1	0.73	80	11,709	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007	231,538	256	0.0071	0.071	3.1	0.91	1.8	979	124	22	181,243
2112	297,657	249,143	3,180	32	0.52	0.4	0.52	145	0.0091	225	0.18	0.91	2.5	9.1	0.75	80	11,877	3.9	0.00091	10	2.8	51	4,551	11	530	0.0071	233,857	256	0.0072	0.072	3.2	0.91	1.8	999	126	23	181,975
2113	298,576	249,671	3,180	32	0.53	0.4	0.52	145	0.0091	226	0.18	0.92	2.5	9.1	0.76	80	11,947	3.9	0.00091	10	2.8	51	4,551	12	530	0.0071	234,413	256	0.0072	0.072	3.2	0.91	1.8	1,010	128	23	181,870
2114	301,761	250,509	3,180	32	0.53	0.41	0.52	145	0.0091	227	0.18	0.94	2.5	9.1	0.78	80	12,063	4.0	0.00091	10	2.9	51	4,551	12	530	0.0072	236,120	256	0.0073	0.073	3.2	0.91	1.8	1,016	128	23	182,135
2115	303,202	251,343	3,180	32	0.53	0.41	0.52	145	0.0091	228	0.18	0.95	2.5	9.1	0.79	80	12,153	4.0	0.00091	10	3.0	51	4,551	12	530	0.0073	237,011	256	0.0073	0.073	3.2	0.91	1.9	1,015	128	23	182,344
2116	307,639	252,867	3,180	32	0.54	0.42	0.52	145	0.0092	232	0.18	0.98	2.6	9.2	0.82	80	12,303	4.1	0.00092	10	3.0	51	4,552	12	530	0.0074	239,554	256	0.0074	0.074	3.3	0.92	1.9	1,005	127	23	183,370
2117	306,517	255,238	3,180	32	0.54	0.42	0.52	145	0.0092	227	0.18	0.98	2.6	9.2	0.82	80	12,375	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	239,961	256	0.0074	0.074	3.3	0.92	1.9	981	124	23	183,400
2118	306,082	258,478	3,180	33	0.54	0.42	0.53	145	0.0092	223	0.18	0.99	2.6	9.2	0.83	80	12,496	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	241,031	256	0.0074	0.074	3.3	0.92	1.9	952	120	22	183,657
2119	305,611	259,895	3,180	33	0.54	0.43	0.53	145	0.0092	222	0.18	0.98	2.6	9.2	0.84	80	12,572	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073	241,308	256	0.0074	0.073	3.3	0.92	1.9	917	116	21	183,671
2120	306,444	262,593	3,181	33	0.54	0.43	0.53	145	0.0092	221	0.18	0.99	2.6	9.2	0.85	80	12,714	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	242,675	256	0.0074	0.074	3.3	0.92	2.0	886	112	20	184,250
2121	304,851	267,122	3,181	37	0.54	0.43	0.54	145	0.0092	206	0.18	0.99	2.6	9.2	0.85	80	12,830	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	243,785	256	0.0073	0.073	3.3	0.92	2.0	850	107	20	184,044
2122	301,229	272,900	3,181	39	0.53	0.43	0.55	145	0.0092	197	0.18	0.98	2.7	9.2	0.85	80	12,987	4.1	0.00092	10	3.1	51	4,552	12	531	0.0073	244,406	256	0.0072	0.072	3.2	0.92	2.0	814	103	19	184,430
2123	299,684	275,549	3,181	40	0.53	0.43	0.55	145	0.0092	195	0.18	0.98	2.7	9.2	0.85	80	13,089	4.1	0.00092	10	3.1	51	4,553	12	531	0.0072	244,692	256	0.0072	0.072	3.2	0.92	2.0	784	99	18	184,660
2124	297,851	280,147	3,181	41	0.53	0.43	0.56	145	0.0093	191	0.19	0.97	2.7	9.3	0.85	80	13,268	4.1	0.00093	10	3.1	51	4,553	12	531	0.0072	245,592	256	0.0072	0.072	3.2	0.93	2.0	734	93	17	185,381
2125	296,775	281,667	3,181	41	0.52	0.43	0.57	145	0.0093	190	0.19	0.97	2.7	9.3	0.85	80	13,351	4.0	0.00093	10	3.1	51	4,553	12	531	0.0071	245,610	256	0.0071	0.071	3.2	0.93	1.9	698	88	16	185,380
2126	295,324	284,951	3,181	42	0.52	0.43	0.57	145	0.0093	188	0.19	0.96	2.7	9.3	0.85	80	13,494	4.0	0.00093	9.9	3.1	51	4,553	12	531	0.0071	246,156	256	0.0071	0.071	3.2	0.93	1.9	626	79	14	185,890
2127	294,760	286,541	3,181	42	0.52	0.43	0.57	145	0.0093	186	0.19	0.95	2.7	9.3	0.85	80	13,593	3.9	0.00093	9.9	3.1	51	4,553	12	531	0.0071	246,430	256	0.0071	0.071	3.1	0.93	1.9	587	74	14	185,957
2128	293,597	289,665	3,181	43	0.52	0.43	0.58	145	0.0093	184	0.19	0.94	2.8	9.3	0.84	80	13,762	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.0071	246,996	256	0.0071	0.071	3.1	0.93	1.9	510	64	12	186,328
2129	293,007	290,125	3,181	43	0.52	0.42	0.58	145	0.0093	183	0.19	0.93	2.8	9.3	0.84	80	13,826	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007	246,804	256	0.0071	0.07	3.1	0.93	1.9	476	60	11	185,930
2130	291,816	292,356	3,182	43	0.51	0.42	0.58	145	0.0093	182	0.19	0.91	2.8	9.3	0.83	80	13,964	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	247,001	256	0.007	0.07	3.1	0.93	1.9	417	53	9.6	186,107
2131	292,214	293,256	3,182	43	0.52	0.42	0.58	145	0.0093	182	0.19	0.91	2.8	9.3	0.83	80	14,055	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	247,428	256	0.007	0.07	3.1	0.93	1.9	397	50	9.1	186,064
2132	292,249	295,795	3,182	43	0.52	0.42	0.59	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,220	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	248,310	256	0.007	0.07	3.1	0.93	1.9	365	46	8.4	186,657
2133	292,216	295,678	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.9	2.8	9.3	0.83	80	14,264	3.7	0.00093	9.8	3.0	51	4,554	11	531	0.007	248,160	256	0.007	0.07	3.1	0.93	1.9	356	45	8.2	186,125
2134	292,084	297,209	3,182	43	0.51	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,386	3.6	0.00093	9.8	2.9	51	4,554	11	531	0.007	248,556	256	0.007	0.07	3.1	0.93	1.9	342	43	7.9	186,338

Table A8. Annual loads of the NAG backfill for the low nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	293,473	298,007	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,473	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.007	249,424	256	0.0071	0.071	3.1	0.93	1.9	341	43	7.8	186,569
2136	294,228	300,087	3,182	44	0.52	0.42	0.59	145	0.0094	180	0.19	0.88	2.8	9.4	0.82	80	14,624	3.6	0.00094	9.9	2.9	51	4,554	10	531	0.0071	250,465	256	0.0071	0.071	3.1	0.94	1.9	338	43	7.8	187,180
2137	294,638	299,791	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,657	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.0071	250,461	256	0.0071	0.071	3.1	0.93	1.9	337	43	7.7	186,716
2138	292,401	302,917	3,182	45	0.52	0.41	0.59	145	0.0093	175	0.19	0.88	2.8	9.3	0.81	80	14,754	3.6	0.00093	9.8	2.9	51	4,554	10	531	0.007	250,635	256	0.007	0.07	3.1	0.93	1.9	337	43	7.7	186,790
2139	289,806	306,735	3,182	46	0.51	0.41	0.6	145	0.0094	171	0.19	0.87	2.8	9.4	0.8	80	14,872	3.5	0.00094	9.8	2.9	51	4,554	10	531	0.0069	250,917	256	0.007	0.07	3.1	0.94	1.9	337	43	7.7	187,056
2140	288,865	309,435	3,182	47	0.51	0.41	0.61	145	0.0094	170	0.19	0.86	2.8	9.4	0.79	80	15,001	3.5	0.00094	9.7	2.8	51	4,554	10	531	0.0069	251,475	256	0.0069	0.069	3.1	0.94	1.9	338	43	7.8	187,514
2141	285,669	310,955	3,182	48	0.5	0.4	0.61	145	0.0093	167	0.19	0.84	2.7	9.3	0.78	80	15,058	3.4	0.00093	9.6	2.8	51	4,554	10	531	0.0068	250,532	256	0.0069	0.069	3.0	0.93	1.9	338	43	7.8	186,895
2142	284,553	312,156	3,182	48	0.5	0.4	0.61	145	0.0093	166	0.19	0.84	2.7	9.3	0.77	80	15,121	3.4	0.00093	9.6	2.8	51	4,555	10	531	0.0068	250,428	256	0.0068	0.068	3.0	0.93	1.9	338	43	7.8	186,886
2143	282,757	314,534	3,182	48	0.5	0.39	0.62	145	0.0094	164	0.19	0.82	2.7	9.4	0.75	80	15,255	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	250,419	256	0.0068	0.068	3.0	0.94	1.9	339	43	7.8	187,034
2144	282,620	316,435	3,182	49	0.5	0.39	0.62	145	0.0094	164	0.19	0.81	2.7	9.4	0.75	80	15,360	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	251,018	256	0.0068	0.068	3.0	0.94	1.9	340	43	7.8	187,551
2145	280,136	317,427	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.79	2.7	9.4	0.72	80	15,442	3.2	0.00094	9.4	2.6	51	4,555	9.4	531	0.0067	250,138	256	0.0067	0.067	3.0	0.94	1.9	339	43	7.8	187,019
2146	279,462	318,319	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.78	2.7	9.4	0.72	80	15,504	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,109	256	0.0067	0.067	3.0	0.94	1.9	338	43	7.8	187,081
2147	278,291	320,039	3,183	49	0.49	0.38	0.63	145	0.0094	161	0.19	0.76	2.7	9.4	0.7	80	15,627	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,097	256	0.0067	0.067	3.0	0.94	1.9	336	42	7.7	187,212
2148	278,328	321,567	3,183	50	0.49	0.37	0.64	145	0.0094	161	0.19	0.75	2.7	9.4	0.69	80	15,722	3.1	0.00094	9.4	2.5	51	4,555	8.9	531	0.0067	250,648	256	0.0067	0.067	3.0	0.94	1.9	334	42	7.7	187,667
2149	276,244	321,860	3,183	50	0.49	0.37	0.64	145	0.0094	159	0.19	0.73	2.6	9.4	0.67	80	15,777	3.0	0.00094	9.3	2.4	51	4,555	8.7	531	0.0066	249,685	256	0.0066	0.066	2.9	0.94	1.9	324	41	7.5	187,030
2150	275,672	322,362	3,183	50	0.49	0.36	0.64	145	0.0093	159	0.19	0.72	2.6	9.3	0.66	80	15,820	2.9	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,550	256	0.0066	0.066	2.9	0.93	1.9	317	40	7.3	186,985

Table A9. Source terms of the NAG backfill for the high nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	24
2024	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	44
2025	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	80
2026	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	125
2027	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	158
2028	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	289
2029	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	270
2030	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	348
2031	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	2,236
2032	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	3,634
2033	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	620
2034	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	2,492
2035	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	7,085
2036	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	12,083
2037	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	13,464
2038	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	26,952
2039	7.8	1,302	85	29	0.0094	0.0023	0.0013	0.0023	1.3	0.00005	31	0.001	0.0058	0.004	0.05	0.00032	0.72	23	0.034	0.000005	0.044	0.008	0.46	41	0.11	4.8	0.000031	581	2.3	0.000031	0.00031	0.014	0.005	0.01	99	13	2.3	45,912
2040	8.2	1,465	225	29	0.017	0.0026	0.0014	0.0022	1.3	0.00005	34	0.001	0.0057	0.004	0.05	0.00082	0.72	27	0.032	0.000005	0.049	0.009	0.46	41	0.1	4.8	0.000035	712	2.3	0.000035	0.00035	0.016	0.005	0.01	88	11	2.0	79,056
2041	8.4	1,508	378	29	0.028	0.0027	0.0015	0.0023	1.3	0.00005	13	0.001	0.0042	0.0081	0.05	0.0017	0.72	30	0.021	0.000005	0.051	0.0089	0.46	41	0.067	4.8	0.000036	821	2.3	0.000036	0.00036	0.016	0.005	0.01	45	5.7	1.0	110,907
2042	8.5	1,409	396	25	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001	0.003	0.0082	0.05	0.002	0.62	28	0.014	0.000005	0.047	0.008	0.39	35	0.042	4.1	0.000034	787	2.0	0.000034	0.00034	0.015	0.005	0.01	17	2.1	0.38	128,839
2043	8.4	1,372	388	24	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.001	0.0026	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.38	34	0.034	4.0	0.000033	767	1.9	0.000033	0.00033	0.015	0.005	0.01	9.1	1.1	0.21	133,866
2044	8.4	1,350	377	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	13	0.001	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.033	3.9	0.000032	752	1.9	0.000032	0.00032	0.014	0.005	0.01	9.8	1.2	0.22	136,575
2045	8.5	1,399	394	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	4.0	0.000034	782	1.9	0.000034	0.00034	0.015	0.005	0.01	12	1.5	0.28	133,758
2046	8.5	1,450	399	25	0.029	0.0026	0.0016	0.0023	1.1	0.00005	12	0.001	0.003	0.0082	0.05	0.0023	0.62	29	0.013	0.000005	0.049	0.0089	0.39	35	0.04	4.1	0.000035	807	2.0	0.000035	0.00035	0.015	0.005	0.01	12	1.5	0.28	128,763
2047	8.5	1,577	410	25	0.03	0.0028	0.0017	0.0022	1.1	0.00005	12	0.001	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.4	35	0.043	4.1	0.000038	868	2.0	0.000038	0.00038	0.017	0.005	0.01	9.0	1.1	0.21	128,089
2048	8.5	1,714	430	24	0.03	0.003	0.0019	0.0022	1.1	0.00005	11	0.001	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041	939	2.0	0.000041	0.00041	0.018	0.005	0.01	8.6	1.1	0.2	129,793
2049	8.5	1,776	447	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.001	0.0045	0.0089	0.05	0.0038	0.61	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043	974	1.9	0.000043	0.00043	0.019	0.005	0.01	9.2	1.2	0.21	131,172
2050	8.5	1,803	451	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043	988	1.9	0.000043	0.00043	0.019	0.005	0.01	7.9	1.0	0.18	132,811
2051	8.5	1,816	452	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	4.0	0.000044	995	1.9	0.000044	0.00044	0.019	0.005	0.01	6.1	0.77	0.14	133,964
2052	8.5	1,827	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.057	3.9	0.000044	1,000	1.9	0.000044	0.00044	0.02	0.005	0.01	3.8	0.48	0.087	135,076
2053	8.5	1,837	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044	1,004	1.9	0.000044	0.00044	0.02	0.005	0.01	1.9	0.25	0.045	135,145
2054	8.5	1,841	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044	1,006	1.9	0.000044	0.00044	0.02	0.005	0.01	1.4	0.17	0.031	135,795
2055	8.5	1,852	451	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.001	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044	1,010	1.9	0.000045	0.00045	0.02	0.005	0.011	1.4	0.18	0.032	136,601
2056	8.6	1,808	551	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.001	0.0048	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043	1,036	1.9	0.000043	0.00043	0.019	0.005	0.01	1.6	0.21	0.037	137,639
2057	8.7	1,730	710	23	0.052	0.0031	0.0022	0.0023	1.1	0.00005	4.7	0.001	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041	1,070	1.9	0.000042	0.00042	0.018	0.005	0.01	1.9	0.24	0.044	137,940
2058	8.7	1,684	801	23	0.059	0.003	0.0021	0.0024	1.1	0.00005	3.8	0.001	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004	1,088	1.8	0.00004	0.00041	0.018	0.005	0.01	2.3	0.29	0.052	138,218
2059	8.7	1,672	832	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004	1,095	1.8	0.00004	0.0004	0.018	0.005	0.01	2.7	0.34	0.061	138,460
2060	8.7	1,671	838	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004	1,097	1.8	0.00004	0.0004	0.018	0.005	0.01	3.1	0.4	0.072	139,518
2061	8.7	1,674	837	23	0.062	0.003	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.014	0.36	33	0.049	3.8	0.00004	1,097	1.8	0.00004	0.0004	0.018	0.005	0.01	3.6	0.46	0.084	139,838
2062	8.8	1,663	872	23	0.065	0.0029	0.002	0.0025	1.0	0.00005	3.3	0.001	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004	1,108	1.8	0.00004	0.0004	0.018	0.005	0.01	4.2	0.53	0.096	140,676
2063	8.8	1,642	908	22	0.07	0.0029	0.002	0.0025	1.0	0.00005	3.0	0.001	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,113	1.8	0.000039	0.00039	0.018	0.005	0.01	4.8	0.61	0.11	141,568
2064	8.8	1,636	915	22	0.069	0.0029	0.002	0.0025	1.0	0.00005	3.0	0.001	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,113	1.8	0.000039	0.00039	0.017	0.005	0.01	5.4	0.68	0.12	142,789
2065	8.9	1,636	951	22	0.092	0.0029	0.0019	0.0026	1.0	0.00005	2.4	0.001	0.004	0.014	0.05	0.0035	0.56	46	0.016	0.000005	0.055	0.013	0.35	32	0.048	3.7	0.000039	1,128	1.8	0.000039	0.00039	0.017	0.005	0.01	6.1	0.77	0.14	143,409
2066	8.9	1,609	994	22	0.1	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.001	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.048	3.7	0.000039	1,134	1.8	0.000039	0.00039	0.017	0.005	0.01	6.8	0.85	0.16	144,573
2067	8.9	1,588	1,023	22	0.11	0.0028	0.0019	0.0027	1.	0.00005	2.0	0.001	0.0039	0.013	0.05	0.0033	0.55	47	0.016	0.000005	0.053	0.012	0.35	31	0.047	3.6	0.000038	1,137	1.8	0.000038	0.00038	0.017	0.005	0.01	7.5	0.94	0.17	145,722
2068	8.9	1,582	1,038	22	0.11	0.0028	0.0019	0.0027	0.99	0.00005	2.0	0.001	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038	1,139	1.7	0.000038	0.00038	0.017	0.005	0.01	8.1	1.0	0.19	147,284
2069	8.9	1,578	1,048	21	0.1	0.0028	0.0019	0.0027	0.98	0.00005	2.0	0.001	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038	1,141	1.7	0.000038	0.00038	0.017	0.005	0.01	8.7	1.1	0.2	148,041
2070	8.9	1,583	1,048	21	0.1	0.0028	0.0019	0.0027	0.97	0.00005	2.1	0.001	0.0038	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.048	3.5	0.000038	1,143	1.7	0.000038	0.00038	0.017	0.005	0.01	8.9	1.1	0.2	149,328
2071	8.9	1,583	1,049	21	0.095	0.0028	0.0019	0.0027	0.96	0.00005	2.1	0.001	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.047	3.5	0.000038	1,143	1.7	0.000038	0.00038	0.017	0.005	0.01	8.4	1.1	0.19	150,505
2072	8.9	1,598	1,052	21	0.1	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.001	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038	1,151	1.7	0.000038	0.00038	0.017	0.005	0.01	7.6	0.96	0.17	151,916
2073	8.9	1,607	1,049	21	0.1	0.0028	0.0019	0.0027	0.95	0.00005	2.1	0.001	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038	1,154	1.7	0.000039	0.00039	0.017	0.005	0.01	7.0	0.88	0.16	152,292
2074	8.9	1,613	1,044	21	0.097	0.0028	0.0019	0.0026	0.95	0.00005	2.1	0.001	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.013	0.33	30	0.048	3.5	0.000039	1,155	1.7	0.000039	0.00039	0.017	0.005	0.01	6.8	0.86	0.16	153,237
2075	8.9	1,623	1,039	21	0.093	0.0029	0.0019	0.0026	0.94	0.00005	2.2	0.001	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	30	0.049	3.4	0.000039	1,157	1.7	0.000039	0.00039	0.017	0.005	0.01	6.6	0.84	0.15	153,995
2076	8.9	1,649	1,044	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	2.0	0.001	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.055	0.013	0.33	29	0.05	3.4	0.000039	1,171	1.6	0.00004	0.0004	0.018	0.005	0.01	6.8	0.86	0.16	155,005
2077	8.9	1,665	1,042	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.001	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004	1,177	1.6	0.00004	0.0004	0.018	0.005	0.01	7.0	0.89	0.16	155,356
2078	8.9	1,678	1,038	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.001	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.056	0.014	0.32	29	0.054	3.4	0.00004	1,182	1.6	0.00004	0.0004	0.018	0.005	0.01	7.3	0.92	0.17	156,236
2079	8.9	1,688	1,042	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001	0.0045	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.055	3.4	0.00004	1,187	1.6	0.000041	0.00041	0.018	0.005	0.01	7.5	0.94	0.17	157,251
2080	8.9	1,694	1,048	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001	0.0046	0.014	0.05	0.0041	0.5	50	0.019	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.00004	1,192	1.6	0.000041	0.00041	0.018	0.005	0.01	7.4	0.94	0.17	158,470
2081	8.9	1,705	1,047	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.001	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.057	0.015	0.32	29	0.058	3.3	0.00004	1,197	1.6	0.000041	0.00041	0.018	0.005	0.01	7.5	0.95	0.17	158,838
2082	8.9	1,697	1,065	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.001	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.015	0.32	28	0.058	3.3	0.00004	1,201	1.6	0.000041	0.00041	0.018	0.005	0.01	7.3	0.92	0.17	159,814
2083	8.9	1,686	1,085	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.001	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.059	3.3	0.00004	1,204	1.6	0.00004	0.00041	0.018	0.005	0.01	7.4	0.93	0.17	160,383
2084	8.9	1,688	1,092	20	0.11	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.001	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004	1,207	1.6	0.000041	0.00041	0.018	0.005	0.01	7.2	0.92	0.17	161,637
2085	8.9	1,680	1,102	20	0.11	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.001	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004	1,208	1.6	0.00004	0.0004	0.018	0.005	0.01	7.4	0.94	0.17	161,890
2086	8.9	1,684	1,106	20	0.11	0.003	0.0022	0.0026	0.89	0.00005	1.9	0.001	0.005	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004	1,211	1.6	0.00004	0.00041	0.018	0.005	0.01	7.2	0.91	0.17	162,778
2087	8.9	1,679	1,112	19	0.1	0.003	0.0022	0.0026	0.89	0.00005	2.0	0.001	0.0049	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.056	0.016	0.31	28	0.06	3.2	0.00004	1,210	1.6	0.00004	0.0004	0.018	0.005	0.01	7.2	0.91	0.17	163,470
2088	8.9	1,691	1,119	19	0.11	0.003	0.0023	0.0026	0.88	0.00005	1.9	0.001	0.0049	0.015	0.05	0.0044	0.48	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.2	0.00004	1,218	1.6	0.000041	0.00041	0.018	0.005	0.01	6.8	0.86	0.16	164,570
2089	9.0	1,688	1,141	19	0.13	0.003	0.0022	0.0027	0.88	0.00005	1.7	0.001	0.0049	0.015	0.05	0.0044	0.48	54	0.02	0.000005	0.057	0.016	0.31	28	0.059	3.2	0.00004	1,226	1.6	0.000041	0.00041	0.018	0.005	0.01	6.7	0.85	0.15	164,772
2090	9.0	1,679	1,158	19	0.13	0.003	0.0022	0.0027	0.88	0.00005	1.6	0.001	0.0049	0.015	0.05	0.0044	0.48	55	0.02	0.000005	0.057	0.016	0.31	27	0.059	3.2	0.00004	1,228	1.5	0.00004	0.0004	0.018	0.005	0.01	6.3	0.8	0.14	165,462
2091	9.0	1,674	1,166	19	0.13	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001	0.0048	0.015	0.05	0.0043	0.48	55	0.02	0.000005	0.056	0.016	0.31	27	0.058	3.2	0.00004	1,229	1.5	0.00004	0.0004	0.018	0.005	0.01	6.4	0.8	0.15	166,285
2092	9.0	1,674	1,174	19	0.13	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001	0.0048	0.015	0.05	0.0043	0.48	56	0.02	0.000005	0.056	0.016	0.3	27	0.058	3.2	0.00004	1,232	1.5	0.00004	0.0004	0.018	0.005	0.01	6.2	0.79	0.14	167,587
2093	9.0	1,658	1,195	19	0.14	0.0029	0.0022	0.0027	0.86	0.00005	1.6	0.001	0.0048	0.014	0.05	0.0043	0.47	56	0.02	0.000005	0.056	0.015	0.3	27	0.058	3.2	0.000039	1,233	1.5	0.00004	0.0004	0.018	0.005	0.01	6.5	0.82	0.15	168,175
2094	9.0	1,636	1,220	19	0.14	0.0029	0.0022	0.0028	0.86	0.00005	1.5	0.001	0.0047	0.014	0.05	0.0042	0.47	57	0.02	0.000005	0.055	0.015	0.3	27	0.057	3.1	0.000039	1,232	1.5	0.000039	0.00039	0.017	0.005	0.01	6.7	0.85	0.15	169,130
2095	9.0	1,622	1,228	19	0.14	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.001	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.1	0.000039	1,229	1.5	0.000039	0.00039	0.017	0.005	0.01	7.1	0.9	0.16	169,816
2096	9.0	1,600	1,243	19	0.14	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.001	0.0045	0.014	0.05	0.004	0.47	57	0.019	0.000005	0.054	0.015	0.3	27	0.055	3.1	0.000039	1,224	1.5	0.000038	0.00038	0.017	0.005	0.01	7.5	0.94	0.17	170,905
2097	9.0	1,599	1,246	19	0.13	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.001	0.0045	0.014	0.05	0.004	0.47	58	0.019	0.000005	0.054	0.015	0.3	27	0.056	3.1	0.000039	1,225	1.5	0.000038	0.00038	0.017	0.005	0.01	7.9	1.	0.18	171,124
2098	9.0	1,593	1,254	18	0.13	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.001	0.0045	0.014	0.05	0.0039	0.46	58	0.019	0.000005	0.054	0.014	0.3	26	0.056	3.1	0.000039	1,225	1.5	0.000038	0.00038	0.017	0.005	0.01	8.3	1.05	0.19	171,837
2099	9.0	1,595	1,255	18	0.13	0.0028	0.0021	0.0028	0.84	0.00005	1.6	0.001	0.0046	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.1	0.000039	1,226	1.5	0.000038	0.00038	0.017	0.005	0.01	8.7	1.1	0.2	172,453
2100	9.0	1,603	1,267	18	0.14	0.0028	0.0021	0.0028	0.84	0.00005	1.5	0.001	0.0046	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.057	3.1	0.000039	1,234	1.5	0.000038	0.00039	0.017	0.005	0.01	9.1	1.15	0.21	173,472
2101	9.0	1,610	1,267	18	0.14	0.0028	0.0021	0.0028	0.83	0.00005	1.5	0.001	0.0046	0.014	0.05	0.004	0.46	60	0.019	0.000005	0.054	0.015	0.29	26	0.057	3.0	0.000039	1,237	1.5	0.000039	0.00039	0.017	0.005	0.01	9.5	1.21	0.22	174,383
2102	9.0	1,612	1,271	18	0.14	0.0028	0.0021	0.0028	0.83	0.00005	1.5	0.001	0.0046	0.014	0.05	0.004	0.45	60	0.02	0.000005	0.054	0.015	0.29	26	0.058	3.0	0.000039	1,238	1.5	0.000039	0.00039	0.017	0.005	0.01	10.0	1.26	0.23	175,164
2103	9.1	1,636	1,280	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.001	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,253	1.5	0.000039	0.00039	0.017	0.005	0.01	10.4	1.31	0.24	175,863
2104	9.1	1,647	1,284	18	0.16	0.0029	0.0022	0.0028	0.82	0.00005	1.4	0.001	0.0048	0.014	0.05	0.0041	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039	1,259	1.4	0.00004	0.0004	0.018	0.005	0.01	10.8	1.36	0.25	177,220
2105	9.1	1,637	1,292	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.001	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039	1,257	1.4	0.000039	0.00039	0.017	0.005	0.01	11.2	1.41	0.26	177,533
2106	9.1	1,606	1,315	18	0.17	0.0028	0.0021	0.0029	0.82	0.00005	1.3	0.001	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	26	0.058	3.0	0.000039	1,253	1.4	0.000039	0.00039	0.017	0.005	0.01	11.5	1.46	0.26	178,211
2107	9.1	1,599	1,330	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.001	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.058	3.0	0.000038	1,255	1.4	0.000038	0.00038	0.017	0.005	0.01	11.8	1.5	0.27	179,040
2108	9.1	1,603	1,342	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.001	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.059	2.9	0.000038	1,261	1.4	0.000039	0.00039	0.017	0.005	0.01	12.1	1.53	0.28	180,178
2109	9.1	1,606	1,351	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.001	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000038	1,266	1.4	0.000039	0.00039	0.017	0.005	0.01	12.4	1.57	0.28	180,248
2110	9.1	1,614	1,358	18	0.18	0.0028	0.0021	0.0029	0.8	0.00005	1.2	0.001	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.061	2.9	0.000038	1,272	1.4	0.000039	0.00039	0.017	0.005	0.01	12.6	1.6	0.29	180,830
2111	9.1	1,621	1,364	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.001	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.062	2.9	0.000039	1,277	1.4	0.000039	0.00039	0.017	0.005	0.01	12.9	1.6	0.3	181,243
2112	9.1	1,635	1,369	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.001	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.063	2.9	0.000039	1,284	1.4	0.000039	0.00039	0.017	0.005	0.01	13.1	1.7	0.3	181,975
2113	9.1	1,641	1,372	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.001	0.005	0.014	0.05	0.0042	0.44	66	0.021	0.000005	0.055	0.016	0.28	25	0.064	2.9	0.000039	1,288	1.4	0.000039	0.00039	0.018	0.005	0.01	13.3	1.7	0.31	181,870
2114	9.1	1,656	1,375	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.001	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.000039	1,295	1.4	0.00004	0.0004	0.018	0.005	0.01	13.4	1.7	0.31	182,135
2115	9.1	1,662	1,378	17	0.17	0.0029	0.0023	0.0029	0.8	0.00005	1.3	0.001	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.066	2.9	0.000039	1,299	1.4	0.00004	0.0004	0.018	0.005	0.01	13.3	1.7	0.31	182,344
2116	9.1	1,677	1,378	17	0.16	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.001	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,305	1.4	0.00004	0.0004	0.018	0.005	0.01	13.1	1.7	0.3	183,370
2117	9.1	1,670	1,391	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.3	0.001	0.0053	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,307	1.4	0.00004	0.0004	0.018	0.005	0.01	12.8	1.6	0.29	183,400
2118	9.1	1,666	1,406	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.3	0.001	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,311	1.4	0.00004	0.0004	0.018	0.005	0.011	12.4	1.6	0.28	183,657
2119	9.1	1,663	1,414	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0045	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.000039	1,313	1.4	0.00004	0.0004	0.018	0.005	0.011	11.9	1.5	0.27	183,671
2120	9.1	1,662	1,424	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,316	1.4	0.00004	0.0004	0.018	0.005	0.011	11.4	1.4	0.26	184,250
2121	9.1	1,656	1,451	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.001	0.0054	0.014	0.05	0.0046	0.43	70	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.000039	1,324	1.4	0.00004	0.0004	0.018	0.005	0.011	10.9	1.4	0.25	184,044
2122	9.1	1,633	1,480	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.055	0.017	0.28	25	0.066	2.9	0.000039	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	10.4	1.3	0.24	184,430
2123	9.1	1,622	1,492	17	0.22	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	10.0	1.3	0.23	184,660
2124	9.2	1,606	1,511	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.001	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.065	2.9	0.000038	1,324	1.4	0.000039	0.00039	0.017	0.005	0.011	9.3	1.2	0.21	185,381
2125	9.2	1,600	1,519	17	0.22	0.0028	0.0023	0.0031	0.78	0.00005	1.02	0.001	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000038	1,325	1.4	0.000039	0.00038	0.017	0.005	0.011	8.8	1.1	0.2	185,380
2126	9.2	1,588	1,533	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.01	0.001	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.063	2.9	0.000038	1,324	1.4	0.000038	0.00038	0.017	0.005	0.01	7.8	0.98	0.18	185,890
2127	9.2	1,585	1,541	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.	0.001	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.062	2.9	0.000038	1,325	1.4	0.000038	0.00038	0.017	0.005	0.01	7.3	0.92	0.17	185,957
2128	9.2	1,575	1,555	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.8	0.000038	1,325	1.4	0.000038	0.00038	0.017	0.005	0.01	6.2	0.78	0.14	186,328
2129	9.2	1,576	1,560	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	5.8	0.73	0.13	185,930
2130	9.2	1,568	1,571	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	5.0	0.63	0.11	186,107
2131	9.2	1,570	1,576	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	4.7	0.59	0.11	186,064
2132	9.2	1,565	1,585	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	4.2	0.54	0.097	186,657
2133	9.2	1,570	1,589	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.9	0.000038	1,333	1.4	0.000038	0.00038	0.017	0.005	0.01	4.1	0.52	0.095	186,125
2134	9.2	1,567	1,595	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0048	0.015	0.05	0.0044	0.43	77	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,334	1.4	0.000038	0.00038	0.017	0.005	0.01	3.9	0.5	0.09	186,338

Table A9. Source terms of the NAG backfill for the high nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,573	1,597	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,337	1.4	0.000038	0.00038	0.017	0.005	0.01	3.9	0.49	0.09	186,569
2136	9.2	1,571	1,603	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0047	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,338	1.4	0.000038	0.00038	0.017	0.005	0.01	3.8	0.49	0.088	187,180
2137	9.2	1,577	1,606	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0048	0.015	0.05	0.0044	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,341	1.4	0.000038	0.00038	0.017	0.005	0.01	3.9	0.49	0.089	186,716
2138	9.2	1,565	1,622	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.001	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.00038	0.017	0.005	0.01	3.8	0.49	0.088	186,790
2139	9.2	1,549	1,640	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.001	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.017	0.005	0.01	3.8	0.49	0.088	187,056
2140	9.2	1,540	1,650	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.001	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.016	0.005	0.01	3.8	0.49	0.088	187,514
2141	9.2	1,528	1,664	17	0.26	0.0027	0.0022	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.054	2.8	0.000037	1,340	1.4	0.000037	0.00037	0.016	0.005	0.01	3.9	0.49	0.089	186,895
2142	9.2	1,522	1,670	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000037	1,340	1.4	0.000037	0.00037	0.016	0.005	0.01	3.9	0.49	0.089	186,886
2143	9.2	1,512	1,682	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.001	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,034
2144	9.2	1,507	1,687	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.87	0.001	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,551
2145	9.2	1,498	1,697	17	0.26	0.0026	0.0021	0.0034	0.78	0.00005	0.87	0.001	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,337	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,019
2146	9.2	1,494	1,701	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,081
2147	9.2	1,486	1,709	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0041	0.014	0.05	0.0037	0.43	83	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000036	1,336	1.4	0.000036	0.00036	0.016	0.005	0.01	3.8	0.48	0.088	187,212
2148	9.2	1,483	1,714	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.004	0.014	0.05	0.0037	0.42	84	0.016	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000036	1,335	1.4	0.000036	0.00036	0.016	0.005	0.01	3.8	0.48	0.087	187,667
2149	9.2	1,477	1,721	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000036	1,335	1.4	0.000036	0.00036	0.016	0.005	0.01	3.7	0.46	0.084	187,030
2150	9.2	1,474	1,724	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0035	0.43	85	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000035	0.00035	0.016	0.005	0.01	3.6	0.45	0.082	186,985

Table A10. Annual loads of the NAG backfill for the high nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	29	0.2	0.69	0.0037	0.000052	0.000029	0.000055	0.032	0.0000012	0.67	0.000024	0.00014	0.000097	0.0012	0.0000024	0.017	0.49	0.00081	0.00000012	0.00098	0.00018	0.011	0.99	0.0027	0.12	0.0000007	12	0.056	0.0000007	0.000007	0.00031	0.00012	0.00024	2.5	0.31	0.057	24
2024	53	0.37	1.3	0.0067	0.000094	0.000053	0.0001	0.057	0.0000022	1.2	0.000044	0.00025	0.00018	0.0022	0.0000044	0.031	0.89	0.0015	0.00000022	0.0018	0.00033	0.02	1.8	0.0048	0.21	0.0000013	22	0.1	0.0000013	0.000013	0.00057	0.00022	0.00044	4.5	0.57	0.1	44
2025	97	0.68	2.3	0.012	0.00017	0.000097	0.00018	0.11	0.000004	2.2	0.00008	0.00046	0.00032	0.004	0.0000081	0.058	1.6	0.0027	0.0000004	0.0033	0.0006	0.037	3.3	0.0089	0.38	0.0000023	41	0.18	0.0000023	0.000023	0.001	0.0004	0.0008	8.2	1.0	0.19	80
2026	152	1.1	3.6	0.019	0.00027	0.00015	0.00029	0.16	0.0000063	3.5	0.00013	0.00072	0.0005	0.0063	0.000013	0.09	2.5	0.0042	0.00000063	0.0051	0.00093	0.057	5.1	0.014	0.6	0.0000036	64	0.29	0.0000036	0.000036	0.0016	0.00063	0.0013	13	1.6	0.3	125
2027	191	1.3	4.5	0.024	0.00034	0.00019	0.00036	0.21	0.0000079	4.4	0.00016	0.0009	0.00063	0.0079	0.000016	0.11	3.2	0.0053	0.00000079	0.0064	0.0012	0.072	6.5	0.017	0.75	0.0000046	81	0.36	0.0000046	0.000046	0.002	0.00079	0.0016	16	2.0	0.37	158
2028	349	2.4	8.2	0.044	0.00062	0.00035	0.00066	0.38	0.000014	8.0	0.00029	0.0017	0.0012	0.014	0.000029	0.21	5.8	0.0097	0.0000014	0.012	0.0021	0.13	12	0.032	1.4	0.0000084	147	0.66	0.0000084	0.000084	0.0037	0.0014	0.0029	30	3.7	0.68	289
2029	326	2.3	7.7	0.041	0.00057	0.00032	0.00062	0.35	0.000013	7.5	0.00027	0.0015	0.0011	0.013	0.000027	0.19	5.5	0.0091	0.0000013	0.011	0.002	0.12	11	0.03	1.3	0.0000078	138	0.62	0.0000078	0.000078	0.0035	0.0013	0.0027	28	3.5	0.63	270
2030	421	2.9	9.9	0.053	0.00074	0.00042	0.0008	0.45	0.000017	9.7	0.00035	0.002	0.0014	0.017	0.000035	0.25	7.0	0.012	0.0000017	0.014	0.0026	0.16	14	0.038	1.7	0.00001	178	0.8	0.00001	0.0001	0.0045	0.0017	0.0035	36	4.5	0.82	348
2031	2,706	19	64	0.34	0.0048	0.0027	0.0051	2.9	0.00011	62	0.0022	0.013	0.0089	0.11	0.00022	1.6	45	0.075	0.000011	0.091	0.017	1.0	91	0.25	11	0.000065	1,141	5.1	0.000065	0.00065	0.029	0.011	0.022	229	29	5.3	2,236
2032	4,396	31	104	0.56	0.0078	0.0044	0.0083	4.7	0.00018	101	0.0036	0.021	0.015	0.18	0.00036	2.6	73	0.12	0.000018	0.15	0.027	1.7	149	0.4	17	0.00011	1,854	8.3	0.00011	0.0011	0.047	0.018	0.036	372	47	8.5	3,634
2033	750	5.2	18	0.095	0.0013	0.00075	0.0014	0.81	0.000031	17	0.00062	0.0035	0.0025	0.031	0.000062	0.44	13	0.021	0.0000031	0.025	0.0046	0.28	25	0.068	3.0	0.000018	316	1.4	0.000018	0.00018	0.008	0.0031	0.0062	63	8.0	1.5	620
2034	3,015	21	71	0.38	0.0053	0.003	0.0057	3.3	0.00012	69	0.0025	0.014	0.01	0.12	0.00025	1.8	50	0.084	0.000012	0.1	0.019	1.1	102	0.28	12	0.000072	1,271	5.7	0.000072	0.00072	0.032	0.012	0.025	255	32	5.9	2,492
2035	8,571	60	202	1.1	0.015	0.0085	0.016	9.3	0.00035	197	0.0071	0.041	0.028	0.35	0.00071	5.1	143	0.24	0.000035	0.29	0.053	3.2	290	0.78	34	0.00021	3,614	16	0.00021	0.0021	0.092	0.035	0.071	725	92	17	7,085
2036	14,618	102	345	1.9	0.026	0.015	0.028	16	0.0006	336	0.012	0.069	0.048	0.6	0.0012	8.7	244	0.41	0.00006	0.49	0.09	5.5	494	1.3	58	0.00035	6,163	28	0.00035	0.0035	0.16	0.06	0.12	1,236	156	28	12,083
2037	16,289	113	385	2.1	0.029	0.016	0.031	18	0.00067	374	0.013	0.077	0.054	0.67	0.0014	9.6	272	0.45	0.000067	0.55	0.1	6.2	551	1.5	64	0.00039	6,868	31	0.00039	0.0039	0.17	0.067	0.13	1,377	174	32	13,464
2038	32,606	227	770	4.1	0.057	0.032	0.062	35	0.0013	749	0.027	0.15	0.11	1.3	0.0027	19	545	0.91	0.00013	1.1	0.2	12	1,102	3.0	128	0.00078	13,748	62	0.00078	0.0078	0.35	0.13	0.27	2,757	349	63	26,952
2039	59,768	3,889	1,312	0.43	0.11	0.058	0.1	60	0.0023	1,430	0.046	0.27	0.18	2.3	0.015	33	1,040	1.5	0.00023	2.0	0.37	21	1,878	5.0	219	0.0014	26,682	105	0.0014	0.014	0.64	0.23	0.46	4,560	577	105	45,912
2040	115,810	17,792	2,260	1.3	0.2	0.11	0.18	103	0.004	2,717	0.079	0.45	0.32	4.0	0.065	57	2,136	2.5	0.0004	3.9	0.71	36	3,235	8.2	377	0.0028	56,264	182	0.0028	0.028	1.2	0.4	0.79	6,967	881	160	79,056
2041	167,259	41,951	3,172	3.1	0.29	0.16	0.25	145	0.0055	1,465	0.11	0.46	0.89	5.5	0.18	79	3,331	2.4	0.00055	5.6	0.98	51	4,540	7.5	529	0.004	91,088	255	0.004	0.04	1.8	0.55	1.1	4,991	631	115	110,907
2042	181,534	50,979	3,172	3.8	0.32	0.19	0.31	145	0.0064	1,508	0.13	0.39	1.1	6.4	0.25	79	3,653	1.8	0.00064	6.1	1.0	51	4,539	5.4	529	0.0044	101,408	255	0.0044	0.044	1.9	0.64	1.3	2,152	272	49	128,839
2043	183,623	51,985	3,171	3.9	0.32	0.19	0.32	145	0.0067	1,598	0.13	0.35	1.1	6.7	0.27	79	3,688	1.5	0.00067	6.2	1.0	51	4,539	4.6	529	0.0044	102,699	255	0.0044	0.044	2.0	0.67	1.3	1,212	153	28	133,866
2044	184,376	51,422	3,171	3.8	0.33	0.2	0.33	145	0.0068	1,711	0.14	0.35	1.1	6.8	0.27	79	3,693	1.5	0.00068	6.2	1.0	51	4,539	4.6	529	0.0044	102,665	255	0.0044	0.044	2.0	0.68	1.4	1,333	169	31	136,575
2045	187,181	52,658	3,172	3.9	0.33	0.2	0.32	145	0.0067	1,574	0.13	0.37	1.1	6.7	0.27	79	3,765	1.6	0.00067	6.3	1.1	51	4,539	4.9	529	0.0045	104,596	255	0.0045	0.045	2.0	0.67	1.3	1,614	204	37	133,758
2046	186,758	51,405	3,172	3.8	0.33	0.2	0.3	145	0.0064	1,506	0.13	0.39	1.1	6.4	0.3	79	3,749	1.7	0.00064	6.3	1.1	51	4,540	5.1	529	0.0045	103,927	255	0.0045	0.045	2.0	0.64	1.3	1,560	197	36	128,763
2047	201,983	52,505	3,173	3.8	0.36	0.22	0.29	145	0.0064	1,495	0.13	0.44	1.1	6.4	0.37	80	4,017	1.9	0.00064	6.8	1.4	51	4,541	5.6	529	0.0048	111,227	255	0.0049	0.049	2.2	0.64	1.3	1,157	146	27	128,089
2048	222,440	55,777	3,173	3.9	0.39	0.25	0.28	145	0.0065	1,455	0.13	0.52	1.1	6.5	0.45	80	4,406	2.2	0.00065	7.5	1.6	51	4,542	6.5	529	0.0053	121,828	255	0.0054	0.053	2.4	0.65	1.3	1,115	141	26	129,793
2049	232,908	58,594	3,174	4.1	0.41	0.27	0.28	145	0.0066	1,399	0.13	0.59	1.2	6.6	0.5	80	4,623	2.5	0.00066	7.8	1.9	51	4,542	7.3	529	0.0056	127,787	255	0.0056	0.056	2.5	0.66	1.3	1,209	153	28	131,172
2050	239,498	59,850	3,174	4.2	0.42	0.29	0.28	145	0.0066	1,406	0.13	0.63	1.2	6.6	0.55	80	4,749	2.6	0.00066	8.1	2.0	51	4,543	7.7	529	0.0057	131,275	255	0.0058	0.058	2.6	0.66	1.3	1,052	133	24	132,811
2051	243,292	60,490	3,174	4.2	0.43	0.3	0.28	145	0.0067	1,419	0.13	0.64	1.2	6.7	0.58	80	4,816	2.7	0.00067	8.2	2.1	51	4,543	7.8	529	0.0058	133,239	255	0.0058	0.059	2.6	0.67	1.3	814	103	19	133,964
2052	246,757	61,046	3,174	4.3	0.44	0.3	0.28	145	0.0068	1,433	0.14	0.65	1.2	6.8	0.61	80	4,878	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059	135,022	255	0.0059	0.059	2.6	0.68	1.4	510	64	12	135,076
2053	248,235	61,113	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,436	0.14	0.66	1.2	6.8	0.62	80	4,900	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.0059	135,713	255	0.006	0.06	2.7	0.68	1.4	262	33	6.0	135,145
2054	249,944	61,330	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,448	0.14	0.66	1.2	6.8	0.63	80	4,930	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006	136,555	255	0.006	0.06	2.7	0.68	1.4	185	23	4.2	135,795
2055	252,972	61,615	3,174	4.3	0.45	0.32	0.29	145	0.0068	1,465	0.14	0.68	1.2	6.8	0.65	80	4,984	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061	138,022	255	0.0061	0.061	2.7	0.68	1.5	191	24	4.4	136,601
2056	248,809	75,807	3,175	5.3	0.44	0.31	0.3	145	0.0069	1,019	0.14	0.67	1.4	6.9	0.63	80	5,234	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006	142,580	255	0.006	0.06	2.7	0.69	1.4	224	28	5.2	137,639
2057	238,664	97,994	3,175	7.1	0.42	0.3	0.32	145	0.0069	642	0.14	0.61	1.8	6.9	0.58	80	5,609	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057	147,637	255	0.0057	0.057	2.5	0.69	1.4	265	34	6.1	137,940
2058	232,800	110,780	3,176	8.2	0.41	0.28	0.33	145	0.0069	519	0.14	0.58	2.0	6.9	0.54	80	5,859	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0056	150,367	255	0.0056	0.056	2.5	0.69	1.4	314	40	7.2	138,218
2059	231,450	115,170	3,176	8.6	0.41	0.28	0.34	145	0.0069	487	0.14	0.57	2.0	6.9	0.53	80	5,973	2.3	0.00069	7.8	1.9	51	4,545	6.6	530	0.0055	151,559	255	0.0056	0.056	2.5	0.69	1.4	370	47	8.5	138,460
2060	233,135	116,900	3,176	8.7	0.41	0.28	0.34	145	0.007	485	0.14	0.57	2.0	7.0	0.53	80	6,057	2.3	0.0007	7.8	1.9	51	4,545	6.7	530	0.0056	153,010	255	0.0056	0.056	2.5	0.7	1.4	436	55	10	139,518
2061	234,102	116,981	3,176	8.7	0.41	0.28	0.34	145	0.007	488	0.14	0.58	2.0	7.0	0.53	80	6,083	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056	153,444	255	0.0056	0.056	2.5	0.7	1.4	509	64	12	139,838
2062	233,986	122,647	3,176	9.2	0.41	0.28	0.35	145	0.007	457	0.14	0.58	2.0	7.0	0.53	80	6,200	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056	155,812	255	0.0056	0.056	2.5	0.7	1.4	590	75	14	140,676
2063	232,497	128,575	3,176	9.9	0.41	0.28	0.36	145	0.0071	422	0.14	0.57	2.0	7.1	0.51	80	6,344	2.3	0.00071	7.8	1.8	51	4,546	6.8	530	0.0056	157,594	255	0.0056	0.056	2.5	0.71	1.4	678	86	16	141,568
2064	233,632	130,611	3,176	9.9	0.41	0.28	0.36	145	0.0071	426	0.14	0.57	2.0	7.1	0.51	80	6,427	2.4	0.00071	7.9	1.8	51	4,546	6.9	530	0.0056	158,910	255	0.0056	0.056	2.5	0.71	1.4	773	98	18	142,789
2065	234,589	136,385	3,176	13	0.41	0.28	0.37	145	0.0072	343	0.14	0.57	2.0	7.2	0.5	80	6,581	2.4	0.00072	7.9	1.8	51	4,546	6.9	530	0.0056	161,808	255	0.0056	0.056	2.5	0.72	1.4	871	110	20	143,409
2066	232,604	143,755	3,176	15	0.41	0.28	0.38	145	0.0072	307	0.14	0.56	2.0	7.2	0.49	80	6,736	2.3	0.00072	7.8	1.8	51	4,546	6.9	530	0.0056	163,990	255	0.0056	0.056	2.5	0.72	1.4	976	123	22	144,573
2067	231,421	149,117	3,177	16	0.41	0.27	0.39	145	0.0073	293	0.15	0.56	2.0	7.3	0.49	80	6,873	2.3	0.00073	7.8	1.8	51	4,546	6.9	530	0.0055	165,642	255	0.0056	0.056	2.5	0.73	1.5	1,086	137	25	145,722
2068	232,959	152,880	3,177	16	0.41	0.28	0.39	145	0.0074	294	0.15	0.56	2.0	7.4	0.48	80	7,026	2.4	0.00074	7.8	1.8	51	4,546	7.0	530	0.0056	167,815	255	0.0056	0.056	2.5	0.74	1.5	1,196	151	27	147,284
2069	233,639	155,103	3,177	16	0.41	0.27	0.4	145	0.0074	299	0.15	0.56	2.0	7.4	0.48	80	7,131	2.4	0.00074	7.9	1.8	51	4,546	7.0	530	0.0056	168,960	255	0.0056	0.056	2.5	0.74	1.5	1,287	163	30	148,041
2070	236,312	156,526	3,177	15	0.42	0.28	0.4	145	0.0075	311	0.15	0.57	2.0	7.5	0.48	80	7,234	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057	170,682	255	0.0057	0.057	2.5	0.75	1.5	1,328	168	31	149,328
2071	238,190	157,850	3,177	14	0.42	0.28	0.4	145	0.0075	323	0.15	0.57	2.0	7.5	0.49	80	7,324	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057	172,012	255	0.0057	0.057	2.5	0.75	1.5	1,269	160	29	150,505
2072	242,807	159,755	3,177	16	0.43	0.29	0.41	145	0.0076	307	0.15	0.58	2.0	7.6	0.5	80	7,442	2.4	0.00076	8.2	1.8	51	4,547	7.1	530	0.0058	174,885	255	0.0058	0.058	2.6	0.76	1.5	1,151	146	26	151,916
2073	244,657	159,770	3,177	15	0.43	0.29	0.4	145	0.0076	315	0.15	0.59	2.1	7.6	0.51	80	7,481	2.5	0.00076	8.2	1.9	51	4,547	7.2	530	0.0059	175,699	255	0.0059	0.059	2.6	0.76	1.5	1,061	134	24	152,292
2074	247,171	160,010	3,177	15	0.44	0.29	0.41	145	0.0077	327	0.15	0.6	2.1	7.7	0.53	80	7,527	2.5	0.00077	8.3	1.9	51	4,547	7.3	530	0.0059	176,912	255	0.0059	0.059	2.6	0.77	1.5	1,038	131	24	153,237
2075	249,872	159,970	3,177	14	0.44	0.3	0.4	145	0.0077	340	0.15	0.62	2.1	7.7	0.54	80	7,572	2.6	0.00077	8.4	2.0	51	4,547	7.5	530	0.006	178,095	255	0.006	0.06	2.7	0.77	1.5	1,018	129	23	153,995
2076	255,542	161,841	3,177	17	0.45	0.31	0.41	145	0.0078	305	0.16	0.64	2.1	7.8	0.56	80	7,693	2.7	0.00078	8.6	2.0	51	4,547	7.8	530	0.0061	181,465	255	0.0062	0.061	2.7	0.78	1.6	1,053	133	24	155,005
2077	258,637	161,819	3,177	17	0.46	0.32	0.4	145	0.0078	309	0.16	0.66	2.2	7.8	0.58	80	7,740	2.8	0.00078	8.7	2.1	51	4,547	8.1	530	0.0062	182,839	255	0.0062	0.062	2.8	0.78	1.6	1,091	138	25	155,356
2078	262,179	162,204	3,177	17	0.46	0.32	0.4	145	0.0078	316	0.16	0.69	2.2	7.8	0.61	80	7,803	2.9	0.00078	8.8	2.2	51	4,547	8.4	530	0.0062	184,593	255	0.0063	0.063	2.8	0.78	1.6	1,141	144	26	156,236
2079	265,408	163,840	3,177	17	0.47	0.33	0.41	145	0.0079	317	0.16	0.71	2.2	7.9	0.63	80	7,891	3.0	0.00079	8.9	2.3	51	4,547	8.7	530	0.0063	186,720	255	0.0064	0.064	2.8	0.79	1.6	1,172	148	27	157,251
2080	268,368	166,029	3,177	17	0.47	0.34	0.41	145	0.0079	319	0.16	0.74	2.3	7.9	0.65	80	7,996	3.1	0.00079	9.0	2.4	51	4,547	9.0	530	0.0064	188,943	255	0.0064	0.065	2.9	0.79	1.6	1,173	148	27	158,470
2081	270,820	166,272	3,177	17	0.48	0.35	0.41	145	0.0079	325	0.16	0.76	2.3	7.9	0.67	80	8,048	3.1	0.00079	9.1	2.4	51	4,548	9.2	530	0.0064	190,130	255	0.0065	0.065	2.9	0.79	1.6	1,193	151	27	158,838
2082	271,220	170,249	3,177	18	0.48	0.35	0.41	145	0.008	314	0.16	0.77	2.3	8.0	0.68	80	8,156	3.2	0.0008	9.1	2.5	51	4,548	9.3	530	0.0064	191,952	255	0.0065	0.065	2.9	0.8	1.6	1,162	147	27	159,814
2083	270,326	173,983	3,178	18	0.48	0.35	0.42	145	0.008	306	0.16	0.78	2.3	8.0	0.69	80	8,253	3.2	0.0008	9.1	2.5	51	4,548	9.4	530	0.0064	193,053	255	0.0065	0.065	2.9	0.8	1.6	1,183	150	27	160,383
2084	272,779	176,556	3,178	18	0.48	0.36	0.42	145	0.0081	310	0.16	0.79	2.3	8.1	0.7	80	8,381	3.3	0.00081	9.2	2.6	51	4,548	9.6	530	0.0065	195,161	255	0.0066	0.066	2.9	0.81	1.6	1,171	148	27	161,637
2085	272,007	178,451	3,178	18	0.48	0.36	0.42	145	0.0081	310	0.16	0.79	2.3	8.1	0.7	80	8,453	3.3	0.00081	9.2	2.6	51	4,548	9.7	530	0.0064	195,547	255	0.0065	0.065	2.9	0.81	1.6	1,198	151	28	161,890
2086	274,151	180,017	3,178	18	0.48	0.37	0.43	145	0.0081	317	0.16	0.81	2.4	8.1	0.72	80	8,558	3.3	0.00081	9.2	2.6	51	4,548	9.8	530	0.0065	197,076	255	0.0066	0.066	2.9	0.81	1.6	1,170	148	27	162,778
2087	274,417	181,762	3,178	17	0.48	0.37	0.43	145	0.0082	322	0.16	0.8	2.4	8.2	0.72	80	8,648	3.3	0.00082	9.2	2.6	51	4,548	9.8	530	0.0065	197,831	255	0.0066	0.066	2.9	0.82	1.6	1,182	149	27	163,470
2088	278,238	184,154	3,178	19	0.49	0.37	0.43	145	0.0082	308	0.16	0.81	2.4	8.2	0.73	80	8,795	3.4	0.00082	9.4	2.6	51	4,548	9.9	530	0.0066	200,479	255	0.0067	0.067	3.0	0.82	1.7	1,114	141	26	164,570
2089	278,070	188,038	3,178	22	0.49	0.37	0.44	145	0.0082	278	0.16	0.81	2.4	8.2	0.72	80	8,919	3.3	0.00082	9.4	2.6	51	4,548	9.8	530	0.0066	201,978	255	0.0067	0.067	3.0	0.82	1.7	1,110	140	26	164,772
2090	277,778	191,572	3,178	22	0.49	0.37	0.44	145	0.0083	272	0.17	0.81	2.4	8.3	0.73	80	9,044	3.3	0.00083	9.3	2.6	51	4,549	9.7	530	0.0066	203,237	255	0.0067	0.067	3.0	0.83	1.7	1,042	132	24	165,462
2091	278,395	193,905	3,178	22	0.49	0.37	0.45	145	0.0083	273	0.17	0.81	2.4	8.3	0.72	80	9,165	3.3	0.00083	9.4	2.6	51	4,549	9.7	530	0.0066	204,381	255	0.0067	0.067	3.0	0.83	1.7	1,058	134	24	166,285
2092	280,457	196,798	3,178	22	0.49	0.37	0.45	145	0.0084	275	0.17	0.81	2.4	8.4	0.73	80	9,323	3.3	0.00084	9.4	2.6	51	4,549	9.8	530	0.0067	206,401	255	0.0067	0.067	3.0	0.84	1.7	1,046	132	24	167,587
2093	278,867	200,885	3,178	23	0.49	0.37	0.46	145	0.0084	266	0.17	0.8	2.4	8.4	0.72	80	9,445	3.3	0.00084	9.4	2.6	51	4,549	9.7	530	0.0066	207,275	256	0.0067	0.067	3.0	0.84	1.7	1,091	138	25	168,175
2094	276,697	206,272	3,178	24	0.49	0.37	0.47	145	0.0085	259	0.17	0.8	2.4	8.5	0.71	80	9,605	3.3	0.00085	9.3	2.6	51	4,549	9.7	530	0.0066	208,419	256	0.0066	0.067	3.0	0.85	1.7	1,132	143	26	169,130
2095	275,374	208,602	3,178	24	0.49	0.36	0.47	145	0.0085	259	0.17	0.79	2.4	8.5	0.7	80	9,692	3.3	0.00085	9.3	2.5	51	4,549	9.6	530	0.0066	208,687	256	0.0066	0.066	2.9	0.85	1.7	1,202	152	28	169,816
2096	273,397	212,401	3,178	24	0.48	0.36	0.48	145	0.0085	258	0.17	0.77	2.4	8.5	0.68	80	9,823	3.2	0.00085	9.2	2.5	51	4,549	9.4	530	0.0066	209,256	256	0.0066	0.066	2.9	0.85	1.7	1,274	161	29	170,905
2097	273,610	213,221	3,178	23	0.48	0.36	0.48	145	0.0086	262	0.17	0.78	2.4	8.6	0.68	80	9,888	3.2	0.00086	9.2	2.5	51	4,549	9.5	530	0.0066	209,610	256	0.0066	0.066	2.9	0.86	1.7	1,350	171	31	171,124
2098	273,650	215,552	3,179	23	0.48	0.36	0.49	145	0.0086	266	0.17	0.78	2.4	8.6	0.68	80	10,014	3.3	0.00086	9.2	2.5	51	4,549	9.6	530	0.0066	210,449	256	0.0066	0.066	2.9	0.86	1.7	1,427	180	33	171,837
2099	275,011	216,411	3,179	22	0.48	0.36	0.49	145	0.0086	272	0.17	0.79	2.4	8.6	0.68	80	10,094	3.3	0.00086	9.3	2.5	51	4,549	9.7	530	0.0066	211,341	256	0.0066	0.066	2.9	0.86	1.7	1,506	190	35	172,453
2100	278,058	219,736	3,179	25	0.49	0.36	0.49	145	0.0087	255	0.17	0.79	2.4	8.7	0.68	80	10,279	3.3	0.00087	9.4	2.5	51	4,549	9.8	530	0.0067	213,995	256	0.0067	0.067	3.0	0.87	1.7	1,584	200	36	173,472
2101	280,722	220,996	3,179	24	0.49	0.37	0.49	145	0.0087	260	0.17	0.81	2.4	8.7	0.69	80	10,385	3.4	0.00087	9.4	2.6	51	4,549	10.0	530	0.0068	215,642	256	0.0067	0.068	3.0	0.87	1.7	1,664	210	38	174,383
2102	282,312	222,686	3,179	24	0.5	0.37	0.49	145	0.0088	264	0.18	0.81	2.4	8.8	0.69	80	10,518	3.4	0.00088	9.5	2.6	51	4,550	10.1	530	0.0068	216,923	256	0.0068	0.068	3.0	0.88	1.8	1,745	221	40	175,164
2103	287,641	225,051	3,179	28	0.51	0.38	0.49	145	0.0088	242	0.18	0.84	2.4	8.8	0.71	80	10,678	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069	220,268	256	0.0069	0.069	3.1	0.88	1.8	1,826	231	42	175,863
2104	291,827	227,479	3,179	28	0.51	0.38	0.5	145	0.0089	244	0.18	0.85	2.5	8.9	0.72	80	10,865	3.6	0.00089	9.8	2.7	51	4,550	11	530	0.007	223,031	256	0.007	0.07	3.1	0.89	1.8	1,912	242	44	177,220
2105	290,604	229,372	3,179	29	0.51	0.38	0.5	145	0.0089	240	0.18	0.85	2.4	8.9	0.71	80	10,911	3.6	0.00089	9.8	2.6	51	4,550	11	530	0.007	223,230	256	0.007	0.07	3.1	0.89	1.8	1,983	251	46	177,533
2106	286,118	234,384	3,179	31	0.5	0.37	0.51	145	0.0089	230	0.18	0.82	2.4	8.9	0.68	80	11,011	3.5	0.00089	9.6	2.5	51	4,550	10	530	0.0069	223,210	256	0.0069	0.069	3.1	0.89	1.8	2,053	260	47	178,211
2107	286,285	238,141	3,179	31	0.5	0.37	0.52	145	0.009	226	0.18	0.83	2.4	9.0	0.69	80	11,144	3.5	0.0009	9.6	2.6	51	4,550	10	530	0.0069	224,767	256	0.0069	0.069	3.1	0.9	1.8	2,117	268	49	179,040
2108	288,736	241,745	3,179	32	0.51	0.38	0.52	145	0.009	226	0.18	0.84	2.4	9.0	0.7	80	11,343	3.6	0.0009	9.7	2.6	51	4,550	11	530	0.0069	227,205	256	0.0069	0.069	3.1	0.9	1.8	2,183	276	50	180,178
2109	289,478	243,424	3,180	32	0.51	0.38	0.52	145	0.009	224	0.18	0.85	2.4	9.0	0.7	80	11,444	3.6	0.0009	9.7	2.6	51	4,551	11	530	0.0069	228,157	256	0.007	0.07	3.1	0.9	1.8	2,233	282	51	180,248
2110	291,896	245,531	3,180	32	0.51	0.38	0.52	145	0.009	225	0.18	0.87	2.5	9.0	0.72	80	11,602	3.7	0.0009	9.8	2.7	51	4,551	11	530	0.0069	229,980	256	0.007	0.07	3.1	0.9	1.8	2,287	289	53	180,830
2111	293,813	247,161	3,180	32	0.52	0.39	0.52	145	0.0091	226	0.18	0.88	2.5	9.1	0.73	80	11,723	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007	231,411	256	0.0071	0.071	3.1	0.91	1.8	2,338	296	54	181,243
2112	297,475	249,052	3,180	32	0.52	0.4	0.52	145	0.0091	228	0.18	0.91	2.5	9.1	0.75	80	11,891	3.9	0.00091	10.0	2.8	51	4,551	11	530	0.0071	233,711	256	0.0072	0.072	3.2	0.91	1.8	2,389	302	55	181,975
2113	298,394	249,580	3,180	31	0.53	0.4	0.52	145	0.0091	229	0.18	0.92	2.5	9.1	0.76	80	11,962	3.9	0.00091	10.0	2.8	51	4,551	12	530	0.0071	234,267	256	0.0072	0.072	3.2	0.91	1.8	2,417	306	56	181,870
2114	301,579	250,399	3,180	31	0.53	0.41	0.52	145	0.0091	232	0.18	0.94	2.5	9.1	0.78	80	12,076	4.0	0.00091	10	2.9	51	4,551	12	530	0.0071	235,938	256	0.0073	0.073	3.2	0.91	1.8	2,432	307	56	182,135
2115	303,001	251,216	3,180	30	0.53	0.41	0.52	145	0.0091	233	0.18	0.95	2.5	9.1	0.79	80	12,166	4.0	0.00091	10	3.0	51	4,551	12	530	0.0072	236,829	256	0.0073	0.073	3.2	0.91	1.9	2,429	307	56	182,344
2116	307,438	252,720	3,180	30	0.54	0.42	0.52	145	0.0092	238	0.18	0.98	2.6	9.2	0.82	80	12,316	4.1	0.00092	10	3.0	51	4,552	12	530	0.0073	239,352	256	0.0074	0.074	3.3	0.92	1.9	2,403	304	55	183,370
2117	306,315	255,073	3,180	31	0.54	0.42	0.52	145	0.0092	234	0.18	0.98	2.6	9.2	0.82	80	12,388	4.1	0.00092	10	3.1	51	4,552	12	530	0.0073	239,759	256	0.0074	0.074	3.3	0.92	1.9	2,342	296	54	183,400
2118	305,880	258,295	3,180	31	0.54	0.42	0.53	145	0.0092	230	0.18	0.98	2.6	9.2	0.83	80	12,508	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073	240,810	256	0.0074	0.074	3.3	0.92	1.9	2,269	287	52	183,657
2119	305,409	259,693	3,180	31	0.54	0.43	0.53	145	0.0092	229	0.18	0.98	2.6	9.2	0.83	80	12,582	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073	241,087	256	0.0074	0.073	3.3	0.92	1.9	2,180	276	50	183,671
2120	306,242	262,372	3,181	31	0.54	0.43	0.53	145	0.0092	229	0.18	0.99	2.6	9.2	0.85	80	12,724	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073	242,454	256	0.0074	0.074	3.3	0.92	2.0	2,102	266	48	184,250
2121	304,685	267,104	3,181	37	0.54	0.43	0.54	145	0.0092	206	0.18	0.99	2.6	9.2	0.85	80	12,842	4.1	0.00092	10	3.1	51	4,552	12	530	0.0073	243,656	256	0.0073	0.073	3.3	0.92	2.0	2,011	254	46	184,044
2122	301,081	272,882	3,181	39	0.53	0.43	0.55	145	0.0092	197	0.18	0.98	2.7	9.2	0.85	80	12,999	4.1	0.00092	10	3.1	51	4,552	12	531	0.0072	244,314	256	0.0072	0.072	3.2	0.92	2.0	1,921	243	44	184,430
2123	299,555	275,531	3,181	40	0.53	0.43	0.55	145	0.0092	195	0.18	0.98	2.7	9.2	0.85	80	13,100	4.1	0.00092	10	3.1	51	4,553	12	531	0.0072	244,600	256	0.0072	0.072	3.2	0.92	2.0	1,846	233	42	184,660
2124	297,758	280,129	3,181	41	0.52	0.43	0.56	145	0.0093	191	0.19	0.97	2.7	9.3	0.85	80	13,279	4.1	0.00093	10	3.1	51	4,553	12	531	0.0071	245,518	256	0.0072	0.072	3.2	0.93	2.0	1,720	217	40	185,381
2125	296,664	281,630	3,181	41	0.52	0.43	0.57	145	0.0093	190	0.19	0.97	2.7	9.3	0.85	80	13,361	4.0	0.00093	10.0	3.1	51	4,553	12	531	0.0071	245,536	256	0.0071	0.071	3.2	0.93	1.9	1,629	206	37	185,380
2126	295,249	284,933	3,181	42	0.52	0.43	0.57	145	0.0093	188	0.19	0.96	2.7	9.3	0.85	80	13,503	4.0	0.00093	9.9	3.1	51	4,553	12	531	0.0071	246,100	256	0.0071	0.071	3.2	0.93	1.9	1,447	183	33	185,890
2127	294,686	286,522	3,181	42	0.52	0.43	0.57	145	0.0093	186	0.19	0.95	2.7	9.3	0.85	80	13,601	3.9	0.00093	9.9	3.1	51	4,553	12	531	0.0071	246,374	256	0.0071	0.071	3.1	0.93	1.9	1,350	171	31	185,957
2128	293,522	289,647	3,181	43	0.52	0.43	0.58	145	0.0093	184	0.19	0.94	2.8	9.3	0.84	80	13,769	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.007	246,940	256	0.0071	0.071	3.1	0.93	1.9	1,155	146	27	186,328
2129	292,933	290,125	3,181	43	0.52	0.42	0.58	145	0.0093	183	0.19	0.93	2.8	9.3	0.84	80	13,832	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007	246,766	256	0.0071	0.07	3.1	0.93	1.9	1,070	135	25	185,930
2130	291,760	292,356	3,182	43	0.51	0.42	0.58	145	0.0093	182	0.19	0.91	2.8	9.3	0.83	80	13,970	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	246,964	256	0.007	0.07	3.1	0.93	1.9	921	117	21	186,107
2131	292,139	293,237	3,182	43	0.52	0.42	0.58	145	0.0093	182	0.19	0.91	2.8	9.3	0.83	80	14,059	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	247,391	256	0.007	0.07	3.1	0.93	1.9	872	110	20	186,064
2132	292,174	295,795	3,182	43	0.52	0.42	0.59	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,224	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	248,254	256	0.007	0.07	3.1	0.93	1.9	791	100	18	186,657
2133	292,141	295,678	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.9	2.8	9.3	0.83	80	14,267	3.7	0.00093	9.8	3.0	51	4,554	11	531	0.007	248,104	256	0.007	0.07	3.1	0.93	1.9	768	97	18	186,125
2134	291,991	297,209	3,182	43	0.51	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,389	3.6	0.00093	9.8	2.9	51	4,554	11	531	0.007	248,519	256	0.007	0.07	3.1	0.93	1.9	733	93	17	186,338

Table A10. Annual loads of the NAG backfill for the high nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	293,380	298,007	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,476	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.0071	249,369	256	0.0071	0.071	3.1	0.93	1.9	729	92	17	186,569
2136	294,116	300,087	3,182	44	0.52	0.42	0.59	145	0.0094	180	0.19	0.88	2.8	9.4	0.82	80	14,627	3.6	0.00094	9.9	2.9	51	4,554	10	531	0.0071	250,409	256	0.0071	0.071	3.1	0.94	1.9	720	91	17	187,180
2137	294,526	299,791	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,660	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.0071	250,386	256	0.0071	0.071	3.1	0.93	1.9	719	91	17	186,716
2138	292,307	302,917	3,182	45	0.52	0.41	0.59	145	0.0093	175	0.19	0.88	2.8	9.3	0.81	80	14,758	3.6	0.00093	9.8	2.9	51	4,554	10	531	0.007	250,579	256	0.007	0.07	3.1	0.93	1.9	718	91	17	186,790
2139	289,713	306,716	3,182	46	0.51	0.41	0.6	145	0.0094	171	0.19	0.87	2.8	9.4	0.8	80	14,875	3.5	0.00094	9.7	2.9	51	4,554	10	531	0.007	250,880	256	0.007	0.07	3.1	0.94	1.9	719	91	17	187,056
2140	288,790	309,416	3,182	47	0.51	0.41	0.61	145	0.0094	170	0.19	0.86	2.8	9.4	0.79	80	15,004	3.5	0.00094	9.7	2.8	51	4,554	10	531	0.007	251,418	256	0.0069	0.069	3.1	0.94	1.9	722	91	17	187,514
2141	285,594	310,955	3,182	48	0.5	0.4	0.61	145	0.0093	167	0.19	0.84	2.7	9.3	0.78	80	15,062	3.4	0.00093	9.6	2.8	51	4,554	10	531	0.0069	250,495	256	0.0069	0.069	3.0	0.93	1.9	721	91	17	186,895
2142	284,497	312,138	3,182	48	0.5	0.4	0.61	145	0.0093	166	0.19	0.84	2.7	9.3	0.77	80	15,125	3.4	0.00093	9.6	2.8	51	4,555	10	531	0.0068	250,391	256	0.0068	0.068	3.0	0.93	1.9	722	91	17	186,886
2143	282,701	314,516	3,182	48	0.5	0.39	0.62	145	0.0094	164	0.19	0.82	2.7	9.4	0.75	80	15,260	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	250,382	256	0.0068	0.068	3.0	0.94	1.9	724	91	17	187,034
2144	282,564	316,417	3,182	49	0.5	0.39	0.62	145	0.0094	164	0.19	0.81	2.7	9.4	0.75	80	15,365	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	250,980	256	0.0068	0.068	3.0	0.94	1.9	726	92	17	187,551
2145	280,098	317,409	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.79	2.7	9.4	0.72	80	15,447	3.2	0.00094	9.4	2.6	51	4,555	9	531	0.0067	250,100	256	0.0067	0.067	3.0	0.94	1.9	724	91	17	187,019
2146	279,425	318,300	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.78	2.7	9.4	0.72	80	15,509	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,071	256	0.0067	0.067	3.0	0.94	1.9	723	91	17	187,081
2147	278,254	320,021	3,183	49	0.49	0.38	0.63	145	0.0094	161	0.19	0.76	2.7	9.4	0.7	80	15,631	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,059	256	0.0067	0.067	3.0	0.94	1.9	716	91	16	187,212
2148	278,291	321,567	3,183	50	0.49	0.37	0.64	145	0.0094	161	0.19	0.75	2.7	9.4	0.69	80	15,727	3.1	0.00094	9.4	2.5	51	4,555	8.9	531	0.0067	250,610	256	0.0067	0.067	3.0	0.94	1.9	712	90	16	187,667
2149	276,225	321,860	3,183	50	0.49	0.37	0.64	145	0.0094	159	0.19	0.73	2.6	9.4	0.67	80	15,781	3.0	0.00094	9.3	2.4	51	4,555	8.7	531	0.0066	249,667	256	0.0066	0.066	2.9	0.94	1.9	687	87	16	187,030
2150	275,653	322,343	3,183	50	0.49	0.36	0.64	145	0.0093	159	0.19	0.72	2.6	9.3	0.66	80	15,824	2.9	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,532	256	0.0066	0.066	2.9	0.93	1.9	669	85	15	186,985

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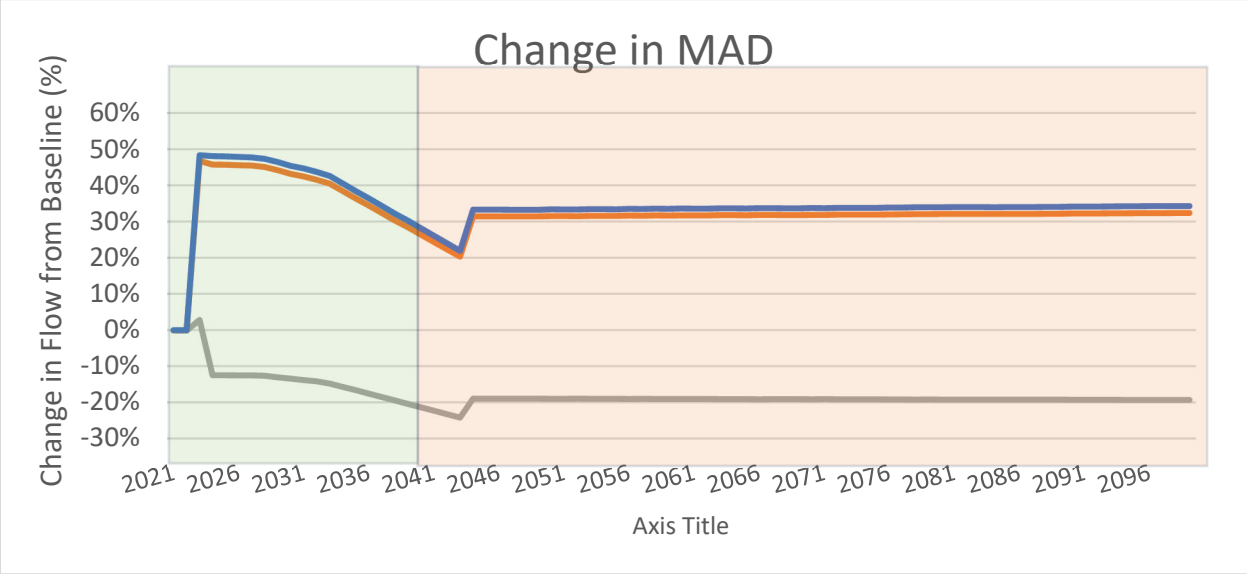
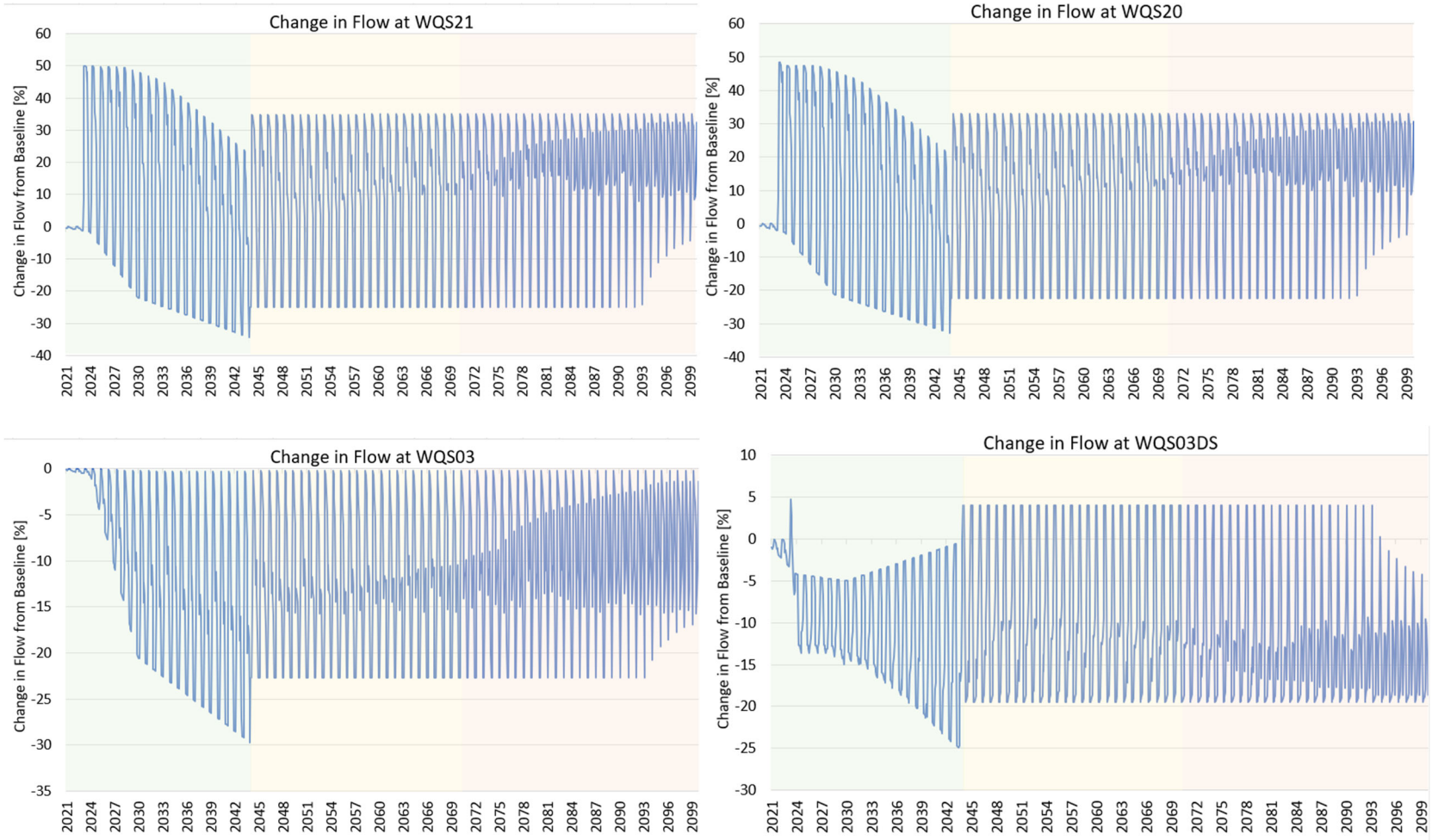
Appendix F Water Quantity Results for Project Case and Alternative Cases

Figure F-1. Four Creek Streamflow Effect to Mean Annual Discharge relative to Base Case Conditions



Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_ChangetoMAD_20250722_CCM.xlsx?web=1

Figure F-2: Four Creek Streamflow Effect to Monthly Average Discharge relative to Base Case Conditions in the Project Case



Source:

*https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/*WaterQuantity_Results_20250725_CCM.xlsm?web=1

Table F-1: Tenas Creek Project Case Streamflow Effect as Monthly Change over Base Case Conditions

Scenario		Tenas Creek Monthly % Change											
		WQS01			WQS02			WQS22			WQS04		
Period	Month	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease
Construction	January	-	0.0	-	-	-0.3	-	-	-0.3	-	-	-0.2	-
	February	-	0.0	-	-	-0.3	-	-	-0.3	-	-	-0.3	-
	March	-	0.0	-	-	-0.3	-	-	-0.2	-	-	-0.2	-
	April	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-
	May	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-
	June	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-
	July	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-
	August	-	0.0	-	-	0.0	-	-	0.0	-	-	0.0	-
	September	-	0.0	-	-	-0.1	-	-	-0.1	-	-	-0.1	-
	October	-	0.0	-	-	-0.1	-	-	-0.1	-	-	-0.1	-
	November	-	0.0	-	-	-0.5	-	-	-0.5	-	-	-0.4	-
	December	-	0.0	-	-	-0.6	-	-	-0.5	-	-	-0.5	-
Operations	January	-	-0.2	-0.4	1.3	-1.5	-3.9	2.8	-1.8	-5.9	2.7	-1.7	-5.5
	February	-	-0.2	-0.4	1.4	-1.5	-3.9	2.8	-1.8	-5.8	2.7	-1.7	-5.5
	March	-	-0.2	-0.4	1.0	-1.5	-3.9	-	-4.8	-8.5	-	-4.7	-8.3
	April	-	0.0	-	0.0	-1.4	-1.6	0.0	-7.6	-10.4	-	-8.4	-11.0
	May	-	0.0	-	0.0	-1.4	-1.5	0.0	-6.3	-7.2	-	-7.2	-8.1
	June	-	0.0	-	0.0	-1.4	-1.5	0.0	-4.9	-5.5	-	-6.0	-6.8
	July	-	0.0	-	0.0	-1.4	-1.7	0.0	-5.0	-6.0	-	-6.1	-7.2
	August	-	0.0	-	0.0	-1.5	-1.8	0.0	-5.3	-6.8	-	-6.4	-7.8
	September	-	0.0	-0.1	-	-1.5	-2.0	-	-5.4	-7.2	-	-6.5	-8.2
	October	-	0.0	-0.1	-	-1.6	-2.1	-	-6.1	-7.4	-	-7.1	-8.4
	November	-	-0.2	-0.4	0.9	-1.7	-4.0	-	-3.7	-7.3	-	-3.8	-7.3
	December	-	-0.2	-0.4	1.7	-1.4	-3.9	3.4	-1.7	-5.9	3.3	-1.5	-5.5
Post-Closure	January	-	-0.2	-0.3	1.9	0.4	-1.3	3.1	-2.6	-6.8	3.0	-2.7	-6.8
	February	-	-0.3	-0.3	1.9	1.3	-0.9	3.1	1.2	-5.2	3.0	1.1	-5.4
	March	-	-0.2	-0.2	0.8	0.6	0.3	-	-1.5	-2.1	-	-1.6	-2.2
	April	-	0.0	-	-	-1.5	-1.5	-	-6.3	-6.5	-	-6.5	-6.6
	May	-	0.0	-	-	-1.5	-1.5	-	-5.6	-5.9	-	-5.8	-6.1
	June	-	0.0	-	-	-1.4	-1.4	-	-4.2	-4.8	-	-4.5	-5.1
	July	-	0.0	-	-	-1.3	-1.4	-	-4.9	-5.5	-	-5.2	-5.7
	August	-	0.0	-	-	-1.3	-1.4	-	-5.2	-6.0	-	-5.4	-6.2
	September	-	0.0	-	-	-1.2	-1.3	-	-5.0	-6.1	-	-5.3	-6.2
	October	-	0.0	-	-	-1.3	-1.3	-	-5.6	-6.0	-	-5.8	-6.2
	November	-	0.0	-	-	-1.3	-1.4	-	-7.6	-8.2	-	-7.7	-8.2
	December	-	0.0	-0.2	-	-1.2	-1.4	-	-7.2	-9.2	-	-7.3	-9.2

Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

Table F-2: Goathorn Creek Project Case Streamflow Effect as Monthly Change over Base Case Conditions

Scenario		Goathorn Creek Monthly % Change											
		WQS06US			WQS06			WQSEA1			WQS05		
Period	Month	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease
Construction	January	-	0.00	-	-	-2.58	-	-	-0.08	-	-	-0.12	-
	February	-	0.00	-	-	-2.58	-	-	-0.08	-	-	-0.13	-
	March	-	-0.01	-	-	-2.58	-	-	-0.08	-	-	-0.13	-
	April	-	0.00	-	-	-2.52	-	-	-0.02	-	-	-0.02	-
	May	-	0.00	-	-	-2.50	-	-	0.00	-	-	-0.01	-
	June	-	0.00	-	-	-2.50	-	-	0.00	-	-	-0.01	-
	July	-	0.00	-	-	-2.50	-	-	0.00	-	-	-0.01	-
	August	-	0.00	-	-	-2.51	-	-	0.00	-	-	-0.03	-
	September	-	0.00	-	-	-2.52	-	-	-0.02	-	-	-0.08	-
	October	-	0.00	-	-	-2.54	-	-	-0.04	-	-	-0.10	-
	November	-	-0.01	-	-	-2.64	-	-	-0.14	-	-	-0.22	-
	December	-	-0.01	-	-	-2.65	-	-	-0.15	-	-	-0.23	-
Operations	January	-	-0.1	-0.2	-	-2.8	-3.0	-	-0.3	-0.5	0.6	-0.7	-1.9
	February	-	-0.1	-0.2	-	-2.8	-3.0	-	-0.3	-0.5	0.7	-0.7	-1.9
	March	-	-0.1	-0.2	-	-6.3	-10.0	0.5	-3.8	-7.6	-	-3.6	-4.9
	April	-	0.0	0.0	-	-5.1	-6.8	1.6	-2.6	-4.3	0.0	-5.4	-7.7
	May	-	0.0	0.0	3.8	1.2	-2.5	6.4	3.8	-	0.0	-1.3	-2.1
	June	-	0.0	0.0	1.1	0.3	-2.5	3.7	2.8	-	2.4	0.1	-1.9
	July	-	0.0	0.0	0.7	-0.9	-2.5	3.2	1.6	-	1.8	0.5	-0.9
	August	-	0.0	0.0	-	-2.1	-2.8	1.2	0.5	-0.3	0.0	-1.1	-1.7
	September	-	0.0	-0.1	0.6	-2.2	-3.1	3.2	0.3	-0.6	0.9	-1.8	-3.3
	October	-	0.0	-0.1	3.4	-0.7	-3.0	6.0	1.8	-0.5	2.3	-0.8	-2.2
	November	-	-0.1	-0.2	-	-2.8	-3.0	-	-0.3	-0.5	0.7	-0.7	-1.9
	December	-	-0.1	-0.2	-	-2.8	-3.0	-	-0.3	-0.5	0.8	-0.6	-1.9
Post-Closure	January	-	0.0	-	2.8	-1.4	-2.4	5.4	1.1	-	1.4	0.7	-0.7
	February	-	0.0	-	-	-2.0	-2.2	1.4	0.5	-	1.1	1.0	-
	March	-	0.0	-	2.3	0.9	-0.6	4.8	3.4	-	1.5	0.6	-
	April	-	0.0	-	1.1	0.1	-2.0	3.7	2.6	-	-	-1.6	-2.6
	May	-	0.0	-	-	-2.6	-2.7	0.0	-0.1	-0.2	-	-2.6	-2.8
	June	-	0.0	-	-	-1.9	-2.1	1.0	0.7	-	-	-1.0	-1.2
	July	-	0.0	-	-	-2.4	-2.4	0.2	0.1	-	-	-0.5	-0.6
	August	-	0.0	-	-	-2.1	-2.2	0.5	0.4	-	-	-0.9	-1.1
	September	-	0.0	-	-	-1.8	-2.0	0.9	0.7	-	-	-1.0	-1.3
	October	-	0.0	-	1.7	1.0	-	4.3	3.6	-	1.7	1.3	-
	November	-	0.0	-	8.7	5.1	-	11.3	7.7	-	1.2	-0.6	-2.2
	December	-	0.0	-	5.7	-0.3	-2.2	8.3	2.2	-	0.3	-1.3	-2.0

Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

Table F-3: Telkwa and Bulkley River Project Case Streamflow Effect as Monthly Change over Base Case Conditions

Scenario		Telkwa River Monthly % Change			Bulkley River Monthly % Change					
		WQS09			WQS11			WQS12		
Period	Month	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease
Construction	January		-0.1			0.0			0.0	
	February		-0.1			0.0			0.0	
	March		-0.1			0.0			0.0	
	April		-0.1			0.0			0.0	
	May		0.0			0.0			0.0	
	June		0.0			0.0			0.0	
	July		0.0			0.0			0.0	
	August		0.0			0.0			0.0	
	September		-0.1			0.0			0.0	
	October		-0.1			0.0			0.0	
	November		-0.2			0.0			0.0	
	December		-0.2			0.0			0.0	
Operations	January	0.6	-0.6	-1.6	0.0	0.0		0.0	0.0	
	February	0.6	-0.6	-1.6	0.0	0.0		0.0	0.0	
	March	0.6	-0.6	-1.6	0.0	0.0		0.0	0.0	-0.1
	April	-	-1.2	-1.7	0.0	0.0		0.0	-0.2	-0.2
	May	0.0	-0.2	-0.3	0.0	0.0		0.0	0.0	
	June	0.2	0.0	-0.2	0.0	0.0		0.0	0.0	
	July	0.2	0.0	-0.2	0.0	0.0		0.0	0.0	
	August	0.0	-0.2	-0.4	0.0	0.0		0.0	0.0	
	September	0.1	-0.3	-0.8	0.0	0.0		0.0	0.0	
	October	0.1	-0.3	-0.8	0.0	0.0		0.0	0.0	
	November	0.7	-0.6	-1.6	0.0	0.0		0.0	0.0	
	December	0.7	-0.5	-1.6	0.0	0.0		0.0	0.0	
Post-Closure	January	1.0	0.8	0.4	0.0	0.0		0.0	0.0	
	February	1.0	0.9	0.8	0.0	0.0		0.0	0.0	
	March	0.7	0.6	0.5	0.0	0.0		0.0	0.0	
	April	-	-0.2	-0.4	0.0	0.0		0.0	0.0	-0.1
	May	-	-0.2	-0.2	0.0	0.0		0.0	0.0	-0.1
	June	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
	July	0.1	0.1	0.1	0.0	0.0		0.0	0.0	
	August	0.2	0.1	0.1	0.0	0.0		0.0	0.0	
	September	0.4	0.4	0.3	0.0	0.0		0.0	0.0	
	October	0.4	0.4	0.3	0.0	0.0		0.0	0.0	
	November	0.7	0.4	0.0	0.0	0.0		0.0	0.0	
	December	1.0	0.5	0.1	0.0	0.0		0.0	0.0	

Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

Table F-4: Goathorn Creek and Telkwa River Streamflow Effect as Monthly Change for Alternative Case 4 (3 consecutive wet years) over baseline conditions

Project Case		Goathorn Creek		Telkwa River
		WQSEA1	WQS05	WQS09
Period	Month	Maximum Percent Increase over Baseline Conditions [%]	Maximum Percent Increase over Baseline Conditions [%]	Maximum Percent Increase over Baseline Conditions [%]
Operations	January	-	0.6	0.6
	February	-	0.7	0.6
	March	0.5	-	0.6
	April	13.3	0.7	-
	May	6.4	0.0	0.0
	June	3.7	2.4	0.2
	July	3.2	1.8	0.2
	August	1.2	0.0	0.0
	September	3.2	0.9	0.1
	October	5.9	2.3	0.1
	November	-	0.7	0.7
	December	-	0.8	0.7

Source:
https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

Table F-5: Goathorn Creek Project Case Streamflow Effect as Monthly Change over Alternative Case 5 (low flow)

Stream	Node	Baseline 7Q10 [m3/s]	Modelled 7Q10 with Ratio [m3/s]			% Change to 7Q10 over Baseline		
			Construction	Operation	Closure and Post-Closure	Construction	Operation	Closure and Post-Closure
Tenas Creek	WQS01	0.003	0.00	0.00	0.00	-1%	-1%	-1%
	WQS02	0.004	0.00	0.00	0.00	-1%	-4%	1%
	WQS22	0.006	0.01	0.01	0.01	-1%	-7%	2%
	WQ04	0.006	0.01	0.01	0.01	-1%	-6%	2%
Four Creek	WQS03	0.000	0.00	0.00	0.00	-30%	-50%	-46%
	WQS21	0.000	0.00	0.00	0.00	-30%	-54%	-47%
	WQS20	0.000	0.00	0.00	0.00	-30%	-52%	-45%
	WQS03_DS	0.001	0.00	0.00	0.00	-30%	-33%	-26%
Goathorn Creek	WQS13	0.174	0.17	0.17	0.17	0%	0%	0%
	WQS06_US	0.191	0.19	0.19	0.19	0%	0%	0%
	WQSEA1	0.220	0.22	0.22	0.22	0%	0%	0%
	WQS06	0.220	0.22	0.22	0.22	0%	0%	0%
	WQS05	0.348	0.35	0.34	0.35	0%	-2%	1%
Telkwa River	WQS09	4.216	4.21	4.15	4.26	0%	-2%	1%
Bulkley River	WQS11	16.503	16.50	16.50	16.50	0%	0%	0%
	WQS12	19.563	19.56	19.56	19.56	0%	0%	0%

Source:
https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_LowFlow_FEAC2025_20250725.xlsm

Table F-6: Percent Change in Mean Annual Discharge for Alternative Assessment Case 1: High Groundwater Seepage Conditions Relative to Base Case Conditions, including Maximum Increase, Maximum Decrease and Average Change, over each Project Stage

Stream	Node	% Change in Mean Annual Discharge relative to Base Case Conditions								
		Construction			Operation			Post-Closure		
		Maximum Increase	Average Change	Maximum Decrease	Maximum Increase	Average Change	Maximum Decrease	Maximum Increase	Average Change	Maximum Decrease
Tenas Creek	WQS01	n.a	0.0%	0.0%	n.a	0.0%	0.0%	n.a	0.0%	0.0%
	WQS02	n.a	0.0%	0.0%	n.a	-1.4%	-1.7%	n.a	-1.2%	-1.3%
	WQS22	n.a	0.0%	0.0%	n.a	-6.1%	-7.0%	n.a	-5.2%	-5.3%
	WQS04	0.0%	0.0%	0.0%	n.a	-7.0%	-8.0%	n.a	-5.5%	-5.6%
Four Creek	WQS03	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	n.a	0.0%	0.0%
	WQS21	n.a	-0.8%	-0.8%	47.1%	33.9%	-1.0%	32.2%	31.0%	n.a
	WQS20	n.a	-0.8%	-0.8%	45.6%	31.9%	-1.0%	30.2%	29.0%	n.a
	WQS03_DS	n.a	-0.6%	-0.6%	2.1%	-13.8%	-19.8%	n.a	-14.8%	-16.2%
Goathorn Creek	WQS13	n.a	0.0%	0.0%	n.a	0.0%	-0.1%	n.a	-0.1%	-0.1%
	WQS06_US	n.a	0.0%	0.0%	n.a	0.0%	0.0%	n.a	0.0%	0.0%
	WQSEA1	n.a	0.0%	0.0%	2.7%	1.4%	n.a	0.7%	0.5%	n.a
	WQS06	n.a	0.0%	0.0%	0.8%	-1.4%	-1.8%	n.a	-1.5%	-2.0%
	WQS05	n.a	0.0%	0.0%	0.7%	0.1%	-0.4%	0.7%	0.6%	n.a
Telkwa River	WQS09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Bulkley River	WQS11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	n.a	0.0%	0.0%
	WQS12	n.a	0.0%	0.0%	n.a	0.0%	0.0%	n.a	0.0%	0.0%

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_ChangetoMAD_20250722_CCM.xlsx?web=1

Note: n.a. (not applicable) values represent nodes which do not experience a net increase or net decrease over Pre-Mining conditions

Table F-7: Tenas Creek Project Case Streamflow Effect as Monthly Change over Base Case Conditions for Alternative Case 1: High Groundwater Seepage

Scenario		Tenas Creek Monthly % Change											
		WQS01			WQS02			WQS22			WQS04		
Period	Month	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease
Construction	January		-0.03			-0.42			-0.04			-0.01	
	February		-0.03			-0.46			-0.05			-0.01	
	March		-0.03			-0.47			-0.04			-0.01	
	April		0.00			-0.01			0.00			0.00	
	May		0.00			-0.01			0.00			0.00	
	June		0.00			-0.02			0.00			0.00	
	July		0.00			-0.06			-0.01			0.00	
	August		0.00			-0.06			-0.01			0.00	
	September		-0.01			-0.11			-0.01			0.00	
	October		-0.01			-0.17			-0.02			0.00	
	November		-0.05			-0.75			-0.08			-0.01	
	December		-0.05			-0.80			-0.08			-0.01	
Operations	January		-0.4	-0.5	9.7	-0.1	-6.5	33.1	5.0	-12.2	29.1	4.5	-10.5
	February		-0.4	-0.5	9.8	-0.1	-6.4	33.4	5.1	-11.9	29.3	4.6	-10.2
	March		-0.4	-0.5	8.6	-0.3	-6.3	19.5	0.3	-13.4	16.6	0.0	-11.9
	April		0.0		0.0	-1.4	-1.8	0.0	-7.6	-10.4	0.0	-8.3	-11.0
	May		0.0		0.0	-1.4	-1.5	0.0	-6.2	-7.2	0.0	-7.1	-8.1
	June		0.0		0.0	-1.3	-1.6	0.0	-4.7	-5.5	0.0	-5.9	-6.8
	July		0.0		0.0	-1.3	-1.9	0.0	-4.4	-6.0	0.0	-5.6	-7.2
	August		0.0		-	-1.3	-2.0	0.0	-4.7	-6.9	0.0	-5.8	-7.9
	September		-0.1	-0.1	0.0	-1.3	-2.4	0.0	-4.4	-7.4	0.0	-5.6	-8.4
	October		-0.1	-0.1	-	-1.4	-2.5	0.0	-5.2	-8.3	0.0	-6.2	-9.2
	November		-0.4	-0.5	8.8	-0.2	-6.3	24.0	2.9	-12.9	20.4	2.2	-11.7
	December		-0.4	-0.5	10.9	0.4	-6.5	36.3	6.4	-12.3	31.8	5.7	-10.5
Post-Closure	January		-0.2	-0.3	11.6	6.5	-0.4	35.1	16.0	-3.0	30.8	13.5	-3.6
	February		-0.3	-0.3	11.6	9.8	-	35.1	28.9		30.8	25.1	
	March		-0.2	-0.2	7.5	6.5	-	19.1	17.6		16.3	15.0	
	April		0.0			-1.4	-1.4		-6.2	-6.3		-6.3	-6.5
	May		0.0			-1.4	-1.4		-5.4	-5.7		-5.6	-5.9
	June		0.0			-1.2	-1.3		-3.4	-3.6		-3.8	-4.1
	July		0.0			-0.6	-0.7		-2.4	-2.9		-3.0	-3.5
	August		0.0			-0.5	-0.7		-2.5	-3.3		-3.1	-3.8
	September		0.0		0.4	0.0	-0.4	0.6	-0.9	-1.8		-1.7	-2.5
	October		0.0		-	-0.5	-0.7		-3.2	-3.7		-3.7	-4.1
	November		0.0		0.3	-0.4	-1.0		-5.5	-6.6		-5.8	-6.8
	December		0.0	-0.2	5.1	0.4	-1.1	1.1	-3.5	-5.4	0.1	-4.1	-5.7

Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

Table F-8: Four Creek Project Case Streamflow Effect as Monthly Change over Base Case Conditions for Alternative Case 1: High Groundwater Seepage

Scenario		Four Creek Monthly % Change											
		WQS03			WQS21			WQS20			WQS03DS		
Period	Month	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease
Construction	January	-	0.00	-	-	-5.27	-	-	-5.27	-	-	-3.87	-
	February	-	0.00	-	-	-6.45	-	-	-6.45	-	-	-4.73	-
	March	-	0.00	-	-	-5.11	-	-	-5.11	-	-	-3.75	-
	April	-	0.00	-	-	-0.13	-	-	-0.13	-	-	-0.09	-
	May	-	0.00	-	-	-0.74	-	-	-0.74	-	-	-0.54	-
	June	-	0.00	-	-	-1.70	-	-	-1.70	-	-	-1.24	-
	July	-	0.00	-	-	-2.50	-	-	-2.50	-	-	-1.83	-
	August	-	0.00	-	-	-6.58	-	-	-6.58	-	-	-4.82	-
	September	-	0.00	-	-	-5.97	-	-	-5.97	-	-	-4.37	-
	October	-	0.00	-	-	-7.49	-	-	-7.49	-	-	-5.49	-
	November	-	0.00	-	-	-10.76	-	-	-10.76	-	-	-7.88	-
	December	-	0.00	-	-	-11.23	-	-	-11.23	-	-	-8.24	-
Operations	January	-	0.0	-	-5.3	-76.9	-100.0	-	-76.9	-100.0	85.0	16.8	-16.8
	February	-	0.0	-	-6.5	-77.2	-100.0	-	-77.2	-100.0	85.6	17.1	-16.8
	March	-	0.0	-	-5.1	-42.4	-57.5	-	-42.9	-58.2	47.2	6.4	-16.0
	April	-	0.0	-	49.7	37.0	-0.2	48.2	35.1	-0.2	4.6	-14.2	-23.9
	May	-	0.0	-	49.5	36.2	-0.7	47.9	34.3	-0.7	2.5	-14.2	-23.1
	June	-	0.0	-	48.3	27.9	-1.7	46.6	26.0	-1.7	-	-12.1	-15.2
	July	-	0.0	-	45.4	19.0	-3.1	43.6	17.1	-4.1	-	-10.3	-17.0
	August	-	0.0	-	33.1	-16.1	-50.0	31.4	-17.8	-51.4	44.8	0.5	-19.8
	September	-	0.0	-	38.0	-8.0	-41.1	36.1	-9.7	-42.3	35.0	-1.7	-19.0
	October	-	0.0	-	12.5	-27.9	-46.8	11.4	-29.2	-47.9	40.5	3.1	-17.9
	November	-	0.0	-	-10.8	-78.9	-100.0	-	-78.9	-100.0	76.2	19.0	-16.3
	December	-	0.0	-	-11.2	-80.7	-100.0	-	-80.7	-100.0	91.9	20.6	-16.6
Post-Closure	January	-	0.0	-	-19.4	-75.6	-100.0	-	-76.0	-100.0	121.3	96.4	-
	February	-	0.0	-	-60.3	-93.9	-100.0	-	-94.0	-100.0	121.3	115.5	-
	March	-	0.0	-	-35.0	-40.6	-47.9	-	-41.5	-48.7	67.0	59.5	-
	April	-	0.0	-	34.5	34.5	-	32.5	32.5	-	-	-18.8	-18.9
	May	-	0.0	-	31.3	28.5	-	29.3	26.5	-	-	-11.6	-14.9
	June	-	0.0	-	25.4	21.4	-	23.4	19.4	-	3.4	-2.9	-7.8
	July	-	0.0	-	16.2	11.6	-	14.1	9.6	-	15.9	9.1	-
	August	-	0.0	-	-19.1	-35.0	-44.3	-	-36.7	-45.9	72.1	63.7	-
	September	-	0.0	-	-4.0	-23.3	-35.3	-	-25.0	-36.8	59.5	48.7	-
	October	-	0.0	-	-17.1	-20.5	-25.2	-	-22.1	-26.7	48.7	43.9	-
	November	-	0.0	-	28.1	12.1	-16.8	26.1	10.3	-18.3	38.3	6.1	-11.8
	December	-	0.0	-	1.2	-33.9	-100.0	-	-35.1	-100.0	121.3	56.1	-

Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

Table F-9: Goathorn Creek Project Case Streamflow Effect as Monthly Change over Base Case Conditions for Alternative Case 1: High Groundwater Seepage

Scenario		Goathorn Creek Monthly % Change											
		WQS06US			WQS06			WQSEA1			WQS05		
Period	Month	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease
Construction	January	-	-0.01	-	-	-2.57	-	-	-0.07	-	-	-0.06	-
	February	-	-0.01	-	-	-2.58	-	-	-0.08	-	-	-0.06	-
	March	-	-0.01	-	-	-2.58	-	-	-0.08	-	-	-0.06	-
	April	-	0.00	-	-	-2.52	-	-	-0.01	-	-	-0.01	-
	May	-	0.00	-	-	-2.50	-	-	0.00	-	-	0.00	-
	June	-	0.00	-	-	-2.50	-	-	0.00	-	-	0.00	-
	July	-	0.00	-	-	-2.50	-	-	0.00	-	-	0.00	-
	August	-	0.00	-	-	-2.50	-	-	0.00	-	-	-0.01	-
	September	-	-0.01	-	-	-2.52	-	-	-0.01	-	-	-0.02	-
	October	-	-0.01	-	-	-2.53	-	-	-0.03	-	-	-0.04	-
	November	-	-0.02	-	-	-2.63	-	-	-0.13	-	-	-0.11	-
	December	-	-0.02	-	-	-2.63	-	-	-0.13	-	-	-0.11	-
Operations	January	-	-0.1	-0.2	-	-2.2	-2.8	1.7	0.3	-0.3	6.4	1.0	-2.1
	February	-	-0.1	-0.2	-	-2.2	-2.8	1.7	0.3	-0.3	6.5	1.1	-2.0
	March	-	-0.1	-0.2	-	-5.7	-8.4	0.5	-3.2	-6.0	0.4	-2.1	-4.7
	April	-	0.0	-	-	-5.0	-6.7	1.6	-2.5	-4.2	0.0	-5.3	-7.6
	May	-	0.0	-	3.8	0.9	-2.5	6.4	3.5	-	0.0	-1.4	-1.9
	June	-	0.0	-	1.2	0.3	-2.5	3.8	2.8	-	2.4	0.1	-1.9
	July	-	0.0	-	0.8	-1.3	-2.5	3.4	1.2	-	1.7	0.3	-0.7
	August	-	0.0	-	-	-2.1	-2.7	1.6	0.4	-0.2	0.1	-0.9	-1.7
	September	-	0.0	-0.1	0.6	-2.2	-2.8	3.2	0.3	-0.3	1.0	-1.2	-3.2
	October	-	0.0	-0.1	3.6	-0.6	-2.6	6.2	1.9	-0.1	2.3	-0.2	-1.9
	November	-	-0.1	-0.2	-	-2.1	-2.8	1.8	0.4	-0.3	6.9	1.3	-2.1
	December	-	-0.1	-0.2	-	-2.1	-2.8	1.9	0.4	-0.3	7.0	1.3	-2.1
Post-Closure	January	-	-0.3	-0.3	-	-0.8	-2.2	1.7	0.3	-0.3	7.1	5.3	-
	February	-	-0.3	-0.3	-	-0.3	-0.9	1.7	0.3	-0.3	7.1	6.8	-
	March	-	-0.2	-0.3	-	-3.0	-4.7	0.5	-3.2	-6.0	3.1	2.0	-
	April	-	0.0	-	0.1	-0.5	-2.2	1.6	-2.5	-4.2	-	-1.7	-2.6
	May	-	0.0	-	-	-2.7	-2.8	6.4	3.5	-	-	-2.5	-2.7
	June	-	0.0	-	-	-2.3	-2.4	3.8	2.8	-	-	-0.9	-1.1
	July	-	0.0	-	-	-2.2	-2.3	3.4	1.2	-	0.3	0.1	-
	August	-	0.0	-0.1	-	-1.8	-2.0	1.6	0.4	-0.2	0.4	0.1	-
	September	-	-0.1	-0.1	-	-1.2	-1.5	3.2	0.3	-0.3	2.1	1.4	-
	October	-	0.0	-0.1	-	-1.5	-1.6	6.2	1.9	-0.1	0.5	0.3	-
	November	-	-0.2	-0.3	-	-3.4	-5.3	1.8	0.4	-0.3	-	-3.1	-5.0
	December	-	-0.2	-0.3	-	-1.4	-2.2	1.9	0.4	-0.3	5.8	0.6	-2.3

Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

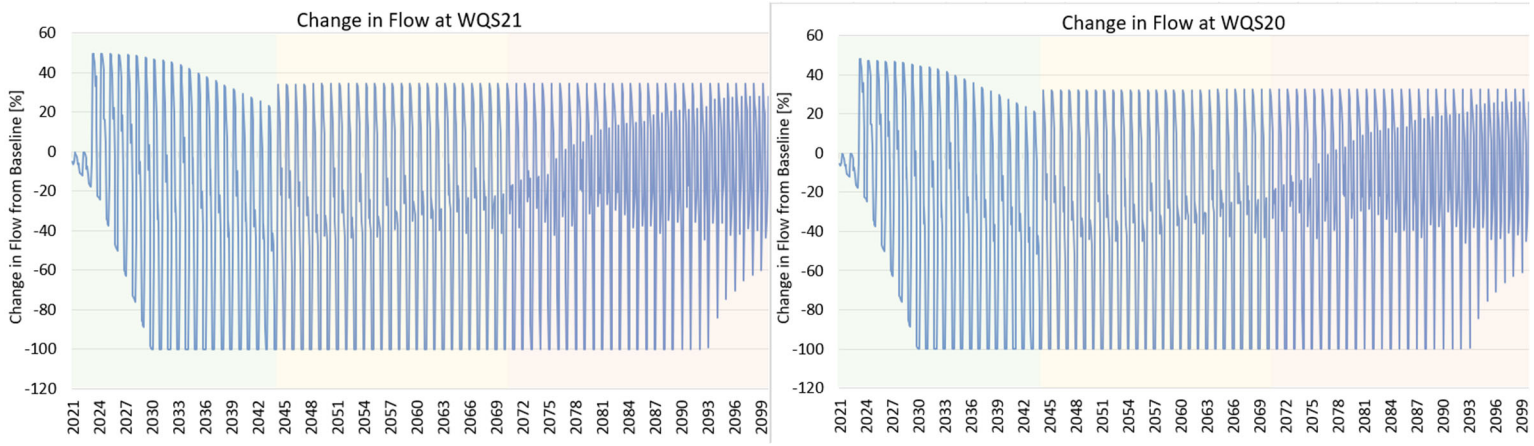
Table F-10: Telkwa and Bulkley River Project Case Streamflow Effect as Monthly Change over Base Case Conditions for Alternative Case 1: High Groundwater Seepage

Scenario		Telkwa River Monthly % Change			Bulkley River Monthly % Change					
		WQS09			WQS11			WQS12		
Period	Month	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease	Maximum Increase	Average	Maximum Decrease
Construction	January	-	-0.04	-	-	0.00	-	-	0.00	-
	February	-	-0.04	-	-	0.00	-	-	0.00	-
	March	-	-0.05	-	-	0.00	-	-	0.00	-
	April	-	-0.02	-	-	0.00	-	-	0.00	-
	May	-	-0.01	-	-	0.00	-	-	0.00	-
	June	-	-0.01	-	-	0.00	-	-	0.00	-
	July	-	-0.01	-	-	0.00	-	-	0.00	-
	August	-	-0.02	-	-	0.00	-	-	0.00	-
	September	-	-0.04	-	-	0.00	-	-	0.00	-
	October	-	-0.04	-	-	0.00	-	-	0.00	-
	November	-	-0.07	-	-	0.00	-	-	0.00	-
	December	-	-0.08	-	-	0.00	-	-	0.00	-
Operations	January	4.8	0.8	-1.5	-	0.0	-	0.1	0.0	-
	February	4.8	0.8	-1.5	-	0.0	-	0.1	0.0	-
	March	4.9	0.8	-1.4	-	0.0	-	0.0	0.0	-
	April	0.0	-0.8	-1.6	-	0.0	-	0.0	-0.2	-0.2
	May	0.1	-0.1	-0.3	-	0.0	-	0.0	0.0	-
	June	0.3	0.0	-0.2	-	0.0	-	0.0	0.0	-
	July	0.5	0.1	-0.2	-	0.0	-	0.0	0.0	-
	August	0.8	0.1	-0.3	-	0.0	-	0.0	0.0	-
	September	2.0	0.3	-0.7	-	0.0	-	0.0	0.0	-
	October	1.9	0.3	-0.7	-	0.0	-	0.0	0.0	-
	November	5.2	1.0	-1.5	-	0.0	-	0.1	0.0	-
	December	5.2	1.0	-1.5	-	0.0	-	0.1	0.0	-
Post-Closure	January	5.3	4.9	-	-	0.0	-	0.1	0.0	-
	February	5.3	5.3	-	-	0.0	-	0.1	0.1	-
	March	3.7	3.5	-	-	0.0	-	0.0	0.0	-
	April	0.1	0.0	-0.2	-	0.0	-	0.0	-0.1	-0.1
	May	0.0	-0.1	-0.1	-	0.0	-	0.0	0.0	-
	June	0.5	0.3	-	-	0.0	-	0.0	0.0	-
	July	0.9	0.7	-	-	0.0	-	0.0	0.0	-
	August	1.3	1.1	-	-	0.0	-	0.0	0.0	-
	September	2.9	2.4	-	-	0.0	-	0.0	0.0	-
	October	1.5	1.4	-	-	0.0	-	0.0	0.0	-
	November	4.5	2.5	-	-	0.0	-	0.0	0.0	-0.1
	December	5.3	3.8	-	-	0.0	-	0.0	0.0	-

Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/Results_Streams_MonthlyChange_07222025_CCM.xlsm

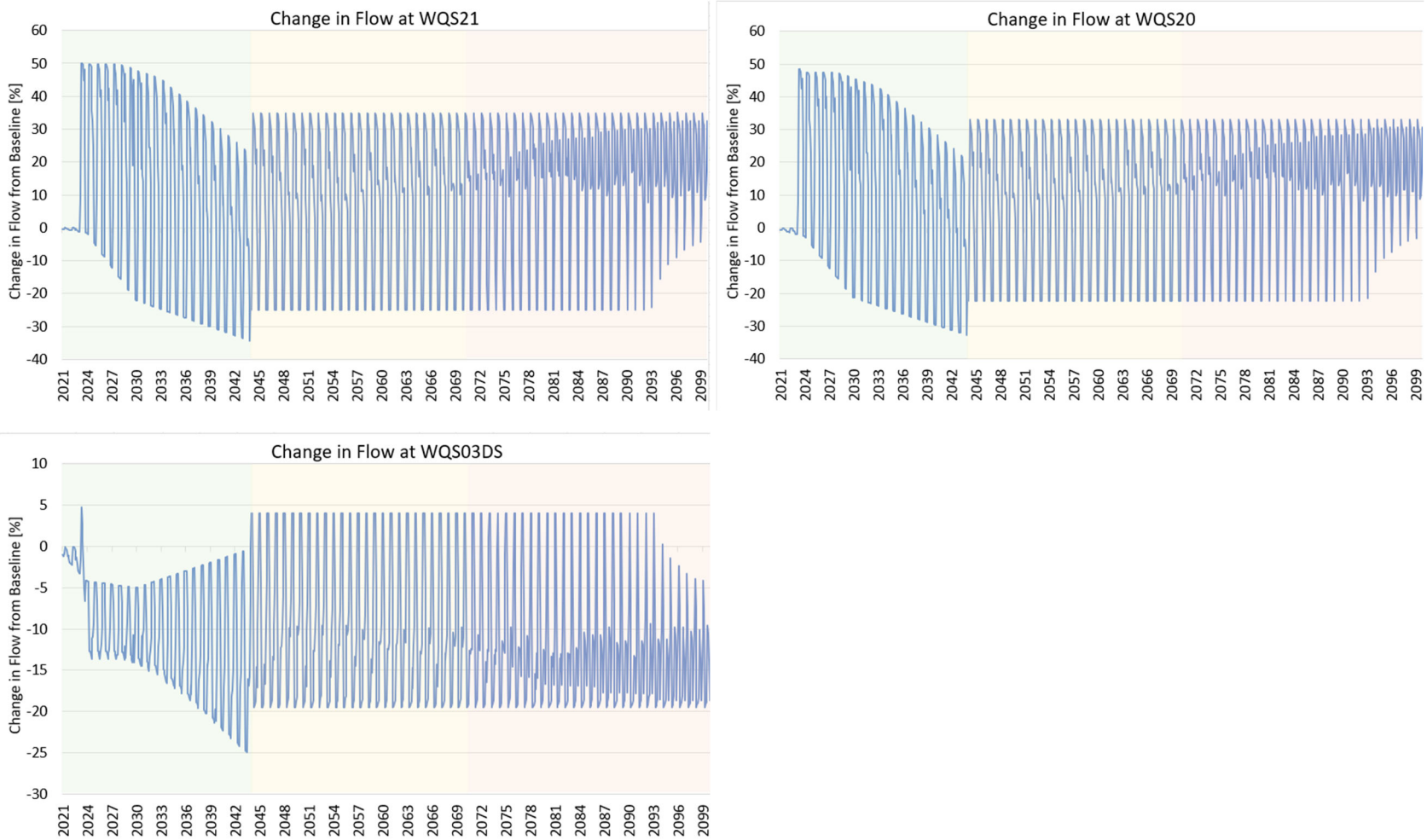
Figure F-3 : Streamflow Effect to Monthly Average Discharge relative to Base Case Conditions in Alternative Case 1



Source:

*https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/*WaterQuantity_Results_20250725_CCM.xlsm?web=1

Figure F-4: Streamflow Effect to Monthly Average Discharge relative to Base Case Conditions in Alternative Case 4



Source:

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/20250403_FEAC_2024/WaterQuantity_Results_20250725_CCM.xlsm?web=1

Appendix G Water Quality Results for Project Case and Alternative Cases

Figure G-1. Management Pond Water Quality Results for Total Selenium with Alternative Assessment Case 2: High Geochemical Source Terms

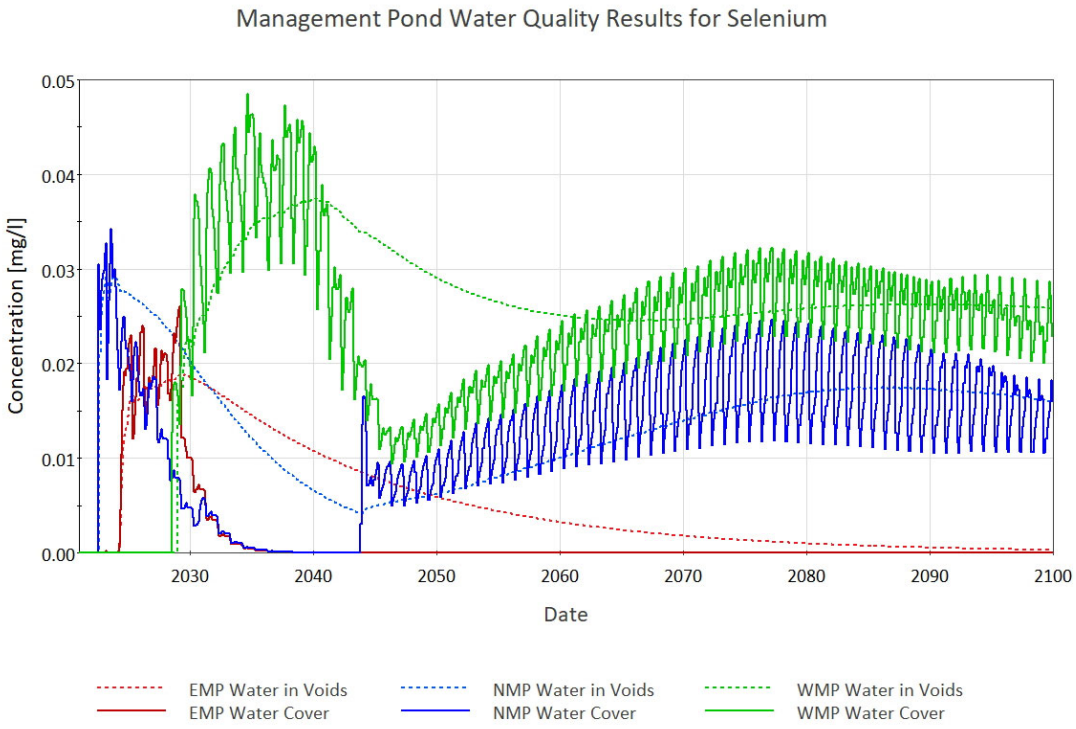


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Figure G-2. Management Pond Water Quality Results for Nitrate-nitrogen with Alternative Assessment Case 2: High Geochemical Source Terms

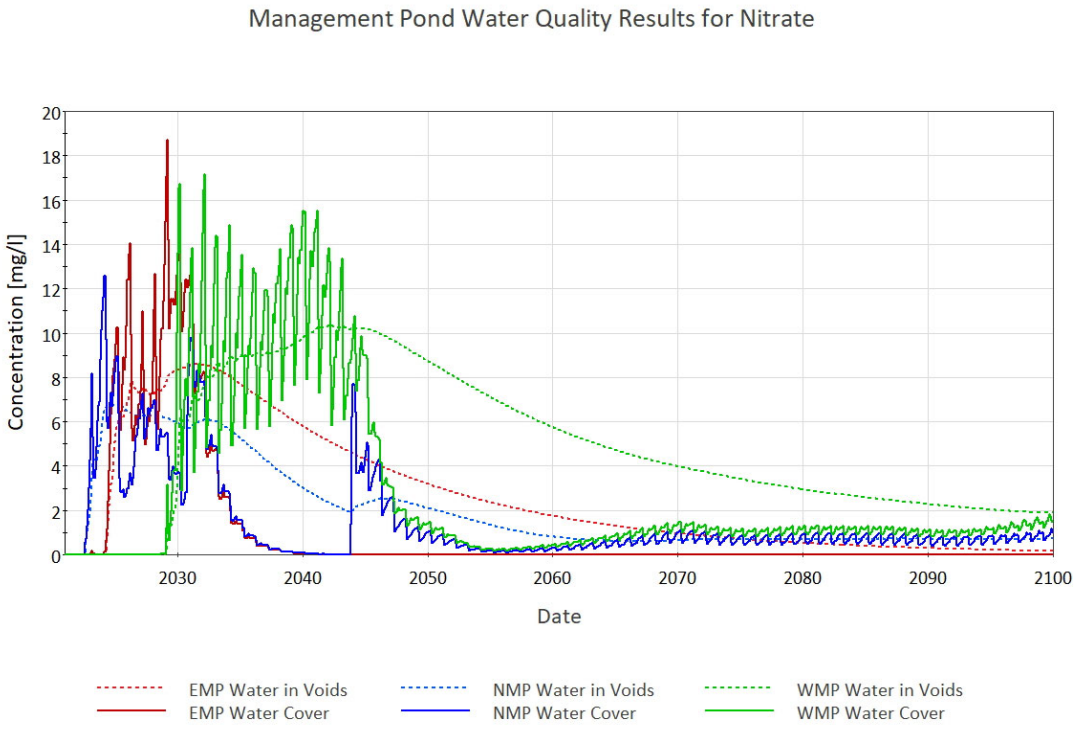

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Figure G-3. Tenas Control Pond Water Quality Results for Total Selenium with Alternative Assessment Case 2: High Geochemical Source Terms

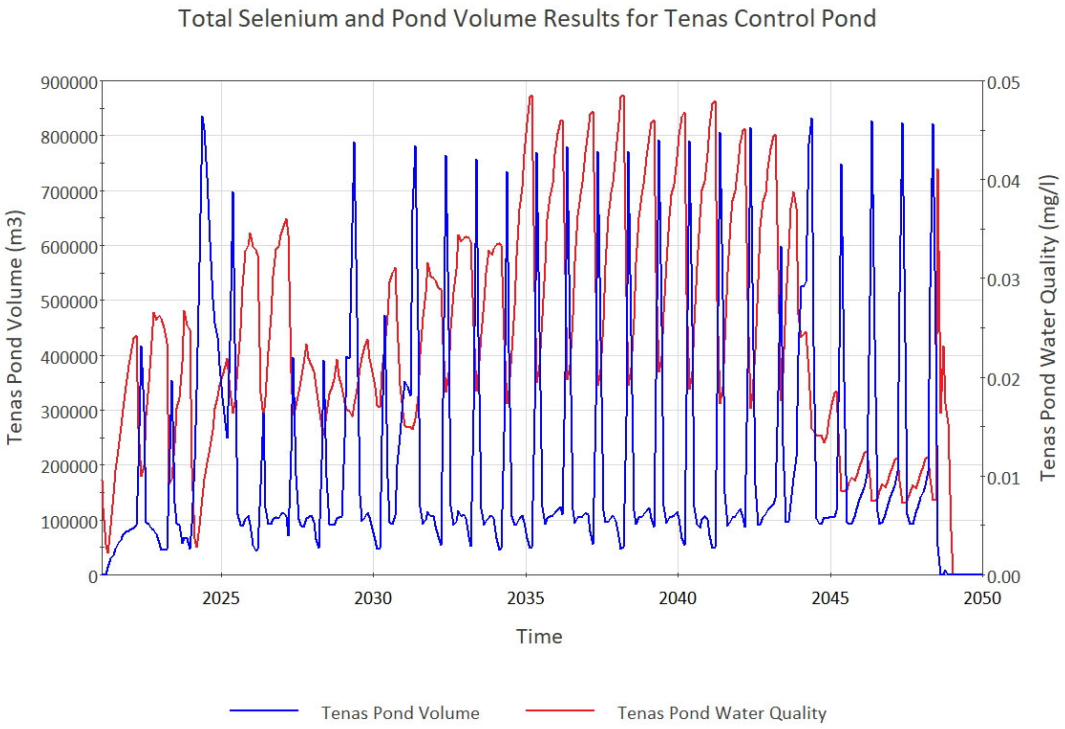

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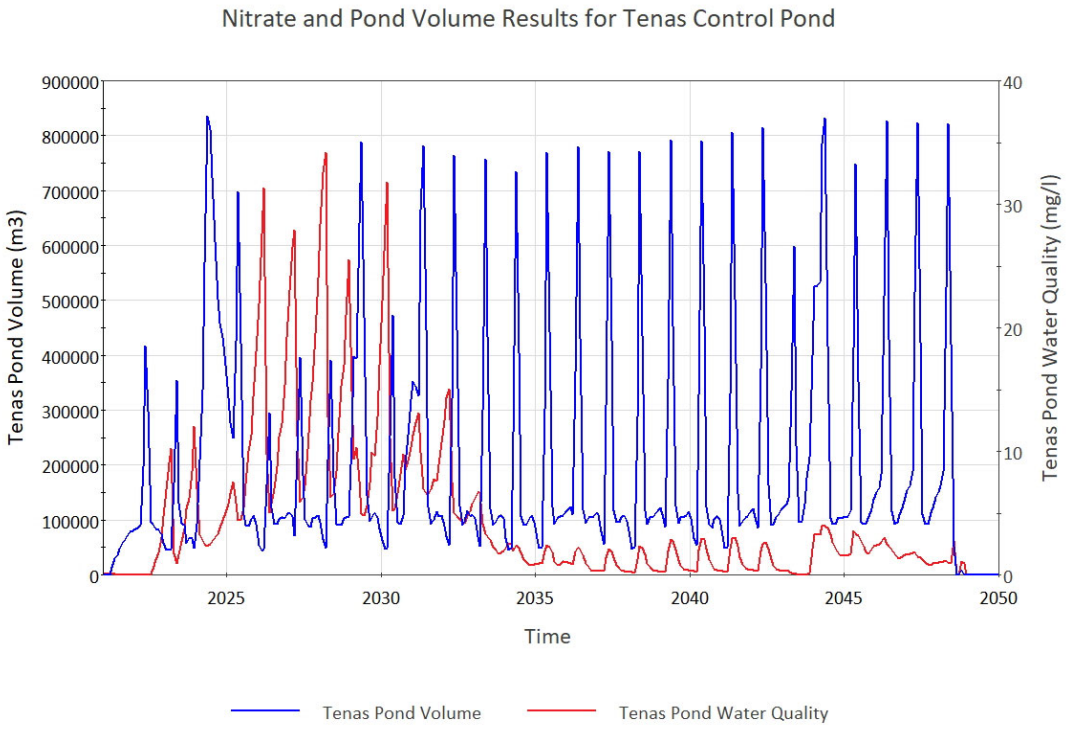
Figure G-4. Tenas Control Pond Water Quality Results for Total Selenium with Alternative Assessment Case 2: High Geochemical Source Terms



Source:
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Figure G-5. Rail Infrastructure Sedimentation Pond Water Quality Results for Total Selenium with Alternative Assessment Case 2: High Geochemical Source Terms

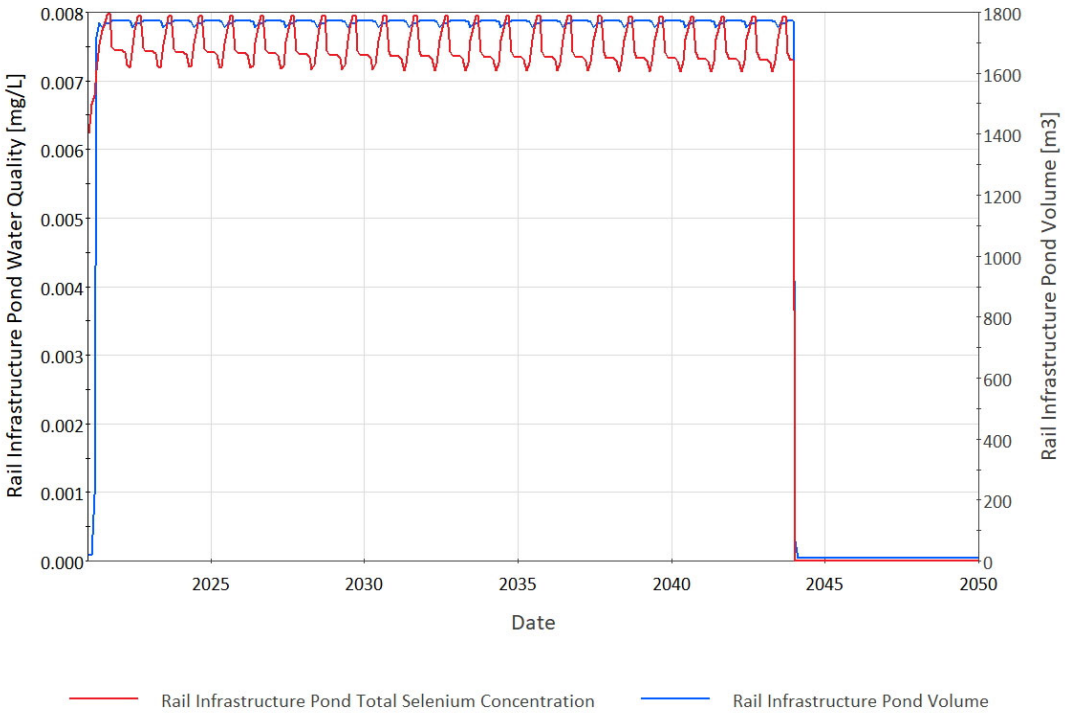

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Table G-1

Parameter	Units	Goathorn WQG	North Management Pond																	
			Baseline in Goathorn Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	154	92	13	13	327	224	54	51	52	57	37	44	85	95	58	75
Alkalinity, total	mg CaCO3/L		54	85	280	240	28	35	720	630	120	130	310	360	180	240	540	620	280	380
Chloride	mg/L	150	0.25	0.50	2.8	3.3	0.31	0.43	11	9.4	1.8	1.9	2.3	3.0	1.8	2.5	2.6	3.4	2.0	2.7
Fluoride	mg/L	1.19	0.032	0.041	0.067	0.057	0.0047	0.0056	0.067	0.057	0.0047	0.0056	0.025	0.030	0.021	0.026	0.025	0.030	0.021	0.026
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.27	0.41	0.078	0.11	1.1	1.6	0.31	0.42	0.071	0.12	0.035	0.049	0.18	0.34	0.072	0.10
Nitrate	mg/L	3	0.043	0.084	2.1	3.2	0.62	0.84	8.6	13	2.5	3.3	0.51	0.87	0.23	0.33	1.4	2.6	0.53	0.75
Nitrite	mg/L	0.02	0.00050	0.0020	0.049	0.073	0.014	0.019	0.20	0.29	0.057	0.077	0.012	0.020	0.0055	0.0077	0.032	0.060	0.012	0.017
Sulfate	mg/L	218	25	38	270	430	32	45	1300	1200	200	220	180	220	130	190	490	620	350	490
Aluminum, total	mg/L	0.27	0.034	0.66	0.38	0.38	0.30	0.30	0.39	0.39	0.30	0.30	0.39	0.39	0.38	0.38	0.39	0.39	0.38	0.38
Antimony, total	mg/L	0.074	0.000055	0.00013	0.00036	0.00034	0.000039	0.000051	0.0011	0.00097	0.00020	0.00021	0.00035	0.00043	0.00026	0.00036	0.00089	0.0011	0.00065	0.00090
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.0012	0.00081	0.00051	0.00052	0.0020	0.0016	0.00071	0.00071	0.00084	0.00090	0.00075	0.00083	0.0013	0.0015	0.0011	0.0013
Barium, total	mg/L	1	0.059	0.071	0.086	0.062	0.012	0.012	0.099	0.076	0.014	0.015	0.024	0.025	0.022	0.023	0.024	0.026	0.022	0.024
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000093	0.000047	0.0000057	0.0000054	0.000093	0.000047	0.0000057	0.0000054	0.000014	0.000015	0.000013	0.000014	0.000014	0.000015	0.000013	0.000014
Boron, total	mg/L	1.2	0.0050	0.050	0.054	0.088	0.0066	0.0093	0.19	0.17	0.032	0.034	0.10	0.14	0.081	0.11	0.11	0.14	0.086	0.12
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000087	0.00015	0.0000071	0.000012	0.00025	0.00033	0.000028	0.000035	0.0000039	0.0000051	0.0000030	0.0000040	0.000013	0.000016	0.0000098	0.000013
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.0012	0.0014	0.00100	0.0010	0.0016	0.0016	0.0011	0.0011	0.0013	0.0013	0.0013	0.0013	0.0014	0.0015	0.0014	0.0014
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.0044	0.0076	0.00049	0.00070	0.027	0.021	0.0041	0.0041	0.00057	0.00069	0.00038	0.00052	0.0017	0.0021	0.0011	0.0016
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0024	0.0017	0.00020	0.00022	0.0028	0.0027	0.00036	0.00041	0.0018	0.0022	0.0013	0.0017	0.0044	0.0050	0.0025	0.0034
Iron, total	mg/L	1	0.040	0.70	1.5	1.5	1.2	1.2	1.5	1.5	1.2	1.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Iron, dissolved	mg/L	0.35	0.015	0.12	0.11	0.19	0.011	0.017	0.23	0.37	0.023	0.034	0.0062	0.0079	0.0052	0.0057	0.032	0.039	0.025	0.033
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.00049	0.00054	0.000057	0.000077	0.0018	0.0016	0.00031	0.00033	0.00050	0.00061	0.00033	0.00046	0.0015	0.0018	0.00097	0.0013
Manganese, total	mg/L	0.913	0.0036	0.029	0.088	0.16	0.029	0.033	0.41	0.39	0.077	0.080	0.029	0.029	0.028	0.029	0.033	0.035	0.031	0.033
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.015	0.014	0.0017	0.0023	0.058	0.049	0.010	0.010	0.0062	0.0076	0.0045	0.0063	0.018	0.022	0.013	0.018
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.0071	0.012	0.00078	0.0011	0.039	0.032	0.0058	0.0059	0.0018	0.0022	0.0012	0.0017	0.0055	0.0067	0.0036	0.0049
Selenium, total	mg/L	0.002	0.000084	0.00020	0.0090	0.011	0.00098	0.0013	0.034	0.033	0.0060	0.0063	0.0065	0.0080	0.0042	0.0059	0.020	0.025	0.013	0.018
Strontium, total	mg/L	2.5	0.080	0.11	0.26	0.36	0.031	0.040	0.81	0.83	0.13	0.14	0.20	0.25	0.16	0.21	0.21	0.26	0.16	0.22
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000010	0.00011	0.00019	0.0000088	0.000014	0.00027	0.00039	0.000029	0.000039	0.000013	0.000016	0.000010	0.000014	0.000021	0.000026	0.000016	0.000022
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.0019	0.0019	0.00022	0.00029	0.0068	0.0059	0.0012	0.0013	0.0020	0.0024	0.0015	0.0020	0.0053	0.0067	0.0038	0.0053
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0099	0.017	0.0011	0.0015	0.045	0.041	0.0066	0.0068	0.0016	0.0018	0.0011	0.0015	0.0040	0.0048	0.0027	0.0036

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_WaterQuality_EAModel_41_20250717.xlsm

Table G-2

Parameter	Units	East Management Pond																		
			Baseline in Four Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
		Four Creek WQG	P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	58	328	14	20	178	340	40	47	12	11	11	10	12	11	11	10
Alkalinity, total	mg CaCO3/L		54	85	150	320	28	40	400	470	89	110	9.2	7.7	7.8	7.3	9.2	7.7	7.8	7.3
Chloride	mg/L	150	0.25	0.50	1.9	2.4	0.36	0.48	6.4	7.3	1.4	1.6	0.031	0.027	0.027	0.025	0.031	0.027	0.027	0.025
Fluoride	mg/L	1.19	0.032	0.041	0.030	0.15	0.0058	0.0094	0.030	0.15	0.0058	0.0094	0.0046	0.0039	0.0039	0.0037	0.0046	0.0039	0.0039	0.0037
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.39	0.59	0.099	0.13	1.6	2.4	0.39	0.53	0.00037	0.00034	0.00032	0.00030	0.00040	0.00041	0.00032	0.00031
Nitrate	mg/L	3	0.043	0.084	3.1	4.7	0.78	1.0	12	19	3.1	4.2	0.0043	0.0034	0.0035	0.0032	0.0043	0.0038	0.0035	0.0033
Nitrite	mg/L	0.02	0.00050	0.0020	0.071	0.11	0.018	0.024	0.29	0.43	0.071	0.096	0.00012	0.00011	0.00011	0.00010	0.00013	0.00012	0.00011	0.00010
Sulfate	mg/L	218	25	38	230	310	47	62	890	1000	180	210	0.82	0.68	0.69	0.64	0.82	0.68	0.69	0.64
Aluminum, total	mg/L	0.27	0.034	0.66	0.38	0.39	0.27	0.26	0.39	0.40	0.27	0.27	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Antimony, total	mg/L	0.074	0.000055	0.00013	0.00022	0.00027	0.000039	0.000053	0.00063	0.00070	0.00014	0.00016	0.0000081	0.0000073	0.0000073	0.0000070	0.0000081	0.0000073	0.0000073	0.0000070
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.00066	0.0013	0.00047	0.00050	0.0013	0.0014	0.00060	0.00064	0.00055	0.00055	0.00055	0.00054	0.00055	0.00055	0.00055	0.00054
Barium, total	mg/L	1	0.059	0.071	0.039	0.23	0.012	0.017	0.048	0.23	0.015	0.019	0.013	0.012	0.012	0.012	0.013	0.012	0.012	0.012
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000033	0.00019	0.0000065	0.0000099	0.000033	0.00019	0.0000065	0.0000099	0.0000062	0.0000054	0.0000054	0.0000050	0.0000062	0.0000054	0.0000054	0.0000050
Boron, total	mg/L	1.2	0.0050	0.050	0.038	0.049	0.0072	0.0100	0.11	0.12	0.024	0.029	0.0016	0.0014	0.0014	0.0013	0.0016	0.0014	0.0014	0.0013
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000064	0.000078	0.000013	0.000016	0.00016	0.00020	0.000034	0.000041	0.00000052	0.00000047	0.00000043	0.00000041	0.00000052	0.00000047	0.00000043	0.00000041
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.0013	0.0014	0.00089	0.00090	0.0017	0.0018	0.00097	0.00099	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.0043	0.0064	0.00090	0.0011	0.019	0.022	0.0036	0.0040	0.000012	0.000011	0.000011	0.000010	0.000012	0.000011	0.000011	0.000010
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0012	0.0038	0.00023	0.00033	0.0018	0.0038	0.00038	0.00049	0.00014	0.00012	0.00012	0.00011	0.00014	0.00012	0.00012	0.00011
Iron, total	mg/L	1	0.040	0.70	1.5	1.6	1.1	1.1	1.6	1.7	1.1	1.1	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Iron, dissolved	mg/L	0.35	0.015	0.12	0.088	0.10	0.018	0.024	0.17	0.21	0.035	0.045	0.0025	0.0022	0.0021	0.0020	0.0025	0.0022	0.0021	0.0020
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.00033	0.00042	0.000056	0.000076	0.00099	0.0011	0.00022	0.00026	0.0000037	0.0000032	0.0000032	0.0000030	0.0000037	0.0000032	0.0000032	0.0000030
Manganese, total	mg/L	0.913	0.0036	0.029	0.097	0.13	0.034	0.038	0.30	0.36	0.073	0.081	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.0093	0.012	0.0016	0.0021	0.031	0.035	0.0069	0.0078	0.000061	0.000055	0.000056	0.000054	0.000061	0.000055	0.000056	0.000054
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.0060	0.0087	0.0013	0.0017	0.025	0.029	0.0050	0.0056	0.000037	0.000032	0.000032	0.000030	0.000037	0.000032	0.000032	0.000030
Selenium, total	mg/L	0.002	0.000084	0.00020	0.0060	0.0080	0.0012	0.0016	0.023	0.026	0.0048	0.0056	0.000013	0.000012	0.000012	0.000011	0.000013	0.000012	0.000012	0.000011
Strontium, total	mg/L	2.5	0.080	0.11	0.20	0.38	0.044	0.059	0.54	0.63	0.12	0.14	0.016	0.014	0.014	0.013	0.016	0.014	0.014	0.013
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000010	0.000080	0.000094	0.000016	0.000021	0.00018	0.00023	0.000039	0.000048	0.0000012	0.0000011	0.0000011	0.0000010	0.0000012	0.0000011	0.0000011	0.0000010
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.0012	0.0015	0.00021	0.00029	0.0038	0.0044	0.00085	0.00099	0.000024	0.000022	0.000022	0.000021	0.000024	0.000022	0.000022	0.000021
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0083	0.011	0.0017	0.0023	0.029	0.035	0.0059	0.0069	0.00019	0.00016	0.00016	0.00015	0.00019	0.00016	0.00016	0.00015

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_WaterQuality_EAModel_41_20250717.xlsm

Table G-3

Parameter	Units	West Management Pond																		
		Tenas WQG	Baseline in Tenas Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	63	65	20	23	268	186	62	60	82	72	58	56	144	125	93	95
Alkalinity, total	mg CaCO3/L		54	85	210	250	59	77	1100	980	520	450	560	480	310	330	970	830	510	530
Chloride	mg/L	150	0.25	0.50	3.9	4.7	1.1	1.5	14	12	6.6	6.0	4.0	4.3	3.2	3.5	4.4	4.7	3.6	3.8
Fluoride	mg/L	1.19	0.032	0.041	0.044	0.051	0.014	0.019	0.044	0.051	0.014	0.019	0.040	0.040	0.034	0.034	0.040	0.040	0.034	0.034
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.54	0.61	0.18	0.27	1.7	2.2	0.65	0.97	0.11	0.15	0.063	0.068	0.28	0.40	0.13	0.14
Nitrate	mg/L	3	0.043	0.084	4.2	4.7	1.4	2.1	14	17	5.1	7.6	0.79	1.1	0.42	0.45	2.1	3.1	0.95	1.0
Nitrite	mg/L	0.02	0.00050	0.0020	0.097	0.11	0.033	0.048	0.32	0.39	0.12	0.18	0.019	0.025	0.0099	0.011	0.049	0.071	0.022	0.024
Sulfate	mg/L	218	25	38	300	370	120	160	1300	1200	620	620	330	310	240	260	810	820	640	690
Aluminum, total	mg/L	0.27	0.034	0.66	0.39	0.39	0.053	0.054	0.40	0.41	0.057	0.059	0.40	0.40	0.39	0.39	0.41	0.40	0.39	0.39
Antimony, total	mg/L	0.074	0.000055	0.00013	0.00042	0.00051	0.00011	0.00015	0.0017	0.0015	0.00084	0.00075	0.00063	0.00058	0.00046	0.00050	0.0015	0.0015	0.0012	0.0012
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.00097	0.0010	0.00031	0.00035	0.0019	0.0017	0.0010	0.00095	0.0011	0.00100	0.00093	0.00094	0.0018	0.0017	0.0015	0.0015
Barium, total	mg/L	1	0.059	0.071	0.042	0.039	0.014	0.016	0.050	0.049	0.024	0.025	0.031	0.028	0.029	0.026	0.032	0.029	0.030	0.027
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000030	0.000026	0.0000099	0.000010	0.000030	0.000026	0.0000099	0.000010	0.000020	0.000017	0.000019	0.000016	0.000020	0.000017	0.000019	0.000016
Boron, total	mg/L	1.2	0.0050	0.050	0.14	0.17	0.034	0.043	0.28	0.27	0.14	0.13	0.18	0.20	0.15	0.16	0.19	0.20	0.15	0.16
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000055	0.00010	0.000026	0.000039	0.00018	0.00023	0.000074	0.000094	0.0000067	0.0000064	0.0000052	0.0000054	0.000023	0.000020	0.000017	0.000018
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.0014	0.0015	0.00026	0.00029	0.0018	0.0019	0.00072	0.00067	0.0014	0.0014	0.0014	0.0014	0.0016	0.0015	0.0015	0.0015
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.0045	0.0067	0.0016	0.0023	0.023	0.022	0.0064	0.0070	0.00097	0.00091	0.00068	0.00073	0.0027	0.0028	0.0020	0.0022
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0017	0.0019	0.00043	0.00051	0.0036	0.0041	0.0012	0.0013	0.0032	0.0028	0.0022	0.0023	0.0078	0.0067	0.0044	0.0047
Iron, total	mg/L	1	0.040	0.70	1.5	1.5	0.34	0.35	1.6	1.7	0.37	0.40	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Iron, dissolved	mg/L	0.35	0.015	0.12	0.073	0.12	0.033	0.047	0.16	0.24	0.069	0.098	0.0087	0.0086	0.0077	0.0067	0.056	0.050	0.043	0.045
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.00044	0.00058	0.00012	0.00017	0.0030	0.0026	0.0013	0.0011	0.00083	0.00082	0.00059	0.00064	0.0024	0.0024	0.0017	0.0019
Manganese, total	mg/L	0.913	0.0036	0.029	0.084	0.13	0.035	0.049	0.34	0.34	0.083	0.11	0.031	0.031	0.030	0.030	0.038	0.038	0.035	0.036
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.011	0.015	0.0034	0.0046	0.095	0.083	0.042	0.036	0.011	0.010	0.0082	0.0089	0.029	0.029	0.023	0.025
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.0059	0.0091	0.0024	0.0034	0.030	0.029	0.011	0.012	0.0031	0.0029	0.0022	0.0023	0.0087	0.0088	0.0064	0.0068
Selenium, total	mg/L	0.002	0.000084	0.00020	0.013	0.015	0.0038	0.0053	0.048	0.046	0.023	0.022	0.011	0.011	0.0076	0.0082	0.031	0.032	0.023	0.024
Strontium, total	mg/L	2.5	0.080	0.11	0.34	0.38	0.11	0.14	0.62	0.64	0.32	0.34	0.34	0.35	0.27	0.29	0.35	0.36	0.28	0.30
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000010	0.000077	0.00013	0.000034	0.000051	0.00020	0.00028	0.000084	0.00011	0.000023	0.000022	0.000018	0.000019	0.000035	0.000033	0.000028	0.000030
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.0023	0.0030	0.00064	0.00084	0.011	0.0096	0.0053	0.0048	0.0036	0.0033	0.0026	0.0029	0.0087	0.0088	0.0069	0.0074
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0073	0.012	0.0032	0.0046	0.035	0.034	0.012	0.014	0.0026	0.0023	0.0019	0.0020	0.0062	0.0061	0.0048	0.0049

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_WaterQuality_EAModel_41_20250717.xlsm

Table G-4

Parameter	Units	Tenas Control Pond																		
		Goathorn WQG	Baseline in Goathorn Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	138	163	90	111	236	291	152	197	66	3274	5	15	91	4721	6	21
Alkalinity, total	mg CaCO3/L		54	85	500	560	270	350	820	1000	530	650	120	7200	4.2	27	230	14000	8.3	55
Chloride	mg/L	150	0.25	0.50	6.0	6.7	3.1	4.0	10	13	6.6	8.1	2.1	120	0.072	0.46	2.7	170	0.095	0.64
Fluoride	mg/L	1.19	0.032	0.041	0.071	0.15	0.046	0.082	0.071	0.15	0.046	0.082	0.028	1.6	0.0010	0.0061	0.028	1.6	0.0010	0.0061
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.56	1.1	0.13	0.24	2.2	4.4	0.48	0.88	0.071	2.3	0.0018	0.0093	0.19	5.3	0.0046	0.022
Nitrate	mg/L	3	0.043	0.084	4.3	8.6	0.96	1.7	17	34	3.7	6.8	0.51	16	0.013	0.065	1.5	40	0.035	0.17
Nitrite	mg/L	0.02	0.00050	0.0020	0.099	0.20	0.023	0.040	0.39	0.79	0.086	0.16	0.012	0.39	0.00031	0.0016	0.034	0.94	0.00082	0.0040
Sulfate	mg/L	218	25	38	410	420	220	260	770	850	520	590	130	7700	4.3	29	290	17000	10.0	66
Aluminum, total	mg/L	0.27	0.034	0.66	0.39	0.39	0.38	0.38	0.39	0.39	0.38	0.38	0.38	1.0	0.37	0.37	0.38	1.1	0.37	0.37
Antimony, total	mg/L	0.074	0.000055	0.00013	0.00073	0.00080	0.00038	0.00049	0.0012	0.0014	0.00079	0.00094	0.00025	0.015	0.000010	0.000058	0.00054	0.031	0.000020	0.00012
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.0018	0.0018	0.0013	0.0014	0.0025	0.0027	0.0018	0.0020	0.00092	0.023	0.00052	0.00059	0.0011	0.036	0.00053	0.00064
Barium, total	mg/L	1	0.059	0.071	0.072	0.080	0.050	0.062	0.075	0.095	0.058	0.072	0.038	1.6	0.0076	0.013	0.041	1.7	0.0077	0.013
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000056	0.000061	0.000038	0.000044	0.000056	0.000061	0.000038	0.000044	0.000034	0.0016	0.0000010	0.0000060	0.000034	0.0016	0.0000010	0.0000060
Boron, total	mg/L	1.2	0.0050	0.050	0.11	0.13	0.063	0.080	0.19	0.23	0.13	0.15	0.090	4.5	0.0031	0.018	0.097	5.3	0.0035	0.021
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000034	0.000030	0.000022	0.000022	0.00011	0.00010	0.000063	0.000062	0.0000070	0.00036	0.0000021	0.0000013	0.000013	0.00075	0.0000048	0.0000029
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.0018	0.0020	0.0016	0.0017	0.0022	0.0024	0.0018	0.0020	0.0014	0.012	0.0012	0.0012	0.0015	0.018	0.0012	0.0012
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.0029	0.0029	0.0019	0.0021	0.012	0.011	0.0050	0.0050	0.00045	0.028	0.000015	0.00011	0.00095	0.059	0.000032	0.00022
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0015	0.0015	0.0011	0.0012	0.0019	0.0019	0.0015	0.0015	0.0012	0.069	0.000042	0.00026	0.0019	0.11	0.000068	0.00041
Iron, total	mg/L	1	0.040	0.70	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.1	1.5	1.5	1.5	2.9	1.5	1.5
Iron, dissolved	mg/L	0.35	0.015	0.12	0.038	0.036	0.026	0.026	0.066	0.059	0.039	0.036	0.014	0.67	0.00043	0.0025	0.026	1.5	0.00094	0.0056
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.0011	0.0012	0.00057	0.00072	0.0020	0.0022	0.0012	0.0015	0.00026	0.017	0.0000091	0.000064	0.00056	0.036	0.000020	0.00014
Manganese, total	mg/L	0.913	0.0036	0.029	0.063	0.061	0.047	0.049	0.19	0.18	0.089	0.090	0.031	0.34	0.025	0.026	0.036	0.58	0.026	0.027
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.036	0.036	0.018	0.022	0.064	0.070	0.040	0.046	0.0055	0.35	0.00022	0.0014	0.013	0.84	0.00049	0.0032
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.0060	0.0061	0.0037	0.0042	0.017	0.016	0.0091	0.0096	0.0012	0.076	0.000041	0.00028	0.0024	0.15	0.000085	0.00058
Selenium, total	mg/L	0.002	0.000084	0.00020	0.022	0.024	0.011	0.014	0.039	0.049	0.024	0.030	0.0044	0.28	0.00016	0.0011	0.0093	0.58	0.00031	0.0022
Strontium, total	mg/L	2.5	0.080	0.11	0.28	0.29	0.18	0.20	0.47	0.53	0.34	0.38	0.18	11	0.0099	0.044	0.21	12	0.011	0.051
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000010	0.000050	0.000077	0.000034	0.000047	0.00013	0.00013	0.000078	0.000089	0.000013	0.00077	0.0000048	0.0000029	0.000018	0.0011	0.0000068	0.0000041
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.0045	0.0048	0.0023	0.0028	0.0078	0.0093	0.0049	0.0060	0.0014	0.084	0.000060	0.00033	0.0032	0.19	0.00012	0.00073
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0088	0.0099	0.0055	0.0066	0.021	0.019	0.012	0.014	0.0021	0.12	0.000065	0.00044	0.0036	0.20	0.00011	0.00076

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_WaterQuality_EAModel_41_20250717.xlsm

Table G-5

Parameter	Units	Rail Infrastructure Sedimentation Pond										
		Bulkley WQG	Baseline in Bulkley River		Operations							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		29	40	70	66	66	63	1518	1443	1468	1377
Alkalinity, total	mg CaCO3/L		28	36	1.8	1.7	1.7	1.7	41	38	39	38
Chloride	mg/L	150	0.25	0.78	0.080	0.074	0.077	0.073	2.3	2.1	2.2	2.1
Fluoride	mg/L	0.84	0.023	0.035								
Ammonia, total	mg-N/L	1.6	0.0050	0.017								
Nitrate	mg/L	3	0.013	0.041								
Nitrite	mg/L	0.02	0.0020	0.0050								
Sulfate	mg/L	128	4.0	5.0	68	64	66	63	1600	1500	1600	1500
Aluminum, total	mg/L	0.18	0.088	1.2	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37
Antimony, total	mg/L		0.000050	0.00010	0.0000034	0.0000032	0.0000033	0.0000031	0.00011	0.00011	0.00011	0.00010
Arsenic, total	mg/L	0.005	0.00021	0.00069	0.00051	0.00051	0.00051	0.00051	0.00062	0.00062	0.00062	0.00061
Barium, total	mg/L	1	0.026	0.035	0.012	0.012	0.012	0.012	0.14	0.13	0.14	0.13
Beryllium, total	mg/L	0.00013	0.000050	0.00010								
Boron, total	mg/L	1.2	0.0050	0.010	0.0083	0.0078	0.0080	0.0076	0.18	0.17	0.18	0.17
Cadmium, dissolved	mg/L	8.50E-05	0.0000025	0.0000068	0.000091	0.000085	0.000087	0.000083	0.0021	0.0020	0.0020	0.0019
Chromium, total	mg/L	0.0089	0.00020	0.0010	0.0012	0.0012	0.0012	0.0012	0.0016	0.0015	0.0015	0.0015
Cobalt, dissolved	mg/L	0.00039	0.000050	0.00010	0.00080	0.00074	0.00077	0.00073	0.021	0.019	0.020	0.019
Copper, dissolved	mg/L	0.0011	0.00058	0.0016	0.00023	0.00021	0.00022	0.00021	0.0062	0.0057	0.0059	0.0056
Iron, total	mg/L	1	0.12	1.3	1.5	1.5	1.5	1.5	1.8	1.7	1.7	1.7
Iron, dissolved	mg/L	0.35	0.032	0.15	0.076	0.071	0.073	0.070	0.30	0.28	0.28	0.27
Lead, dissolved	mg/L	0.0022	0.000025	0.000050	0.000046	0.000043	0.000044	0.000042	0.0010	0.00096	0.00098	0.00094
Manganese, total	mg/L	0.73	0.012	0.053	0.071	0.068	0.069	0.067	1.2	1.1	1.2	1.1
Mercury, total	mg/L	0.00002	0.0000025	0.0000053	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00037	0.00052	0.00018	0.00017	0.00017	0.00016	0.0034	0.0032	0.0033	0.0032
Nickel, dissolved	mg/L	0.001	0.00025	0.00073	0.0023	0.0021	0.0022	0.0021	0.048	0.045	0.046	0.044
Selenium, total	mg/L	0.002	0.000025	0.00020	0.00035	0.00032	0.00033	0.00032	0.0080	0.0074	0.0077	0.0073
Strontium, total	mg/L	2.5	0.042	0.060	0.072	0.067	0.069	0.066	1.5	1.4	1.4	1.4
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000013	0.00010	0.000096	0.000098	0.000094	0.0025	0.0024	0.0024	0.0023
Uranium, total	mg/L	0.0085	0.000035	0.000083	0.000031	0.000029	0.000030	0.000029	0.00047	0.00044	0.00045	0.00043
Zinc, dissolved	mg/L	0.0039	0.00075	0.0023	0.0034	0.0032	0.0033	0.0031	0.093	0.087	0.090	0.086

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_WaterQuality_EAModel_41_20250717.xlsm

Table G-6

Parameter	Units	North Management Pond Void Space and Seepage Water Quality																		
		Goathorn WQG	Baseline in Goathorn Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	89	85	31	31	224	222	113	113	42	42	34	34	74	74	58	58
Alkalinity, total	mg CaCO3/L		54	85	200	210	86	87	600	600	300	300	260	260	170	170	440	440	290	290
Chloride	mg/L	150	0.25	0.50	2.5	2.6	1.0	1.1	8.6	8.7	4.3	4.3	2.1	2.1	2.0	2.0	2.4	2.4	2.3	2.3
Fluoride	mg/L	1.19	0.032	0.041	0.044	0.043	0.017	0.017	0.044	0.043	0.017	0.017	0.023	0.023	0.022	0.022	0.023	0.023	0.022	0.022
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.22	0.22	0.14	0.14	0.87	0.87	0.56	0.56	0.089	0.090	0.048	0.048	0.32	0.32	0.12	0.12
Nitrate	mg/L	3	0.043	0.084	1.7	1.7	1.1	1.1	6.8	6.8	4.4	4.4	0.68	0.69	0.33	0.34	2.5	2.5	0.90	0.91
Nitrite	mg/L	0.02	0.00050	0.0020	0.040	0.040	0.026	0.026	0.16	0.16	0.10	0.10	0.016	0.016	0.0078	0.0079	0.058	0.058	0.021	0.021
Sulfate	mg/L	218	25	38	270	280	110	120	970	980	480	490	170	170	140	140	460	460	390	390
Aluminum, total	mg/L	0.27	0.034	0.66	0.022	0.023	0.010	0.010	0.031	0.032	0.015	0.016	0.016	0.016	0.010	0.010	0.017	0.017	0.011	0.012
Antimony, total	mg/L	0.074	0.000055	0.00013	0.00028	0.00029	0.00012	0.00012	0.00091	0.00092	0.00045	0.00046	0.00031	0.00032	0.00027	0.00027	0.00082	0.00083	0.00069	0.00069
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.00067	0.00065	0.00024	0.00024	0.0014	0.0014	0.00067	0.00068	0.00029	0.00029	0.00026	0.00026	0.00072	0.00073	0.00059	0.00059
Barium, total	mg/L	1	0.059	0.071	0.049	0.049	0.019	0.019	0.064	0.064	0.026	0.027	0.016	0.016	0.015	0.015	0.017	0.017	0.016	0.016
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000050	0.000046	0.000016	0.000016	0.000050	0.000046	0.000016	0.000016	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013
Boron, total	mg/L	1.2	0.0050	0.050	0.049	0.051	0.021	0.022	0.16	0.16	0.077	0.078	0.097	0.097	0.088	0.088	0.10	0.10	0.094	0.095
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000082	0.000083	0.000034	0.000034	0.00021	0.00021	0.000094	0.000095	0.0000093	0.0000094	0.0000044	0.0000045	0.000025	0.000026	0.000014	0.000014
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00036	0.00037	0.00014	0.00015	0.00081	0.00081	0.00039	0.00040	0.00012	0.00012	0.00011	0.00011	0.00022	0.00022	0.00021	0.00021
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.0042	0.0045	0.0018	0.0019	0.019	0.019	0.0093	0.0094	0.00052	0.00053	0.00045	0.00046	0.0022	0.0023	0.0015	0.0015
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0014	0.0014	0.00057	0.00058	0.0021	0.0022	0.00097	0.00099	0.0016	0.0016	0.0013	0.0013	0.0037	0.0038	0.0025	0.0025
Iron, total	mg/L	1	0.040	0.70	0.11	0.11	0.045	0.045	0.21	0.21	0.089	0.090	0.014	0.014	0.0068	0.0068	0.032	0.032	0.029	0.029
Iron, dissolved	mg/L	0.35	0.015	0.12	0.11	0.11	0.045	0.045	0.21	0.21	0.089	0.090	0.014	0.014	0.0068	0.0068	0.032	0.032	0.029	0.029
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.00042	0.00044	0.00018	0.00019	0.0015	0.0015	0.00074	0.00075	0.00043	0.00043	0.00034	0.00034	0.0013	0.0013	0.0010	0.0010
Manganese, total	mg/L	0.913	0.0036	0.029	0.080	0.085	0.034	0.035	0.29	0.30	0.14	0.14	0.0087	0.0089	0.0038	0.0038	0.031	0.032	0.010	0.010
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.012	0.013	0.0053	0.0054	0.046	0.046	0.023	0.024	0.0056	0.0056	0.0050	0.0050	0.017	0.017	0.015	0.015
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.0069	0.0073	0.0029	0.0030	0.028	0.028	0.014	0.014	0.0016	0.0016	0.0013	0.0013	0.0049	0.0050	0.0041	0.0041
Selenium, total	mg/L	0.002	0.000084	0.00020	0.0082	0.0087	0.0033	0.0034	0.029	0.029	0.014	0.015	0.0056	0.0056	0.0044	0.0044	0.017	0.018	0.013	0.013
Strontium, total	mg/L	2.5	0.080	0.11	0.25	0.26	0.099	0.10	0.66	0.66	0.31	0.32	0.18	0.18	0.17	0.17	0.19	0.19	0.18	0.18
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000010	0.00010	0.00010	0.000042	0.000043	0.00024	0.00024	0.00010	0.00011	0.000014	0.000014	0.000012	0.000013	0.000030	0.000030	0.000021	0.000021
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.0015	0.0016	0.00066	0.00068	0.0056	0.0056	0.0028	0.0028	0.0018	0.0018	0.0015	0.0015	0.0049	0.0049	0.0041	0.0041
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0097	0.010	0.0041	0.0042	0.033	0.034	0.016	0.016	0.0014	0.0014	0.0013	0.0013	0.0042	0.0042	0.0033	0.0033

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_void_WaterQuality_EAModel_41_20250717.xlsm

Table G-7

Parameter	Units	East Management Pond Void Space and Seepage Water Quality																		
		Four Creek WQG	Baseline in Four Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		123	172	47	47	19	18	132	135	85	83	13	13	9	9	50	51	21	21
Alkalinity, total	mg CaCO3/L		140	190	130	130	63	61	340	350	220	210	36	36	16	16	120	120	43	43
Chloride	mg/L	150	0.25	0.53	1.6	1.6	0.91	0.90	5.3	5.3	3.5	3.4	0.51	0.52	0.17	0.17	2.0	2.0	0.62	0.62
Fluoride	mg/L	1.37	0.053	0.070	0.027	0.027	0.011	0.010	0.027	0.027	0.011	0.010	0.0069	0.0069	0.0047	0.0047	0.0069	0.0069	0.0047	0.0047
Ammonia, total	mg-N/L	0.992	0.0025	0.011	0.28	0.28	0.19	0.19	1.1	1.1	0.74	0.74	0.12	0.12	0.037	0.037	0.47	0.48	0.15	0.15
Nitrate	mg/L	3	0.016	0.17	2.2	2.2	1.5	1.5	8.6	8.6	5.9	5.8	0.94	0.96	0.29	0.29	3.7	3.8	1.1	1.2
Nitrite	mg/L	0.02	0.00050	0.0010	0.050	0.050	0.034	0.034	0.20	0.20	0.13	0.13	0.022	0.022	0.0067	0.0067	0.086	0.088	0.026	0.027
Sulfate	mg/L	309	2.1	26	190	200	120	120	690	690	450	450	69	70	21	22	260	260	79	80
Aluminum, total	mg/L	0.69	0.081	1.1	0.017	0.017	0.0085	0.0082	0.026	0.027	0.014	0.014	0.0051	0.0052	0.0026	0.0026	0.0083	0.0084	0.0035	0.0036
Antimony, total	mg/L	0.074	0.000050	0.00011	0.00018	0.00018	0.000093	0.000092	0.00053	0.00053	0.00035	0.00034	0.000052	0.000053	0.000020	0.000020	0.00020	0.00020	0.000064	0.000064
Arsenic, total	mg/L	0.005	0.00067	0.0010	0.00037	0.00037	0.00016	0.00016	0.00080	0.00082	0.00049	0.00048	0.000097	0.000099	0.000054	0.000055	0.00028	0.00029	0.00011	0.00011
Barium, total	mg/L	1	0.078	0.13	0.031	0.032	0.012	0.012	0.040	0.041	0.018	0.018	0.0082	0.0083	0.0063	0.0063	0.012	0.012	0.0073	0.0074
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000026	0.000027	0.0000093	0.0000088	0.000026	0.000027	0.0000093	0.0000088	0.0000065	0.0000066	0.0000056	0.0000056	0.0000065	0.0000066	0.0000056	0.0000056
Boron, total	mg/L	1.2	0.011	0.020	0.032	0.033	0.017	0.017	0.092	0.093	0.060	0.060	0.0096	0.0098	0.0036	0.0036	0.034	0.034	0.011	0.011
Cadmium, dissolved	mg/L	0.00023	0.0000050	0.000011	0.000057	0.000058	0.000034	0.000033	0.00014	0.00014	0.000089	0.000087	0.000018	0.000019	0.0000059	0.0000060	0.000049	0.000050	0.000015	0.000015
Chromium, total	mg/L	0.0089	0.00040	0.0015	0.00023	0.00023	0.00011	0.00011	0.00049	0.00050	0.00030	0.00030	0.000065	0.000066	0.000034	0.000035	0.00018	0.00018	0.000068	0.000069
Cobalt, dissolved	mg/L	0.00056	0.000050	0.00014	0.0034	0.0034	0.0023	0.0022	0.014	0.014	0.0088	0.0088	0.0013	0.0013	0.00040	0.00040	0.0051	0.0052	0.0016	0.0016
Copper, dissolved	mg/L	0.0047	0.0011	0.0033	0.00094	0.00097	0.00042	0.00041	0.0015	0.0015	0.00078	0.00076	0.00027	0.00027	0.00016	0.00016	0.00046	0.00047	0.00022	0.00022
Iron, total	mg/L	1	0.078	0.78	0.077	0.079	0.044	0.043	0.15	0.15	0.089	0.087	0.025	0.025	0.0090	0.0090	0.049	0.050	0.016	0.017
Iron, dissolved	mg/L	0.35	0.015	0.35	0.077	0.079	0.044	0.043	0.15	0.15	0.089	0.087	0.025	0.025	0.0090	0.0090	0.049	0.050	0.016	0.017
Lead, dissolved	mg/L	0.0061	0.000025	0.000075	0.00027	0.00027	0.00015	0.00014	0.00086	0.00087	0.00056	0.00055	0.000079	0.000081	0.000026	0.000027	0.00031	0.00032	0.000098	0.000098
Manganese, total	mg/L	1.089	0.0022	0.018	0.061	0.063	0.040	0.040	0.21	0.21	0.14	0.14	0.023	0.023	0.0071	0.0071	0.078	0.079	0.024	0.024
Mercury, total	mg/L	0.00002	0.0000038	0.000012	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038
Molybdenum, total	mg-N/L	0.034	0.00023	0.00040	0.0075	0.0076	0.0040	0.0040	0.026	0.026	0.017	0.017	0.0022	0.0022	0.00069	0.00069	0.0096	0.0098	0.0030	0.0030
Nickel, dissolved	mg/L	0.0047	0.00050	0.0011	0.0051	0.0052	0.0033	0.0032	0.019	0.019	0.012	0.012	0.0018	0.0019	0.00058	0.00059	0.0070	0.0072	0.0022	0.0022
Selenium, total	mg/L	0.002	0.000050	0.000095	0.0052	0.0052	0.0031	0.0031	0.019	0.019	0.012	0.012	0.0017	0.0018	0.00053	0.00054	0.0069	0.0071	0.0021	0.0021
Strontium, total	mg/L	2.5	0.17	0.24	0.17	0.17	0.093	0.091	0.43	0.43	0.28	0.28	0.055	0.055	0.024	0.024	0.16	0.17	0.057	0.058
Silver, total	mg/L	0.0015	0.0000050	0.000021	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000010	0.000071	0.000073	0.000041	0.000041	0.00016	0.00016	0.00010	0.000100	0.000023	0.000023	0.0000077	0.0000078	0.000056	0.000057	0.000018	0.000018
Uranium, total	mg/L	0.0085	0.000099	0.00026	0.00096	0.00097	0.00053	0.00053	0.0032	0.0033	0.0021	0.0021	0.00029	0.00030	0.000096	0.000096	0.0012	0.0012	0.00037	0.00038
Zinc, dissolved	mg/L	0.0139	0.0010	0.0023	0.0071	0.0073	0.0043	0.0043	0.023	0.023	0.015	0.015	0.0025	0.0025	0.00086	0.00087	0.0084	0.0086	0.0027	0.0027

Red highlights indicate value above WQG calculated for the receiving stream

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_void_WaterQuality_EAModel_41_20250717.xlsm

Table G-8

Parameter	Units	West Management Pond Void Space and Seepage Water Quality																		
		Tenas WQG	Baseline in Tenas Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		75	101	36	36	13	13	203	199	62	62	60	60	47	46	117	117	90	90
Alkalinity, total	mg CaCO3/L		85	110	120	120	43	43	810	810	460	460	350	350	230	230	690	700	550	550
Chloride	mg/L	150	0.25	0.52	2.2	2.3	0.85	0.84	10	10	6.1	6.1	3.2	3.2	3.0	3.0	8.8	8.9	5.7	5.7
Fluoride	mg/L	1.22	0.031	0.045	0.029	0.029	0.011	0.011	0.029	0.029	0.011	0.011	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
Ammonia, total	mg-N/L	1.3	0.0025	0.0085	0.37	0.37	0.19	0.18	1.3	1.3	0.70	0.70	0.35	0.35	0.17	0.17	1.2	1.2	0.55	0.55
Nitrate	mg/L	3	0.0050	0.060	2.9	2.9	1.4	1.4	10	10	5.5	5.5	2.7	2.7	1.3	1.3	9.6	9.7	4.3	4.3
Nitrite	mg/L	0.02	0.00050	0.0020	0.066	0.066	0.033	0.033	0.24	0.24	0.13	0.13	0.062	0.063	0.030	0.030	0.22	0.22	0.099	0.099
Sulfate	mg/L	218	2.6	7.3	230	230	120	120	1000	1000	620	620	250	250	240	240	880	890	740	740
Aluminum, total	mg/L	0.35	0.047	1.7	0.010	0.011	0.0046	0.0045	0.018	0.018	0.0079	0.0078	0.021	0.021	0.014	0.014	0.023	0.023	0.018	0.018
Antimony, total	mg/L	0.074	0.00012	0.00024	0.00022	0.00023	0.000078	0.000077	0.0012	0.0012	0.00072	0.00072	0.00046	0.00046	0.00039	0.00039	0.0012	0.0012	0.0012	0.0012
Arsenic, total	mg/L	0.005	0.00045	0.00089	0.00030	0.00030	0.00012	0.00011	0.0013	0.0013	0.00079	0.00078	0.00042	0.00042	0.00038	0.00038	0.0012	0.0012	0.0011	0.0011
Barium, total	mg/L	1	0.035	0.046	0.023	0.023	0.0092	0.0090	0.037	0.037	0.019	0.019	0.024	0.024	0.022	0.022	0.036	0.036	0.027	0.027
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000017	0.000017	0.0000061	0.0000060	0.000017	0.000017	0.0000061	0.0000060	0.000018	0.000018	0.000018	0.000018	0.000018	0.000018	0.000018	0.000018
Boron, total	mg/L	1.2	0.015	0.050	0.069	0.070	0.020	0.020	0.22	0.22	0.12	0.12	0.14	0.14	0.13	0.13	0.21	0.21	0.18	0.18
Cadmium, dissolved	mg/L	0.00017	0.0000025	0.0000057	0.000055	0.000056	0.000032	0.000032	0.00016	0.00016	0.000088	0.000088	0.000044	0.000045	0.000020	0.000021	0.00011	0.00011	0.000054	0.000054
Chromium, total	mg/L	0.0089	0.00032	0.0018	0.00019	0.00020	0.000085	0.000084	0.00088	0.00088	0.00051	0.00051	0.00020	0.00020	0.00018	0.00018	0.00075	0.00075	0.00048	0.00049
Cobalt, dissolved	mg/L	0.00045	0.000050	0.000050	0.0040	0.0042	0.0021	0.0021	0.019	0.020	0.0080	0.0081	0.0026	0.0026	0.0014	0.0014	0.0082	0.0083	0.0044	0.0044
Copper, dissolved	mg/L	0.0026	0.00091	0.0014	0.00081	0.00082	0.00029	0.00029	0.0021	0.0021	0.00088	0.00087	0.0023	0.0023	0.0017	0.0017	0.0050	0.0050	0.0034	0.0034
Iron, total	mg/L	1	0.043	0.25	0.063	0.063	0.038	0.038	0.13	0.13	0.079	0.079	0.056	0.057	0.026	0.026	0.12	0.12	0.074	0.074
Iron, dissolved	mg/L	0.35	0.015	0.015	0.063	0.063	0.038	0.038	0.13	0.13	0.079	0.079	0.056	0.057	0.026	0.026	0.12	0.12	0.074	0.074
Lead, dissolved	mg/L	0.0031	0.000025	0.000025	0.00025	0.00025	0.00010	0.00010	0.0021	0.0021	0.0012	0.0012	0.00061	0.00061	0.00048	0.00048	0.0019	0.0019	0.0017	0.0017
Manganese, total	mg/L	0.935	0.0044	0.010	0.071	0.074	0.039	0.039	0.27	0.29	0.11	0.11	0.048	0.049	0.021	0.021	0.11	0.11	0.048	0.048
Mercury, total	mg/L	0.00002	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00012	0.00015	0.0069	0.0070	0.0027	0.0027	0.068	0.068	0.038	0.038	0.0085	0.0085	0.0079	0.0079	0.053	0.054	0.035	0.035
Nickel, dissolved	mg/L	0.0025	0.00025	0.00025	0.0054	0.0056	0.0030	0.0030	0.026	0.026	0.013	0.013	0.0041	0.0042	0.0029	0.0029	0.014	0.014	0.0094	0.0094
Selenium, total	mg/L	0.002	0.000052	0.000067	0.0078	0.0078	0.0033	0.0033	0.037	0.037	0.021	0.021	0.0083	0.0083	0.0076	0.0076	0.031	0.031	0.026	0.026
Strontium, total	mg/L	2.5	0.11	0.13	0.21	0.21	0.093	0.092	0.53	0.55	0.32	0.32	0.27	0.27	0.26	0.26	0.48	0.48	0.36	0.36
Silver, total	mg/L	0.00005	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.0000050	0.000067	0.000067	0.000041	0.000041	0.00018	0.00018	0.00010	0.00010	0.000061	0.000062	0.000035	0.000035	0.00013	0.00013	0.000069	0.000069
Uranium, total	mg/L	0.0085	0.00012	0.00017	0.0013	0.0013	0.00045	0.00044	0.0080	0.0080	0.0046	0.0046	0.0027	0.0027	0.0022	0.0022	0.0075	0.0075	0.0072	0.0072
Zinc, dissolved	mg/L	0.0071	0.0010	0.0015	0.0068	0.0071	0.0039	0.0039	0.029	0.030	0.015	0.015	0.0055	0.0055	0.0033	0.0033	0.017	0.017	0.0093	0.0093

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_void_WaterQuality_EAModel_41_20250717.xlsm

Table G-9

Parameter	Units	Tenas Control Pond Void Space and Seepage Water Quality																		
		Goathorn WQG	Baseline in Goathorn Creek		Operations								Closure							
					Final EAC Project Case (2024)				High Source terms (Alternative Case 2)				Final EAC Project Case (2024)				High Source terms (Alternative Case 2)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	136	159	86	107	230	287	152	191	63	3274	2	12	87	4721	3	18
Alkalinity, total	mg CaCO3/L		54	85	500	560	270	350	820	1000	530	650	120	7200	4.2	27	230	14000	8.3	55
Chloride	mg/L	150	0.25	0.50	6.0	6.7	3.1	4.0	10	13	6.6	8.1	2.1	120	0.072	0.46	2.7	170	0.095	0.64
Fluoride	mg/L	1.19	0.032	0.041	0.071	0.15	0.046	0.082	0.071	0.15	0.046	0.082	0.028	1.6	0.0010	0.0061	0.028	1.6	0.0010	0.0061
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.56	1.1	0.13	0.24	2.2	4.4	0.48	0.88	0.071	2.3	0.0018	0.0093	0.19	5.3	0.0046	0.022
Nitrate	mg/L	3	0.043	0.084	4.3	8.6	0.96	1.7	17	34	3.7	6.8	0.51	16	0.013	0.065	1.5	40	0.035	0.17
Nitrite	mg/L	0.02	0.00050	0.0020	0.099	0.20	0.023	0.040	0.39	0.79	0.086	0.16	0.012	0.39	0.00031	0.0016	0.034	0.94	0.00082	0.0040
Sulfate	mg/L	218	25	38	410	420	220	260	770	850	520	590	130	7700	4.3	29	290	17000	10.0	66
Aluminum, total	mg/L	0.27	0.034	0.66	0.019	0.017	0.013	0.012	0.020	0.017	0.014	0.013	0.013	0.63	0.00039	0.0023	0.015	0.78	0.00048	0.0029
Antimony, total	mg/L	0.074	0.000055	0.00013	0.00072	0.00079	0.00038	0.00049	0.0012	0.0014	0.00078	0.00094	0.00025	0.015	0.0000085	0.000056	0.00054	0.031	0.000018	0.00012
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.0013	0.0013	0.00074	0.00088	0.0020	0.0022	0.0013	0.0015	0.00041	0.022	0.000013	0.000083	0.00062	0.036	0.000020	0.00013
Barium, total	mg/L	1	0.059	0.071	0.066	0.074	0.043	0.055	0.068	0.088	0.051	0.065	0.032	1.6	0.00100	0.0060	0.034	1.7	0.0011	0.0065
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000056	0.000061	0.000038	0.000044	0.000056	0.000061	0.000038	0.000044	0.000034	0.0016	0.0000010	0.0000060	0.000034	0.0016	0.0000010	0.0000060
Boron, total	mg/L	1.2	0.0050	0.050	0.11	0.13	0.063	0.080	0.19	0.23	0.13	0.15	0.090	4.5	0.0028	0.017	0.097	5.3	0.0032	0.020
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000034	0.000030	0.000022	0.000022	0.00011	0.00010	0.000063	0.000062	0.0000070	0.00036	0.0000021	0.0000013	0.000013	0.00075	0.00000048	0.0000029
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00066	0.00078	0.00039	0.00051	0.00097	0.0012	0.00066	0.00082	0.00021	0.011	0.0000065	0.000041	0.00030	0.017	0.0000097	0.000063
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.0029	0.0029	0.0019	0.0021	0.012	0.011	0.0050	0.0050	0.00045	0.028	0.000015	0.00011	0.00095	0.059	0.000032	0.00022
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0015	0.0015	0.0011	0.0012	0.0019	0.0019	0.0015	0.0015	0.0012	0.069	0.000042	0.00026	0.0019	0.11	0.000068	0.00041
Iron, total	mg/L	1	0.040	0.70	0.038	0.036	0.026	0.026	0.066	0.059	0.039	0.036	0.014	0.67	0.00043	0.0025	0.026	1.5	0.00094	0.0056
Iron, dissolved	mg/L	0.35	0.015	0.12	0.038	0.036	0.026	0.026	0.066	0.059	0.039	0.036	0.014	0.67	0.00043	0.0025	0.026	1.5	0.00094	0.0056
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.0011	0.0012	0.00057	0.00072	0.0020	0.0022	0.0012	0.0015	0.00026	0.017	0.0000091	0.000064	0.00056	0.036	0.000020	0.00014
Manganese, total	mg/L	0.913	0.0036	0.029	0.038	0.036	0.022	0.024	0.16	0.15	0.064	0.065	0.0059	0.31	0.00017	0.0012	0.010	0.55	0.00030	0.0021
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.036	0.036	0.018	0.022	0.064	0.070	0.040	0.046	0.0055	0.35	0.00019	0.0013	0.013	0.84	0.00046	0.0032
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.0060	0.0061	0.0037	0.0042	0.017	0.016	0.0091	0.0096	0.0012	0.076	0.000041	0.00028	0.0024	0.15	0.000085	0.00058
Selenium, total	mg/L	0.002	0.000084	0.00020	0.022	0.024	0.011	0.014	0.039	0.049	0.024	0.030	0.0044	0.28	0.00015	0.0011	0.0092	0.58	0.00031	0.0022
Strontium, total	mg/L	2.5	0.080	0.11	0.28	0.28	0.18	0.20	0.47	0.53	0.34	0.38	0.18	11	0.0065	0.040	0.20	12	0.0074	0.047
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00003	0.0000050	0.000010	0.000050	0.000077	0.000034	0.000047	0.00013	0.00013	0.000078	0.000089	0.000013	0.00077	0.00000048	0.0000029	0.000018	0.0011	0.00000068	0.0000041
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.0044	0.0048	0.0022	0.0028	0.0078	0.0093	0.0049	0.0060	0.0014	0.084	0.000047	0.00032	0.0032	0.19	0.00011	0.00072
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0088	0.0099	0.0055	0.0066	0.021	0.019	0.012	0.014	0.0021	0.12	0.000065	0.00044	0.0036	0.20	0.00011	0.00076

Red highlights indicate value above WQG calculated for the receiving stream
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_MMPs_void_WaterQuality_EAModel_41_20250717.xlsm

Table G-10

Parameter	Units	Four Creek																					
		WQG	Baseline		WQS20 Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		123	172	149	201	128	133	162	201	131	70	149	201	128	133	156	208	131	74	147	205	131	133
Alkalinity, total	mg-$CaCO_3$/L		140	190	170	230	150	150	190	230	150	78	170	230	150	150	180	240	150	83	170	230	150	150
Chloride	mg/L	150	0.25	0.53	0.35	0.41	0.30	0.27	0.39	0.41	0.30	0.14	0.35	0.41	0.30	0.27	0.37	0.42	0.31	0.15	0.35	0.41	0.30	0.27
Fluoride	mg/L	1.4	0.053	0.070	0.076	0.099	0.065	0.066	0.083	0.099	0.066	0.034	0.076	0.099	0.065	0.066	0.080	0.10	0.066	0.036	0.076	0.100	0.066	0.067
Ammonia, total	mg-N/L	0.99	0.0025	0.011	0.0035	0.0041	0.0030	0.0027	0.0039	0.0041	0.0030	0.0014	0.0035	0.0041	0.0030	0.0027	0.0037	0.0042	0.0031	0.0015	0.0035	0.0041	0.0030	0.0027
Nitrate	mg/L	3.0	0.016	0.17	0.024	0.098	0.014	0.064	0.024	0.097	0.014	0.033	0.024	0.098	0.014	0.064	0.024	0.10	0.014	0.036	0.024	0.098	0.014	0.065
Nitrite	mg/L	0.020	0.00050	0.0010	0.00093	0.00081	0.00080	0.00055	0.0010	0.00081	0.00080	0.00028	0.00093	0.00081	0.00080	0.00055	0.00097	0.00085	0.00081	0.00030	0.00093	0.00082	0.00080	0.00055
Sulfate	mg/L	309	2.1	26	3.1	3.4	2.7	2.3	3.4	3.4	2.7	1.2	3.1	3.4	2.7	2.3	3.2	3.6	2.7	1.2	3.1	3.4	2.7	2.3
Aluminum, total	mg/L	0.69	0.081	1.1	0.14	0.075	0.12	0.051	0.15	0.075	0.12	0.026	0.14	0.075	0.12	0.051	0.15	0.078	0.12	0.027	0.14	0.075	0.12	0.051
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00014	0.000081	0.00012	0.000055	0.00015	0.000081	0.00012	0.000028	0.00014	0.000081	0.00012	0.000055	0.00015	0.000085	0.00012	0.000030	0.00014	0.000082	0.00012	0.000055
Arsenic, total	mg/L	0.0050	0.00067	0.0010	0.00096	0.0010	0.00082	0.00068	0.0011	0.0010	0.00082	0.00035	0.00096	0.0010	0.00082	0.00068	0.0010	0.0011	0.00083	0.00037	0.00095	0.0010	0.00082	0.00069
Barium, total	mg/L	1.0	0.078	0.13	0.096	0.14	0.083	0.094	0.11	0.14	0.083	0.048	0.096	0.14	0.083	0.094	0.10	0.15	0.084	0.052	0.097	0.14	0.083	0.095
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.00011	0.000081	0.000090	0.000055	0.00012	0.000081	0.000090	0.000028	0.00011	0.000081	0.000090	0.000055	0.00011	0.000085	0.000092	0.000030	0.00011	0.000082	0.000090	0.000055
Boron, total	mg/L	1.2	0.011	0.020	0.014	0.021	0.012	0.014	0.015	0.021	0.012	0.0072	0.014	0.021	0.012	0.014	0.015	0.022	0.012	0.0077	0.014	0.021	0.012	0.014
Cadmium, dissolved	mg/L	0.00023	0.0000050	0.000011	0.0000072	0.0000041	0.0000061	0.0000028	0.0000079	0.0000041	0.0000061	0.0000014	0.0000072	0.0000041	0.0000061	0.0000028	0.0000075	0.0000042	0.0000062	0.0000015	0.0000072	0.0000041	0.0000061	0.0000028
Chromium, total	mg/L	0.0089	0.00040	0.0015	0.00071	0.00034	0.00060	0.00023	0.00077	0.00034	0.00060	0.00012	0.00071	0.00034	0.00060	0.00023	0.00074	0.00036	0.00061	0.00012	0.00070	0.00034	0.00060	0.00023
Cobalt, dissolved	mg/L	0.00056	0.000050	0.00014	0.00011	0.000081	0.000090	0.000055	0.00012	0.000081	0.000090	0.000028	0.00011	0.000081	0.000090	0.000055	0.00011	0.000085	0.000092	0.000030	0.00011	0.000082	0.000090	0.000055
Copper, dissolved	mg/L	0.0047	0.0011	0.0033	0.0018	0.0016	0.0016	0.0011	0.0020	0.0016	0.0016	0.00056	0.0018	0.0016	0.0016	0.0011	0.0019	0.0017	0.0016	0.00059	0.0018	0.0016	0.0016	0.0011
Iron, total	mg/L	1.0	0.078	0.78	0.13	0.067	0.11	0.045	0.15	0.066	0.11	0.023	0.13	0.067	0.11	0.045	0.14	0.070	0.12	0.024	0.13	0.067	0.11	0.046
Iron, dissolved	mg/L	0.35	0.015	0.35	0.021	0.024	0.018	0.016	0.023	0.024	0.018	0.0084	0.021	0.024	0.018	0.016	0.022	0.025	0.018	0.0089	0.021	0.025	0.018	0.016
Lead, dissolved	mg/L	0.0061	0.000025	0.000075	0.000035	0.000041	0.000030	0.000027	0.000039	0.000041	0.000030	0.000014	0.000035	0.000041	0.000030	0.000027	0.000037	0.000042	0.000031	0.000015	0.000035	0.000041	0.000030	0.000027
Manganese, total	mg/L	1.1	0.0022	0.018	0.0034	0.0023	0.0029	0.0015	0.0037	0.0023	0.0029	0.00078	0.0034	0.0023	0.0029	0.0015	0.0035	0.0024	0.0029	0.00083	0.0034	0.0023	0.0029	0.0015
Mercury, total	mg/L	0.000020	0.0000038	0.000012	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038
Molybdenum, total	mg/L	0.034	0.00023	0.00040	0.00028	0.00039	0.00024	0.00026	0.00031	0.00039	0.00024	0.00013	0.00028	0.00039	0.00024	0.00026	0.00030	0.00041	0.00025	0.00014	0.00028	0.00039	0.00024	0.00026
Nickel, dissolved	mg/L	0.0047	0.00050	0.0011	0.00071	0.00041	0.00060	0.00028	0.00077	0.00041	0.00060	0.00014	0.00071	0.00041	0.00060	0.00028	0.00074	0.00042	0.00061	0.00015	0.00070	0.00041	0.00060	0.00028
Selenium, total	mg/L	0.0020	0.000050	0.000095	0.000071	0.000041	0.000060	0.000028	0.000077	0.000041	0.000060	0.000014	0.000071	0.000041	0.000060	0.000028	0.000074	0.000042	0.000061	0.000015	0.000070	0.000041	0.000060	0.000028
Strontium, total	mg/L	2.5	0.17	0.24	0.23	0.31	0.19	0.21	0.25	0.31	0.19	0.11	0.23	0.31	0.19	0.21	0.24	0.32	0.20	0.11	0.22	0.31	0.19	0.21
Silver, total	mg/L	0.0015	0.0000050	0.000021	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000010	0.0000071	0.0000081	0.0000060	0.0000054	0.0000077	0.0000081	0.0000061	0.0000028	0.0000071	0.0000081	0.0000060	0.0000054	0.0000074	0.0000085	0.0000061	0.0000030	0.0000070	0.0000082	0.0000061	0.0000055
Uranium, total	mg/L	0.0085	0.000099	0.00026	0.00011	0.00020	0.000095	0.00013	0.00012	0.00019	0.000095	0.000067	0.00011	0.00020	0.000095	0.00013	0.00012	0.00020	0.000096	0.000071	0.00011	0.00020	0.000095	0.00013
Zinc, dissolved	mg/L	0.014	0.0010	0.0023	0.0014	0.0023	0.0012	0.0015	0.0015	0.0023	0.0012	0.00078	0.0014	0.0023	0.0012	0.0015	0.0015	0.0024	0.0012	0.00083	0.0014	0.0023	0.0012	0.0015

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-11

Parameter	Units	Four Creek																					
		WQG	Baseline		WQS21																		
					Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		123	172	131	165	122	131	140	298	115	65	131	165	122	131	137	174	122	65	131	167	122	131
Alkalinity, total	mg-$CaCO_3$/L		140	190	150	190	130	150	160	340	130	75	150	190	130	150	150	190	130	74	150	190	130	150
Chloride	mg/L	150	0.25	0.53	0.31	0.33	0.28	0.26	0.33	0.64	0.28	0.13	0.31	0.33	0.28	0.26	0.32	0.35	0.28	0.13	0.31	0.34	0.28	0.26
Fluoride	mg/L	1.4	0.053	0.070	0.067	0.082	0.060	0.063	0.071	0.15	0.060	0.033	0.067	0.082	0.060	0.063	0.070	0.084	0.061	0.032	0.067	0.082	0.061	0.063
Ammonia, total	mg-N/L	0.99	0.0025	0.011	0.0031	0.0033	0.0028	0.0026	0.0033	0.0064	0.0028	0.0013	0.0031	0.0033	0.0028	0.0026	0.0032	0.0035	0.0028	0.0013	0.0031	0.0034	0.0028	0.0026
Nitrate	mg/L	3.0	0.016	0.17	0.018	0.080	0.013	0.062	0.018	0.097	0.013	0.032	0.018	0.080	0.013	0.062	0.018	0.083	0.013	0.032	0.018	0.080	0.013	0.062
Nitrite	mg/L	0.020	0.00050	0.0010	0.00082	0.00067	0.00074	0.00052	0.00087	0.0015	0.00073	0.00027	0.00082	0.00067	0.00074	0.00052	0.00085	0.00069	0.00074	0.00027	0.00081	0.00067	0.00074	0.00052
Sulfate	mg/L	309	2.1	26	2.7	2.8	2.5	2.2	2.9	5.5	2.4	1.1	2.7	2.8	2.5	2.2	2.8	2.9	2.5	1.1	2.7	2.8	2.5	2.2
Aluminum, total	mg/L	0.69	0.081	1.1	0.12	0.062	0.11	0.048	0.13	0.18	0.11	0.025	0.12	0.062	0.11	0.048	0.13	0.064	0.11	0.024	0.12	0.062	0.11	0.049
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00012	0.000067	0.00011	0.000052	0.00013	0.00019	0.00011	0.000027	0.00012	0.000067	0.00011	0.000052	0.00013	0.000069	0.00011	0.000027	0.00012	0.000067	0.00011	0.000053
Arsenic, total	mg/L	0.0050	0.00067	0.0010	0.00084	0.00084	0.00076	0.00065	0.00089	0.0017	0.00075	0.00034	0.00084	0.00084	0.00076	0.00065	0.00088	0.00087	0.00076	0.00033	0.00084	0.00084	0.00076	0.00066
Barium, total	mg/L	1.0	0.078	0.13	0.084	0.12	0.076	0.090	0.089	0.20	0.075	0.046	0.084	0.12	0.076	0.090	0.088	0.12	0.077	0.046	0.084	0.12	0.076	0.090
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000093	0.000067	0.000084	0.000052	0.000098	0.00012	0.000083	0.000027	0.000093	0.000067	0.000084	0.000052	0.000097	0.000069	0.000084	0.000027	0.000093	0.000067	0.000084	0.000052
Boron, total	mg/L	1.2	0.011	0.020	0.012	0.017	0.011	0.013	0.013	0.030	0.011	0.0069	0.012	0.017	0.011	0.013	0.013	0.018	0.011	0.0069	0.012	0.017	0.011	0.014
Cadmium, dissolved	mg/L	0.00023	0.0000050	0.000011	0.0000063	0.0000033	0.0000057	0.0000026	0.0000067	0.0000094	0.0000056	0.0000014	0.0000063	0.0000033	0.0000057	0.0000026	0.0000066	0.0000035	0.0000057	0.0000013	0.0000063	0.0000034	0.0000057	0.0000026
Chromium, total	mg/L	0.0089	0.00040	0.0015	0.00062	0.00028	0.00056	0.00022	0.00066	0.00087	0.00055	0.00012	0.00062	0.00028	0.00056	0.00022	0.00064	0.00029	0.00056	0.00011	0.00062	0.00028	0.00056	0.00022
Cobalt, dissolved	mg/L	0.00056	0.000050	0.00014	0.000093	0.000067	0.000084	0.000052	0.000098	0.00016	0.000083	0.000027	0.000093	0.000067	0.000084	0.000052	0.000097	0.000069	0.000084	0.000027	0.000093	0.000067	0.000084	0.000052
Copper, dissolved	mg/L	0.0047	0.0011	0.0033	0.0016	0.0013	0.0014	0.0010	0.0017	0.0029	0.0014	0.00054	0.0016	0.0013	0.0014	0.0010	0.0017	0.0014	0.0015	0.00053	0.0016	0.0013	0.0015	0.0010
Iron, total	mg/L	1.0	0.078	0.78	0.12	0.055	0.11	0.043	0.12	0.17	0.10	0.023	0.12	0.055	0.11	0.043	0.12	0.057	0.11	0.022	0.12	0.055	0.11	0.043
Iron, dissolved	mg/L	0.35	0.015	0.35	0.019	0.020	0.017	0.016	0.020	0.039	0.017	0.0080	0.019	0.020	0.017	0.016	0.019	0.021	0.017	0.0080	0.019	0.020	0.017	0.016
Lead, dissolved	mg/L	0.0061	0.000025	0.000075	0.000031	0.000033	0.000028	0.000026	0.000033	0.000064	0.000028	0.000013	0.000031	0.000033	0.000028	0.000026	0.000032	0.000035	0.000028	0.000013	0.000031	0.000034	0.000028	0.000026
Manganese, total	mg/L	1.1	0.0022	0.018	0.0030	0.0019	0.0027	0.0015	0.0032	0.0048	0.0026	0.00076	0.0030	0.0019	0.0027	0.0015	0.0031	0.0019	0.0027	0.00074	0.0030	0.0019	0.0027	0.0015
Mercury, total	mg/L	0.000020	0.0000038	0.000012	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038
Molybdenum, total	mg/L	0.034	0.00023	0.00040	0.00025	0.00032	0.00022	0.00025	0.00026	0.00057	0.00022	0.00013	0.00025	0.00032	0.00022	0.00025	0.00026	0.00033	0.00022	0.00013	0.00025	0.00032	0.00022	0.00025
Nickel, dissolved	mg/L	0.0047	0.00050	0.0011	0.00062	0.00033	0.00056	0.00026	0.00066	0.00093	0.00055	0.00014	0.00062	0.00033	0.00056	0.00026	0.00064	0.00035	0.00056	0.00013	0.00062	0.00034	0.00056	0.00026
Selenium, total	mg/L	0.0020	0.000050	0.000095	0.000062	0.000033	0.000056	0.000026	0.000066	0.000093	0.000055	0.000014	0.000062	0.000033	0.000056	0.000026	0.000064	0.000035	0.000056	0.000013	0.000062	0.000034	0.000056	0.000026
Strontium, total	mg/L	2.5	0.17	0.24	0.20	0.25	0.18	0.20	0.21	0.45	0.18	0.10	0.20	0.25	0.18	0.20	0.21	0.26	0.18	0.10	0.20	0.25	0.18	0.20
Silver, total	mg/L	0.0015	0.0000050	0.000021	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000010	0.0000062	0.0000067	0.0000056	0.0000052	0.0000066	0.000013	0.0000055	0.0000027	0.0000062	0.0000067	0.0000056	0.0000052	0.0000064	0.0000069	0.0000056	0.0000027	0.0000062	0.0000067	0.0000056	0.0000052
Uranium, total	mg/L	0.0085	0.000099	0.00026	0.000098	0.00016	0.000088	0.00012	0.00010	0.00026	0.000087	0.000064	0.000098	0.00016	0.000088	0.00012	0.00010	0.00017	0.000088	0.000064	0.000098	0.00016	0.000088	0.00012
Zinc, dissolved	mg/L	0.014	0.0010	0.0023	0.0012	0.0019	0.0011	0.0014	0.0013	0.0031	0.0011	0.00075	0.0012	0.0019	0.0011	0.0014	0.0013	0.0019	0.0011	0.00074	0.0012	0.0019	0.0011	0.0015

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-12

Parameter	Units	Four Creek																					
					WQS03_DS																		
					Closure																		
			Baseline		Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
		WQG	P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		123	172	162	214	131	140	156	190	124	133	162	214	131	140	165	239	137	152	162	214	131	140
Alkalinity, total	mg-$CaCO_3$/L		140	190	180	240	150	160	180	220	150	160	190	240	150	170	200	270	160	180	180	240	150	160
Chloride	mg/L	150	0.25	0.53	0.47	0.47	0.34	0.33	0.42	0.45	0.35	0.34	0.95	1.1	0.43	0.49	0.73	1.8	0.36	0.62	0.44	0.45	0.33	0.33
Fluoride	mg/L	1.4	0.053	0.070	0.081	0.11	0.067	0.068	0.078	0.093	0.063	0.065	0.081	0.11	0.067	0.068	0.085	0.12	0.069	0.074	0.082	0.11	0.067	0.068
Ammonia, total	mg-N/L	0.99	0.0025	0.011	0.038	0.050	0.010	0.015	0.026	0.031	0.0086	0.010	0.14	0.19	0.032	0.051	0.080	0.32	0.013	0.078	0.030	0.043	0.0091	0.014
Nitrate	mg/L	3.0	0.016	0.17	0.29	0.43	0.072	0.16	0.19	0.28	0.059	0.12	1.1	1.5	0.24	0.45	0.62	2.6	0.095	0.66	0.23	0.38	0.062	0.15
Nitrite	mg/L	0.020	0.00050	0.0010	0.0072	0.0090	0.0021	0.0028	0.0049	0.0055	0.0018	0.0019	0.026	0.034	0.0061	0.0094	0.015	0.058	0.0027	0.014	0.0057	0.0078	0.0019	0.0025
Sulfate	mg/L	309	2.1	26	26	33	7.1	9.7	18	20	8.3	9.9	91	120	19	30	53	210	9.0	48	21	30	6.6	9.3
Aluminum, total	mg/L	0.69	0.081	1.1	0.15	0.079	0.12	0.052	0.13	0.071	0.11	0.050	0.15	0.079	0.12	0.052	0.15	0.088	0.12	0.057	0.15	0.080	0.12	0.052
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00015	0.000087	0.00012	0.000061	0.00014	0.000086	0.00012	0.000063	0.00019	0.00014	0.00013	0.000077	0.00019	0.00020	0.00013	0.000093	0.00015	0.000087	0.00012	0.000061
Arsenic, total	mg/L	0.0050	0.00067	0.0010	0.0010	0.0011	0.00084	0.00070	0.00095	0.00097	0.00080	0.00068	0.0010	0.0011	0.00085	0.00072	0.0011	0.0012	0.00087	0.00079	0.0010	0.0011	0.00084	0.00071
Barium, total	mg/L	1.0	0.078	0.13	0.10	0.15	0.084	0.096	0.10	0.13	0.080	0.093	0.10	0.15	0.084	0.096	0.11	0.17	0.088	0.10	0.11	0.15	0.084	0.097
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.00011	0.000086	0.000091	0.000056	0.00010	0.000077	0.000087	0.000054	0.00011	0.000086	0.000091	0.000056	0.00012	0.000096	0.000095	0.000062	0.00011	0.000087	0.000092	0.000056
Boron, total	mg/L	1.2	0.011	0.020	0.016	0.023	0.013	0.015	0.016	0.023	0.014	0.016	0.023	0.028	0.014	0.018	0.022	0.041	0.014	0.021	0.016	0.023	0.013	0.015
Cadmium, dissolved	mg/L	0.00023	0.0000050	0.000011	0.000012	0.000011	0.0000074	0.0000048	0.0000097	0.0000075	0.0000067	0.0000039	0.000023	0.000025	0.0000093	0.0000081	0.000021	0.000059	0.0000081	0.000015	0.000011	0.000010	0.0000072	0.0000047
Chromium, total	mg/L	0.0089	0.00040	0.0015	0.00074	0.00036	0.00061	0.00024	0.00067	0.00032	0.00058	0.00023	0.00074	0.00037	0.00061	0.00025	0.00079	0.00041	0.00063	0.00029	0.00074	0.00036	0.00061	0.00024
Cobalt, dissolved	mg/L	0.00056	0.000050	0.00014	0.00052	0.00063	0.00017	0.00019	0.00037	0.00040	0.00015	0.00014	0.0018	0.0024	0.00042	0.00060	0.0010	0.0040	0.00021	0.00091	0.00043	0.00058	0.00016	0.00019
Copper, dissolved	mg/L	0.0047	0.0011	0.0033	0.0019	0.0017	0.0016	0.0011	0.0018	0.0016	0.0015	0.0011	0.0019	0.0017	0.0016	0.0012	0.0021	0.0019	0.0017	0.0013	0.0019	0.0017	0.0016	0.0011
Iron, total	mg/L	1.0	0.078	0.78	0.14	0.071	0.12	0.048	0.13	0.063	0.11	0.046	0.14	0.073	0.12	0.051	0.16	0.11	0.12	0.064	0.14	0.071	0.12	0.049
Iron, dissolved	mg/L	0.35	0.015	0.35	0.026	0.027	0.020	0.019	0.023	0.023	0.019	0.018	0.033	0.037	0.021	0.022	0.040	0.087	0.021	0.033	0.025	0.026	0.020	0.019
Lead, dissolved	mg/L	0.0061	0.000025	0.000075	0.000055	0.000060	0.000036	0.000036	0.000050	0.000059	0.000039	0.000040	0.00013	0.00017	0.000051	0.000061	0.000094	0.00026	0.000039	0.000082	0.000050	0.000055	0.000035	0.000035
Manganese, total	mg/L	1.1	0.0022	0.018	0.010	0.012	0.0044	0.0040	0.0077	0.0076	0.0038	0.0029	0.029	0.037	0.0079	0.0099	0.020	0.070	0.0051	0.017	0.0088	0.011	0.0042	0.0039
Mercury, total	mg/L	0.000020	0.0000038	0.000012	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038	0.0000038
Molybdenum, total	mg/L	0.034	0.00023	0.00040	0.00096	0.0012	0.00039	0.00050	0.00067	0.00083	0.00042	0.00050	0.0035	0.0047	0.00087	0.0013	0.0019	0.0068	0.00045	0.0017	0.00077	0.0011	0.00036	0.00048
Nickel, dissolved	mg/L	0.0047	0.00050	0.0011	0.0012	0.0011	0.00072	0.00048	0.00095	0.00075	0.00068	0.00041	0.0030	0.0035	0.0011	0.0010	0.0021	0.0058	0.00080	0.0015	0.0011	0.0010	0.00071	0.00047
Selenium, total	mg/L	0.0020	0.000050	0.000095	0.00064	0.00081	0.00017	0.00022	0.00042	0.00052	0.00022	0.00024	0.0024	0.0032	0.00051	0.00078	0.0013	0.0053	0.00022	0.0012	0.00050	0.00071	0.00016	0.00020
Strontium, total	mg/L	2.5	0.17	0.24	0.24	0.33	0.20	0.21	0.24	0.30	0.19	0.21	0.25	0.33	0.21	0.23	0.28	0.36	0.21	0.25	0.24	0.33	0.20	0.22
Silver, total	mg/L	0.0015	0.0000050	0.000021	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000010	0.000013	0.000015	0.0000076	0.0000080	0.000011	0.000011	0.0000069	0.0000069	0.000025	0.000031	0.0000097	0.000012	0.000024	0.000074	0.0000084	0.000021	0.000012	0.000014	0.0000074	0.0000079
Uranium, total	mg/L	0.0085	0.000099	0.00026	0.00019	0.00025	0.00012	0.00016	0.00019	0.00027	0.00013	0.00018	0.00050	0.00067	0.00017	0.00026	0.00033	0.00099	0.00013	0.00033	0.00017	0.00023	0.00011	0.00016
Zinc, dissolved	mg/L	0.014	0.0010	0.0023	0.0020	0.0025	0.0014	0.0018	0.0017	0.0022	0.0013	0.0017	0.0040	0.0052	0.0018	0.0024	0.0032	0.0087	0.0015	0.0032	0.0019	0.0025	0.0014	0.0018

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-13

Parameter	Units	Tenas Creek																					
					WQS02																		
					Closure																		
		WQG	Baseline		Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		75	101	79	113	72	94	79	114	73	95	79	114	72	94	79	113	72	94	79	113	72	94
Alkalinity, total	mg-$CaCO_3$/L		85	110	87	120	79	95	87	130	80	100	87	130	80	100	87	110	79	95	86	120	79	95
Chloride	mg/L	150	0.25	0.52	0.29	0.38	0.27	0.28	0.32	0.61	0.28	0.35	0.31	0.63	0.28	0.36	0.29	0.35	0.27	0.28	0.29	0.37	0.27	0.28
Fluoride	mg/L	1.2	0.031	0.045	0.035	0.049	0.032	0.041	0.035	0.050	0.032	0.042	0.035	0.049	0.032	0.041	0.035	0.049	0.032	0.041	0.034	0.049	0.032	0.041
Ammonia, total	mg-N/L	1.3	0.0025	0.0085	0.0047	0.017	0.0031	0.0061	0.0089	0.040	0.0037	0.010	0.010	0.055	0.0044	0.015	0.0047	0.014	0.0031	0.0054	0.0044	0.016	0.0031	0.0060
Nitrate	mg/L	3.0	0.0050	0.060	0.020	0.16	0.0071	0.076	0.052	0.34	0.011	0.11	0.064	0.46	0.017	0.15	0.020	0.14	0.0071	0.070	0.017	0.16	0.0067	0.075
Nitrite	mg/L	0.020	0.00050	0.0020	0.00090	0.0031	0.00061	0.0011	0.0016	0.0072	0.00072	0.0019	0.0019	0.0099	0.00084	0.0028	0.00090	0.0025	0.00061	0.0010	0.00084	0.0030	0.00061	0.0011
Sulfate	mg/L	218	2.6	7.3	4.1	13	3.0	6.4	7.2	32	3.9	12	8.1	41	4.2	14	4.1	11	3.0	5.8	3.9	13	2.9	6.2
Aluminum, total	mg/L	0.35	0.047	1.7	0.061	0.040	0.055	0.033	0.061	0.040	0.056	0.034	0.061	0.040	0.055	0.034	0.061	0.039	0.055	0.033	0.061	0.040	0.055	0.034
Antimony, dissolved	mg/L	0.074	0.00010	0.00023	0.00017	0.00011	0.00016	0.000089	0.00017	0.00013	0.00016	0.000097	0.00017	0.00013	0.00016	0.00010	0.00017	0.00010	0.00016	0.000088	0.00017	0.00011	0.00016	0.000089
Arsenic, total	mg/L	0.0050	0.00045	0.00089	0.00058	0.00045	0.00052	0.00038	0.00058	0.00045	0.00053	0.00039	0.00058	0.00046	0.00053	0.00039	0.00058	0.00045	0.00052	0.00037	0.00057	0.00045	0.00052	0.00038
Barium, total	mg/L	1.0	0.035	0.046	0.037	0.046	0.034	0.038	0.037	0.046	0.034	0.039	0.037	0.046	0.034	0.038	0.037	0.046	0.034	0.038	0.037	0.046	0.034	0.038
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000058	0.000060	0.000053	0.000050	0.000058	0.000060	0.000053	0.000051	0.000058	0.000060	0.000053	0.000050	0.000058	0.000060	0.000053	0.000050	0.000057	0.000060	0.000053	0.000050
Boron, total	mg/L	1.2	0.015	0.050	0.015	0.024	0.014	0.019	0.016	0.034	0.014	0.022	0.015	0.027	0.014	0.021	0.015	0.023	0.014	0.019	0.015	0.024	0.014	0.019
Cadmium, dissolved	mg/L	0.00017	0.0000025	0.0000057	0.0000029	0.0000045	0.0000027	0.0000030	0.0000034	0.0000075	0.0000028	0.0000035	0.0000033	0.0000075	0.0000028	0.0000038	0.0000029	0.0000041	0.0000027	0.0000029	0.0000029	0.0000044	0.0000027	0.0000030
Chromium, total	mg/L	0.0089	0.00032	0.0018	0.00036	0.00041	0.00033	0.00034	0.00036	0.00041	0.00033	0.00035	0.00036	0.00041	0.00033	0.00035	0.00036	0.00041	0.00033	0.00034	0.00036	0.00041	0.00033	0.00034
Cobalt, dissolved	mg/L	0.00045	0.000050	0.000050	0.000068	0.00017	0.000057	0.000080	0.00010	0.00035	0.000062	0.00012	0.00011	0.00042	0.000066	0.00015	0.000068	0.00014	0.000057	0.000074	0.000065	0.00016	0.000056	0.000079
Copper, dissolved	mg/L	0.0026	0.00091	0.0014	0.0010	0.0011	0.00095	0.00091	0.0010	0.0012	0.00095	0.00095	0.0010	0.0011	0.00095	0.00093	0.0010	0.0011	0.00095	0.00091	0.0010	0.0011	0.00095	0.00091
Iron, total	mg/L	1.0	0.043	0.25	0.047	0.040	0.043	0.034	0.047	0.041	0.043	0.034	0.047	0.040	0.043	0.035	0.047	0.040	0.043	0.034	0.047	0.040	0.043	0.034
Iron, dissolved	mg/L	0.35	0.015	0.015	0.017	0.018	0.016	0.016	0.017	0.022	0.016	0.016	0.017	0.021	0.016	0.016	0.017	0.018	0.016	0.015	0.017	0.018	0.016	0.016
Lead, dissolved	mg/L	0.0031	0.000025	0.000025	0.000029	0.000044	0.000027	0.000029	0.000036	0.000086	0.000029	0.000040	0.000037	0.000099	0.000030	0.000048	0.000029	0.000040	0.000027	0.000028	0.000029	0.000043	0.000027	0.000029
Manganese, total	mg/L	0.94	0.0044	0.010	0.0059	0.0049	0.0054	0.0033	0.0061	0.0081	0.0055	0.0038	0.0060	0.0076	0.0055	0.0040	0.0059	0.0044	0.0054	0.0032	0.0059	0.0047	0.0054	0.0033
Mercury, total	mg/L	0.000020	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00012	0.00015	0.00017	0.00046	0.00013	0.00023	0.00029	0.0013	0.00016	0.00043	0.00047	0.0025	0.00021	0.00078	0.00017	0.00039	0.00013	0.00021	0.00016	0.00043	0.00013	0.00022
Nickel, dissolved	mg/L	0.0025	0.00025	0.00025	0.00029	0.00043	0.00027	0.00030	0.00033	0.00073	0.00028	0.00037	0.00035	0.00089	0.00029	0.00042	0.00029	0.00039	0.00027	0.00029	0.00029	0.00042	0.00027	0.00030
Selenium, total	mg/L	0.0020	0.000052	0.000067	0.000091	0.00037	0.000057	0.00014	0.00021	0.0011	0.000086	0.00033	0.00025	0.0014	0.000099	0.00044	0.000091	0.00029	0.000057	0.00013	0.000084	0.00034	0.000055	0.00014
Strontium, total	mg/L	2.5	0.11	0.13	0.11	0.16	0.10	0.13	0.11	0.17	0.10	0.14	0.11	0.16	0.10	0.14	0.11	0.16	0.10	0.13	0.11	0.16	0.10	0.13
Silver, total	mg/L	0.000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.0000050	0.0000058	0.0000077	0.0000054	0.0000057	0.0000062	0.000012	0.0000055	0.0000065	0.0000059	0.000011	0.0000055	0.0000065	0.0000058	0.0000072	0.0000054	0.0000055	0.0000058	0.0000075	0.0000053	0.0000057
Uranium, total	mg/L	0.0085	0.00012	0.00017	0.00012	0.00033	0.00011	0.00025	0.00015	0.00051	0.00012	0.00030	0.00015	0.00054	0.00012	0.00032	0.00012	0.00031	0.00011	0.00024	0.00012	0.00032	0.00011	0.00025
Zinc, dissolved	mg/L	0.0071	0.0010	0.0015	0.0012	0.0018	0.0011	0.0016	0.0012	0.0022	0.0011	0.0016	0.0012	0.0023	0.0011	0.0017	0.0012	0.0018	0.0011	0.0015	0.0012	0.0018	0.0011	0.0016

Red highlight is an WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-14

Parameter	Units	Tenas Creek																					
					WQS22																		
					Closure																		
		WQG	Baseline		Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		75	101	82	117	75	94	83	118	75	95	83	118	76	95	82	117	75	94	82	117	75	94
Alkalinity, total	mg-$CaCO_3$/L		85	110	91	120	81	98	91	130	82	100	92	150	83	110	91	120	81	97	91	120	81	97
Chloride	mg/L	150	0.25	0.52	0.31	0.50	0.28	0.32	0.35	0.68	0.29	0.37	0.36	0.94	0.30	0.45	0.31	0.45	0.28	0.30	0.31	0.48	0.28	0.31
Fluoride	mg/L	1.2	0.031	0.045	0.036	0.052	0.032	0.042	0.036	0.052	0.032	0.042	0.036	0.052	0.032	0.042	0.036	0.052	0.032	0.041	0.036	0.052	0.032	0.042
Ammonia, total	mg-N/L	1.3	0.0025	0.0085	0.0066	0.030	0.0037	0.0094	0.011	0.044	0.0042	0.011	0.017	0.099	0.0063	0.027	0.0066	0.023	0.0037	0.0081	0.0060	0.028	0.0036	0.0091
Nitrate	mg/L	3.0	0.0050	0.060	0.034	0.26	0.011	0.10	0.064	0.37	0.015	0.11	0.12	0.81	0.032	0.24	0.034	0.21	0.011	0.091	0.029	0.25	0.011	0.099
Nitrite	mg/L	0.020	0.00050	0.0020	0.0012	0.0053	0.00072	0.0017	0.0019	0.0079	0.00080	0.0020	0.0031	0.018	0.0012	0.0049	0.0012	0.0042	0.00072	0.0015	0.0011	0.0051	0.00070	0.0017
Sulfate	mg/L	218	2.6	7.3	6.0	23	3.6	9.3	9.2	37	4.6	13	13	72	6.1	25	6.0	19	3.6	8.2	5.5	22	3.5	9.0
Aluminum, total	mg/L	0.35	0.047	1.7	0.064	0.042	0.056	0.034	0.064	0.041	0.056	0.034	0.064	0.042	0.056	0.034	0.064	0.041	0.056	0.034	0.064	0.042	0.056	0.034
Antimony, dissolved	mg/L	0.074	0.00010	0.00023	0.00018	0.00012	0.00016	0.000093	0.00018	0.00014	0.00016	0.000100	0.00018	0.00018	0.00016	0.00012	0.00018	0.00011	0.00016	0.000091	0.00018	0.00012	0.00016	0.000093
Arsenic, total	mg/L	0.0050	0.00045	0.00089	0.00060	0.00047	0.00053	0.00038	0.00060	0.00047	0.00054	0.00039	0.00061	0.00049	0.00054	0.00040	0.00060	0.00047	0.00053	0.00038	0.00060	0.00047	0.00053	0.00038
Barium, total	mg/L	1.0	0.035	0.046	0.039	0.048	0.034	0.039	0.039	0.048	0.034	0.039	0.039	0.048	0.034	0.039	0.039	0.048	0.034	0.038	0.039	0.048	0.034	0.039
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000060	0.000063	0.000054	0.000051	0.000060	0.000062	0.000054	0.000051	0.000060	0.000063	0.000054	0.000051	0.000060	0.000063	0.000054	0.000050	0.000060	0.000063	0.000054	0.000051
Boron, total	mg/L	1.2	0.015	0.050	0.016	0.029	0.014	0.020	0.017	0.037	0.015	0.022	0.016	0.034	0.015	0.023	0.016	0.027	0.014	0.020	0.016	0.028	0.014	0.020
Cadmium, dissolved	mg/L	0.00017	0.0000025	0.0000057	0.0000031	0.0000062	0.0000028	0.0000035	0.0000036	0.0000081	0.0000029	0.0000036	0.0000040	0.000012	0.0000030	0.0000051	0.0000031	0.0000053	0.0000028	0.0000033	0.0000030	0.0000059	0.0000028	0.0000034
Chromium, total	mg/L	0.0089	0.00032	0.0018	0.00037	0.00043	0.00033	0.00034	0.00037	0.00042	0.00033	0.00035	0.00038	0.00044	0.00033	0.00036	0.00037	0.00043	0.00033	0.00034	0.00037	0.00043	0.00033	0.00035
Cobalt, dissolved	mg/L	0.00045	0.000050	0.000050	0.000084	0.00027	0.000062	0.00011	0.00011	0.00039	0.000066	0.00012	0.00016	0.00075	0.000083	0.00026	0.000084	0.00022	0.000062	0.000098	0.000079	0.00025	0.000061	0.00011
Copper, dissolved	mg/L	0.0026	0.00091	0.0014	0.0011	0.0012	0.00097	0.00093	0.0011	0.0012	0.00097	0.00096	0.0011	0.0012	0.00097	0.00096	0.0011	0.0012	0.00097	0.00092	0.0011	0.0012	0.00097	0.00093
Iron, total	mg/L	1.0	0.043	0.25	0.050	0.042	0.044	0.034	0.050	0.041	0.044	0.035	0.050	0.043	0.044	0.036	0.050	0.042	0.044	0.034	0.049	0.042	0.044	0.034
Iron, dissolved	mg/L	0.35	0.015	0.015	0.018	0.020	0.016	0.016	0.018	0.022	0.016	0.016	0.018	0.025	0.016	0.018	0.018	0.019	0.016	0.016	0.018	0.019	0.016	0.016
Lead, dissolved	mg/L	0.0031	0.000025	0.000025	0.000033	0.000063	0.000028	0.000034	0.000041	0.000099	0.000031	0.000043	0.000051	0.00016	0.000034	0.000068	0.000033	0.000055	0.000028	0.000032	0.000032	0.000060	0.000028	0.000034
Manganese, total	mg/L	0.94	0.0044	0.010	0.0062	0.0067	0.0056	0.0038	0.0063	0.0088	0.0056	0.0039	0.0067	0.012	0.0058	0.0055	0.0062	0.0058	0.0056	0.0036	0.0062	0.0065	0.0056	0.0038
Mercury, total	mg/L	0.000020	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00012	0.00015	0.00023	0.00079	0.00015	0.00034	0.00036	0.0014	0.00019	0.00049	0.00077	0.0044	0.00031	0.0014	0.00023	0.00064	0.00015	0.00030	0.00021	0.00073	0.00015	0.00032
Nickel, dissolved	mg/L	0.0025	0.00025	0.00025	0.00031	0.00058	0.00028	0.00035	0.00036	0.00079	0.00029	0.00039	0.00044	0.0014	0.00032	0.00061	0.00031	0.00051	0.00028	0.00033	0.00031	0.00056	0.00028	0.00035
Selenium, total	mg/L	0.0020	0.000052	0.000067	0.00015	0.00067	0.000074	0.00024	0.00025	0.0012	0.00011	0.00037	0.00043	0.0026	0.00016	0.00080	0.00015	0.00053	0.000074	0.00020	0.00013	0.00062	0.000070	0.00023
Strontium, total	mg/L	2.5	0.11	0.13	0.12	0.17	0.11	0.14	0.12	0.17	0.11	0.14	0.12	0.17	0.11	0.14	0.12	0.17	0.11	0.13	0.12	0.17	0.11	0.14
Silver, total	mg/L	0.000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.0000050	0.0000061	0.0000099	0.0000056	0.0000064	0.0000066	0.000013	0.0000056	0.0000067	0.0000067	0.000016	0.0000058	0.0000080	0.0000061	0.0000088	0.0000056	0.0000061	0.0000061	0.0000096	0.0000055	0.0000063
Uranium, total	mg/L	0.0085	0.00012	0.00017	0.00013	0.00041	0.00011	0.00027	0.00017	0.00056	0.00012	0.00031	0.00021	0.00080	0.00014	0.00041	0.00013	0.00038	0.00011	0.00026	0.00013	0.00040	0.00011	0.00027
Zinc, dissolved	mg/L	0.0071	0.0010	0.0015	0.0012	0.0020	0.0011	0.0016	0.0012	0.0022	0.0011	0.0017	0.0012	0.0029	0.0011	0.0019	0.0012	0.0019	0.0011	0.0016	0.0012	0.0019	0.0011	0.0016

Red highlight is an WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-15

Parameter	Units	Tenas Creek																					
					WQS04																		
					Closure																		
		WQG	Baseline		Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		75	101	88	127	76	94	88	127	76	95	88	128	76	98	88	127	76	94	88	127	76	95
Alkalinity, total	mg-$CaCO_3$/L		85	110	96	130	83	99	96	150	85	100	97	160	85	110	96	130	83	98	96	130	83	99
Chloride	mg/L	150	0.25	0.52	0.32	0.52	0.29	0.33	0.37	0.76	0.30	0.40	0.38	1.0	0.31	0.48	0.32	0.46	0.29	0.31	0.32	0.50	0.28	0.32
Fluoride	mg/L	1.2	0.031	0.045	0.038	0.056	0.033	0.042	0.038	0.055	0.033	0.043	0.038	0.056	0.033	0.042	0.038	0.056	0.033	0.042	0.038	0.056	0.033	0.042
Ammonia, total	mg-N/L	1.3	0.0025	0.0085	0.0068	0.031	0.0039	0.010	0.011	0.047	0.0044	0.012	0.018	0.10	0.0066	0.030	0.0068	0.024	0.0039	0.0087	0.0062	0.029	0.0037	0.0099
Nitrate	mg/L	3.0	0.0050	0.060	0.035	0.27	0.012	0.11	0.065	0.39	0.016	0.12	0.12	0.84	0.034	0.26	0.035	0.22	0.012	0.095	0.030	0.25	0.011	0.10
Nitrite	mg/L	0.020	0.00050	0.0020	0.0013	0.0056	0.00074	0.0019	0.0020	0.0084	0.00083	0.0022	0.0033	0.019	0.0012	0.0054	0.0013	0.0044	0.00074	0.0016	0.0012	0.0052	0.00072	0.0018
Sulfate	mg/L	218	2.6	7.3	6.1	24	3.7	10	10	43	4.9	15	14	79	6.4	27	6.1	19	3.7	8.8	5.6	22	3.6	9.7
Aluminum, total	mg/L	0.35	0.047	1.7	0.068	0.045	0.058	0.034	0.067	0.045	0.058	0.034	0.068	0.045	0.058	0.034	0.068	0.045	0.058	0.034	0.067	0.045	0.058	0.034
Antimony, dissolved	mg/L	0.074	0.00010	0.00023	0.00019	0.00013	0.00016	0.000095	0.00019	0.00016	0.00017	0.00010	0.00019	0.00018	0.00017	0.00012	0.00019	0.00012	0.00016	0.000093	0.00019	0.00013	0.00016	0.000095
Arsenic, total	mg/L	0.0050	0.00045	0.00089	0.00064	0.00051	0.00055	0.00039	0.00064	0.00051	0.00055	0.00039	0.00064	0.00053	0.00055	0.00041	0.00064	0.00051	0.00055	0.00038	0.00064	0.00051	0.00055	0.00039
Barium, total	mg/L	1.0	0.035	0.046	0.041	0.052	0.035	0.039	0.041	0.051	0.035	0.039	0.041	0.052	0.035	0.039	0.041	0.052	0.035	0.039	0.041	0.052	0.035	0.039
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000064	0.000068	0.000055	0.000051	0.000064	0.000067	0.000055	0.000051	0.000064	0.000068	0.000055	0.000051	0.000064	0.000068	0.000055	0.000051	0.000064	0.000068	0.000055	0.000051
Boron, total	mg/L	1.2	0.015	0.050	0.017	0.030	0.015	0.021	0.018	0.041	0.015	0.024	0.017	0.035	0.015	0.023	0.017	0.028	0.015	0.020	0.017	0.029	0.015	0.020
Cadmium, dissolved	mg/L	0.00017	0.0000025	0.0000057	0.0000032	0.0000065	0.0000029	0.0000036	0.0000037	0.0000085	0.0000029	0.0000038	0.0000042	0.000013	0.0000031	0.0000053	0.0000032	0.0000055	0.0000029	0.0000034	0.0000032	0.0000062	0.0000029	0.0000036
Chromium, total	mg/L	0.0089	0.00032	0.0018	0.00040	0.00046	0.00034	0.00035	0.00040	0.00046	0.00034	0.00035	0.00040	0.00047	0.00034	0.00036	0.00040	0.00046	0.00034	0.00035	0.00039	0.00046	0.00034	0.00035
Cobalt, dissolved	mg/L	0.00045	0.000050	0.000050	0.000090	0.00029	0.000065	0.00012	0.00012	0.00042	0.000069	0.00014	0.00017	0.00082	0.000087	0.00028	0.000090	0.00024	0.000065	0.00010	0.000084	0.00028	0.000063	0.00012
Copper, dissolved	mg/L	0.0026	0.00091	0.0014	0.0011	0.0013	0.00099	0.00094	0.0012	0.0013	0.00100	0.00098	0.0012	0.0013	0.00100	0.00097	0.0011	0.0013	0.00099	0.00093	0.0011	0.0013	0.00099	0.00094
Iron, total	mg/L	1.0	0.043	0.25	0.052	0.045	0.045	0.035	0.052	0.044	0.045	0.035	0.052	0.046	0.045	0.036	0.052	0.045	0.045	0.034	0.052	0.045	0.045	0.035
Iron, dissolved	mg/L	0.35	0.015	0.015	0.019	0.021	0.017	0.016	0.019	0.023	0.017	0.017	0.019	0.025	0.017	0.018	0.019	0.021	0.017	0.016	0.019	0.021	0.017	0.016
Lead, dissolved	mg/L	0.0031	0.000025	0.000025	0.000034	0.000065	0.000029	0.000036	0.000044	0.00012	0.000032	0.000048	0.000052	0.00018	0.000035	0.000073	0.000034	0.000057	0.000029	0.000034	0.000033	0.000062	0.000029	0.000035
Manganese, total	mg/L	0.94	0.0044	0.010	0.0065	0.0071	0.0057	0.0040	0.0066	0.0092	0.0057	0.0041	0.0069	0.013	0.0060	0.0058	0.0065	0.0061	0.0057	0.0037	0.0065	0.0068	0.0057	0.0039
Mercury, total	mg/L	0.000020	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00012	0.00015	0.00024	0.00090	0.00016	0.00038	0.00039	0.0017	0.00021	0.00058	0.00085	0.0049	0.00032	0.0015	0.00024	0.00073	0.00016	0.00033	0.00022	0.00084	0.00015	0.00037
Nickel, dissolved	mg/L	0.0025	0.00025	0.00025	0.00033	0.00063	0.00029	0.00037	0.00037	0.00085	0.00030	0.00041	0.00047	0.0016	0.00033	0.00065	0.00033	0.00054	0.00029	0.00034	0.00032	0.00061	0.00029	0.00036
Selenium, total	mg/L	0.0020	0.000052	0.000067	0.00015	0.00079	0.000079	0.00027	0.00029	0.0014	0.00012	0.00045	0.00048	0.0029	0.00017	0.00088	0.00015	0.00062	0.000079	0.00023	0.00013	0.00074	0.000074	0.00026
Strontium, total	mg/L	2.5	0.11	0.13	0.13	0.18	0.11	0.14	0.13	0.19	0.11	0.14	0.13	0.19	0.11	0.14	0.13	0.18	0.11	0.14	0.13	0.18	0.11	0.14
Silver, total	mg/L	0.000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.0000050	0.0000065	0.000010	0.0000057	0.0000066	0.0000068	0.000014	0.0000058	0.0000070	0.0000070	0.000017	0.0000060	0.0000084	0.0000065	0.0000092	0.0000057	0.0000063	0.0000064	0.000010	0.0000057	0.0000065
Uranium, total	mg/L	0.0085	0.00012	0.00017	0.00014	0.00043	0.00012	0.00028	0.00019	0.00063	0.00013	0.00033	0.00021	0.00086	0.00014	0.00043	0.00014	0.00039	0.00012	0.00027	0.00013	0.00041	0.00012	0.00028
Zinc, dissolved	mg/L	0.0071	0.0010	0.0015	0.0013	0.0021	0.0011	0.0016	0.0013	0.0024	0.0011	0.0017	0.0013	0.0031	0.0012	0.0020	0.0013	0.0021	0.0011	0.0016	0.0013	0.0021	0.0011	0.0016

Red highlight is an WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-16

Parameter	Units	Goathorn Creek																					
		WQG	Baseline		WQSEA1																		
					Operations																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	78	110	71	89	78	110	71	89	82	110	71	89	80	171	71	151	78	132	68	89
Alkalinity, total	mg-$CaCO_3$/L		54	85	67	100	54	69	72	100	53	70	87	100	60	69	67	130	54	110	73	130	55	70
Chloride	mg/L	150	0.25	0.50	0.47	0.31	0.32	0.25	0.52	0.30	0.31	0.25	0.72	0.35	0.40	0.25	0.47	0.49	0.32	0.42	0.55	0.31	0.33	0.25
Fluoride	mg/L	1.2	0.032	0.041	0.039	0.050	0.035	0.040	0.041	0.050	0.035	0.040	0.039	0.050	0.035	0.040	0.040	0.075	0.035	0.066	0.039	0.062	0.035	0.040
Ammonia, total	mg-N/L	1.6	0.0025	0.0070	0.019	0.0065	0.0058	0.0026	0.019	0.0058	0.0056	0.0026	0.065	0.019	0.014	0.0028	0.019	0.0076	0.0058	0.0043	0.019	0.0095	0.0062	0.0026
Nitrate	mg/L	3.0	0.043	0.084	0.17	0.100	0.068	0.078	0.17	0.099	0.066	0.078	0.54	0.20	0.13	0.079	0.17	0.16	0.068	0.13	0.17	0.12	0.070	0.078
Nitrite	mg/L	0.020	0.00050	0.0020	0.0034	0.0012	0.0010	0.00051	0.0033	0.0011	0.00099	0.00051	0.012	0.0035	0.0025	0.00055	0.0034	0.0014	0.0010	0.00085	0.0033	0.0017	0.0011	0.00052
Sulfate	mg/L	218	25	38	39	29	28	24	43	29	28	24	61	32	35	24	39	49	28	42	45	29	29	24
Aluminum, total	mg/L	0.27	0.034	0.66	0.063	0.030	0.048	0.018	0.065	0.030	0.047	0.019	0.063	0.030	0.048	0.018	0.063	0.036	0.048	0.029	0.072	0.038	0.049	0.019
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00012	0.000063	0.000097	0.000050	0.00013	0.000062	0.000096	0.000050	0.00015	0.000067	0.00011	0.000050	0.00012	0.00010	0.000097	0.000085	0.00013	0.000063	0.000098	0.000051
Arsenic, total	mg/L	0.0050	0.00020	0.00060	0.00029	0.00037	0.00024	0.00019	0.00031	0.00037	0.00024	0.00019	0.00033	0.00037	0.00025	0.00019	0.00029	0.00037	0.00024	0.00030	0.00032	0.00047	0.00024	0.00019
Barium, total	mg/L	1.0	0.059	0.071	0.067	0.076	0.060	0.063	0.067	0.076	0.060	0.064	0.067	0.076	0.060	0.063	0.069	0.12	0.060	0.11	0.067	0.093	0.060	0.064
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000060	0.000053	0.000053	0.000049	0.000060	0.000053	0.000053	0.000049	0.000060	0.000053	0.000053	0.000049	0.000062	0.000095	0.000053	0.000084	0.000060	0.000063	0.000053	0.000049
Boron, total	mg/L	1.2	0.0050	0.050	0.0093	0.0087	0.0066	0.0055	0.011	0.0087	0.0064	0.0055	0.014	0.0087	0.0080	0.0055	0.0093	0.0099	0.0066	0.0088	0.011	0.011	0.0068	0.0055
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000013	0.0000060	0.000011	0.0000049	0.000013	0.0000060	0.000011	0.0000049	0.000016	0.0000065	0.000011	0.0000049	0.000013	0.000010	0.000011	0.0000084	0.000013	0.0000060	0.000011	0.0000049
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00031	0.00019	0.00025	0.00016	0.00033	0.00019	0.00024	0.00016	0.00033	0.00019	0.00025	0.00016	0.00031	0.00031	0.00025	0.00027	0.00034	0.00023	0.00025	0.00016
Cobalt, dissolved	mg/L	0.000450	0.000050	0.00010	0.00018	0.000076	0.000093	0.000050	0.00022	0.000074	0.000087	0.000050	0.00052	0.00012	0.00016	0.000052	0.00018	0.00011	0.000093	0.000085	0.00022	0.000090	0.00010	0.000051
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0016	0.0010	0.0014	0.00092	0.0016	0.0010	0.0014	0.00092	0.0016	0.0010	0.0014	0.00092	0.0016	0.0018	0.0014	0.0016	0.0016	0.0012	0.0014	0.00092
Iron, total	mg/L	1.0	0.040	0.70	0.14	0.040	0.080	0.018	0.14	0.038	0.077	0.018	0.14	0.041	0.081	0.018	0.14	0.048	0.080	0.028	0.17	0.057	0.086	0.018
Iron, dissolved	mg/L	0.35	0.015	0.12	0.019	0.016	0.016	0.015	0.019	0.016	0.016	0.015	0.020	0.016	0.017	0.015	0.019	0.029	0.016	0.025	0.019	0.019	0.016	0.015
Lead, dissolved	mg/L	0.0	0.000025	0.000050	0.000063	0.000035	0.000037	0.000025	0.000074	0.000035	0.000036	0.000025	0.00012	0.000042	0.000052	0.000025	0.000063	0.000054	0.000037	0.000042	0.000077	0.000035	0.000039	0.000025
Manganese, total	mg/L	0.91	0.0036	0.029	0.0077	0.0030	0.0054	0.0022	0.0081	0.0031	0.0053	0.0022	0.011	0.0035	0.0063	0.0022	0.0077	0.0048	0.0054	0.0037	0.0082	0.0031	0.0056	0.0022
Mercury, total	mg/L	0.000020	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.0017	0.00075	0.00085	0.00043	0.0020	0.00073	0.00079	0.00043	0.0034	0.00099	0.0013	0.00044	0.0017	0.0011	0.00085	0.00074	0.0021	0.00075	0.00091	0.00044
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.00051	0.00031	0.00034	0.00025	0.00058	0.00030	0.00033	0.00025	0.00092	0.00036	0.00046	0.00025	0.00051	0.00049	0.00034	0.00042	0.00059	0.00031	0.00035	0.00025
Selenium, total	mg/L	0.0020	0.000084	0.00020	0.00074	0.00027	0.00030	0.000082	0.00093	0.00025	0.00025	0.000083	0.0016	0.00042	0.00057	0.000088	0.00074	0.00034	0.00030	0.00014	0.0011	0.00027	0.00034	0.000085
Strontium, total	mg/L	2.5	0.080	0.11	0.092	0.14	0.081	0.10	0.093	0.14	0.080	0.10	0.10	0.14	0.084	0.10	0.092	0.19	0.081	0.17	0.095	0.18	0.081	0.10
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000010	0.0000079	0.0000055	0.0000060	0.0000049	0.0000091	0.0000056	0.0000060	0.0000050	0.000011	0.0000061	0.0000069	0.0000050	0.0000079	0.0000095	0.0000060	0.0000084	0.0000083	0.0000063	0.0000060	0.0000050
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.00019	0.00013	0.00010	0.000100	0.00023	0.00013	0.000092	0.00010	0.00039	0.00016	0.00016	0.00010	0.00019	0.00021	0.00010	0.00017	0.00026	0.00014	0.00011	0.00010
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0020	0.0012	0.0017	0.0010	0.0021	0.0012	0.0017	0.0010	0.0024	0.0012	0.0018	0.0010	0.0020	0.0020	0.0017	0.0017	0.0021	0.0015	0.0017	0.0010

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-17

Parameter	Units	Goathorn Creek																					
					WQSEA1																		
					Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
		WQG	Baseline																					
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	78	115	71	90	78	116	71	93	78	119	71	93	78	173	71	134	78	116	71	90
Alkalinity, total	mg-$CaCO_3$/L		54	85	58	120	51	83	58	100	51	78	64	150	54	96	58	160	51	120	58	120	52	83
Chloride	mg/L	150	0.25	0.50	0.35	0.73	0.29	0.41	0.34	0.41	0.29	0.33	0.39	0.93	0.31	0.51	0.36	0.89	0.29	0.63	0.36	0.56	0.29	0.42
Fluoride	mg/L	1.2	0.032	0.041	0.039	0.049	0.035	0.040	0.039	0.051	0.035	0.041	0.039	0.049	0.035	0.040	0.039	0.074	0.035	0.059	0.039	0.049	0.035	0.040
Ammonia, total	mg-N/L	1.6	0.0025	0.0070	0.0053	0.012	0.0033	0.0067	0.0050	0.0086	0.0032	0.0050	0.012	0.027	0.0046	0.015	0.0053	0.019	0.0033	0.011	0.0045	0.0094	0.0032	0.0065
Nitrate	mg/L	3.0	0.043	0.084	0.061	0.14	0.047	0.10	0.059	0.13	0.046	0.096	0.11	0.27	0.057	0.17	0.061	0.26	0.047	0.16	0.054	0.12	0.046	0.10
Nitrite	mg/L	0.020	0.00050	0.0020	0.00098	0.0020	0.00064	0.0012	0.00096	0.0016	0.00063	0.00095	0.0022	0.0048	0.00089	0.0027	0.00098	0.0034	0.00064	0.0020	0.00084	0.0017	0.00063	0.0012
Sulfate	mg/L	218	25	38	31	55	26	36	29	38	26	30	40	95	29	59	31	79	26	56	31	46	26	37
Aluminum, total	mg/L	0.27	0.034	0.66	0.056	0.099	0.044	0.039	0.049	0.037	0.042	0.023	0.057	0.099	0.044	0.039	0.057	0.081	0.044	0.055	0.057	0.077	0.044	0.040
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00011	0.00011	0.000094	0.000072	0.00011	0.000078	0.000094	0.000060	0.00012	0.00017	0.000099	0.00011	0.00011	0.00014	0.000094	0.00011	0.00011	0.00010	0.000094	0.000072
Arsenic, total	mg/L	0.0050	0.00020	0.00060	0.00026	0.00039	0.00023	0.00024	0.00026	0.00034	0.00023	0.00022	0.00027	0.00044	0.00023	0.00027	0.00026	0.00047	0.00023	0.00034	0.00026	0.00039	0.00023	0.00024
Barium, total	mg/L	1.0	0.059	0.071	0.068	0.076	0.060	0.063	0.068	0.080	0.061	0.065	0.068	0.076	0.060	0.063	0.068	0.12	0.060	0.093	0.067	0.076	0.060	0.063
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000061	0.000059	0.000054	0.000048	0.000061	0.000060	0.000054	0.000050	0.000061	0.000059	0.000054	0.000048	0.000061	0.000095	0.000054	0.000072	0.000060	0.000058	0.000054	0.000048
Boron, total	mg/L	1.2	0.0050	0.050	0.0088	0.023	0.0062	0.012	0.0074	0.011	0.0059	0.0077	0.0091	0.026	0.0065	0.013	0.0089	0.025	0.0062	0.017	0.0087	0.019	0.0062	0.012
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000012	0.0000072	0.000010	0.0000054	0.000012	0.0000072	0.000010	0.0000054	0.000012	0.0000095	0.000011	0.0000065	0.000012	0.000012	0.000010	0.0000082	0.000012	0.0000071	0.000010	0.0000054
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00028	0.00045	0.00023	0.00023	0.00026	0.00024	0.00023	0.00018	0.00028	0.00047	0.00023	0.00024	0.00028	0.00044	0.00023	0.00034	0.00028	0.00036	0.00023	0.00024
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.000091	0.00017	0.000065	0.00011	0.000092	0.00014	0.000064	0.000094	0.00019	0.00043	0.000088	0.00025	0.000091	0.00032	0.000065	0.00018	0.000090	0.00018	0.000065	0.00011
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0016	0.0013	0.0014	0.00099	0.0016	0.0012	0.0014	0.00096	0.0016	0.0015	0.0014	0.0011	0.0016	0.0019	0.0014	0.0015	0.0016	0.0013	0.0014	0.00098
Iron, total	mg/L	1.0	0.040	0.70	0.11	0.34	0.064	0.096	0.092	0.076	0.057	0.035	0.11	0.34	0.064	0.098	0.11	0.21	0.064	0.14	0.11	0.22	0.066	0.10
Iron, dissolved	mg/L	0.35	0.015	0.12	0.018	0.018	0.016	0.015	0.018	0.018	0.016	0.015	0.018	0.021	0.016	0.017	0.018	0.031	0.016	0.023	0.018	0.018	0.016	0.015
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.000043	0.000094	0.000031	0.000055	0.000039	0.000053	0.000030	0.000038	0.000073	0.00020	0.000038	0.00011	0.000043	0.00012	0.000031	0.000084	0.000042	0.000089	0.000032	0.000056
Manganese, total	mg/L	0.91	0.0036	0.029	0.0059	0.0088	0.0048	0.0042	0.0053	0.0045	0.0047	0.0031	0.0067	0.0099	0.0051	0.0056	0.0059	0.0094	0.0048	0.0065	0.0059	0.0065	0.0049	0.0044
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.00076	0.0019	0.00061	0.00099	0.00081	0.0011	0.00059	0.00076	0.0012	0.0039	0.00077	0.0020	0.00076	0.0024	0.00061	0.0016	0.00078	0.0014	0.00062	0.0010
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.00035	0.00054	0.00029	0.00039	0.00033	0.00043	0.00029	0.00033	0.00047	0.00099	0.00034	0.00069	0.00035	0.00089	0.00029	0.00061	0.00035	0.00053	0.00029	0.00039
Selenium, total	mg/L	0.0020	0.000084	0.00020	0.00033	0.0013	0.00017	0.00058	0.00035	0.00062	0.00016	0.00036	0.00074	0.0025	0.00030	0.0015	0.00033	0.0016	0.00017	0.00093	0.00032	0.0010	0.00018	0.00060
Strontium, total	mg/L	2.5	0.080	0.11	0.090	0.15	0.080	0.11	0.090	0.14	0.080	0.11	0.091	0.15	0.081	0.12	0.090	0.21	0.080	0.17	0.089	0.15	0.080	0.11
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000010	0.0000072	0.0000090	0.0000060	0.0000066	0.0000070	0.0000085	0.0000060	0.0000062	0.0000078	0.000011	0.0000062	0.0000077	0.0000072	0.000014	0.0000060	0.0000100	0.0000072	0.0000090	0.0000060	0.0000066
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.00012	0.00044	0.000076	0.00023	0.00012	0.00022	0.000072	0.00016	0.00022	0.00088	0.00011	0.00046	0.00012	0.00051	0.000076	0.00036	0.00012	0.00036	0.000078	0.00024
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0018	0.0015	0.0016	0.0012	0.0018	0.0015	0.0016	0.0012	0.0019	0.0020	0.0017	0.0014	0.0018	0.0024	0.0016	0.0018	0.0018	0.0015	0.0016	0.0012

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-18

Parameter	Units	Goathorn Creek																					
		WQG	Baseline		WQS06																		
					Operations																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	81	109	71	89	81	108	71	89	85	109	72	89	83	169	71	148	82	129	71	89
Alkalinity, total	mg-$CaCO_3$/L		54	85	70	96	55	68	74	96	55	69	92	96	61	68	70	130	55	110	76	120	56	69
Chloride	mg/L	150	0.25	0.50	0.49	0.33	0.33	0.25	0.53	0.32	0.32	0.25	0.75	0.38	0.40	0.25	0.49	0.52	0.33	0.42	0.56	0.33	0.34	0.25
Fluoride	mg/L	1.2	0.032	0.041	0.041	0.048	0.036	0.039	0.042	0.048	0.036	0.039	0.041	0.048	0.036	0.039	0.042	0.074	0.036	0.065	0.041	0.060	0.036	0.039
Ammonia, total	mg-N/L	1.6	0.0025	0.0070	0.019	0.0072	0.0059	0.0026	0.019	0.0071	0.0057	0.0026	0.064	0.020	0.014	0.0029	0.019	0.0097	0.0059	0.0043	0.018	0.0084	0.0062	0.0027
Nitrate	mg/L	3.0	0.043	0.084	0.17	0.11	0.070	0.077	0.17	0.11	0.067	0.077	0.53	0.22	0.13	0.079	0.17	0.17	0.070	0.13	0.17	0.11	0.072	0.078
Nitrite	mg/L	0.020	0.00050	0.0020	0.0034	0.0013	0.0011	0.00051	0.0033	0.0013	0.0010	0.00051	0.012	0.0037	0.0025	0.00056	0.0034	0.0018	0.0011	0.00085	0.0033	0.0015	0.0011	0.00052
Sulfate	mg/L	218	25	38	41	31	29	24	44	30	28	24	63	35	36	24	41	50	29	42	46	31	30	24
Aluminum, total	mg/L	0.27	0.034	0.66	0.065	0.028	0.049	0.018	0.067	0.028	0.048	0.018	0.065	0.028	0.049	0.018	0.065	0.040	0.049	0.029	0.074	0.036	0.050	0.019
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00013	0.000067	0.000099	0.000050	0.00013	0.000066	0.000098	0.000050	0.00016	0.000073	0.00011	0.000050	0.00013	0.00011	0.000099	0.000085	0.00013	0.000067	0.00010	0.000050
Arsenic, total	mg/L	0.0050	0.00020	0.00060	0.00031	0.00035	0.00025	0.00018	0.00032	0.00035	0.00024	0.00019	0.00035	0.00035	0.00026	0.00019	0.00031	0.00035	0.00025	0.00029	0.00033	0.00046	0.00025	0.00019
Barium, total	mg/L	1.0	0.059	0.071	0.071	0.073	0.061	0.063	0.071	0.073	0.062	0.063	0.071	0.073	0.062	0.063	0.073	0.12	0.062	0.11	0.071	0.090	0.061	0.063
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000063	0.000054	0.000055	0.000049	0.000063	0.000054	0.000055	0.000049	0.000063	0.000054	0.000055	0.000049	0.000065	0.000095	0.000055	0.000083	0.000063	0.000060	0.000055	0.000049
Boron, total	mg/L	1.2	0.0050	0.050	0.0098	0.0083	0.0067	0.0054	0.011	0.0083	0.0066	0.0054	0.015	0.0083	0.0081	0.0054	0.0098	0.010	0.0067	0.0087	0.011	0.011	0.0069	0.0054
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000013	0.0000065	0.000011	0.0000049	0.000013	0.0000065	0.000011	0.0000049	0.000016	0.0000073	0.000012	0.0000049	0.000013	0.000011	0.000011	0.0000084	0.000013	0.0000065	0.000011	0.0000049
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00032	0.00020	0.00025	0.00016	0.00034	0.00020	0.00025	0.00016	0.00034	0.00020	0.00026	0.00016	0.00032	0.00032	0.00025	0.00027	0.00035	0.00022	0.00026	0.00016
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.00019	0.000084	0.000095	0.000050	0.00022	0.000081	0.000088	0.000050	0.00051	0.00014	0.00016	0.000052	0.00019	0.00012	0.000095	0.000084	0.00022	0.000097	0.00010	0.000051
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0016	0.0011	0.0014	0.00091	0.0016	0.0011	0.0014	0.00092	0.0016	0.0011	0.0014	0.00091	0.0017	0.0018	0.0014	0.0015	0.0016	0.0012	0.0014	0.00092
Iron, total	mg/L	1.0	0.040	0.70	0.14	0.046	0.082	0.018	0.14	0.046	0.078	0.018	0.14	0.046	0.082	0.018	0.14	0.061	0.082	0.028	0.17	0.050	0.087	0.019
Iron, dissolved	mg/L	0.35	0.015	0.12	0.019	0.016	0.017	0.015	0.019	0.016	0.017	0.015	0.021	0.017	0.017	0.015	0.019	0.028	0.017	0.025	0.020	0.018	0.017	0.015
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.000066	0.000038	0.000038	0.000025	0.000075	0.000037	0.000036	0.000025	0.00012	0.000048	0.000053	0.000025	0.000066	0.000058	0.000038	0.000042	0.000079	0.000038	0.000040	0.000025
Manganese, total	mg/L	0.91	0.0036	0.029	0.0079	0.0035	0.0055	0.0022	0.0083	0.0035	0.0054	0.0022	0.012	0.0041	0.0064	0.0022	0.0079	0.0053	0.0055	0.0037	0.0083	0.0036	0.0057	0.0022
Mercury, total	mg/L	0.000020	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.0017	0.00085	0.00087	0.00043	0.0020	0.00081	0.00080	0.00043	0.0035	0.0012	0.0014	0.00044	0.0017	0.0012	0.00087	0.00073	0.0022	0.00085	0.00093	0.00044
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.00054	0.00033	0.00035	0.00025	0.00059	0.00032	0.00034	0.00025	0.00095	0.00042	0.00047	0.00025	0.00054	0.00052	0.00035	0.00042	0.00060	0.00034	0.00036	0.00025
Selenium, total	mg/L	0.0020	0.000084	0.00020	0.00078	0.00032	0.00030	0.000083	0.00092	0.00030	0.00026	0.000085	0.0017	0.00052	0.00058	0.000092	0.00078	0.00041	0.00030	0.00014	0.0011	0.00032	0.00034	0.000089
Strontium, total	mg/L	2.5	0.080	0.11	0.096	0.14	0.083	0.10	0.096	0.14	0.082	0.10	0.11	0.14	0.086	0.10	0.096	0.19	0.083	0.17	0.099	0.17	0.083	0.10
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000010	0.0000082	0.0000058	0.0000061	0.0000049	0.0000093	0.0000060	0.0000061	0.0000049	0.000012	0.0000067	0.0000071	0.0000049	0.0000082	0.0000096	0.0000061	0.0000083	0.0000085	0.0000060	0.0000062	0.0000049
Uranium, total	mg/L	0.00850	0.000056	0.00014	0.00020	0.00014	0.00010	0.000099	0.00023	0.00014	0.000094	0.000099	0.00042	0.00018	0.00016	0.00010	0.00020	0.00022	0.00010	0.00017	0.00026	0.00014	0.00011	0.000100
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0021	0.0012	0.0017	0.0010	0.0022	0.0012	0.0017	0.0010	0.0026	0.0013	0.0019	0.0010	0.0021	0.0020	0.0017	0.0017	0.0022	0.0014	0.0017	0.0010

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-19

Parameter	Units	Goathorn Creek																					
		WQG	Baseline		WQS06																		
					Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	84	122	71	90	84	122	71	93	84	125	71	93	84	173	71	134	81	122	71	90
Alkalinity, total	mg-$CaCO_3$/L		54	85	61	120	53	82	61	100	53	77	65	150	55	95	61	160	53	120	60	120	53	83
Chloride	mg/L	150	0.25	0.50	0.36	0.82	0.30	0.41	0.34	0.43	0.29	0.33	0.40	1.1	0.32	0.50	0.37	0.88	0.30	0.62	0.37	0.58	0.30	0.41
Fluoride	mg/L	1.2	0.032	0.041	0.042	0.051	0.036	0.040	0.042	0.053	0.036	0.041	0.042	0.051	0.036	0.040	0.042	0.074	0.036	0.059	0.041	0.051	0.036	0.040
Ammonia, total	mg-N/L	1.6	0.0025	0.0070	0.0053	0.013	0.0034	0.0066	0.0051	0.0086	0.0032	0.0050	0.012	0.028	0.0047	0.015	0.0053	0.019	0.0034	0.011	0.0046	0.0094	0.0033	0.0063
Nitrate	mg/L	3.0	0.043	0.084	0.062	0.15	0.048	0.10	0.060	0.13	0.047	0.095	0.11	0.27	0.058	0.17	0.062	0.25	0.048	0.16	0.056	0.13	0.047	0.10
Nitrite	mg/L	0.020	0.00050	0.0020	0.00099	0.0023	0.00066	0.0012	0.00097	0.0016	0.00064	0.00094	0.0022	0.0050	0.00090	0.0026	0.00099	0.0034	0.00066	0.0019	0.00086	0.0017	0.00064	0.0011
Sulfate	mg/L	218	25	38	31	61	27	36	30	39	26	30	41	110	30	57	32	78	27	55	32	48	27	36
Aluminum, total	mg/L	0.27	0.034	0.66	0.058	0.12	0.045	0.038	0.051	0.039	0.043	0.023	0.058	0.12	0.045	0.038	0.059	0.084	0.045	0.054	0.059	0.080	0.045	0.040
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00011	0.00012	0.000096	0.000071	0.00011	0.000082	0.000096	0.000060	0.00012	0.00020	0.00010	0.00010	0.00011	0.00014	0.000096	0.00011	0.00011	0.00011	0.000096	0.000071
Arsenic, total	mg/L	0.0050	0.00020	0.00060	0.00027	0.00040	0.00023	0.00023	0.00027	0.00035	0.00023	0.00022	0.00028	0.00046	0.00024	0.00027	0.00027	0.00049	0.00023	0.00033	0.00027	0.00041	0.00023	0.00024
Barium, total	mg/L	1.0	0.059	0.071	0.072	0.081	0.062	0.063	0.073	0.084	0.062	0.065	0.072	0.081	0.062	0.063	0.072	0.12	0.062	0.093	0.071	0.080	0.062	0.063
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000065	0.000062	0.000055	0.000049	0.000065	0.000064	0.000055	0.000050	0.000065	0.000062	0.000055	0.000049	0.000065	0.000095	0.000055	0.000072	0.000064	0.000062	0.000055	0.000049
Boron, total	mg/L	1.2	0.0050	0.050	0.0089	0.027	0.0063	0.011	0.0075	0.011	0.0060	0.0077	0.0092	0.031	0.0067	0.013	0.0091	0.025	0.0063	0.017	0.0090	0.019	0.0064	0.011
Cadmium, dissolved	mg/L	0.00016	0.0000075	0.000033	0.000013	0.0000076	0.000011	0.0000054	0.000013	0.0000077	0.000011	0.0000054	0.000013	0.0000099	0.000011	0.0000065	0.000013	0.000012	0.000011	0.0000083	0.000012	0.0000076	0.000011	0.0000054
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00029	0.00052	0.00024	0.00023	0.00027	0.00025	0.00023	0.00018	0.00029	0.00055	0.00024	0.00024	0.00029	0.00045	0.00024	0.00034	0.00029	0.00038	0.00024	0.00024
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.000092	0.00018	0.000066	0.00011	0.000093	0.00014	0.000065	0.000093	0.00018	0.00043	0.000089	0.00024	0.000092	0.00031	0.000067	0.00018	0.000090	0.00018	0.000066	0.00011
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0017	0.0014	0.0014	0.00099	0.0017	0.0013	0.0014	0.00096	0.0017	0.0016	0.0014	0.0011	0.0017	0.0019	0.0014	0.0015	0.0016	0.0014	0.0014	0.00099
Iron, total	mg/L	1.0	0.040	0.70	0.11	0.41	0.065	0.093	0.090	0.074	0.058	0.034	0.11	0.41	0.065	0.094	0.11	0.22	0.065	0.13	0.11	0.22	0.067	0.100
Iron, dissolved	mg/L	0.35	0.015	0.12	0.019	0.019	0.017	0.015	0.019	0.019	0.017	0.015	0.019	0.021	0.017	0.017	0.019	0.031	0.017	0.023	0.019	0.019	0.017	0.015
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.000043	0.00011	0.000032	0.000054	0.000040	0.000053	0.000031	0.000038	0.000072	0.00020	0.000039	0.00011	0.000043	0.00012	0.000032	0.000082	0.000044	0.000091	0.000032	0.000055
Manganese, total	mg/L	0.91	0.0036	0.029	0.0060	0.010	0.0049	0.0041	0.0056	0.0047	0.0048	0.0031	0.0068	0.012	0.0052	0.0055	0.0061	0.0096	0.0050	0.0063	0.0062	0.0068	0.0050	0.0043
Mercury, total	mg/L	0.000020	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.00077	0.0021	0.00062	0.00097	0.00082	0.0011	0.00061	0.00075	0.0012	0.0046	0.00078	0.0019	0.00077	0.0024	0.00062	0.0015	0.00081	0.0014	0.00063	0.00100
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.00036	0.00060	0.00030	0.00038	0.00034	0.00044	0.00030	0.00033	0.00047	0.0010	0.00034	0.00067	0.00036	0.00089	0.00030	0.00060	0.00036	0.00054	0.00030	0.00039
Selenium, total	mg/L	0.0020	0.000084	0.00020	0.00032	0.0015	0.00017	0.00056	0.00035	0.00062	0.00016	0.00035	0.00073	0.0030	0.00031	0.0014	0.00032	0.0016	0.00017	0.00090	0.00033	0.0010	0.00018	0.00058
Strontium, total	mg/L	2.5	0.080	0.11	0.095	0.15	0.083	0.11	0.096	0.15	0.083	0.11	0.096	0.16	0.084	0.12	0.095	0.21	0.083	0.17	0.094	0.15	0.082	0.11
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000010	0.0000074	0.0000094	0.0000062	0.0000065	0.0000073	0.0000088	0.0000061	0.0000062	0.0000080	0.000011	0.0000064	0.0000076	0.0000074	0.000014	0.0000062	0.0000099	0.0000074	0.0000094	0.0000062	0.0000066
Uranium, total	mg/L	0.00850	0.000056	0.00014	0.00012	0.00051	0.000078	0.00023	0.00012	0.00022	0.000073	0.00016	0.00022	0.0010	0.00011	0.00044	0.00012	0.00051	0.000078	0.00035	0.00012	0.00036	0.000080	0.00023
Zinc, dissolved	mg/L	0.0074	0.0013	0.0021	0.0019	0.0016	0.0017	0.0012	0.0019	0.0016	0.0017	0.0012	0.0020	0.0021	0.0017	0.0014	0.0019	0.0024	0.0017	0.0018	0.0019	0.0016	0.0017	0.0012

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-20

Parameter	Units	Goathorn Creek																					
		WQG	Baseline		WQS05																		
					Operations																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	85	93	75	87	85	93	75	87	89	93	75	87	88	142	75	126	88	142	75	126
Alkalinity, total	mg-$CaCO_3$/L		54	85	78	76	64	69	80	76	63	69	95	79	68	69	79	110	64	100	79	110	64	100
Chloride	mg/L	150	0.25	0.50	0.46	0.32	0.32	0.24	0.48	0.31	0.31	0.24	0.66	0.36	0.38	0.24	0.46	0.46	0.32	0.35	0.46	0.46	0.32	0.35
Fluoride	mg/L	1.190707	0.032	0.041	0.042	0.042	0.036	0.038	0.043	0.042	0.036	0.038	0.042	0.042	0.036	0.038	0.042	0.062	0.036	0.055	0.042	0.062	0.036	0.055
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.015	0.0069	0.0051	0.0025	0.016	0.0068	0.0049	0.0026	0.050	0.019	0.011	0.0027	0.015	0.0095	0.0051	0.0036	0.015	0.0095	0.0051	0.0036
Nitrate	mg/L	3	0.043	0.084	0.13	0.11	0.053	0.071	0.13	0.10	0.051	0.071	0.41	0.20	0.097	0.073	0.13	0.15	0.053	0.10	0.13	0.15	0.053	0.10
Nitrite	mg/L	0.02	0.00050	0.0020	0.0027	0.0013	0.00093	0.00049	0.0027	0.0012	0.00088	0.00050	0.0090	0.0034	0.0019	0.00054	0.0027	0.0018	0.00093	0.00072	0.0027	0.0018	0.00093	0.00072
Sulfate	mg/L	218	25	38	32	26	23	21	33	26	22	21	49	32	27	21	33	36	23	29	33	36	23	29
Aluminum, total	mg/L	0.270189	0.034	0.66	0.067	0.030	0.052	0.020	0.067	0.030	0.051	0.020	0.067	0.030	0.052	0.020	0.067	0.045	0.052	0.029	0.067	0.045	0.052	0.029
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00015	0.000075	0.00012	0.000055	0.00015	0.000074	0.00012	0.000055	0.00017	0.000080	0.00012	0.000055	0.00015	0.00011	0.00012	0.000083	0.00015	0.00011	0.00012	0.000083
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.00040	0.00028	0.00033	0.00020	0.00040	0.00028	0.00033	0.00020	0.00043	0.00028	0.00034	0.00020	0.00041	0.00037	0.00033	0.00030	0.00041	0.00037	0.00033	0.00030
Barium, total	mg/L	1	0.059	0.071	0.066	0.064	0.056	0.057	0.066	0.063	0.056	0.057	0.066	0.064	0.056	0.057	0.067	0.092	0.056	0.080	0.067	0.092	0.056	0.080
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000065	0.000055	0.000056	0.000048	0.000065	0.000055	0.000056	0.000048	0.000065	0.000055	0.000056	0.000048	0.000067	0.000080	0.000056	0.000070	0.000067	0.000080	0.000056	0.000070
Boron, total	mg/L	1.2	0.0050	0.050	0.012	0.010	0.0089	0.0070	0.012	0.010	0.0088	0.0071	0.016	0.010	0.0100	0.0070	0.012	0.013	0.0089	0.011	0.012	0.013	0.0089	0.011
Cadmium, dissolved	mg/L	0.000163	0.0000075	0.000033	0.000011	0.0000061	0.0000089	0.0000045	0.000011	0.0000061	0.0000089	0.0000045	0.000013	0.0000068	0.0000096	0.0000045	0.000011	0.0000087	0.0000089	0.0000064	0.000011	0.0000087	0.0000089	0.0000064
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00035	0.00023	0.00028	0.00018	0.00035	0.00023	0.00028	0.00019	0.00036	0.00023	0.00028	0.00018	0.00035	0.00035	0.00028	0.00028	0.00035	0.00035	0.00028	0.00028
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.00016	0.000079	0.000085	0.000049	0.00017	0.000079	0.000080	0.000049	0.00045	0.00014	0.00013	0.000050	0.00016	0.00011	0.000085	0.000071	0.00016	0.00011	0.000085	0.000071
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0016	0.0011	0.0013	0.00089	0.0016	0.0011	0.0013	0.00089	0.0016	0.0011	0.0013	0.00089	0.0016	0.0015	0.0013	0.0013	0.0016	0.0015	0.0013	0.0013
Iron, total	mg/L	1	0.040	0.70	0.12	0.046	0.072	0.019	0.12	0.046	0.070	0.020	0.12	0.047	0.072	0.019	0.12	0.066	0.072	0.029	0.12	0.066	0.072	0.029
Iron, dissolved	mg/L	0.35	0.015	0.12	0.020	0.017	0.017	0.014	0.020	0.017	0.017	0.014	0.021	0.017	0.017	0.014	0.020	0.024	0.017	0.021	0.020	0.024	0.017	0.021
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.000059	0.000036	0.000036	0.000024	0.000063	0.000035	0.000034	0.000024	0.00010	0.000047	0.000047	0.000025	0.000059	0.000051	0.000036	0.000035	0.000059	0.000051	0.000036	0.000035
Manganese, total	mg/L	0.913	0.0036	0.029	0.0076	0.0036	0.0056	0.0023	0.0080	0.0036	0.0055	0.0023	0.011	0.0042	0.0063	0.0023	0.0076	0.0053	0.0056	0.0033	0.0076	0.0053	0.0056	0.0033
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.0014	0.00071	0.00068	0.00038	0.0015	0.00067	0.00063	0.00038	0.0028	0.0011	0.0010	0.00039	0.0014	0.00095	0.00068	0.00053	0.0014	0.00095	0.00068	0.00053
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.00050	0.00032	0.00034	0.00024	0.00052	0.00031	0.00032	0.00024	0.00084	0.00042	0.00042	0.00024	0.00050	0.00046	0.00034	0.00035	0.00050	0.00046	0.00034	0.00035
Selenium, total	mg/L	0.002	0.000084	0.00020	0.00063	0.00025	0.00024	0.000078	0.00068	0.00024	0.00020	0.000080	0.0013	0.00040	0.00044	0.000085	0.00063	0.00034	0.00024	0.00011	0.00063	0.00034	0.00024	0.00011
Strontium, total	mg/L	2.5	0.080	0.11	0.11	0.11	0.092	0.10	0.10	0.11	0.091	0.10	0.11	0.11	0.094	0.10	0.11	0.17	0.092	0.15	0.11	0.17	0.092	0.15
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.0008	0.0000050	0.000010	0.0000079	0.0000059	0.0000061	0.0000048	0.0000085	0.0000060	0.0000061	0.0000048	0.000010	0.0000067	0.0000068	0.0000048	0.0000079	0.0000087	0.0000061	0.0000070	0.0000079	0.0000087	0.0000061	0.0000070
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.00019	0.00015	0.00011	0.00012	0.00020	0.00015	0.000100	0.00012	0.00035	0.00019	0.00015	0.00012	0.00019	0.00023	0.00011	0.00018	0.00019	0.00023	0.00011	0.00018
Zinc, dissolved	mg/L	0.007405	0.0013	0.0021	0.0019	0.0013	0.0016	0.0011	0.0020	0.0013	0.0016	0.0011	0.0023	0.0014	0.0017	0.0011	0.0019	0.0019	0.0016	0.0016	0.0019	0.0019	0.0016	0.0016

Red highlight is an WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-21

Parameter	Units	Goathorn Creek																					
					WQS05																		
					Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
		WQG	Baseline																					
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		74	100	88	127	75	91	91	128	75	94	91	129	75	95	88	166	75	121	88	166	75	121
Alkalinity, total	mg-$CaCO_3$/L		54	85	76	120	63	85	77	130	64	87	78	140	66	98	76	160	63	110	76	160	63	110
Chloride	mg/L	150	0.25	0.50	0.36	0.66	0.31	0.37	0.42	0.56	0.32	0.38	0.47	0.84	0.34	0.49	0.36	0.84	0.31	0.53	0.36	0.84	0.31	0.53
Fluoride	mg/L	1.190707	0.032	0.041	0.043	0.055	0.036	0.041	0.043	0.055	0.036	0.042	0.043	0.055	0.036	0.041	0.043	0.073	0.036	0.053	0.043	0.073	0.036	0.053
Ammonia, total	mg-N/L	1.56	0.0025	0.0070	0.0078	0.016	0.0041	0.0082	0.012	0.023	0.0044	0.0092	0.021	0.048	0.0070	0.021	0.0078	0.033	0.0041	0.014	0.0078	0.033	0.0041	0.014
Nitrate	mg/L	3	0.043	0.084	0.068	0.17	0.043	0.11	0.098	0.24	0.046	0.12	0.17	0.43	0.066	0.21	0.068	0.34	0.043	0.16	0.068	0.34	0.043	0.16
Nitrite	mg/L	0.02	0.00050	0.0020	0.0015	0.0028	0.00078	0.0015	0.0022	0.0042	0.00084	0.0017	0.0039	0.0088	0.0013	0.0039	0.0015	0.0059	0.00078	0.0025	0.0015	0.0059	0.00078	0.0025
Sulfate	mg/L	218	25	38	26	49	22	28	29	45	22	28	37	85	26	47	26	65	22	39	26	65	22	39
Aluminum, total	mg/L	0.270189	0.034	0.66	0.060	0.089	0.049	0.033	0.059	0.045	0.048	0.026	0.060	0.090	0.049	0.033	0.061	0.069	0.049	0.044	0.061	0.069	0.049	0.044
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.00015	0.00012	0.00012	0.000077	0.00015	0.00012	0.00012	0.000078	0.00015	0.00016	0.00012	0.00011	0.00015	0.00015	0.00012	0.00011	0.00015	0.00015	0.00012	0.00011
Arsenic, total	mg/L	0.005	0.00020	0.00060	0.00041	0.00045	0.00033	0.00027	0.00041	0.00044	0.00033	0.00027	0.00041	0.00049	0.00033	0.00030	0.00041	0.00051	0.00033	0.00036	0.00041	0.00051	0.00033	0.00036
Barium, total	mg/L	1	0.059	0.071	0.066	0.074	0.056	0.056	0.066	0.074	0.056	0.057	0.066	0.074	0.056	0.056	0.066	0.098	0.056	0.072	0.066	0.098	0.056	0.072
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000068	0.000067	0.000057	0.000050	0.000068	0.000068	0.000057	0.000051	0.000068	0.000067	0.000057	0.000050	0.000068	0.000090	0.000057	0.000065	0.000068	0.000090	0.000057	0.000065
Boron, total	mg/L	1.2	0.0050	0.050	0.011	0.022	0.0090	0.014	0.014	0.022	0.0094	0.014	0.012	0.025	0.0096	0.016	0.011	0.031	0.0090	0.019	0.011	0.031	0.0090	0.019
Cadmium, dissolved	mg/L	0.000163	0.0000075	0.000033	0.000010	0.0000070	0.0000089	0.0000051	0.000010	0.0000078	0.0000089	0.0000052	0.000011	0.0000095	0.0000092	0.0000065	0.000010	0.000011	0.0000089	0.0000069	0.000010	0.000011	0.0000089	0.0000069
Chromium, total	mg/L	0.0089	0.00020	0.00084	0.00033	0.00043	0.00027	0.00026	0.00033	0.00038	0.00027	0.00024	0.00033	0.00045	0.00027	0.00027	0.00033	0.00050	0.00027	0.00034	0.00033	0.00050	0.00027	0.00034
Cobalt, dissolved	mg/L	0.00045	0.000050	0.00010	0.00011	0.00018	0.000072	0.00011	0.00014	0.00024	0.000075	0.00012	0.00023	0.00048	0.00010	0.00026	0.00011	0.00038	0.000072	0.00018	0.00011	0.00038	0.000072	0.00018
Copper, dissolved	mg/L	0.0013	0.0011	0.0036	0.0016	0.0013	0.0013	0.00098	0.0016	0.0014	0.0014	0.00099	0.0016	0.0014	0.0014	0.0010	0.0016	0.0018	0.0013	0.0013	0.0016	0.0018	0.0013	0.0013
Iron, total	mg/L	1	0.040	0.70	0.094	0.30	0.061	0.062	0.068	0.056	0.056	0.032	0.094	0.30	0.061	0.064	0.097	0.16	0.061	0.086	0.097	0.16	0.061	0.086
Iron, dissolved	mg/L	0.35	0.015	0.12	0.020	0.021	0.017	0.016	0.020	0.022	0.017	0.016	0.021	0.023	0.017	0.018	0.020	0.031	0.017	0.021	0.020	0.031	0.017	0.021
Lead, dissolved	mg/L	0.0026	0.000025	0.000050	0.000042	0.000084	0.000033	0.000046	0.000053	0.000079	0.000034	0.000045	0.000070	0.00015	0.000042	0.000091	0.000042	0.00011	0.000033	0.000066	0.000042	0.00011	0.000033	0.000066
Manganese, total	mg/L	0.913	0.0036	0.029	0.0063	0.0082	0.0053	0.0040	0.0065	0.0063	0.0053	0.0036	0.0075	0.0096	0.0057	0.0056	0.0063	0.010	0.0053	0.0058	0.0063	0.010	0.0053	0.0058
Mercury, total	mg/L	0.00002	0.0000025	0.0000052	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00048	0.00062	0.00067	0.0016	0.00052	0.00075	0.00085	0.0014	0.00055	0.00077	0.0015	0.0034	0.00076	0.0018	0.00067	0.0021	0.00052	0.0011	0.00067	0.0021	0.00052	0.0011
Nickel, dissolved	mg/L	0.0022	0.00025	0.00060	0.00037	0.00051	0.00031	0.00038	0.00043	0.00059	0.00032	0.00039	0.00058	0.0010	0.00037	0.00066	0.00037	0.00094	0.00031	0.00055	0.00037	0.00094	0.00031	0.00055
Selenium, total	mg/L	0.002	0.000084	0.00020	0.00031	0.0011	0.00016	0.00043	0.00046	0.00092	0.00018	0.00044	0.00081	0.0022	0.00033	0.0012	0.00031	0.0014	0.00016	0.00070	0.00031	0.0014	0.00016	0.00070
Strontium, total	mg/L	2.5	0.080	0.11	0.11	0.16	0.093	0.12	0.11	0.17	0.094	0.12	0.11	0.17	0.094	0.12	0.11	0.23	0.093	0.16	0.11	0.23	0.093	0.16
Silver, total	mg/L	0.00005	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.0008	0.0000050	0.000010	0.0000073	0.0000093	0.0000063	0.0000066	0.0000080	0.000010	0.0000063	0.0000067	0.0000085	0.000012	0.0000066	0.0000079	0.0000073	0.000015	0.0000063	0.0000092	0.0000073	0.000015	0.0000063	0.0000092
Uranium, total	mg/L	0.0085	0.000056	0.00014	0.00013	0.00041	0.000095	0.00023	0.00019	0.00039	0.00010	0.00023	0.00024	0.00078	0.00013	0.00041	0.00013	0.00055	0.000095	0.00033	0.00013	0.00055	0.000095	0.00033
Zinc, dissolved	mg/L	0.007405	0.0013	0.0021	0.0018	0.0020	0.0016	0.0013	0.0018	0.0021	0.0016	0.0014	0.0019	0.0024	0.0016	0.0016	0.0018	0.0027	0.0016	0.0018	0.0018	0.0027	0.0016	0.0018

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-22

Parameter	Units	Telkwa River																					
		WQG	Baseline		WQS09																		
					Operations																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		44	64	42	62	38	58	42	62	38	58	42	62	38	58	42	62	38	58	42	61	38	58
Alkalinity, total	mg-$CaCO_3$/L		43	63	37	60	34	58	37	60	34	58	38	60	35	58	37	60	34	59	37	60	35	58
Chloride	mg/L	150	0.25	0.50	0.28	0.25	0.26	0.24	0.28	0.26	0.26	0.24	0.29	0.26	0.26	0.24	0.28	0.26	0.26	0.25	0.28	0.26	0.26	0.24
Fluoride	mg/L	1.0	0.028	0.038	0.029	0.035	0.027	0.035	0.029	0.035	0.027	0.035	0.029	0.035	0.027	0.035	0.029	0.036	0.027	0.035	0.029	0.035	0.027	0.035
Ammonia, total	mg-N/L	1.7	0.0025	0.0095	0.0037	0.0050	0.0028	0.0047	0.0037	0.0050	0.0027	0.0047	0.0068	0.0059	0.0032	0.0047	0.0037	0.0052	0.0028	0.0048	0.0037	0.0050	0.0028	0.0047
Nitrate	mg/L	3.0	0.012	0.076	0.022	0.060	0.013	0.058	0.021	0.060	0.012	0.058	0.047	0.066	0.016	0.058	0.022	0.061	0.013	0.059	0.022	0.060	0.013	0.058
Nitrite	mg/L	0.020	0.00050	0.0050	0.00071	0.00056	0.00054	0.00049	0.00070	0.00055	0.00054	0.00049	0.0013	0.00071	0.00063	0.00049	0.00071	0.00057	0.00054	0.00050	0.00071	0.00056	0.00055	0.00049
Sulfate	mg/L	218	5.6	9.0	7.8	7.7	6.5	7.5	7.8	7.8	6.4	7.5	8.9	8.2	6.8	7.5	7.9	7.7	6.5	7.3	7.8	7.8	6.6	7.5
Aluminum, total	mg/L	0.19	0.12	1.5	0.25	0.046	0.24	0.034	0.25	0.046	0.24	0.034	0.25	0.046	0.24	0.034	0.25	0.048	0.24	0.035	0.25	0.046	0.24	0.034
Antimony, dissolved	mg/L	0.074	0.000050	0.000050	0.000062	0.000052	0.000056	0.000050	0.000062	0.000052	0.000056	0.000050	0.000063	0.000052	0.000057	0.000050	0.000062	0.000053	0.000056	0.000050	0.000061	0.000052	0.000057	0.000050
Arsenic, total	mg/L	0.0050	0.00023	0.00055	0.00026	0.00022	0.00024	0.00021	0.00026	0.00022	0.00024	0.00021	0.00026	0.00022	0.00024	0.00021	0.00026	0.00022	0.00024	0.00021	0.00026	0.00022	0.00024	0.00021
Barium, total	mg/L	1.0	0.041	0.048	0.043	0.043	0.040	0.042	0.043	0.043	0.040	0.042	0.043	0.043	0.040	0.042	0.043	0.044	0.040	0.042	0.043	0.043	0.040	0.042
Beryllium, total	mg/L	0.00013	0.000050	0.000050	0.000054	0.000051	0.000051	0.000049	0.000054	0.000050	0.000051	0.000049	0.000054	0.000051	0.000051	0.000049	0.000054	0.000051	0.000051	0.000049	0.000054	0.000050	0.000051	0.000049
Boron, total	mg/L	1.2	0.0050	0.050	0.0058	0.0063	0.0054	0.0052	0.0058	0.0063	0.0054	0.0052	0.0061	0.0063	0.0055	0.0052	0.0059	0.0065	0.0054	0.0053	0.0059	0.0062	0.0054	0.0052
Cadmium, dissolved	mg/L	0.00011	0.0000061	0.0000099	0.0000075	0.0000052	0.0000069	0.0000049	0.0000075	0.0000052	0.0000069	0.0000049	0.0000077	0.0000052	0.0000070	0.0000049	0.0000076	0.0000053	0.0000070	0.0000049	0.0000075	0.0000052	0.0000070	0.0000049
Chromium, total	mg/L	0.0089	0.00020	0.0010	0.00023	0.00018	0.00022	0.00018	0.00023	0.00019	0.00022	0.00018	0.00024	0.00019	0.00022	0.00018	0.00024	0.00019	0.00022	0.00018	0.00023	0.00019	0.00022	0.00018
Cobalt, dissolved	mg/L	0.000390	0.000050	0.000082	0.000060	0.000052	0.000054	0.000049	0.000062	0.000052	0.000053	0.000049	0.000078	0.000056	0.000057	0.000049	0.000061	0.000053	0.000054	0.000050	0.000064	0.000053	0.000054	0.000049
Copper, dissolved	mg/L	0.0008	0.00060	0.0016	0.00080	0.00056	0.00073	0.00054	0.00080	0.00056	0.00073	0.00054	0.00080	0.00056	0.00073	0.00054	0.00081	0.00057	0.00073	0.00054	0.00080	0.00056	0.00073	0.00054
Iron, total	mg/L	1.0	0.29	1.3	0.32	0.22	0.30	0.21	0.32	0.23	0.29	0.21	0.32	0.22	0.30	0.21	0.32	0.23	0.30	0.21	0.31	0.22	0.29	0.21
Iron, dissolved	mg/L	0.35	0.088	0.26	0.067	0.12	0.064	0.12	0.067	0.12	0.064	0.12	0.067	0.12	0.064	0.12	0.067	0.13	0.064	0.12	0.066	0.12	0.063	0.12
Lead, dissolved	mg/L	0.0	0.000025	0.000097	0.000029	0.000026	0.000026	0.000024	0.000029	0.000026	0.000026	0.000024	0.000032	0.000027	0.000027	0.000025	0.000029	0.000026	0.000026	0.000025	0.000030	0.000026	0.000026	0.000025
Manganese, total	mg/L	0.79	0.019	0.075	0.021	0.010	0.020	0.0093	0.021	0.010	0.020	0.0093	0.022	0.010	0.020	0.0093	0.021	0.011	0.020	0.0095	0.021	0.010	0.020	0.0093
Mercury, total	mg/L	0.000020	0.0000025	0.0000068	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00050	0.00072	0.00066	0.00048	0.00059	0.00044	0.00066	0.00048	0.00058	0.00044	0.00077	0.00051	0.00061	0.00044	0.00066	0.00049	0.00059	0.00045	0.00068	0.00049	0.00059	0.00044
Nickel, dissolved	mg/L	0.0013	0.00025	0.00025	0.00028	0.00025	0.00026	0.00024	0.00028	0.00026	0.00026	0.00024	0.00031	0.00026	0.00027	0.00024	0.00028	0.00026	0.00026	0.00025	0.00029	0.00026	0.00026	0.00024
Selenium, total	mg/L	0.0020	0.000080	0.00020	0.00012	0.000090	0.000091	0.000078	0.00012	0.000090	0.000088	0.000078	0.00017	0.00010	0.00011	0.000079	0.00012	0.000093	0.000091	0.000079	0.00014	0.000094	0.000095	0.000078
Strontium, total	mg/L	2.5	0.067	0.087	0.062	0.084	0.058	0.082	0.062	0.084	0.058	0.082	0.063	0.084	0.058	0.082	0.063	0.085	0.058	0.083	0.062	0.084	0.058	0.082
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.0000050	0.0000055	0.0000051	0.0000052	0.0000049	0.0000055	0.0000051	0.0000052	0.0000049	0.0000057	0.0000051	0.0000052	0.0000049	0.0000056	0.0000052	0.0000052	0.0000050	0.0000055	0.0000051	0.0000052	0.0000049
Uranium, total	mg/L	0.0085	0.000057	0.000091	0.000066	0.000084	0.000059	0.000071	0.000067	0.000084	0.000059	0.000071	0.000080	0.000084	0.000063	0.000071	0.000067	0.000086	0.000059	0.000072	0.000070	0.000083	0.000060	0.000071
Zinc, dissolved	mg/L	0.0042	0.0015	0.0015	0.0016	0.0015	0.0015	0.0014	0.0016	0.0015	0.0015	0.0014	0.0016	0.0015	0.0015	0.0014	0.0016	0.0015	0.0015	0.0015	0.0016	0.0015	0.0015	0.0014

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-23

Parameter	Units	Telkwa River																					
		WQG	Baseline		WQS09																		
					Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		44	64	41	68	38	58	41	68	38	61	41	68	38	61	41	68	38	61	41	68	38	61
Alkalinity, total	mg-$CaCO_3$/L		43	63	36	67	34	59	36	68	34	60	36	68	35	61	36	68	34	60	36	67	34	60
Chloride	mg/L	150	0.25	0.50	0.27	0.28	0.26	0.26	0.27	0.28	0.26	0.26	0.28	0.30	0.26	0.27	0.27	0.28	0.26	0.26	0.27	0.28	0.26	0.26
Fluoride	mg/L	1.0	0.028	0.038	0.029	0.039	0.027	0.035	0.029	0.039	0.027	0.035	0.029	0.039	0.027	0.035	0.029	0.039	0.027	0.035	0.029	0.039	0.027	0.035
Ammonia, total	mg-N/L	1.7	0.0025	0.0095	0.0030	0.0059	0.0027	0.0052	0.0034	0.0066	0.0028	0.0053	0.0041	0.0084	0.0030	0.0064	0.0030	0.0061	0.0027	0.0053	0.0029	0.0058	0.0027	0.0052
Nitrate	mg/L	3.0	0.012	0.076	0.014	0.067	0.012	0.062	0.017	0.073	0.012	0.063	0.023	0.087	0.014	0.071	0.014	0.070	0.012	0.063	0.014	0.067	0.012	0.062
Nitrite	mg/L	0.020	0.00050	0.0050	0.00058	0.00070	0.00054	0.00058	0.00065	0.00081	0.00054	0.00060	0.00079	0.0011	0.00059	0.00080	0.00058	0.00072	0.00054	0.00060	0.00058	0.00069	0.00053	0.00058
Sulfate	mg/L	218	5.6	9.0	7.1	9.3	6.4	8.3	7.3	9.8	6.5	8.3	8.0	12	6.8	10	7.1	9.6	6.4	8.3	7.1	9.5	6.4	8.3
Aluminum, total	mg/L	0.19	0.12	1.5	0.26	0.050	0.24	0.036	0.26	0.049	0.24	0.035	0.26	0.050	0.24	0.036	0.26	0.050	0.24	0.036	0.26	0.050	0.24	0.036
Antimony, dissolved	mg/L	0.074	0.000050	0.000050	0.000060	0.000058	0.000056	0.000052	0.000059	0.000058	0.000056	0.000052	0.000060	0.000062	0.000057	0.000054	0.000060	0.000058	0.000056	0.000053	0.000059	0.000058	0.000056	0.000052
Arsenic, total	mg/L	0.0050	0.00023	0.00055	0.00025	0.00024	0.00024	0.00021	0.00025	0.00024	0.00024	0.00021	0.00025	0.00024	0.00024	0.00022	0.00025	0.00024	0.00024	0.00022	0.00025	0.00024	0.00024	0.00021
Barium, total	mg/L	1.0	0.041	0.048	0.042	0.047	0.040	0.042	0.042	0.047	0.040	0.043	0.042	0.047	0.040	0.042	0.042	0.047	0.040	0.043	0.042	0.047	0.040	0.042
Beryllium, total	mg/L	0.00013	0.000050	0.000050	0.000054	0.000054	0.000051	0.000049	0.000054	0.000054	0.000051	0.000049	0.000054	0.000054	0.000051	0.000049	0.000054	0.000054	0.000051	0.000050	0.000054	0.000054	0.000051	0.000049
Boron, total	mg/L	1.2	0.0050	0.050	0.0057	0.0069	0.0054	0.0058	0.0058	0.0070	0.0055	0.0058	0.0058	0.0071	0.0055	0.0060	0.0058	0.0070	0.0054	0.0059	0.0057	0.0069	0.0054	0.0058
Cadmium, dissolved	mg/L	0.00011	0.0000061	0.0000099	0.0000073	0.0000054	0.0000070	0.0000049	0.0000073	0.0000054	0.0000070	0.0000050	0.0000074	0.0000056	0.0000070	0.0000051	0.0000073	0.0000054	0.0000070	0.0000050	0.0000073	0.0000054	0.0000070	0.0000049
Chromium, total	mg/L	0.0089	0.00020	0.0010	0.00023	0.00021	0.00022	0.00019	0.00023	0.00021	0.00022	0.00018	0.00023	0.00021	0.00022	0.00019	0.00023	0.00021	0.00022	0.00019	0.00023	0.00021	0.00022	0.00019
Cobalt, dissolved	mg/L	0.000390	0.000050	0.000082	0.000056	0.000062	0.000053	0.000055	0.000059	0.000067	0.000053	0.000056	0.000066	0.000086	0.000056	0.000067	0.000056	0.000064	0.000053	0.000056	0.000056	0.000062	0.000053	0.000055
Copper, dissolved	mg/L	0.0008	0.00060	0.0016	0.00077	0.00063	0.00073	0.00055	0.00077	0.00063	0.00073	0.00055	0.00078	0.00064	0.00073	0.00056	0.00078	0.00064	0.00073	0.00056	0.00077	0.00063	0.00073	0.00055
Iron, total	mg/L	1.0	0.29	1.3	0.32	0.23	0.30	0.21	0.32	0.23	0.29	0.21	0.32	0.23	0.30	0.21	0.32	0.23	0.30	0.22	0.32	0.23	0.30	0.21
Iron, dissolved	mg/L	0.35	0.088	0.26	0.069	0.12	0.064	0.12	0.069	0.12	0.064	0.12	0.069	0.12	0.064	0.12	0.069	0.13	0.064	0.12	0.069	0.12	0.064	0.12
Lead, dissolved	mg/L	0.0	0.000025	0.000097	0.000028	0.000029	0.000026	0.000026	0.000027	0.000030	0.000026	0.000027	0.000030	0.000036	0.000027	0.000031	0.000028	0.000029	0.000026	0.000027	0.000028	0.000029	0.000026	0.000027
Manganese, total	mg/L	0.79	0.019	0.075	0.022	0.011	0.020	0.0094	0.022	0.011	0.020	0.0094	0.022	0.011	0.020	0.0096	0.022	0.011	0.020	0.0096	0.022	0.011	0.020	0.0094
Mercury, total	mg/L	0.000020	0.0000025	0.0000068	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00050	0.00072	0.00061	0.00053	0.00058	0.00048	0.00061	0.00054	0.00058	0.00048	0.00066	0.00070	0.00060	0.00057	0.00061	0.00053	0.00058	0.00048	0.00061	0.00053	0.00058	0.00048
Nickel, dissolved	mg/L	0.0013	0.00025	0.00025	0.00027	0.00028	0.00026	0.00026	0.00027	0.00029	0.00026	0.00026	0.00029	0.00033	0.00027	0.00028	0.00027	0.00028	0.00026	0.00026	0.00027	0.00028	0.00026	0.00026
Selenium, total	mg/L	0.0020	0.000080	0.00020	0.00010	0.00014	0.000087	0.00011	0.00011	0.00015	0.000089	0.00011	0.00014	0.00026	0.00010	0.00017	0.00010	0.00014	0.000087	0.00011	0.00010	0.00013	0.000087	0.00011
Strontium, total	mg/L	2.5	0.067	0.087	0.061	0.095	0.058	0.084	0.060	0.095	0.058	0.084	0.061	0.095	0.058	0.084	0.061	0.096	0.058	0.085	0.061	0.095	0.058	0.084
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.0000050	0.0000055	0.0000055	0.0000052	0.0000051	0.0000054	0.0000056	0.0000052	0.0000051	0.0000055	0.0000057	0.0000052	0.0000052	0.0000055	0.0000056	0.0000052	0.0000051	0.0000054	0.0000055	0.0000052	0.0000051
Uranium, total	mg/L	0.0085	0.000057	0.000091	0.000063	0.000097	0.000059	0.000082	0.000065	0.000099	0.000059	0.000082	0.000072	0.00012	0.000062	0.000098	0.000063	0.000098	0.000059	0.000084	0.000063	0.000099	0.000059	0.000082
Zinc, dissolved	mg/L	0.0042	0.0015	0.0015	0.0016	0.0016	0.0015	0.0015	0.0016	0.0016	0.0015	0.0015	0.0016	0.0016	0.0015	0.0015	0.0016	0.0016	0.0015	0.0015	0.0016	0.0016	0.0015	0.0015

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-24

Parameter	Units	Bulkley River																					
		WQG	Baseline		WQS11 Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		29	40	27	34	26	34	27	34	26	34	27	34	26	34	27	34	26	34	27	34	26	34
Alkalinity, total	mg-$CaCO_3$/L		28	36	27	34	26	33	27	34	26	33	27	34	26	33	27	34	26	33	27	34	26	33
Chloride	mg/L	150	0.25	0.78	0.26	0.51	0.25	0.50	0.26	0.51	0.25	0.50	0.26	0.51	0.25	0.50	0.26	0.51	0.25	0.50	0.26	0.52	0.25	0.50
Fluoride	mg/L	0.8	0.023	0.035	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028
Ammonia, total	mg-N/L	1.6	0.0050	0.017	0.0052	0.0061	0.0051	0.0059	0.0052	0.0061	0.0051	0.0059	0.0052	0.0061	0.0051	0.0059	0.0052	0.0061	0.0051	0.0059	0.0052	0.0061	0.0050	0.0059
Nitrate	mg/L	3.0	0.013	0.041	0.014	0.038	0.013	0.037	0.014	0.038	0.013	0.037	0.014	0.038	0.013	0.037	0.014	0.038	0.013	0.037	0.014	0.038	0.013	0.038
Nitrite	mg/L	0.020	0.0020	0.0050	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052
Sulfate	mg/L	128	4.0	5.0	4.1	4.7	4.0	4.6	4.1	4.7	4.0	4.6	4.1	4.7	4.0	4.6	4.1	4.7	4.0	4.6	4.1	4.8	4.0	4.6
Aluminum, total	mg/L	0.18	0.088	1.2	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050
Arsenic, total	mg/L	0.0050	0.00021	0.00069	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020
Barium, total	mg/L	1.0	0.026	0.035	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050
Boron, total	mg/L	1.2	0.0050	0.010	0.0052	0.0052	0.0050	0.0050	0.0052	0.0052	0.0050	0.0050	0.0052	0.0052	0.0050	0.0050	0.0052	0.0052	0.0050	0.0050	0.0052	0.0052	0.0050	0.0050
Cadmium, dissolved	mg/L	0.00009	0.0000025	0.0000068	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025
Chromium, total	mg/L	0.0089	0.00020	0.0010	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017
Cobalt, dissolved	mg/L	0.000390	0.000050	0.00010	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000050	0.000050	0.000052	0.000052	0.000050	0.000050
Copper, dissolved	mg/L	0.0011	0.00058	0.0016	0.00060	0.00058	0.00059	0.00056	0.00060	0.00058	0.00059	0.00056	0.00060	0.00058	0.00059	0.00056	0.00060	0.00058	0.00059	0.00056	0.00060	0.00059	0.00058	0.00056
Iron, total	mg/L	1.0	0.12	1.3	0.15	0.084	0.15	0.077	0.15	0.084	0.15	0.077	0.15	0.084	0.15	0.077	0.15	0.084	0.15	0.077	0.15	0.085	0.15	0.077
Iron, dissolved	mg/L	0.35	0.032	0.15	0.016	0.035	0.015	0.035	0.016	0.035	0.015	0.035	0.016	0.035	0.015	0.035	0.016	0.035	0.015	0.035	0.016	0.035	0.015	0.035
Lead, dissolved	mg/L	0.0	0.000025	0.000050	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025
Manganese, total	mg/L	0.73	0.012	0.053	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074
Mercury, total	mg/L	0.000020	0.0000025	0.0000053	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00037	0.00052	0.00038	0.00035	0.00037	0.00034	0.00038	0.00035	0.00037	0.00034	0.00038	0.00035	0.00037	0.00034	0.00038	0.00035	0.00037	0.00034	0.00038	0.00036	0.00037	0.00034
Nickel, dissolved	mg/L	0.0010	0.00025	0.00073	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025
Selenium, total	mg/L	0.0020	0.000025	0.00020	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025
Strontium, total	mg/L	2.5	0.042	0.060	0.040	0.054	0.039	0.053	0.040	0.054	0.039	0.053	0.040	0.054	0.039	0.053	0.040	0.054	0.039	0.053	0.040	0.054	0.039	0.053
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000013	0.0000052	0.0000052	0.0000050	0.0000050	0.0000052	0.0000052	0.0000050	0.0000050	0.0000052	0.0000052	0.0000051	0.0000050	0.0000052	0.0000052	0.0000050	0.0000050	0.0000052	0.0000052	0.0000050	0.0000050
Uranium, total	mg/L	0.0085	0.000035	0.000083	0.000036	0.000041	0.000035	0.000040	0.000036	0.000041	0.000035	0.000040	0.000036	0.000041	0.000035	0.000040	0.000036	0.000041	0.000035	0.000040	0.000036	0.000041	0.000035	0.000040
Zinc, dissolved	mg/L	0.0039	0.00075	0.0023	0.0015	0.0011	0.0015	0.00100	0.0015	0.0011	0.0015	0.00100	0.0015	0.0011	0.0015	0.00100	0.0015	0.0011	0.0015	0.00100	0.0015	0.0011	0.0015	0.00100

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-25

Parameter	Units	Bulkley River																					
		WQG	Baseline		WQS11 Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		29	40	27	35	26	34	27	35	26	34	27	35	26	34	27	35	26	34	27	35	26	34
Alkalinity, total	mg-$CaCO_3$/L		28	36	27	34	26	33	27	34	26	33	27	34	26	33	27	34	26	33	27	34	26	33
Chloride	mg/L	150	0.25	0.78	0.27	0.53	0.25	0.50	0.27	0.53	0.25	0.50	0.27	0.53	0.25	0.50	0.27	0.53	0.25	0.50	0.27	0.53	0.25	0.50
Fluoride	mg/L	0.8	0.023	0.035	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028	0.024	0.029	0.023	0.028
Ammonia, total	mg-N/L	1.6	0.0050	0.017	0.0052	0.0062	0.0051	0.0059	0.0052	0.0062	0.0051	0.0059	0.0052	0.0062	0.0051	0.0059	0.0052	0.0062	0.0051	0.0059	0.0052	0.0062	0.0051	0.0059
Nitrate	mg/L	3.0	0.013	0.041	0.014	0.040	0.013	0.038	0.014	0.040	0.013	0.038	0.014	0.040	0.013	0.038	0.014	0.040	0.013	0.038	0.014	0.040	0.013	0.038
Nitrite	mg/L	0.020	0.0020	0.0050	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052	0.0028	0.00065	0.0027	0.00052
Sulfate	mg/L	128	4.0	5.0	4.1	4.8	4.0	4.6	4.1	4.8	4.0	4.6	4.1	4.8	4.0	4.6	4.1	4.8	4.0	4.6	4.1	4.8	4.0	4.6
Aluminum, total	mg/L	0.18	0.088	1.2	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039	0.11	0.045	0.11	0.039
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050
Arsenic, total	mg/L	0.0050	0.00021	0.00069	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020	0.00022	0.00021	0.00021	0.00020
Barium, total	mg/L	1.0	0.026	0.035	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024	0.027	0.025	0.026	0.024
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050
Boron, total	mg/L	1.2	0.0050	0.010	0.0052	0.0052	0.0051	0.0050	0.0052	0.0052	0.0051	0.0050	0.0052	0.0052	0.0051	0.0050	0.0052	0.0052	0.0051	0.0050	0.0052	0.0052	0.0051	0.0050
Cadmium, dissolved	mg/L	0.00009	0.0000025	0.0000068	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025	0.0000026	0.0000026	0.0000025	0.0000025
Chromium, total	mg/L	0.0089	0.00020	0.0010	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017	0.00021	0.00018	0.00020	0.00017
Cobalt, dissolved	mg/L	0.000390	0.000050	0.00010	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050	0.000052	0.000052	0.000051	0.000050
Copper, dissolved	mg/L	0.0011	0.00058	0.0016	0.00060	0.00059	0.00059	0.00056	0.00060	0.00059	0.00059	0.00056	0.00060	0.00059	0.00059	0.00056	0.00060	0.00059	0.00059	0.00056	0.00060	0.00059	0.00059	0.00056
Iron, total	mg/L	1.0	0.12	1.3	0.16	0.084	0.15	0.077	0.16	0.084	0.15	0.077	0.16	0.084	0.15	0.077	0.16	0.084	0.15	0.077	0.16	0.084	0.15	0.077
Iron, dissolved	mg/L	0.35	0.032	0.15	0.016	0.037	0.015	0.035	0.016	0.037	0.015	0.035	0.016	0.037	0.015	0.035	0.016	0.037	0.015	0.035	0.016	0.037	0.015	0.035
Lead, dissolved	mg/L	0.0	0.000025	0.000050	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025
Manganese, total	mg/L	0.73	0.012	0.053	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074	0.012	0.0080	0.012	0.0074
Mercury, total	mg/L	0.000020	0.0000025	0.0000053	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00037	0.00052	0.00038	0.00036	0.00037	0.00034	0.00038	0.00036	0.00037	0.00034	0.00038	0.00036	0.00037	0.00034	0.00038	0.00036	0.00037	0.00034	0.00038	0.00036	0.00037	0.00034
Nickel, dissolved	mg/L	0.0010	0.00025	0.00073	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025	0.00026	0.00026	0.00025	0.00025
Selenium, total	mg/L	0.0020	0.000025	0.00020	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025	0.000026	0.000026	0.000025	0.000025
Strontium, total	mg/L	2.5	0.042	0.060	0.040	0.055	0.040	0.053	0.040	0.055	0.040	0.053	0.040	0.055	0.040	0.053	0.040	0.055	0.040	0.053	0.040	0.055	0.040	0.053
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000013	0.0000052	0.0000052	0.0000051	0.0000050	0.0000052	0.0000052	0.0000051	0.0000050	0.0000052	0.0000052	0.0000051	0.0000050	0.0000052	0.0000052	0.0000051	0.0000050	0.0000052	0.0000052	0.0000051	0.0000050
Uranium, total	mg/L	0.0085	0.000035	0.000083	0.000036	0.000042	0.000035	0.000040	0.000036	0.000042	0.000035	0.000040	0.000036	0.000042	0.000035	0.000040	0.000036	0.000042	0.000035	0.000040	0.000036	0.000042	0.000035	0.000040
Zinc, dissolved	mg/L	0.0039	0.00075	0.0023	0.0016	0.0011	0.0015	0.00100	0.0016	0.0011	0.0015	0.00100	0.0016	0.0011	0.0015	0.00100	0.0016	0.0011	0.0015	0.00100	0.0016	0.0011	0.0015	0.00100

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-26

Parameter	Units	Bulkley River																					
		WQG	Baseline		WQS12																		
					Operations																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		29	40	30	41	29	38	30	41	29	38	30	41	29	38	30	41	29	38	30	41	29	38
Alkalinity, total	mg-$CaCO_3$/L		28	36	29	39	28	37	29	39	28	37	29	39	28	37	29	38	28	36	29	39	28	37
Chloride	mg/L	150	0.25	0.78	0.27	0.51	0.26	0.46	0.27	0.51	0.26	0.46	0.27	0.51	0.26	0.46	0.27	0.50	0.26	0.47	0.27	0.51	0.26	0.47
Fluoride	mg/L	0.8	0.023	0.035	0.025	0.031	0.024	0.029	0.025	0.031	0.024	0.029	0.025	0.031	0.024	0.029	0.025	0.031	0.024	0.029	0.025	0.032	0.024	0.029
Ammonia, total	mg-N/L	1.6	0.0050	0.017	0.0051	0.0063	0.0047	0.0057	0.0051	0.0063	0.0047	0.0057	0.0053	0.0063	0.0048	0.0057	0.0051	0.0062	0.0047	0.0057	0.0051	0.0064	0.0047	0.0057
Nitrate	mg/L	3.0	0.013	0.041	0.016	0.042	0.013	0.041	0.016	0.042	0.013	0.041	0.020	0.043	0.014	0.041	0.016	0.042	0.013	0.040	0.016	0.043	0.013	0.041
Nitrite	mg/L	0.020	0.0020	0.0050	0.0026	0.00075	0.0024	0.00053	0.0026	0.00075	0.0024	0.00053	0.0026	0.00077	0.0024	0.00053	0.0026	0.00075	0.0024	0.00053	0.0027	0.00076	0.0024	0.00053
Sulfate	mg/L	128	4.0	5.0	4.8	5.4	4.5	5.0	4.8	5.5	4.5	5.0	4.8	5.5	4.5	5.0	4.8	5.3	4.5	4.9	4.7	5.5	4.5	5.0
Aluminum, total	mg/L	0.18	0.088	1.2	0.15	0.050	0.13	0.039	0.15	0.050	0.13	0.039	0.15	0.050	0.13	0.039	0.15	0.050	0.13	0.039	0.14	0.051	0.13	0.039
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.000054	0.000055	0.000052	0.000050	0.000054	0.000056	0.000052	0.000050	0.000054	0.000055	0.000052	0.000050	0.000054	0.000055	0.000052	0.000050	0.000054	0.000056	0.000052	0.000050
Arsenic, total	mg/L	0.0050	0.00021	0.00069	0.00023	0.00022	0.00022	0.00020	0.00023	0.00022	0.00022	0.00020	0.00023	0.00022	0.00022	0.00020	0.00023	0.00022	0.00022	0.00020	0.00023	0.00023	0.00022	0.00020
Barium, total	mg/L	1.0	0.026	0.035	0.031	0.029	0.029	0.027	0.031	0.029	0.029	0.027	0.031	0.029	0.029	0.027	0.031	0.029	0.029	0.026	0.030	0.029	0.029	0.027
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000053	0.000055	0.000051	0.000050	0.000053	0.000055	0.000051	0.000050	0.000053	0.000055	0.000051	0.000050	0.000053	0.000055	0.000051	0.000050	0.000053	0.000056	0.000051	0.000050
Boron, total	mg/L	1.2	0.0050	0.010	0.0054	0.0055	0.0051	0.0050	0.0054	0.0056	0.0051	0.0050	0.0054	0.0055	0.0052	0.0050	0.0054	0.0055	0.0051	0.0050	0.0054	0.0056	0.0051	0.0050
Cadmium, dissolved	mg/L	0.00009	0.0000025	0.0000068	0.0000038	0.0000031	0.0000033	0.0000029	0.0000038	0.0000031	0.0000033	0.0000029	0.0000038	0.0000031	0.0000033	0.0000029	0.0000038	0.0000030	0.0000033	0.0000028	0.0000036	0.0000031	0.0000032	0.0000029
Chromium, total	mg/L	0.0089	0.00020	0.0010	0.00022	0.00019	0.00021	0.00017	0.00022	0.00019	0.00021	0.00017	0.00022	0.00019	0.00021	0.00017	0.00022	0.00019	0.00021	0.00017	0.00022	0.00019	0.00021	0.00017
Cobalt, dissolved	mg/L	0.000390	0.000050	0.00010	0.000054	0.000055	0.000051	0.000050	0.000054	0.000055	0.000051	0.000050	0.000057	0.000055	0.000052	0.000050	0.000054	0.000055	0.000051	0.000050	0.000054	0.000056	0.000051	0.000050
Copper, dissolved	mg/L	0.0011	0.00058	0.0016	0.00064	0.00062	0.00061	0.00056	0.00064	0.00062	0.00061	0.00056	0.00064	0.00062	0.00061	0.00056	0.00064	0.00061	0.00061	0.00055	0.00064	0.00063	0.00061	0.00056
Iron, total	mg/L	1.0	0.12	1.3	0.20	0.11	0.18	0.099	0.20	0.11	0.18	0.099	0.20	0.11	0.18	0.099	0.20	0.11	0.18	0.096	0.19	0.11	0.17	0.099
Iron, dissolved	mg/L	0.35	0.032	0.15	0.028	0.050	0.024	0.048	0.028	0.050	0.024	0.048	0.028	0.050	0.024	0.048	0.028	0.048	0.024	0.046	0.026	0.050	0.023	0.048
Lead, dissolved	mg/L	0.0	0.000025	0.000050	0.000027	0.000028	0.000026	0.000025	0.000027	0.000028	0.000026	0.000025	0.000027	0.000028	0.000026	0.000025	0.000027	0.000027	0.000026	0.000025	0.000027	0.000028	0.000026	0.000025
Manganese, total	mg/L	0.73	0.012	0.053	0.015	0.0090	0.013	0.0077	0.015	0.0090	0.013	0.0078	0.015	0.0090	0.013	0.0078	0.015	0.0088	0.013	0.0077	0.014	0.0090	0.013	0.0078
Mercury, total	mg/L	0.000020	0.0000025	0.0000053	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00037	0.00052	0.00044	0.00040	0.00041	0.00036	0.00044	0.00040	0.00041	0.00036	0.00044	0.00040	0.00042	0.00036	0.00044	0.00039	0.00041	0.00035	0.00043	0.00040	0.00041	0.00036
Nickel, dissolved	mg/L	0.0010	0.00025	0.00073	0.00027	0.00028	0.00026	0.00025	0.00027	0.00028	0.00026	0.00025	0.00027	0.00028	0.00026	0.00025	0.00027	0.00027	0.00026	0.00025	0.00027	0.00028	0.00026	0.00025
Selenium, total	mg/L	0.0020	0.000025	0.00020	0.000042	0.000036	0.000036	0.000033	0.000041	0.000036	0.000036	0.000033	0.000046	0.000038	0.000039	0.000033	0.000042	0.000035	0.000036	0.000032	0.000041	0.000037	0.000036	0.000033
Strontium, total	mg/L	2.5	0.042	0.060	0.045	0.061	0.043	0.057	0.045	0.061	0.043	0.057	0.045	0.061	0.043	0.057	0.045	0.060	0.043	0.057	0.045	0.062	0.043	0.057
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000013	0.0000053	0.0000055	0.0000051	0.0000050	0.0000053	0.0000055	0.0000051	0.0000050	0.0000053	0.0000055	0.0000051	0.0000050	0.0000053	0.0000055	0.0000051	0.0000050	0.0000053	0.0000056	0.0000051	0.0000050
Uranium, total	mg/L	0.0085	0.000035	0.000083	0.000042	0.000048	0.000040	0.000045	0.000042	0.000048	0.000040	0.000045	0.000042	0.000048	0.000040	0.000045	0.000042	0.000047	0.000040	0.000044	0.000042	0.000048	0.000039	0.000045
Zinc, dissolved	mg/L	0.0039	0.00075	0.0023	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

Table G-27

Parameter	Units	Bulkley River																					
		WQG	Baseline		WQS12																		
					Closure																		
					Final EAC Project Case (2024)				Maximized hydraulic groundwater conductivity (Alt Case 1)				High Source terms (Alt Case 2)				Low Flow (Alt Case 5)				10% Increased precipitation (Alt Case 7)			
			P50	P95	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter	Max Summer	Max Winter	Average Summer	Average Winter
Total Hardness	mg-$CaCO_3$/L		29	40	31	41	29	38	31	41	29	38	31	41	29	38	31	41	29	38	31	41	29	38
Alkalinity, total	mg-$CaCO_3$/L		28	36	30	41	28	37	30	41	28	37	30	41	28	37	30	40	28	36	30	41	28	37
Chloride	mg/L	150	0.25	0.78	0.27	0.54	0.26	0.47	0.27	0.55	0.26	0.47	0.27	0.55	0.26	0.47	0.27	0.54	0.26	0.47	0.27	0.55	0.26	0.47
Fluoride	mg/L	0.8	0.023	0.035	0.026	0.033	0.024	0.029	0.026	0.033	0.024	0.029	0.026	0.033	0.024	0.029	0.026	0.032	0.024	0.029	0.026	0.033	0.024	0.029
Ammonia, total	mg-N/L	1.6	0.0050	0.017	0.0049	0.0066	0.0047	0.0058	0.0049	0.0068	0.0047	0.0058	0.0049	0.0070	0.0048	0.0060	0.0049	0.0066	0.0047	0.0058	0.0049	0.0066	0.0047	0.0058
Nitrate	mg/L	3.0	0.013	0.041	0.015	0.047	0.013	0.041	0.015	0.048	0.013	0.041	0.015	0.049	0.014	0.042	0.015	0.046	0.013	0.041	0.015	0.047	0.013	0.041
Nitrite	mg/L	0.020	0.0020	0.0050	0.0025	0.00077	0.0024	0.00054	0.0025	0.00077	0.0024	0.00055	0.0025	0.00079	0.0024	0.00057	0.0025	0.00076	0.0024	0.00054	0.0025	0.00076	0.0024	0.00054
Sulfate	mg/L	128	4.0	5.0	4.7	5.7	4.5	5.1	4.8	5.9	4.5	5.1	4.8	6.0	4.5	5.3	4.7	5.6	4.5	5.0	4.7	5.7	4.5	5.1
Aluminum, total	mg/L	0.18	0.088	1.2	0.15	0.051	0.13	0.040	0.15	0.051	0.13	0.039	0.15	0.051	0.13	0.040	0.15	0.051	0.13	0.040	0.15	0.051	0.13	0.040
Antimony, dissolved	mg/L	0.074	0.000050	0.00010	0.000055	0.000057	0.000052	0.000050	0.000055	0.000057	0.000052	0.000050	0.000055	0.000057	0.000052	0.000051	0.000055	0.000056	0.000052	0.000050	0.000055	0.000057	0.000052	0.000050
Arsenic, total	mg/L	0.0050	0.00021	0.00069	0.00023	0.00023	0.00022	0.00020	0.00023	0.00023	0.00022	0.00020	0.00023	0.00023	0.00022	0.00020	0.00023	0.00022	0.00022	0.00020	0.00023	0.00023	0.00022	0.00020
Barium, total	mg/L	1.0	0.026	0.035	0.031	0.030	0.029	0.027	0.031	0.030	0.029	0.027	0.031	0.030	0.029	0.027	0.031	0.029	0.029	0.026	0.031	0.030	0.029	0.027
Beryllium, total	mg/L	0.00013	0.000050	0.00010	0.000054	0.000056	0.000051	0.000050	0.000054	0.000057	0.000051	0.000050	0.000054	0.000056	0.000051	0.000050	0.000054	0.000056	0.000051	0.000050	0.000054	0.000056	0.000051	0.000050
Boron, total	mg/L	1.2	0.0050	0.010	0.0054	0.0057	0.0052	0.0051	0.0054	0.0058	0.0052	0.0051	0.0054	0.0058	0.0052	0.0051	0.0054	0.0057	0.0052	0.0051	0.0054	0.0057	0.0052	0.0051
Cadmium, dissolved	mg/L	0.00009	0.0000025	0.0000068	0.0000038	0.0000032	0.0000033	0.0000028	0.0000038	0.0000032	0.0000033	0.0000029	0.0000038	0.0000032	0.0000033	0.0000029	0.0000038	0.0000031	0.0000033	0.0000028	0.0000038	0.0000032	0.0000033	0.0000028
Chromium, total	mg/L	0.0089	0.00020	0.0010	0.00022	0.00020	0.00021	0.00017	0.00022	0.00020	0.00021	0.00017	0.00022	0.00020	0.00021	0.00017	0.00022	0.00019	0.00021	0.00017	0.00022	0.00019	0.00021	0.00017
Cobalt, dissolved	mg/L	0.000390	0.000050	0.00010	0.000054	0.000058	0.000051	0.000051	0.000054	0.000059	0.000051	0.000051	0.000054	0.000060	0.000052	0.000052	0.000054	0.000057	0.000051	0.000051	0.000054	0.000058	0.000051	0.000051
Copper, dissolved	mg/L	0.0011	0.00058	0.0016	0.00065	0.00063	0.00062	0.00056	0.00065	0.00063	0.00062	0.00056	0.00065	0.00063	0.00062	0.00056	0.00065	0.00062	0.00062	0.00056	0.00065	0.00063	0.00062	0.00056
Iron, total	mg/L	1.0	0.12	1.3	0.20	0.11	0.18	0.097	0.20	0.11	0.18	0.098	0.20	0.11	0.18	0.097	0.20	0.11	0.18	0.096	0.20	0.11	0.18	0.097
Iron, dissolved	mg/L	0.35	0.032	0.15	0.028	0.052	0.024	0.046	0.028	0.053	0.024	0.047	0.028	0.052	0.024	0.046	0.028	0.050	0.024	0.045	0.028	0.052	0.024	0.046
Lead, dissolved	mg/L	0.0	0.000025	0.000050	0.000027	0.000028	0.000026	0.000025	0.000027	0.000029	0.000026	0.000025	0.000027	0.000029	0.000026	0.000026	0.000027	0.000028	0.000026	0.000025	0.000027	0.000029	0.000026	0.000025
Manganese, total	mg/L	0.73	0.012	0.053	0.015	0.0090	0.014	0.0078	0.015	0.0091	0.014	0.0078	0.015	0.0091	0.014	0.0078	0.015	0.0089	0.014	0.0077	0.015	0.0090	0.014	0.0078
Mercury, total	mg/L	0.000020	0.0000025	0.0000053	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025	0.0000025
Molybdenum, total	mg-N/L	0.034	0.00037	0.00052	0.00045	0.00040	0.00041	0.00036	0.00045	0.00041	0.00041	0.00036	0.00045	0.00042	0.00041	0.00037	0.00045	0.00040	0.00041	0.00036	0.00045	0.00041	0.00041	0.00036
Nickel, dissolved	mg/L	0.0010	0.00025	0.00073	0.00027	0.00028	0.00026	0.00025	0.00027	0.00029	0.00026	0.00025	0.00027	0.00029	0.00026	0.00025	0.00027	0.00028	0.00026	0.00025	0.00027	0.00028	0.00026	0.00025
Selenium, total	mg/L	0.0020	0.000025	0.00020	0.000041	0.000045	0.000036	0.000037	0.000042	0.000046	0.000036	0.000037	0.000043	0.000057	0.000038	0.000045	0.000041	0.000041	0.000036	0.000036	0.000041	0.000042	0.000036	0.000037
Strontium, total	mg/L	2.5	0.042	0.060	0.046	0.064	0.043	0.057	0.046	0.064	0.043	0.057	0.046	0.064	0.043	0.057	0.046	0.063	0.043	0.057	0.046	0.064	0.043	0.057
Silver, total	mg/L	0.000050	0.0000050	0.000020	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Thallium, total	mg/L	0.00080	0.0000050	0.000013	0.0000054	0.0000057	0.0000051	0.0000050	0.0000054	0.0000057	0.0000051	0.0000050	0.0000054	0.0000057	0.0000051	0.0000050	0.0000054	0.0000056	0.0000051	0.0000050	0.0000054	0.0000057	0.0000051	0.0000050
Uranium, total	mg/L	0.0085	0.000035	0.000083	0.000043	0.000051	0.000040	0.000046	0.000043	0.000052	0.000040	0.000046	0.000043	0.000054	0.000040	0.000048	0.000043	0.000050	0.000040	0.000045	0.000043	0.000051	0.000040	0.000046
Zinc, dissolved	mg/L	0.0039	0.00075	0.0023	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011	0.0016	0.0012	0.0015	0.0011

Red highlight is a WQG exceedance
Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20250403_FEAC_2024/Results_Streams_WaterQuality_UEA_v41_20250717.xlsm

APPENDIX 4.3-B: TENAS PROJECT – HYDROMETEOROLOGICAL BASELINE AND MODEL DEVELOPMENT REPORT (UPDATE 2025), SRK CONSULTING

TELKWA COAL
LIMITED

Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2025)

Prepared for

Telkwa Mining Ltd

Prepared by

srk consulting

SRK Consulting (Canada) Inc.
CAPR002055
August 2025

Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2025)

August 2025

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Attachments

Attachment A AGRA 1999 Report
Attachment B Baseflow Separation Results
Attachment C AGRA Data

Executive Summary

As part of the Tenas Project Environmental Assessment, SRK Consulting (Canada) Inc. (SRK) was retained by Telkwa Mining Ltd (TCM) to complete a hydrometeorological analysis for the Tenas Project (the Project).

The Project is located approximately 25 km southwest of the town of Smithers, BC within the Telkwa River watershed and is composed of an open pit, backfill, external stockpiles, water management ponds, control ponds, process plant and rail load out.

This report presents the hydrometeorological baseline of the Project. The key objective of this report is to to develop inputs to the Project water management plan and water and load balance model.

Site hydrometeorological conditions are monitored via a site weather station and five (5) hydrometric stations located on each of the major watercourses (Goathorn-Hydro, Telkwa-Hydro, Tenas-Hydro/Tenas-Hydro B, and Four-Hydro). The weather station was operated from 2017 to 2022. Hydrometric stations have two to three complete hydrologic years of data recorded within the 2017 to 2022 period. For this assessment, the relatively short site datasets are supplemented with regional datasets and climate re-analysis models.

Synthetic long-term Project climate datasets were developed based on transposing the regional datasets at Smithers Airport to the site and adjusting for observed orographic effects. These datasets were used to derive Project design parameters and water and load balance inputs, as well as to support development of a rainfall-runoff model. This model was developed and calibrated for each of the local hydrometric stations. A combination of the calibrated models from Goathorn Creek and Tenas Creek were applied to the Tenas Project area.

Selected climate parameters are summarized in Table 0-1 to Table 0-3.

Table 0-1: Derived Monthly and Annual Project Climate Normals

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Temperature (°C)[1]	-9.2	-6.1	-2.7	2.1	6.8	10.7	13.0	12.5	8.4	2.6	-3.8	-7.9	2.2
Rainfall (mm) [1]	4.3	2.6	3.1	15.1	41.7	70.7	58.1	55.8	63.8	42.8	10.2	2.0	370.2
Snowfall (mm) [1]	56.6	32.8	24.0	17.5	8.9	0.2	0.0	0.3	4.6	42.7	63.6	54.4	305.6
Total Precipitation (mm) [1]	60.9	35.4	27.2	32.6	50.5	70.9	58.1	56.1	68.4	85.6	73.8	56.4	675.9
Evaporation (mm)[2]	0	0	0	60	97	108	116	99	50	0	0	0	529

Notes:

[1] Based on 1981 – 2022

[2] Based on 1953 – 2018

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Evaporation_rev02.Rmd and in \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 0-2: Extreme Precipitation

Return Period	24-hour Precipitation [mm]	72-hour Precipitation [mm]
2	42.0	56.7
5	56.1	75.6
10	66.3	89.3
25	80.2	108.1
50	91.3	123.0
100	103.1	138.9
200	115.6	155.7
500	133.3	179.6
1000	147.7	199.1
PMP (Spring)	297	-
PMP (Summer/Autumn)	334	-

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 0-3: Extreme Snowmelt

Return Period	24-hour Snowmelt [mm SWE]	72-hour Snowmelt [mm SWE]
2	34.0	57.5
5	43.3	73.3
10	50.9	86.1
25	62.8	106.4
50	74.0	125.4
100	87.7	148.5
200	104.4	176.8
500	132.4	224.3
1000	159.4	269.9

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Mean annual runoff for the Project was determined to be 219 mm/year with an annual runoff coefficient of 0.36 with the highest flows occurring in May and June due to freshet, and low flows occurring during the winter.

Climate change scenarios for RCP4.5, RCP6.5 and RCP8.5 were evaluated for the Project Area. The effects of the RCP4.5 scenario were used to generate mean annual and monthly temperature and precipitation correction factors, which also affect runoff and evaporation rates, as summarized in Table 0-4.

Table 0-4: Projected Climate Change Impacts on Selected Climate Parameters

Timeframe	Mean Annual Temperature (°C)	Mean Annual Precipitation (mm)	Mean Annual Evaporation (mm)
2011-2040	1.2°C	+5%	+2%
2041-2070	2.4°C	+12%	+4%
2071-2100	3.0°C	+15%	+5%

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Climate_Change_rev03.Rmd

Extreme precipitation magnitudes are expected to increase. Monthly streamflow is expected to experience an overall increase in flow magnitude and a shift to an earlier spring freshet. No significant trend in peak flows is projected.

The short duration of the Project meteorological and hydrometric datasets is a limitation of this hydrometeorological baseline report. SRK recommends ongoing monitoring of Project meteorologic conditions, and continued hydrometric station monitoring at Four-Hydro and Tenas-Hydro B as a minimum.This report should be updated when additional data become available. In particular, the Four-Hydro discharge record requires additional flow measurements to characterize baseline conditions for effects assessments and to support predictive modelling.

1 Introduction

SRK Consulting (Canada) Inc. has been tasked with updating the meteorological and hydrological characterization to develop inputs required for the Tenas Project (the Project) in support of the Environmental Assessment (EA).

The following report provides an updated summary of baseline meteorology and hydrology data collected between 2017 and 2022. Regional records were used to extend the local records in order to develop statistical climate and hydrologic parameters that will be used to support various technical studies for the EA, including water management designs, groundwater modeling, and the water and load balance model. The main changes pertain to the updating of the synthetic climate record based on additional data from the local station since the development of the EA baseline report (SRK 2022) and the hydrological parameters based on new calibration to the available data.

1.1 Project Setting

The Tenas Coal Project is a proposed coal mine located in the Coast Mountains of the Cordilleran Region near the Town of Telkwa approximately 25 km southwest of Smithers, British Columbia. The coal preparation plant, maintenance facilities and service facilities would be located approximately 6 km southwest of Telkwa. The Project footprint elevation ranges from 750 to 1050 meters above sea level (masl) with a median elevation of 800 masl. The Ministry of Environment and Climate Change Strategy (MECCS) have published hydrological zones that represent areas of homogeneous hydrologic and geomorphic characteristics. The Tenas Project is within Zone 8 – Nechako Plateau.

The Project encompasses the lower reaches of the Telkwa River, Tenas Creek, Goathorn Creek and Four Creek. The Telkwa River is a major tributary to the Bulkley River near the village of Telkwa, British Columbia, which ultimately flows into the Skeena River. Four Creek is a tributary of Goathorn Creek, and Goathorn Creek and Tenas Creek are tributaries of the Telkwa River.

Figure 1-1 shows the Project location.

Tenas Project

Site Location

610000 615000 620000 625000 630000 635000

6070000 6065000 6060000 6055000 6050000

Smithers

Telkwa

Telkwa River

Bulkley River

Goathorn Creek

Tenas Creek

Four Creek

Legend

- Backfill
- Core Footprint
- Pit Lake
- Plant and Maintenance Area
- Pond
- Rock Cover
- Watercourse

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Features: Allegiance Coal, 2020
- Basedata: Government of British Columbia
- Basemap: World Topo Base

N

1:105,000

0 1 2 3 4 5

Kilometers

NAD 1983 UTM Zone 9N

Page Size: 11" x 17"

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srk consulting

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1.2 Scope of Report

Meteorology and hydrology studies conducted as part of the Telkwa Coal Project Prefeasibility studies (SRK 2017a, 2017b) identified gaps in the existing meteorological and hydrological datasets. Site specific hydrometeorological data started being collected in 2017. The first years of records (2017-2019) were used by SRK to develop a hydrometeorological baseline for the site (SRK, 2022). Project data collection continued between 2020 and 2022. These new records were incorporated into the hydrometeorological analysis to support Project advancement in 2022 and are documented in this report.

This report is an update to the the baseline Project climate and hydrology previously developed by SRK (SRK, 2022) and generates projections of future climate conditions. This update includes available data up to October 2023.

- Section 2 presents the available meteorological datasets (2017-2022)
- Section 3 presents the available hydrometric datasets (2017-2022)
- Section 4 describes how available datasets were used to develop the Project Area meteorology and hydrometric synthetic time series
- Section 5 outlines how climate change impacts on Project air temperature, precipitation, lake evaporation and streamflow were evaluated from 2022 onwards.

2 Baseline Meteorology

2.1 Section Overview

Meteorological characteristics are typically assessed by integrating Project-specific and regional meteorology records as well as comparing previous studies related to the Project and regional indices. Placing the Project-specific parameters in context using regional analyses is important to be able to provide meteorological inputs to the Project based on extended periods of record.

2.2 Available Meteorological Data

Baseline meteorological monitoring was initiated at the Telkwa Coal Project site in September 2017 by ERM Consultants.

This section summarizes the available monitoring data for the Telkwa Coal Project. Regional climate data from the surrounding area has also been assessed to place the Telkwa Coal Project climate into context.

2.2.1 Project Data

Baseline climate data for the Project Area was collected at the Tenas Deposit automatic weather station (54.59° N, 127.19° W), installed on 29 September 2017 and operated through September 2022. Figure 2-1 illustrates the location of the Tenas Deposit Station and Table 2-1 provides the metadata.

The monitoring record from the Tenas Deposit Station was compiled, reviewed, and validated by ERM (ERM 2019). The following data is recorded at the weather station:

- Hourly average wind speed
- Hourly wind direction and standard deviation of wind direction for 2017
- Hourly average air temperature
- Hourly average relative humidity
- Hourly average solar radiation
- Hourly average barometric pressure
- Hourly sampled snow depth
- 5-minute and hourly accumulated total precipitation

Details concerning the meteorological station configuration, data collection and preliminary gap-filling procedures are outlined in Section 4 of The Tenas Project 2017 to 2019 Baseline Report (ERM 2019).

2.2.2 Regional Data

Regional meteorological data for British Columbia is available from private as well as provincial and federal government sources. Regional re-analysis products for historical climate and future scenarios are available as gridded products developed by third parties based on government

datasets. Within the Nechako Plateau hydrological zone, there are over 90 regional meteorological stations monitored by the Meteorological Service of Canada (MSC). This division of Environment and Climate Change Canada provides public historical meteorological data and information.

Figure 2-1 illustrates the locations of selected regional meteorological stations with respect to the Project. Three stations have historically operated in the town of Smithers. Smithers Airport Auto and Smithers A are understood to be the same station, after an upgrade in 2018. Table 2-1 presents the metadata for the selected regional stations.

Table 2-1: Regional Meteorological Station Selections

Station Name	Climate Identifier	Latitude [° N]	Longitude [° W]	Elevation [masl]	Record Start	Record End	Distance from Project [km]
QUICK	1076638	54.62	126.90	533	1962	1995	19.1
SMITHERS AIRPORT AUTO	1077501	54.82	127.19	518	2013	2023	25.2
SMITHERS A	1077500	54.82	127.18	522	1942	2018	25.2
SMITHERS	1077499	54.83	127.18	523	2010	2023	26.3
HOUSTON	1073615	54.40	126.67	610	1957	2023	40.0
TOPLEY LANDING	1078209	54.82	126.16	722	1962	2017	71.0
EQUITY SILVER	1072692	54.2	126.28	1280	1981	2021	73.6
SUSKWA VALLEY	107G879	55.29	127.17	534	1982	2023	77.5
BURNS LAKE DECKER LAKE	1091174	54.38	125.96	713	1990	2023	83.1

Source: in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Temperature_1CT027.003_rev01.html

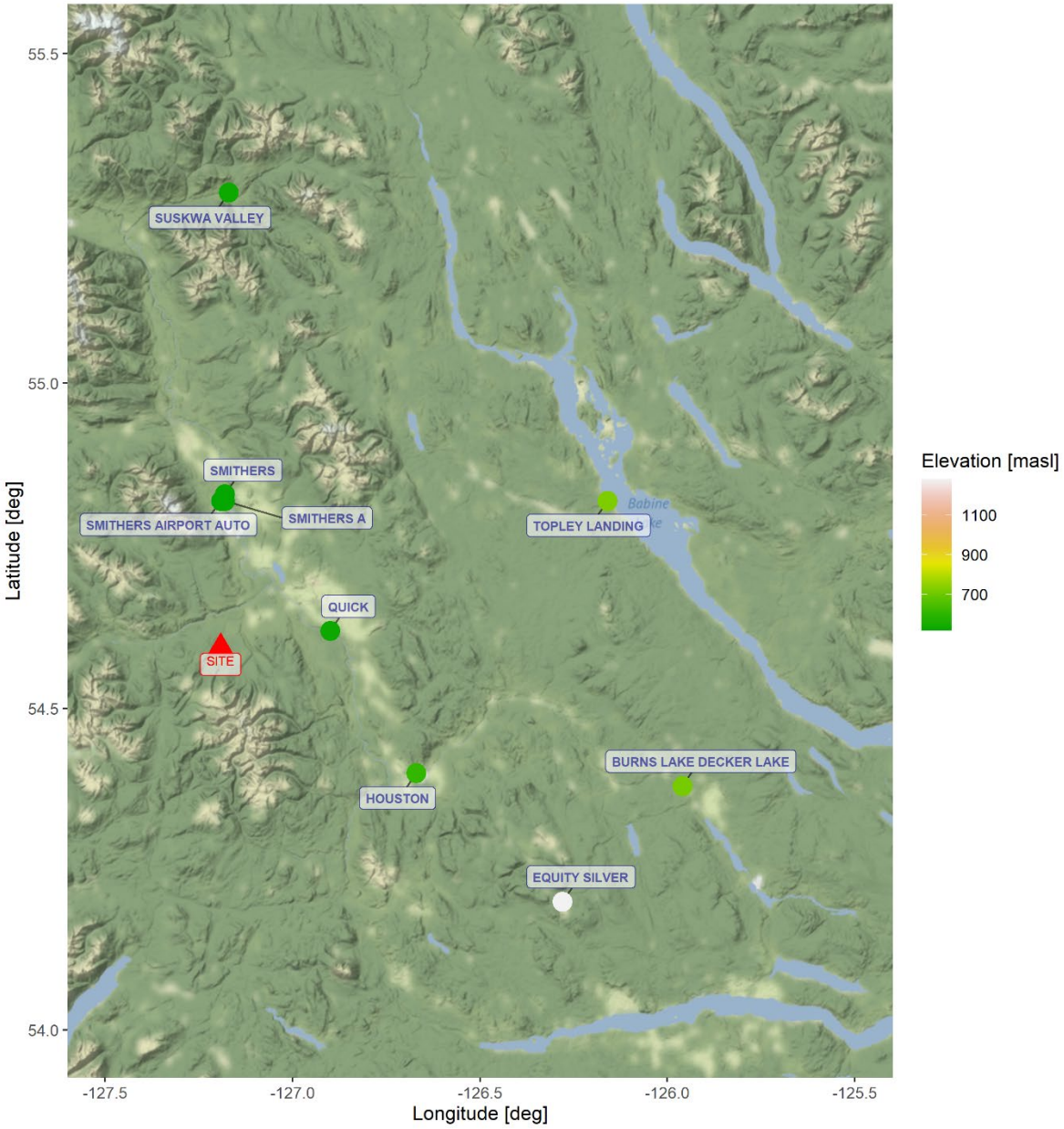

Figure 2-1: Meteorological Stations Used in Project ("Site") and Regional Assessment

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Temperature_1CT027.003_rev01.html

Note: Smithers A and Smithers Airport Auto are located at the same geographic location.

2.2.3 Missing Data

The meteorological records from the Tenas Deposit Station have low amount of absent records with nearly 100% of records available for precipitation and air temperature (maximum, minimum, and daily averages). Higher quantity of missing records were found for solar radiation - mostly during the winter, presumably because of snow cover – and pan evaporation. The missing records and data availability are provided in Figure 2-2 for all measured variables.

Figure 2-2: Site meteorological records availability

Source: compiled from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Note: Total data availability is presented after the variable name in parenthesis. Abbreviations have the following measing, ir row-wise order: evap = Pan Evaporation, gust = Wind Gust, prcp = Precipitation, rain = Rainfall, rh = Relative Humidity, snow = Snowfall, snowpack = Snowpack, ssrd = Shortwave Solar Radiation, tavg = Average Daily Temperature, tmax = Maximum Daily Temperature, tmin = Minimum Daily Temperature, ws = Wind Speed.

In terms of regional datasets, most stations also present some gaps in their records. Based on the correlations between stations these gaps could be patched appropriately as described in the sections below. Figure 2-3 and Figure 2-4 present the number of days with mean temperature and precipitation records respectively available at each regional station from 1942 to 2023. The color ramp on the right-hand side indicates 0 days of data (white) to a full 366 days (dark blue).

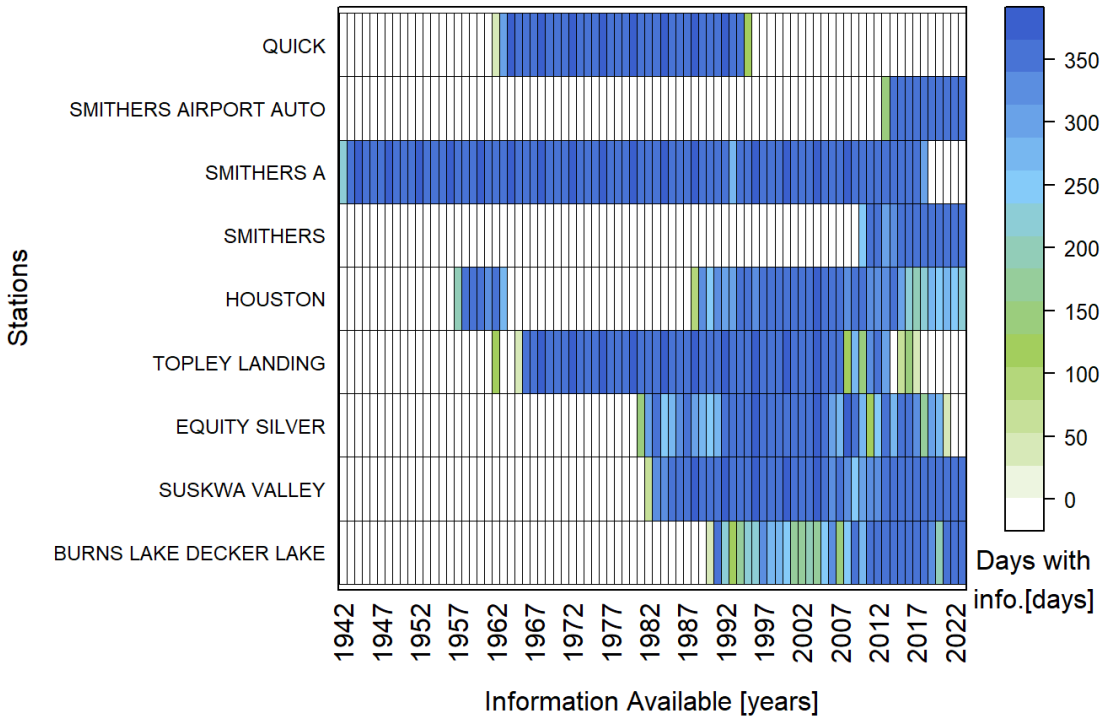

Figure 2-3: Number of Days with Mean Temperature Data Available Every Year from Regional Stations

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

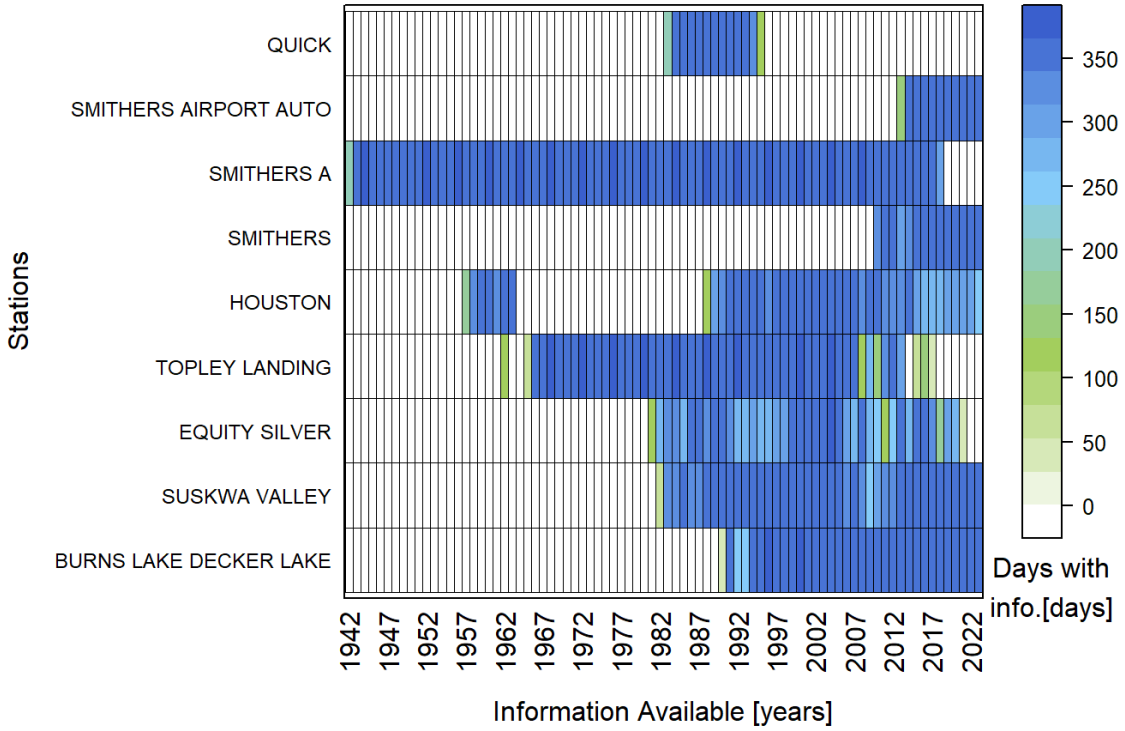

Figure 2-4: Number of Days with Precipitation Data Available Every Year from Regional Stations

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

2.2.4 Regional Snow Datasets

The British Columbia Snow Survey Data includes datasets from two regional networks:

The Automated Snow Weather Station (ASWS) network is comprised of stations operated by the Ministry of Environment, BC Hydro and others. These stations collect hourly snow water equivalent, snow depth, air temperature, and precipitation. Data is available in near-real-time. Tsai Creek Station is the closest station of this type to the Project and is published by the Ministry of Environment and Climate Change Strategy (MECCS, 2020).

The Manual Snow Survey Sites network is operated by the province of British Columbia and manually measures snow depth and snow water equivalent. Measurements are taken monthly when snow is present, providing a record of snowpack across the province. Hudson Bay is the closest manual survey site to the Project. This data is also published by MECCS (2019).

Figure 2-5 illustrates the locations of Tsai Creek and Hudson Bay snow survey stations, and Table 2-2 presents details pertaining to these stations.

Table 2-2: Regional Snow Survey Stations

Station Name	Station Identifier	Latitude [°]	Longitude [°]	Elevation [masl]	Record Start	Record End	Distance from Project [km]
Tsai Creek	4B17P	54.64	-127.68	1360	2003	Current	31.8
Hudson Bay	4B03A	54.76	-127.27	1480	1972	Current	19.4

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork Snowpack_rev02.Rmd

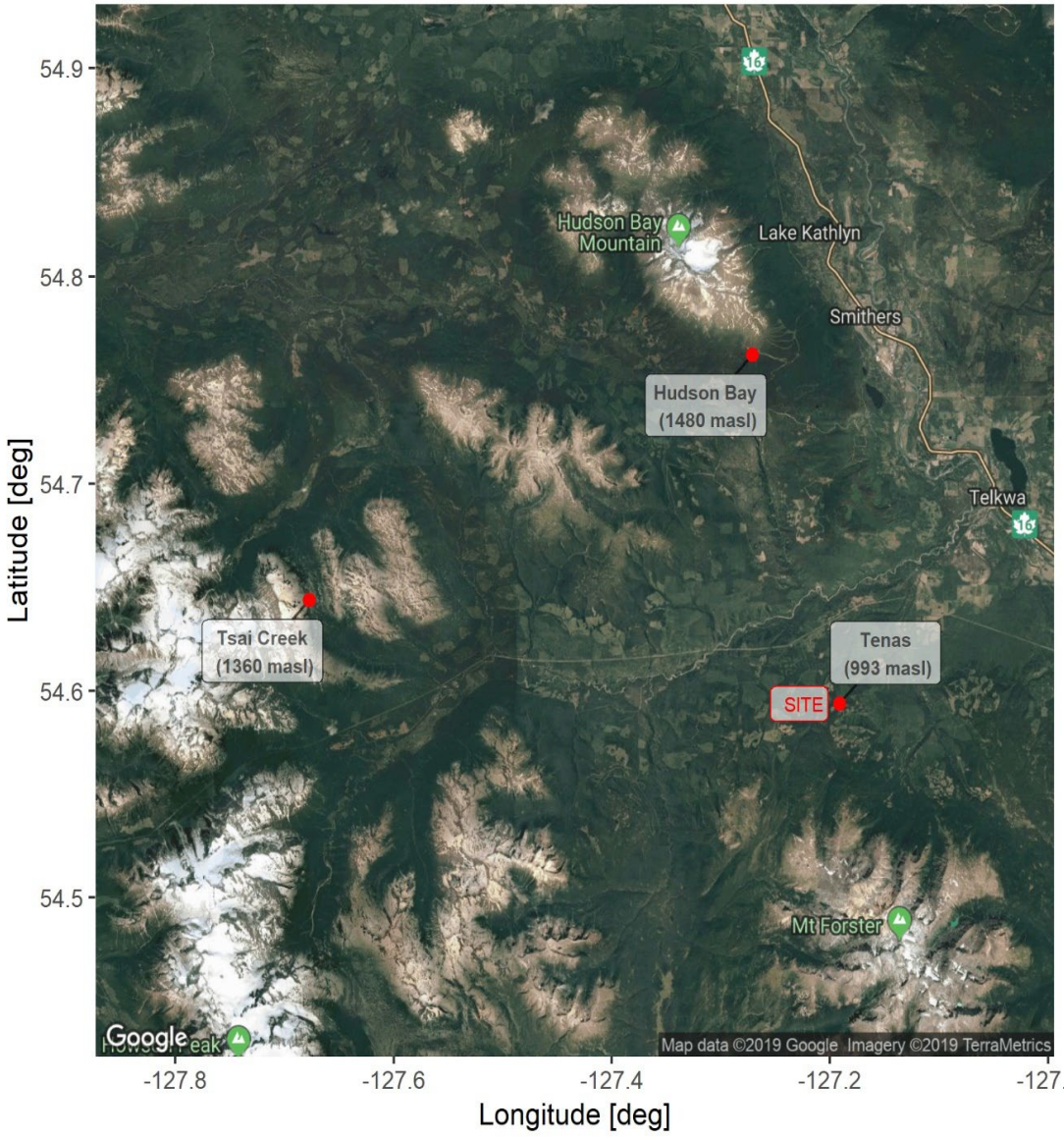

Figure 2-5: Regional Snow Pillow Stations Hudson Bay and Tsai Creek Shown in Relation to Tenas Deposit Station

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork Snowpack_rev02.Rmd

2.2.5 Reanalysis Meteorological Datasets

Reanalysis products were used to calculate regional orographic trends for precipitation and temperature. The regional stations could not account for these orographic trends, particularly in winter due to inversions present at some stations, and Project data did not produce a meaningful relationship to regional stations due to its relatively short duration of record.

Climate reanalysis combines gridded global models with observed historical data to produce historical climate and to incorporate adjustments based on developed relationships. Multiple reanalysis datasets are available in different spatiotemporal resolutions. Table 2-3 presents the three reanalysis datasets examined for this study.

Table 2-3: Overview of Reanalysis Datasets Examined in this Study

Reanalysis	Institution	Period of Record
ERA-5 (ECMWF 2020)	European Centre for Medium-Range Weather Forecast (ECMWF)	1979-current
MERRA-2 Modern-Era Retrospective Analysis for research and applications (NASA, 2017)	US National Aeronautics and Space Administration (NASA)	1980- current
PRISM (PCIC 2014)	Pacific Climate Impact Consortium (PCIC)	1950-2007

Source: Compiled in text.

ERA-5 and MERRA-2 are global datasets that provide sub-daily values for multiple meteorological parameters. PRISM is a climate-elevation regression model, used to generate a reanalysis dataset that provides precipitation and maximum and minimum temperature averages on a monthly timestep for the Pacific Region of Canada and the northwestern USA.

2.3 Summary of Available Data

This section presents a summary of the Project Area and regional meteorological datasets.

Meteorological parameters were summarized for the three years of Project data using monthly averages of daily minimum, mean and maximum air temperatures. Monthly average sums of the minimum, mean and maximum total precipitation were calculated. Annual maximum snow water equivalent (SWE) was computed for the Project based on regional snow survey data, transposed to the Project Area.

Other parameters measured at the Tenas Deposit Station include: Wind speed and direction, solar radiation, relative humidity, and barometric/atmospheric pressure. Evaporation rates were calculated based on thes parameters. Measured and calculated parameters are summarized for the Project Area and the long-term regional records in the following sections.

2.3.1 Air Temperature

Project

Temperature is used to estimate snowmelt, evaporation, evapotranspiration, and other inputs such as pond freeze depths. Air temperatures recorded at the Tenas Deposit Station ranged from -31.7°C (January 15, 2020) to 34.5°C (June 27, 2021). Figure 2-6 presents the daily maximum,

average and minimum temperature at the Tenas Deposit Station. During the period of record, the coldest month was the month of December 2021 with a mean temperature of -14.0°C, and the hottest month was the month of July 2018 at 15.5°C. The summary of monthly maximum, average and minimum daily temperatures is presented in Table 2-4.

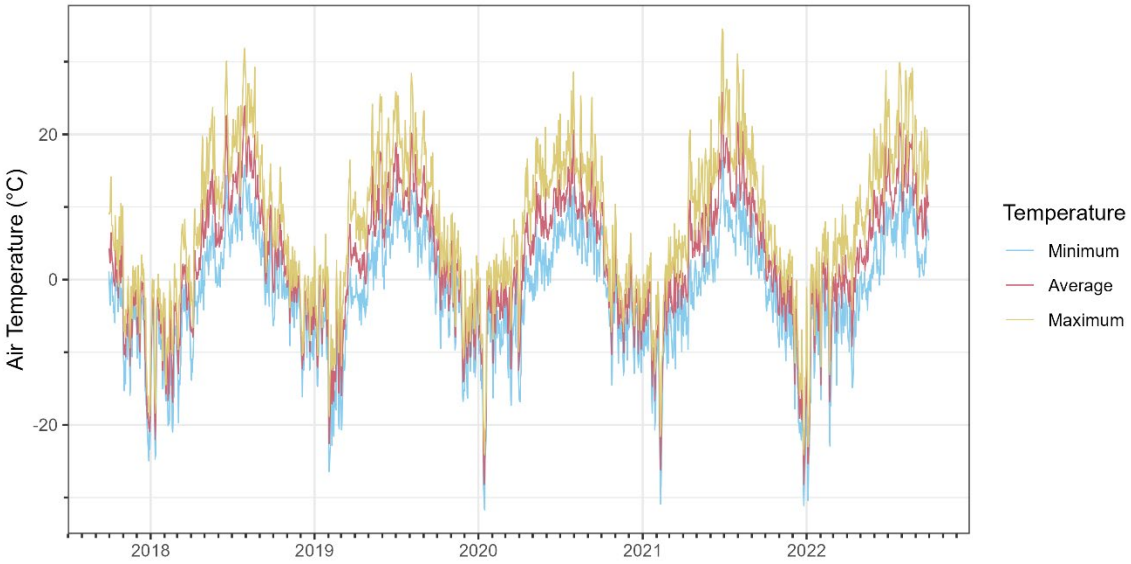

Figure 2-6: Tenas Deposit Meteorological Station Temperature Record

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\graphs\ts_site_airtemp.png

Table 2-4: Tenas Deposit Meteorological Station Daily Air Temperature (°C) for October 2017-2022

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017	Max.										14.2	2.5	3.4	14.2
	Mean										1.9	-5.6	-8.9	-4.2
	Min.										-5.9	-15.9	-24.9	-24.9
2018	Max.	0.8	2.2	8.3	19.8	23.7	30.1	31.8	29.3	18.5	15.5	6.2	0.6	31.8
	Mean	-7.6	-9.8	-3.3	1.1	9.4	10.6	15.5	15.3	5.9	3.0	-1.0	-6.1	2.8
	Min.	-24.7	-21.0	-19.7	-13.9	-1.1	-1.0	5.0	4.9	-5.2	-6.3	-9.1	-16.1	-24.7
2019	Max.	6.2	2.7	16.5	12.7	25.6	24.8	25.9	28.4	23.2	12.3	9.1	1.3	28.4
	Mean	-3.8	-12.7	-1.3	2.4	10.5	10.9	12.9	12.9	8.2	0.7	-1.9	-7.9	2.6
	Min.	-14.7	-26.5	-20.7	-6.2	-1.4	-1.3	3.8	1.7	-4.8	-9.5	-16.8	-16.3	-26.5
2020	Max.	2.4	5.7	8.3	16.6	21.0	21.9	28.6	25.3	25.1	17.0	10.4	6.4	28.6
	Mean	−9.8	−3.5	−3.2	2.0	8.3	9.3	12.6	10.7	9.4	0.7	−3.4	−3.8	2.4
	Min.	−31.7	−16.3	−17.3	−16.8	−3.0	−0.8	4.6	1.9	−0.3	−14.5	−13.2	−12.9	-31.7
2021	Max.	3.7	5.8	7.7	20.6	18.0	34.5	31.1	29.4	21.1	8.1	4.4	0.6	34.5
	Mean	−6.4	−8.9	−1.5	3.1	6.5	13.0	14.4	13.1	7.7	0.6	−2.4	−14.0	2.1
	Min.	−20.7	−30.9	−12.3	−9.6	−2.3	−0.4	3.3	0.7	0.0	−8.8	−11.2	−31.1	-31.1
2022	Max.	4.4	8.0	10.3	13.1	20.8	28.8	29.9	29.1	22.0				29.9
	Mean	−7.6	−3.5	−0.6	−0.7	4.9	11.0	14.3	15.0	9.4				4.7
	Min.	−30.4	−22.9	−14.5	−14.9	−4.2	−0.8	3.1	3.0	0.3				-30.4

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

Temperature records for the Smithers Airport station were extended and patched using data from the Houston station. Figure 2-7 shows the annual distribution of regional temperatures, where the coldest and warmest months are typically January and July, respectively. Regional stations show similar temperature behaviour throughout the year except for Tsai Creek and Equity Silver. These two regional stations appear to show milder winters suggesting a temperature inversion for higher elevations. This suggests monthly correction factors are more appropriate to account for the potential of temperature inversions during the winter months.

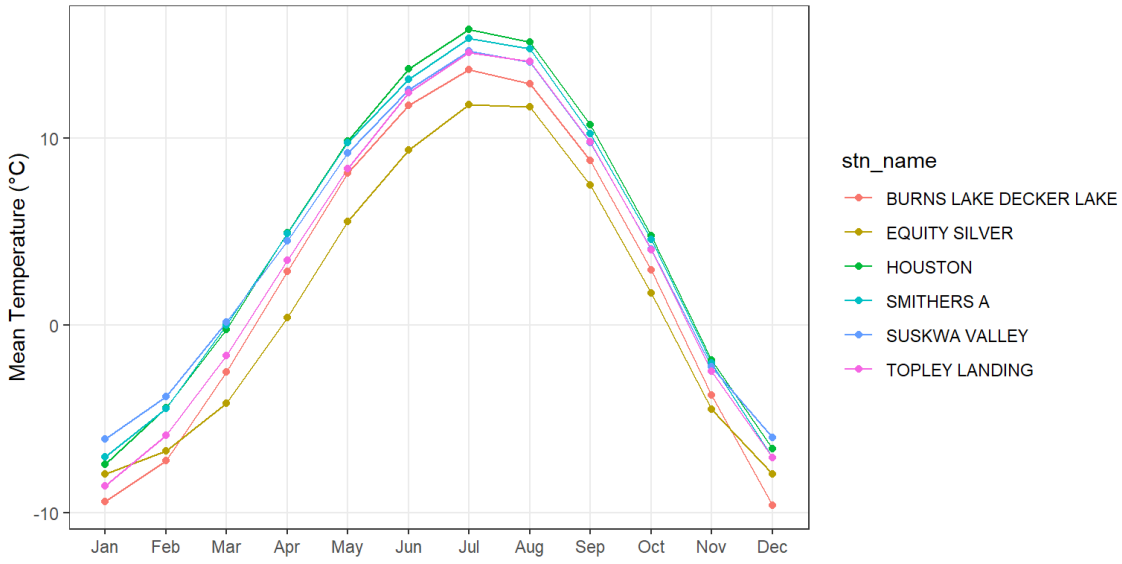

Figure 2-7: Monthly Average Temperatures at Regional Meteorological Stations

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regionally, mean annual temperature decreases with increasing elevation. For a Project site elevation of 993 m (corresponding to the location of the Tenas Deposit Station), the mean annual temperature is approximately 2.5°C colder than temperatures recorded at the Smithers Airport Station (Figure 2-8).

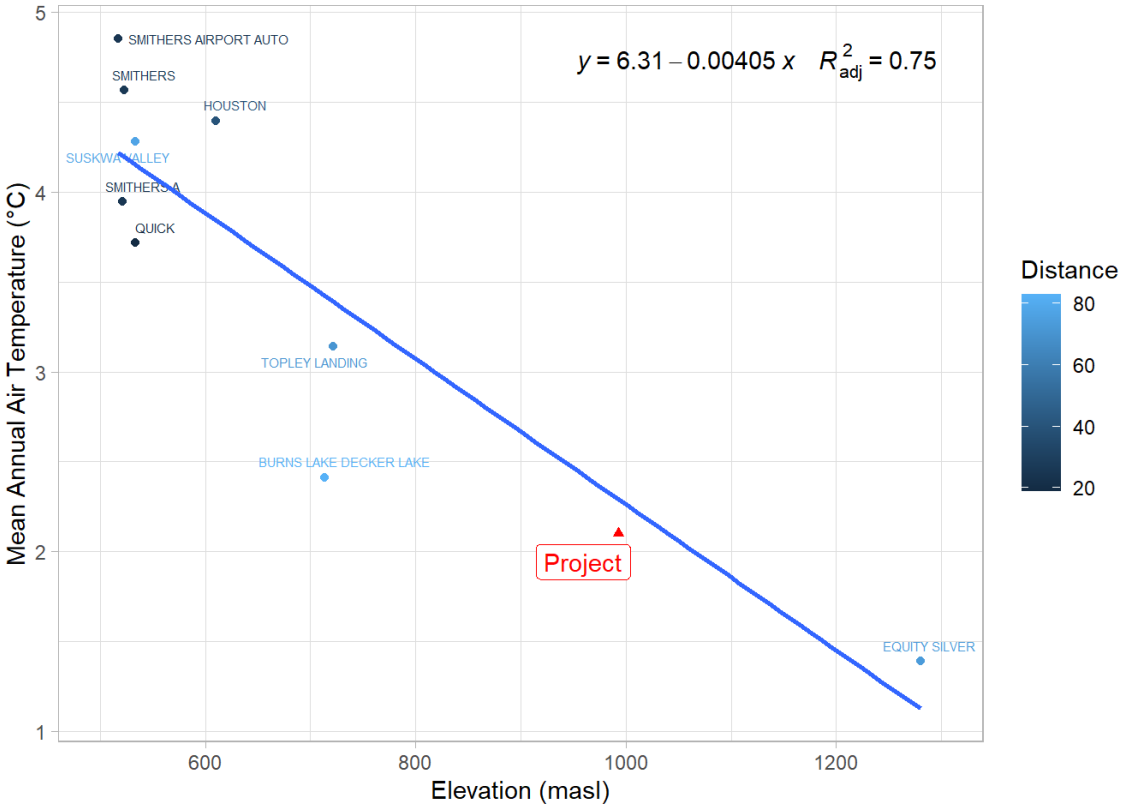

Figure 2-8: Regional Mean Annual Temperature – Elevation Trend

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

2.3.2 Precipitation

Project

The Tenas Deposit Station recorded annual precipitation from 502 mm to 719 mm in 2018 – 2021. Figure 2-9 presents the recorded daily precipitation from October 2017 to September 2022. The largest single-day precipitation events occurred on 24 October 2017 for rainfall (73 mm) and on 7 February 2018 for snowfall (65 mm). The 24 October 2017 event corresponds to an exceptional runoff event that exceeded historical streamflow records for regional stations in the area (ERM 2019).

The recorded total precipitation at the Tenas Deposit Station (Figure 2-9) was divided into rainfall (mm) and snowfall (mm SWE) components if the Project air temperature record was less than 0 degrees Celsius. Using this estimation, snow ranged from 34% to 71% of total annual precipitation (see Table 2-8 for regional comparison). Monthly cumulative values of measured total precipitation and estimated rainfall and snowfall are summarized in Table 2-5.

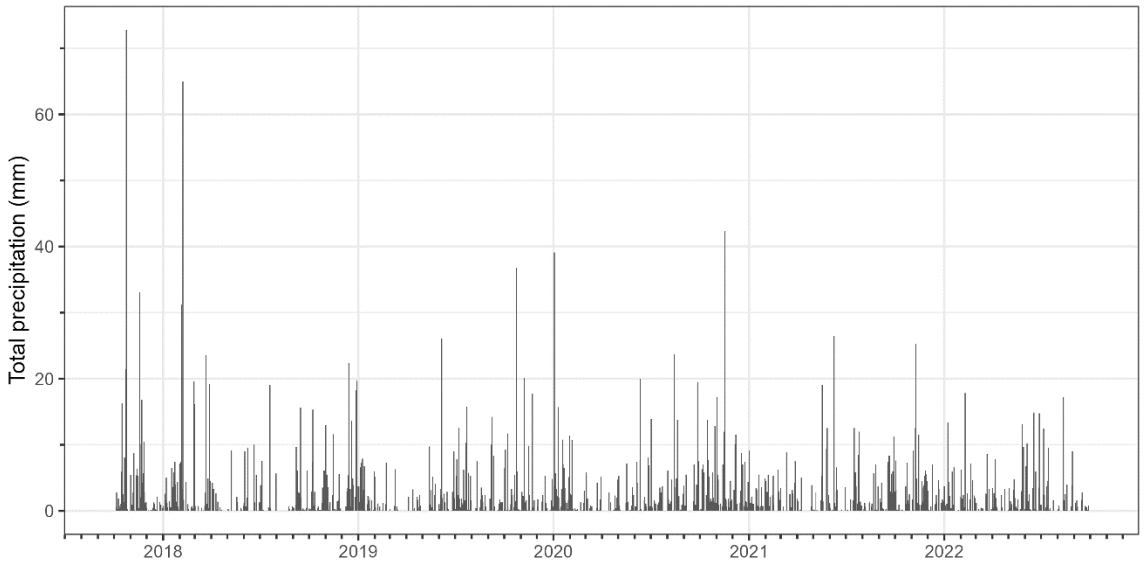

Figure 2-9: Tenas Deposit Meteorological Station Measured Total Precipitation for October 2017-2019

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-5: Tenas Deposit Meteorological Station Total Precipitation (measured), Rain (estimated), Snow (estimated)

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2017	Total Precipitation [mm]										147	134	10	--
	Rainfall [mm]										114	0	0	--
	Snowfall [mm SWE]										33	134	10	--
2018	Total Precipitation [mm]	50	150	81	14	14	42	50	2	50	54	51	113	672
	Rainfall [mm]	0	0	1	3	14	42	50	2	30	42	9	0	195
	Snowfall [mm SWE]	50	150	80	10	0	0	0	0	20	11	42	113	477
2019	Total Precipitation [mm]	60	19	8	13	26	57	83	21	47	93	73	22	522
	Rainfall [mm]	5	0	0	7	26	57	83	21	46.5	69	32	0	346
	Snowfall [mm SWE]	55	19	8	6	0	0	0	0	0.5	24	41	22	176
2020	Total Precipitation [mm]	126	26	30	14	25	63	35	84	55	84	107	70	719
	Rainfall [mm]	0	1	1	14	25	63	35	84	55	20	23	18	339
	Snowfall [mm SWE]	126	25	29	0	0	0	0	0	0	64	84	51	380

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2021	Total Precipitation [mm]	43	40	36	14	56	52	61	24	75	32	107	29	568
	Rainfall [mm]	0	1	4	5	53	52	61	24	75	16	13	0	305
	Snowfall [mm SWE]	43	39	32	9	3	0	0	0	0	15	94	29	263
2022	Total Precipitation [mm]	43	55	21	28	48	75	41	41	11				--
	Rainfall [mm]	0	23	9	3	47	75	41	41	11				--
	Snowfall [mm SWE]	43	31	12	25	1	0	0	0	0				--

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

A regional precipitation analysis was carried out to identify trends and elevation correlations. The Smithers Airport Auto and Smithers A stations (10775001 and 1077500) were merged to generate a long-term record. Remaining gaps in this record were patched with Quick as well as ERA-5, using quantile mapping methods. The resulting patched Smithers A record provides 73 years of complete data.

Average yearly precipitation, rainfall and snowfall for regional stations are presented in Table 2-6 for their corresponding period of record. Regional stations present varying mean annual precipitation (MAP) in the range of 415 mm to 760 mm with precipitation occurring mainly as rainfall except for Equity Silver where almost half of the precipitation falls as snow due to its higher elevation.

Table 2-6: Regional Stations Annual Precipitation, Rain, Snow and Corresponding Proportions

Station	Mean Annual Precipitation [mm]	Mean Annual Rainfall [mm]	Mean Annual Rainfall [%]	Mean Annual Snowfall [SWE mm]	Mean Annual Snowfall [%]
SMITHERS A (patched)	511	344	67%	166	33%
QUICK	469	308	66%	161	34%
HOUSTON	425	293	69%	132	31%
TOPLEY LANDING	539	310	58%	229	42%
EQUITY SILVER	661	348	53%	314	47%
SUSKWA VALLEY	756	552	73%	204	27%
BURNS LAKE DECKER LAKE	415	249	60%	166	40%

Notes:
1. Rainfall and snowfall proportions as percentages of the mean annual precipitation.
2. Smithers A patched with Smithers Airport Auto, Quick and ERA-5.
3. Mean annual values calculated based only on years with snow and rain measurements

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html and Canadian Climate Normals https://climate.weather.gc.ca/climate_normals/index_e.html

Figure 2-10 illustrates the regional correlation between MAP and elevation. A negative value for the determination coefficient (R^2 presented in Figure 2-10) indicates the correlation between elevation and MAP using only the regional meteorological datasets is poor.

The relationship between MAP and elevation is likely less significant at this location due to the more dominant effects of topography and the Pacific Ocean as a moisture source. The west-east gradient and proximity to mountain range with rain shadow effects are the most important factors affecting precipitation in this area. Orographic gradients were further evaluated using Reanalysis datasets and are discussed in Section 4.1.2.

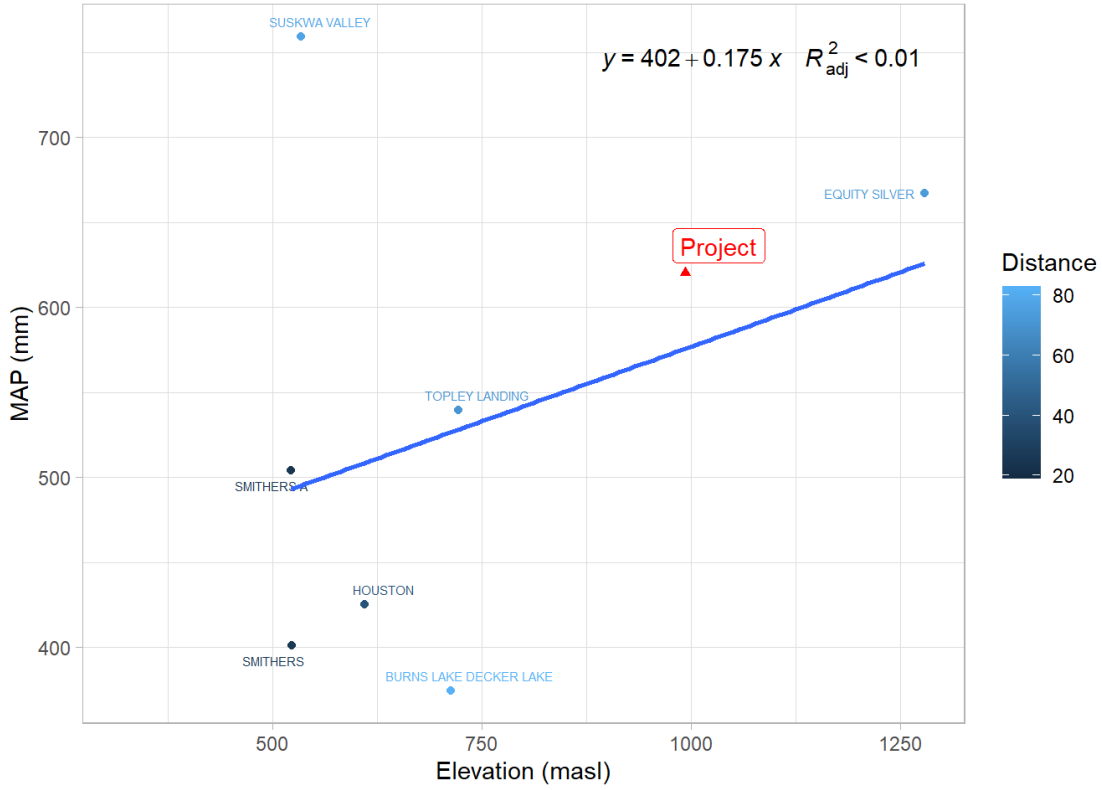

Figure 2-10: Regional Mean Annual Precipitation – Elevation Trend

Note: Quick station data not included due to differing timelines
Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Monthly precipitation was also reviewed and compared to site data over the concurrent period of record. Monthly precipitation data for the regional stations is presented in Table 2-7.

Table 2-7: Regional Stations Monthly Precipitation Records

Year	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2017	SMITHERS A (patched)	45	11	7	17	86	46	255	21	89	143	68	3	579
	HOUSTON	0[1]	10[1]	1[1]	6[1]	83[1]	34[1]	7[1]	1[1]	3[1]	81[1]	17 [1]	4[1]	245
	TOPLEY LANDING			0[1]	24[1]	62[1]								--
	EQUITY SILVER	52	50	44		116	74	30	26	50	133	95	23	692
	SUSKWA VALLEY	38	17	36	32	120	69[1]	75	55	104	149	83	26	804
	BURNS LAKE DECKER LAKE	21	12	13	23	68	38	30	11	48	70	48	4	385
2018	SMITHERS A (patched)	21	24	33	10	21	69	17	0	23	38	68	28	404
	HOUSTON	8[1]	39[1]	33[1]	2[1]	12[1]	23[1]	41[1]	0[1]	31[1]	24[1]	40[1]	20[1]	245
	TOPLEY LANDING													--
	EQUITY SILVER	77	130	64	21	29	24[1]							--
	SUSKWA VALLEY	53	46[1]	67	22	20	49	46	7	58	55	76	78	575
	BURNS LAKE DECKER LAKE	37	54	25	6	15	36	37	3	40	44	48	0[1]	346
2019	SMITHERS A (patched)	55	6	7	21	21	41	68	28	26	79	85	19	381
	HOUSTON	23[1]	1[1]	0[1]	0[1]	16.8[1]	40[1]	42[1]	26	49.4	73[1]	12[1]	13[1]	297
	TOPLEY LANDING													--
	EQUITY SILVER	0[1]	5[1]	10	24	37.6	68	121	40	41[1]	24[1]	44[1]	38	451
	SUSKWA VALLEY	94	22	12	42	31	43	99	70	51	105	88	28	685
	BURNS LAKE DECKER LAKE	8[1]	11	2	14	34	39	72	20	26	58	34	16	334
2020	SMITHERS A (patched)	32	21	12	10	31	66	59	115	19	2	1	0	498
	HOUSTON	54[1]	17[1]	5[1]	11[1]	14[1]	56	59[1]	55[1]	16[1]	63[1]	41[1]	10[1]	402
	TOPLEY LANDING													--
	EQUITY SILVER		16[1]	22[1]	22	34	93	68	111	64	67	65[1]	34[1]	--
	SUSKWA VALLEY	83	39	60	24	45	94	100	174	102	94	68	71	954
	BURNS LAKE DECKER LAKE	66	12	10	14	3[1]					0[1]	63	36	--

Year	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2021	SMITHERS A (patched)	2	21	27	5	22	24	38	31	91	21	79	6	369
	HOUSTON	3[1]	18[1]	6[1]	2[1]	52[1]	19[1]	27[1]	19	40[1]	14[1]	21[1]	19[1]	250
	TOPLEY LANDING													--
	EQUITY SILVER	42												--
	SUSKWA VALLEY	47	36	61	25	53	47	50	54	128	46	118	53	717
	BURNS LAKE DECKER LAKE	30	28	11	9	63	23	52	37	60	21	41	26	402
2022	SMITHERS A (patched)	47	43	8	28	45	49	17	35	9	49	39	29	388
	HOUSTON	27[1]	4[1]	1[1]	2[1]	49[1]	70	49[1]	34[1]	4[1]	30[1]	15[1]	19[1]	304
	TOPLEY LANDING													--
	EQUITY SILVER													--
	SUSKWA VALLEY	50	71	20	42	63	79	70	62	37	80	63	52	690
	BURNS LAKE DECKER LAKE	42	17	10	12	47	75	62	65	5	11	32		415
2023	SMITHERS A (patched)	16	40	9	25	7	12	26	23	18	32	28[1]		--
	HOUSTON	7[1]	13[1]	3[1]	0[1]	0[1]	6[1]	79	8[1]	17[1]	11[1]	0[1]		--
	TOPLEY LANDING													--
	EQUITY SILVER													--
	SUSKWA VALLEY	64	85	18	72	32	21	60	44	48	47	85		--
	BURNS LAKE DECKER LAKE	23	42	9	25	9	105	106	25	22	41	16		--

[1]Incomplete month. More than 5 days missing from record.

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

2.3.3 Snow Depth

Project

Table 2-8 presents the daily mean snow depth data recorded at the Tenas Deposit Station. Snowpack at the Project does not have a large potential of being redistributed by wind as the general surrounding area is heavily forested and recorded wind speeds are low (see Section 2.3.4). Snow depth measurements recorded at the Tenas Deposit Station are believed to be representative of the Project (ERM 2019). Snow depths are measured continuously at the Project while snowpack snow water equivalent measurements are not available.

Table 2-8: Snow Depth Summary at Tenas Deposit Station for October 2017 to 2022

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	Maximum Snow Depth [cm]										16	60	51
	Average Snow Depth [cm]										4	28	47
	Minimum Snow Depth [cm]										0	3	44
2018	Maximum Snow Depth [cm]	78	122	149	140	64	0	0	0	8	4	16	75
	Average Snow Depth [cm]	63	101	119	110	12	0	0	0	1	0	9	38
	Minimum Snow Depth [cm]	51	76	97	68	0	0	0	0	0	0	3	13
2019	Maximum Snow Depth [cm]	76	83	83	55	6	0	0	0	0	29	19	15
	Average Snow Depth [cm]	66	75	74	32	0	0	0	0	0	5	5	14
	Minimum Snow Depth [cm]	56	72	56	10	0	0	0	0	0	0	0	12
2020	Maximum Snow Depth [cm]	72	83	80	73	1	0	0	0	0	23	45	60
	Average Snow Depth [cm]	58	70	73	45	0	0	0	0	0	9	23	46
	Minimum Snow Depth [cm]	27	65	66	5	0	0	0	0	0	0	4	32
2021	Maximum Snow Depth [cm]	78	100	100	93	20	0	0	0	0	2	40	60
	Average Snow Depth [cm]	68	91	94	70	2	0	0	0	0	0	27	50
	Minimum Snow Depth [cm]	63	77	89	25	0	0	0	0	0	0	1	40
2022	Maximum Snow Depth [cm]	74	88	86	80	50	0	0	0	0			
	Average Snow Depth [cm]	71	78	79	73	15	0	0	0	0			
	Minimum Snow Depth [cm]	63	71	72	53	0	0	0	0	0			

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

The Tenas Deposit Station records total precipitation and snow depth but does not measure the snow water equivalent. The automated regional snow pillow station operated by environment Canada at Tsai Creek measures precipitation, temperature, snow depth and hourly snow water equivalent. The snow depth record at Tsai Creek is much higher than the snow depth record at the Tenas Deposit Station although the accumulation pattern is similar. However, melt timing occurs later at Tsai Creek due to the elevation difference between the two stations as well as

other physiographic characteristics such as aspect. At Tsai Creek, snowmelt typically begins in April, peaks in May and then is finished by early June.

Hudson Bay manual survey station also offers records near the Project. Figure 2-11 illustrates snow depth records at these regional stations compared to the project records, and Table 2-9 presents monthly average snow depth at Tsai Creek together with monthly survey results carried out at Hudson Bay.

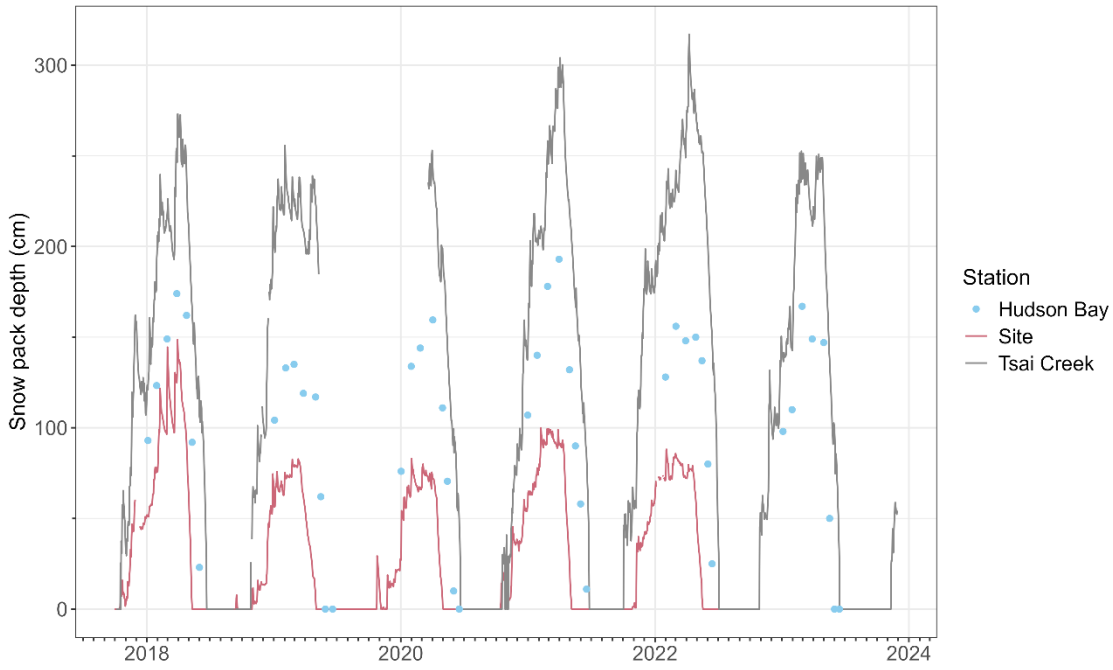

Figure 2-11: Snow Depth Records at Tsai Creek, Hudson Bay and Tenas Deposit

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-9: Average Snow Depth at Tsai Creek and Hudson Bay Stations for October 2017 to 2023

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	Average Snow Depth at Tsai Creek [cm]									0	23	85	126
	Hudson Bay monthly Snow Depth Survey [cm]	105		127		126	25						
2018	Average Snow Depth at Tsai Creek [cm]	155	215	219	249	155	60	0	0	0	4	80	148
	Hudson Bay monthly Snow Depth Survey [cm]	108	149	174	162	92	23						108
2019	Average Snow Depth at Tsai Creek [cm]	219	229	220	215	197	0	0					
	Hudson Bay monthly Snow Depth Survey [cm]	104	134	119		60	0						
2020	Average Snow Depth at Tsai Creek [cm]			240	211	140	45	0	0	0	10	47	117
	Hudson Bay monthly Snow Depth Survey [cm]	105	144		135	70	5						107
2021	Average Snow Depth at Tsai Creek [cm]	195	218	269	264	177	78	0	0	0	47	109	181
	Hudson Bay monthly Snow Depth Survey [cm]	140	178	193	132	90	34						
2022	Average Snow Depth at Tsai Creek [cm]	202	228	248	285	247	141	4	0	0	5	67	110
	Hudson Bay monthly Snow Depth Survey [cm]	128		152	150	137	52						
2023	Average Snow Depth at Tsai Creek [cm]	147	218	231	238	149	34	0	0	0	0	30	
	Hudson Bay monthly Snow Depth Survey [cm]	104	167	149		98	0						

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

2.3.4 Wind

Project

Wind speeds at the Project are generally low (less than 2 m/s) and are predominantly from the southwest (i.e., travelling down the Tenas Creek watershed). Figure 2-12 illustrates the wind rose representing wind speed data for the hydrologic year from October 2017 to September 2022. Table 2-10 presents the monthly average wind speed for each year of record from the Project station. The maximum hourly mean wind speed recorded at the Tenas Deposit Station between October 2017 to September 2022 was 6.7 m/s and the maximum wind gust speed was 15.9 m/s.

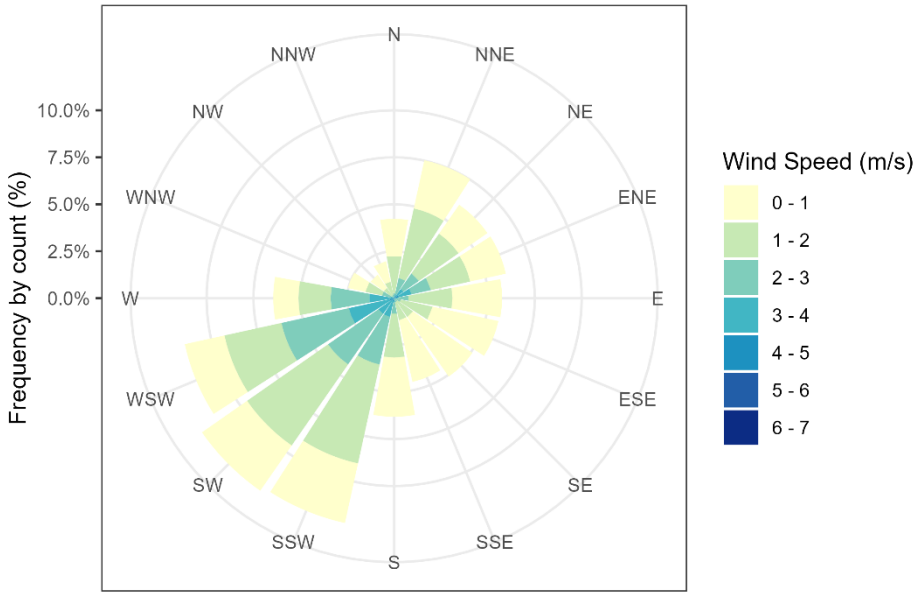

Figure 2-12: Wind Rose at Project for 2017-2022

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-10: Project Monthly Average Wind Speed Summary [m/s]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017										1.2	1.1	0.9
2018	0.7	1.2	1.5	2.0	2.5	2.9	3.3	2.3	1.4	1.1	0.9	1.1
2019	1.0	1.4	1.3	1.6	1.8	1.7	1.4	1.5	1.3	1.1	1.2	0.7
2020	1.2	1.5	1.8	1.7	1.9	1.8	1.7	1.6	1.1	1.2	1.2	1.0
2021	1.2	1.6	1.7	1.7	1.5	1.6	1.5	1.6	1.4	1.3	1.3	1.0
2022	1.5	1.6	1.3	1.6	1.5	1.5	1.6	1.4	1.2			

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

Winds at the Smithers Airport station were found to be predominantly from the southeast and slightly higher than the Project Area. Wind speeds are typically used to evaluate evaporation and wave run-up and setup for freeboard estimates. Given the short period of record overlap, it was determined that higher wind speed measured at the Smithers Airport station is conservative and appropriate for application to the Project.

Figure 2-13 illustrates the wind roses based on wind speeds recorded from October 2017 to November 2023 at Smithers Airport station.

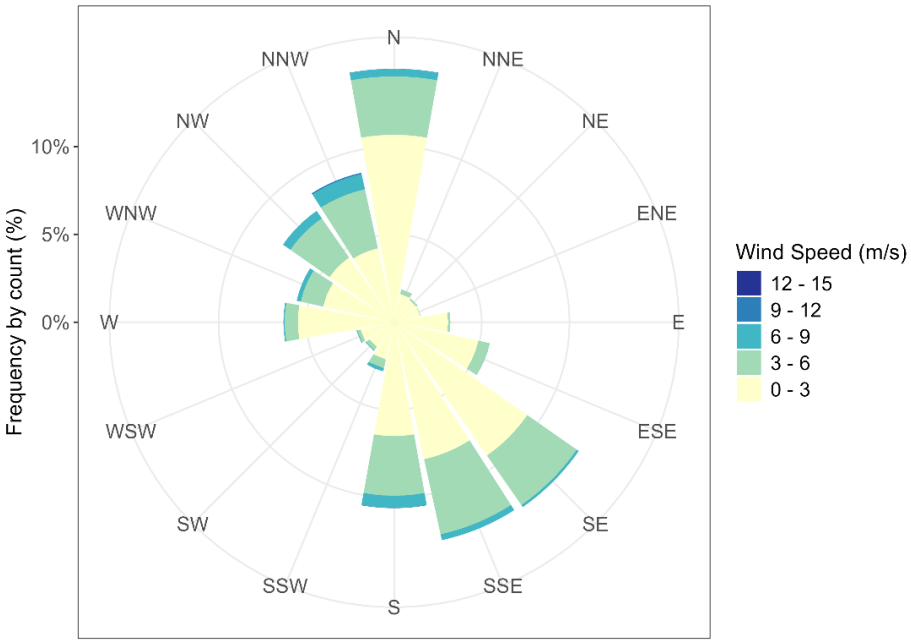

Figure 2-13: Wind Rose for Smithers A – October 2017 to November 2023

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Smithers A values have been adapted to the Project for design purposes but should be replaced with Project-specific data when it becomes available. Wind speeds are typically not transposable across large distances and due to physiographic characteristics unique to each location. Table 2-11 summarizes the monthly average wind speeds and Table 2-12 presents the frequency analysis for sustained wind speeds adopted for the Project.

Table 2-11: Average Monthly Wind Speed [m/s] at Smithers A Regional Station

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average (m/s)	2.0	1.9	2.0	2.2	2.0	1.8	1.6	1.5	1.4	1.9	1.9	2.0	1.9

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-12: Sustained Wind Speed Frequency Analysis for Smithers Airport Station

Return Period	Wind Speed [m/s]
2	12.6
5	14.8
10	16.3
25	18.2
50	19.5
100	20.9
200	22.3
500	24.1
1000	25.5

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\ Wind_and_Freeboard_EA_rev00.Rmd

2.3.5 Solar Radiation

Project

The amount and intensity of solar radiation is a function of elevation, latitude, catchment orientation (slope and aspect) and shadows cast by topographic features and the atmosphere (i.e., cloud cover). Solar radiation at the Tenas Deposit Station is measured in power density units of W/m^2. Many periods of erroneous data were removed from the dataset due to snow accumulation on top of the sensor. Figure 2-14 illustrates daily solar radiation measured at the Tenas Deposit Station from October 2017 to September 2022.

Average daily solar radiation ranged from 1.5 W/m^2 to 376 W/m^2. As illustrated, incoming solar radiation has both seasonal and annual cycles. Diurnal variation in the sub-daily record (not shown) demonstrate typically higher values at midday and during summer while lower values typically occur between late evening to morning, and in winter. Table 2-13 presents the average monthly solar radiation at the Tenas Deposit Station.

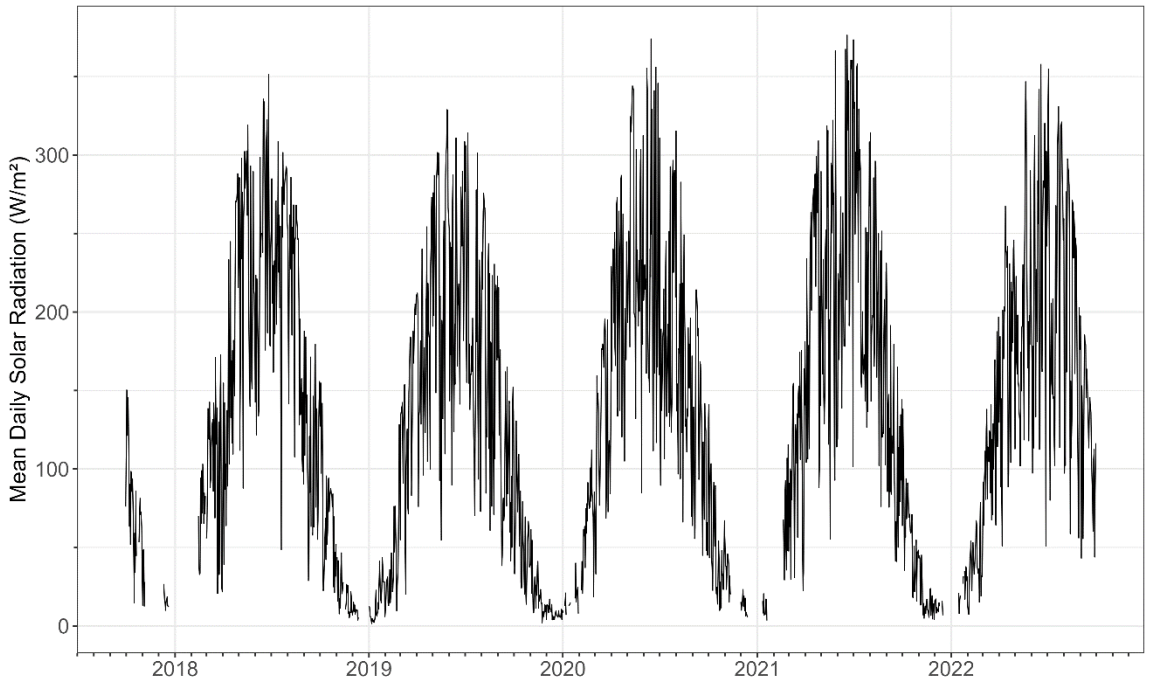

Figure 2-14: Average Daily Solar Radiation at the Tenas Deposit Station for October 2017 to 2019

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-13: Average Monthly Solar Radiation at the Tenas Deposit Station for October 2017 to 2022 [W/m^2]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017										79.8	30.2	15.7	
2018		72.0	99.3	165.2	233.0	237.6	242.2	202.3	112.5	73.1	20.1	9.2	
2019	18.4	40.8	137.3	181.4	230.5	219.5	182.3	183.6	108.5	58.4	20.9	11.1	115.5
2020	16.8	66.4	126.8	206.2	245.4	228.2	196.0	165.5	120.2	51.3	34.3	12.3	122.4
2021	11.6	67.4	105.1	214.3	213.0	249.1	242.4	196.5	112.1	59.1	17.1	12.4	125.0
2022	25.8	38.7	109.9	176.2	192.7	221.1	229.4	194.4	125.0				

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

The Smithers Airport Station does not record solar radiation. The Canadian Weather Energy and Engineering Dataset (CWEEDS) dataset is available for the location of Smithers Airport and was compared to incoming solar radiation recorded at the Tenas Deposit Station. Table 2-14 presents the average monthly solar radiation at the Smithers Airport station from the CWEEDS dataset.

Table 2-14: Average Monthly Solar Radiation [W/m^2] at Smithers Airport Location

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	67	133	249	366	465	485	425	327	232	147	77	48	196

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

Based on available data, incoming solar radiation at the Project was found to be lower than the solar radiation from the CWEEDS dataset for the Smithers Airport location, understood to be due to the former being located in the north face of a mountain while the latter is located in an open, flat location and receives greater insolation.

2.3.6 Relative Humidity

Relative humidity refers to the ratio of the amount of moisture in the air to the relative maximum potential amount that air could hold at a given temperature and atmospheric pressure. As relative humidity approaches 100%, the likelihood of precipitation increases. On a monthly basis, the average relative humidity was typically greatest from November to January, remaining consistently above 85%, and was the lowest overall during the months of July and August (Figure 2-16). The monthly maximum, average and minimum daily relative humidity values are summarized in Table 2-15.

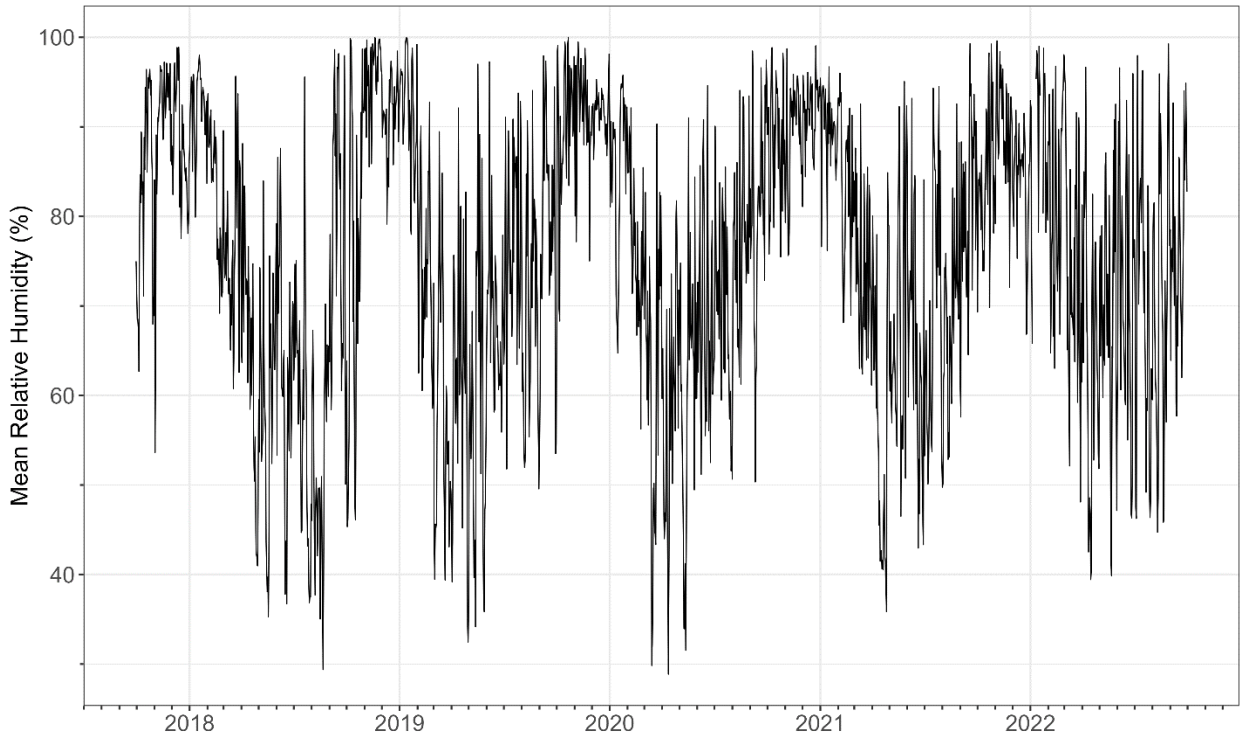

Figure 2-15: Average Daily Relative Humidity at the Tenas Deposit Station for October 2017 to September 2022

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-15: Tenas Deposit Monthly Average Relative Humidity [%]

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017	Max										94.9	95.4	93.1	95.4
	Avg										80.8	83.2	90.0	88.3
	Min										72.0	65.6	83.5	65.6
2018	Max	95.5	91.5	91.4	85.9	82.9	84.7	78.9	72.5	94.2	89.5	99.6	96.1	99.6
	Avg	92.0	83.2	76.8	63.9	59.6	63.2	58.2	51.6	78.3	75.5	96.0	91.3	74.1
	Min	87.5	72.3	59.9	42.9	37.9	42.8	38.8	32.0	59.2	59.6	89.7	84.9	32.0
2019	Max	96.7	86.8	77.7	84.9	82.4	90.3	93.9	90.7	93.9	98.1	97.4	94.8	98.1
	Avg	96.7	86.8	77.7	84.9	82.4	90.3	93.9	90.7	93.9	98.1	97.4	94.8	98.1
	Min	86.3	59.1	40.0	38.6	36.8	47.1	56.9	48.9	59.8	75.1	81.7	86.9	36.8
2020	Max	90.3	90.8	81.7	82.3	86.0	89.2	88.5	93.3	94.6	97.4	95.5	97.0	97.4
	Avg	85.6	76.9	62.9	58.3	60.4	68.9	70.4	76.4	81.1	88.5	89.2	91.6	75.9
	Min	79.3	61.3	43.8	36.9	36.5	47.4	51.8	56.9	63.6	75.4	80.0	83.6	36.5
2021	Max	95.0	90.5	92.3	78.6	90.6	88.6	91.3	91.4	95.9	96.3	97.4	89.0	97.4
	Avg	89.6	83.7	74.1	56.8	67.4	66.2	69.7	68.8	81.7	83.7	90.3	83.5	76.3
	Min	82.4	75.0	53.7	35.5	45.6	43.2	48.6	46.6	61.7	66.8	78.6	77.4	35.5
2022	Max	92.4	94.1	94.8	88.7	93.6	94.3	92.3	91.8	96.9				96.9
	Avg	84.9	82.0	74.1	64.8	69.8	71.2	70.4	70.6	76.7				73.8
	Min	75.8	67.9	49.6	41.1	44.3	48.2	48.7	49.8	52.1				44.1

*Light grey denotes no measurements.

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

Hourly relative humidity recorded at the Smithers Airport station was evaluated for the period of record (1953-2023) and the monthly average values are presented in Table 2-16. Patterns in relative humidity were similar to what was observed at the Tenas Deposit Station.

Table 2-16: Average Monthly Relative Humidity [%] at Smithers A Location

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average (%)	83.3	79.3	71.6	63.8	62.2	66.4	69.8	73.4	80.2	82.2	85.8	85.0	75.2

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

Monthly relative humidity values were compared between October 2017 and September 2022 and are shown in Figure 2-16, where the red line represents the identity function. Based on these records, the Smithers Airport station relative humidity is generally lower than at the Tenas Deposit Station.

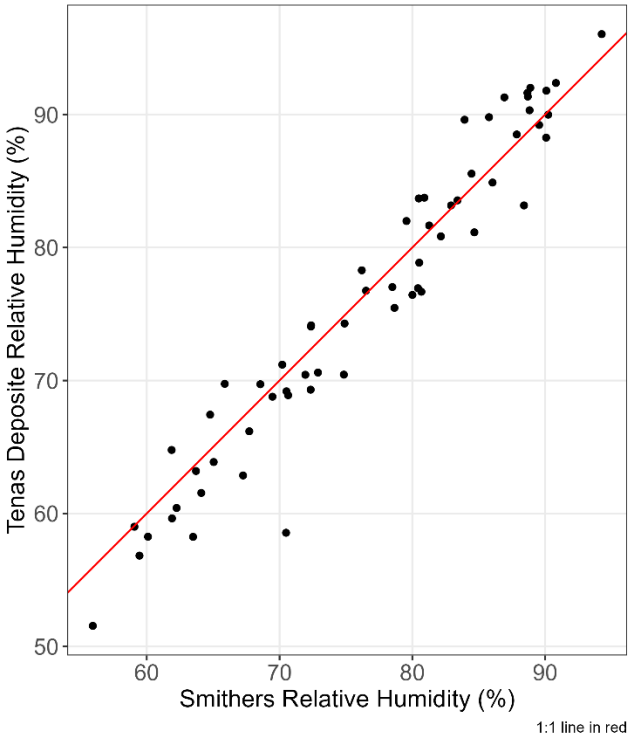

Figure 2-16: Monthly Average Relative Humidity at Smithers Airport Station and Tenas Deposit Station for October 2017 to September 2022

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

2.3.7 Evaporation

Project

Open water evaporation is an important component of the water balance for the Project area. Since the initial EAC application (Aug 2022), new pan evaporation data from site has become available from 2019 and 2022 readings. Daily records are illustrated in Figure 2-17. The monthly total evaporation values are summarized in Table 2-17 showing only complete months of data (August 2019 and June-September 2022).

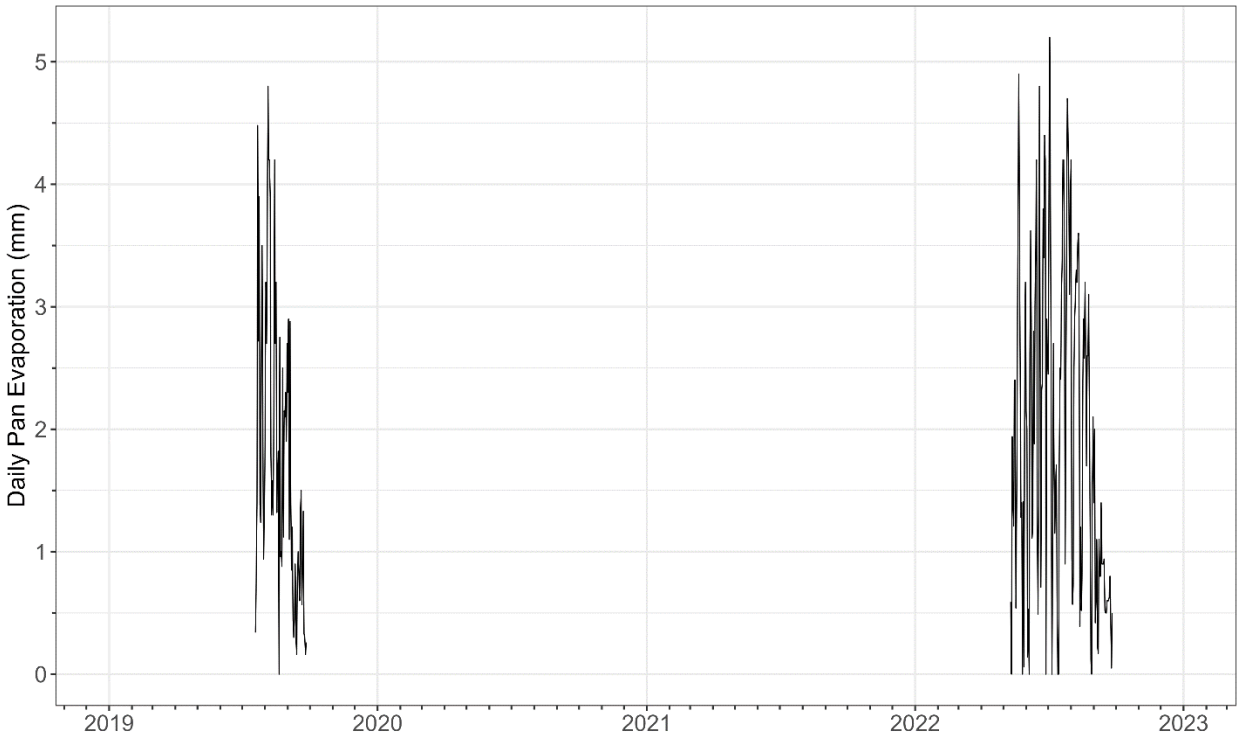

Figure 2-17: Daily Pan Evaporation at the Tenas Deposit Station for July 2019 to September 2022

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-17: Monthly Pan Evaporation at the Tenas Deposit Station for July 2019 to 2022 [mm]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019								72.0				
2022						68.9	79.4	65.2				

*Light grey denotes no measurements.

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

Two approaches were used in order to evaluate open water evaporation: (1) Penman (Penman, 1948) and (2) Morton CRWE (Morton, 1983) approaches. The Penman and Morton CRWE approaches were applied to three datasets to estimate mean daily potential evaporation and then subsequently compared to the Topley Landing pan evaporation measurements (adjusted to represent lake evaporation). The three datasets are: (1) patched regional data (Smithers Airport Station), (2) patched Project data (Tenas Deposit Station) and (3) derived Project data based on reanalysis and regional datasets. Monthly average lake evaporation results are presented in Figure 2-18.

The Penman formula is a semi-empirical equation that incorporates energy budget and mass transfer approaches to estimate daily potential evapotranspiration or open water evaporation. Open water evaporation E_0 (in mm/day) is calculated according to the formula:

$$E_o = \frac{\left(\frac{\Delta}{\gamma} H + E_a\right)}{\frac{\Delta}{\gamma} + 1}$$

Where $\frac{\Delta}{\gamma}$ is an empirical parameter dependent on temperature, H is calculated based on incoming solar radiation, outgoing radiation, albedo of the open water surface and the proportion of cloudiness.

E_a is calculated semi-empirically as well using windspeed, and vapour pressure.

The Morton CRWE formula generates an estimate of monthly potential evaporation using the input parameters in Table 2-18.

Table 2-18: Morton CRWE Evaporation Formulation Input Parameters

Parameter	Description	Value
T_{max}, T_{min}	Timeseries of daily maximum and minimum project temperatures	See Section 2.3.1, 4.2.2
RH_{max}, RH_{min}	Timeseries of daily maximum and minimum project relative humidity	See Section 2.3.6, 4.1
T_{dew}	Timeseries of daily project dew point temperature.	Computed with the Magnus Formula (Magnus, 1844)
Rs	Timeseries of daily project solar irradiance	See Section 2.3.5, 4.2.5
epsilon	Surface emissivity (Morton, 1986)	0.92

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

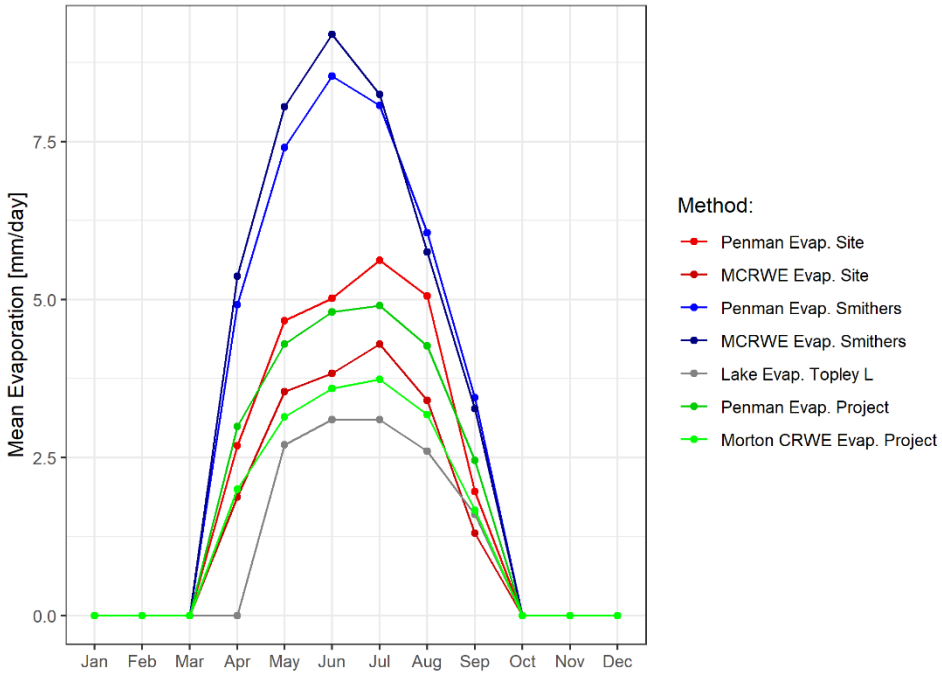

Figure 2-18: Estimated Monthly Average Lake Evaporation

The only regional station with evaporation measurements is Topley Landing, located 71 km northeast of the Project at an elevation of 722 masl. Mean annual lake evaporation at Topley Landing was 401 mm based on the 1981-2010 Canadian Climate Normals published by Environment Canada. Note that relative humidity and solar radiation are not measured at Topley Landing so the methods listed above could not be directly compared for Topley Landing.

3 Baseline Hydrology

3.1 Section Overview

The baseline characterization incorporates historical flow records from selected long-term Water Survey of Canada (WSC) stations as well as available data from local Project hydrometric stations.

Local data has been collected as part of the Tenas Project baseline monitoring program. Information from September 2017 to September 2018 is synthesized in the Tenas Project 2017 to 2018 Baseline Report (ERM 2019) with more recent information provided by ERM in the form of field reports. New hydrologic data has also been collected at Tenas-Hydro, and Four-Hydro stations between 2021 and 2022. Additional data collected by AGRA Earth and Environmental Ltd in 1997-1998 is presented in Attachment C.

Hydrometric records generated for the Project Area spanning 2017 to 2022 are shown in Section 3.2 for the open water period. Regional data for each Water Survey of Canada station are discussed in Section 3.2 and summarized in Section 3.3.

3.2 Available Hydrometric Data

3.2.1 Project Data

Catchment Delineations

Catchment areas were defined by ERM (ERM 2019) and verified by SRK. Project Area hydrometric stations as well as regional Water Survey of Canada stations are shown in Figure 3-1.

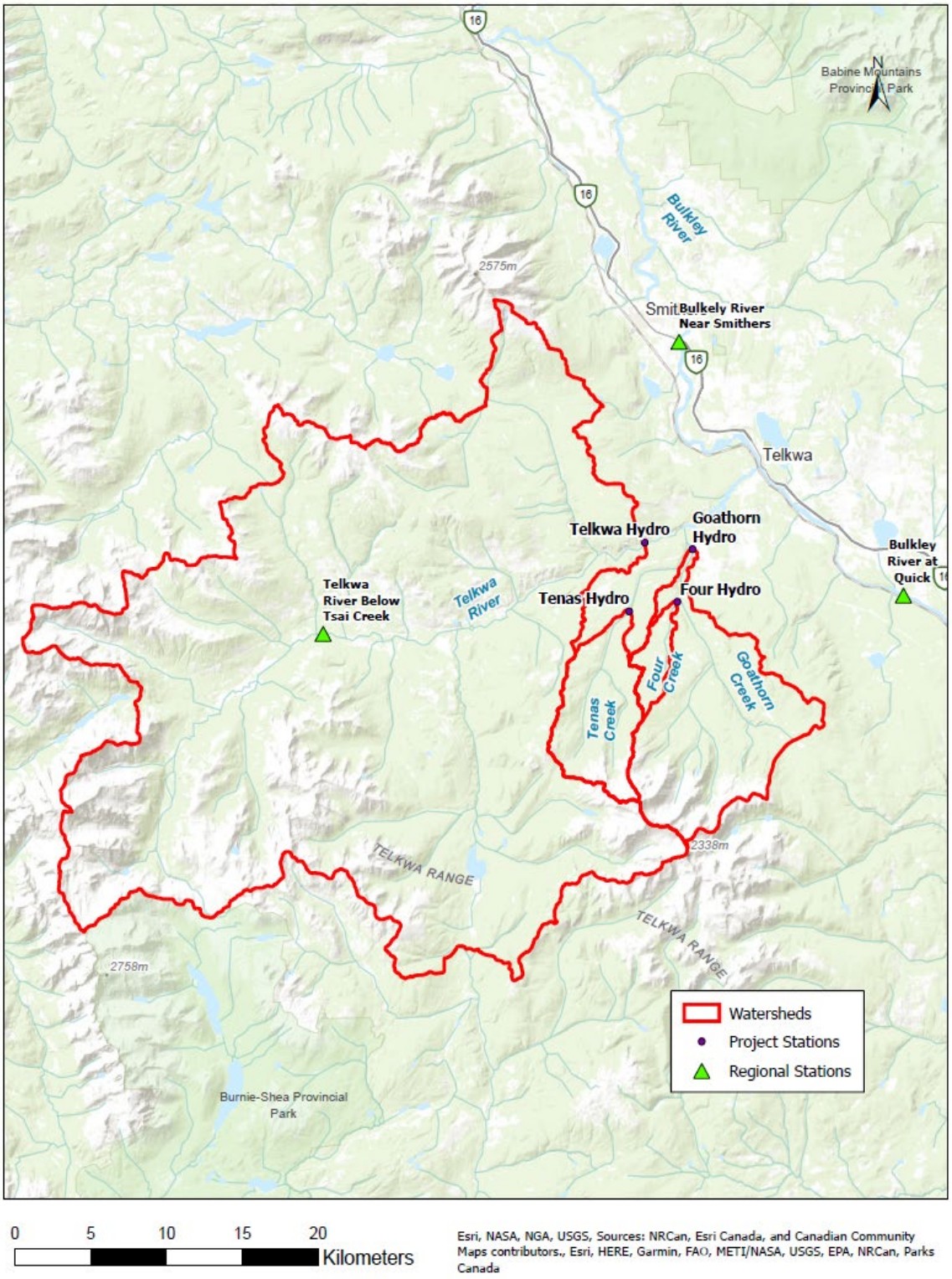

Figure 3-1: Map of Project Area With Project Hydrometric Station Catchments Delineated

Source: \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!080_Deliverables\Hydromet Baseline Update\040_Figures\ Figure3.1_Hydrometric_Stations_20201023.jpg

Hydrometric Data

Historical hydrometric data was collected in 1997-1998 by AGRA Earth and Environmental Ltd for development of the Project Area by Luscar Ltd. Hydrometric spot measurements were collected at Four Creek and Tenas Creek and converted to continuous discharge for a subset of each open-water season. Four Creek data from this period was assessed in more detail than Tenas Creek records due to the short duration of data collected in 2020 by ERM.

Table 3-1 summarizes relevant information for each Project hydrometric station.

Recent rating curves and continuous discharge were developed for each hydrometric station by ERM (Figure 3-2). Additional details on the instrumentation and rating curve development is summarized in the 2017-2018 Baseline Report (ERM 2019). The Tenas-Hydro station was moved approximately 200 m upstream in 2018. Additional monitoring, rating curve development and analysis for 2019 hydrometric data was completed by ERM.

The Four-Hydro station was installed in April 2020. Monitoring of other local hydrometric stations in 2020 was not completed. Additional streamflow data were collected in Four Creek and Tenas Creek in 2021 and 2022.

Table 3-1: Summary of Project Area Hydrometric Stations Location and Measurement Information

Station Name	Longitude	Latitude	Average Catchment Elevation (masl)	Area (km^2)	Period of Measurement	Rating Curve Equation Q = C(h-a)b (developed at)	# of Manual Measurements
Telkwa-Hydro	54.65	-127.17	1,243	966.9	May 2017 – November 2019	C: 56.634 a: 97.955 b: 2.113 (March 2020)	8 (2017) 10 (2018) 6 (2019)
Tenas-Hydro & Tenas-Hydro B	54.62	-127.19	1,181	46.8 47.6	May 2017 – November 2022	C: 13.233 a: 97.21 b: 2.278 (October 2022)	5 (2017) 10 (2018) 6 (2019) 4 (2021) 9 (2022)
Goathorn-Hydro	54.65	-127.12	1,243	123.5	May 2017 – November 2019	C: 9.383 a: 98.18 b: 2.361 (March 2020)	9 (2017) 10 (2018) 6 (2019)
Four-Hydro	54.62	-127.14	985	11.0	April 2020 – November 2022	breakpoint at h = 99.330 for h ≤ 99.330 C: 36.987 a: 99.311 b: 1.964 for h > 99.330 C: 18.379 a: 99.246 b: 2.860 (October 2022)	8 (2020) 4 (2021) 9 (2022)

Source: Compiled in text. \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!020_Project_Data\020_Client\20200312_HydrologyData_DFarmer\2.0 Rating Curves and Hydrographs

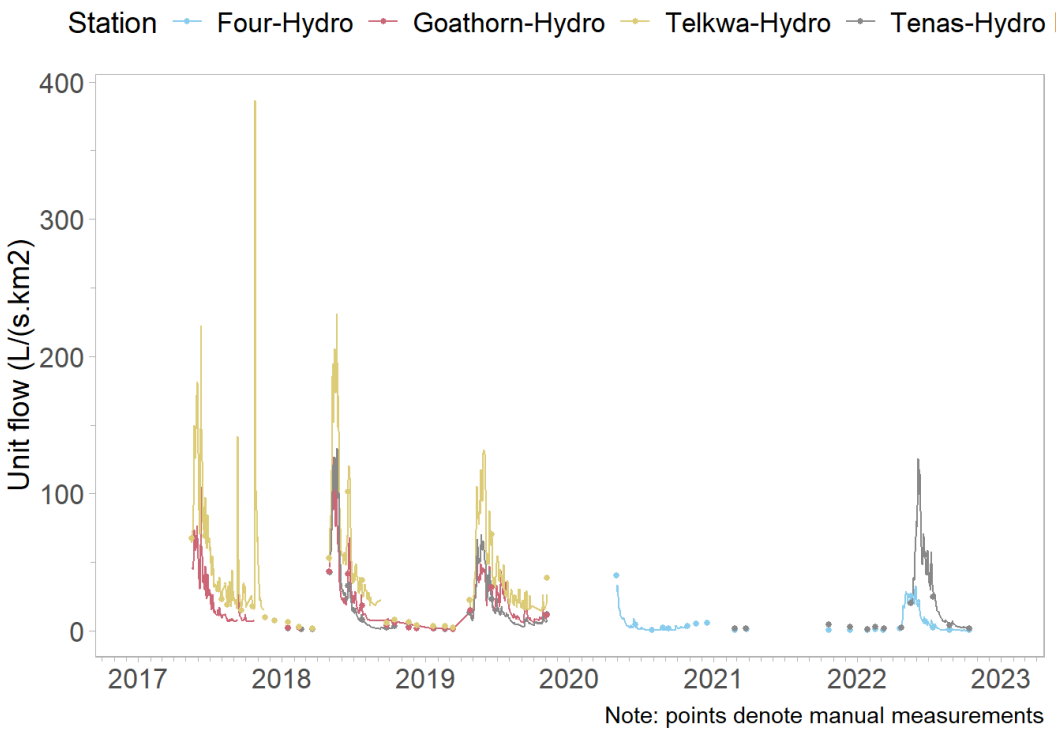

Figure 3-2: Available Streamflow Data Recorded at the Project Hydrometric Stations

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

3.2.2 Regional Data

Water Survey of Canada (WSC) is the national authority responsible for the collection, interpretation and dissemination of standardized water resource data in Canada. Stations within the same BC hydrological zone were evaluated and additional selection criteria were subsequently applied.

Figure 3-1 illustrates the four regional WSC stations selected based on proximity to the Project hydrometric stations as well as for having similar flow regimes. These stations have more than 10 years of data and catchment areas ranging between 125 km^2 to 8,940 km^2. Table 3-2 summaries the metadata for these stations and the length of published historical record.

Table 3-2: Summary of Regional Hydrometric Stations

Station ID	Station Name	Longitude [°]	Latitude [°]	Area [km^2]	First Year	Last Year
08EE008	Goathorn Creek near Telkwa	54.65	-127.12	125	1960	2024[1]
08EE020	Telkwa River below Tsai Creek	54.61	-127.50	367	1975	2024
08EE004	Bulkley River at Quick	54.62	-126.90	7,340	1930	2020
08EE005	Bulkley River near Smithers	54.77	-127.13	8,940	1945	2023

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.002 2017-18 permitting Support (Phase 2)\0200_SurfaceWater\Hydrology\R files\Flows_update_rev02.Rmd

Notes:
1. Goathorn Creek near Telkwa (08EE008) was decommissioned in January 2018 and re-installed in October 2019.

Discharge from all four Water Survey of Canada regional stations (Table 3-2) followed a nival regime with an initial increase in discharge observed in April followed by annual maximum in response to snowmelt typically during May. Discharge responded to rainfall events throughout the summer and a recession to annual low flows was observable in the late fall and winter. The time series of each regional hydrometric station are shown in Figure 3-3, Figure 3-4 , Figure 3-5, Figure 3-6.

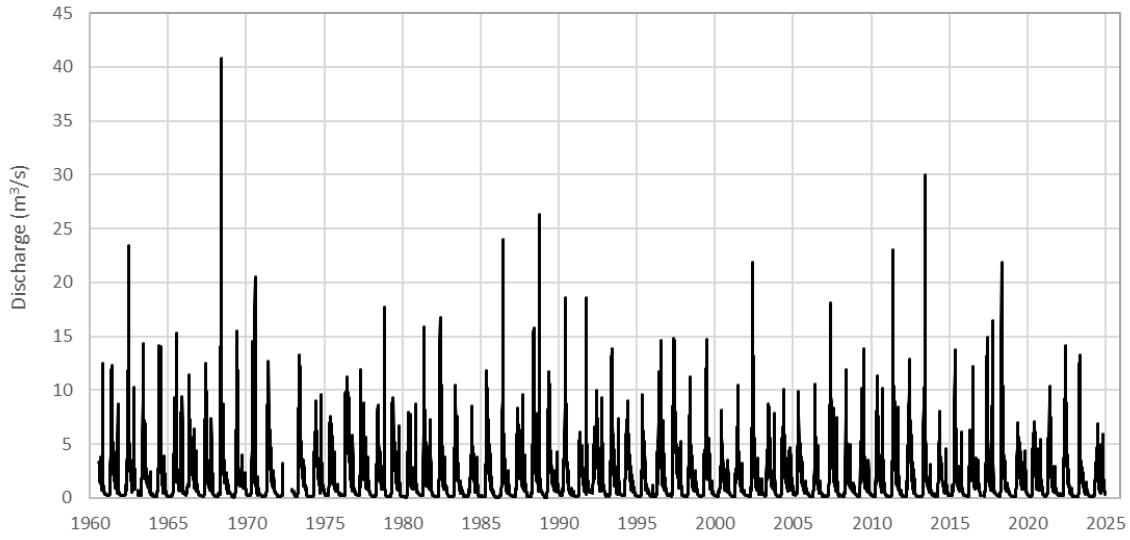

Figure 3-3: Goathorn Creek Near Telkwa (08EE008) Discharge data from 1960-2024

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

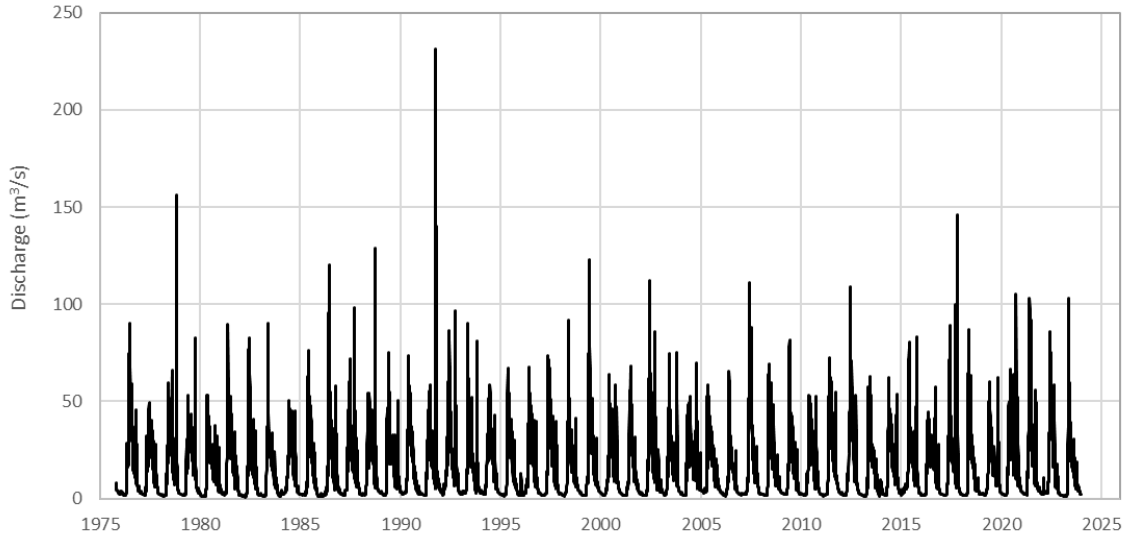

Figure 3-4: Telkwa River Below Tsai Creek (08EE020) Discharge from 1975-2023

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

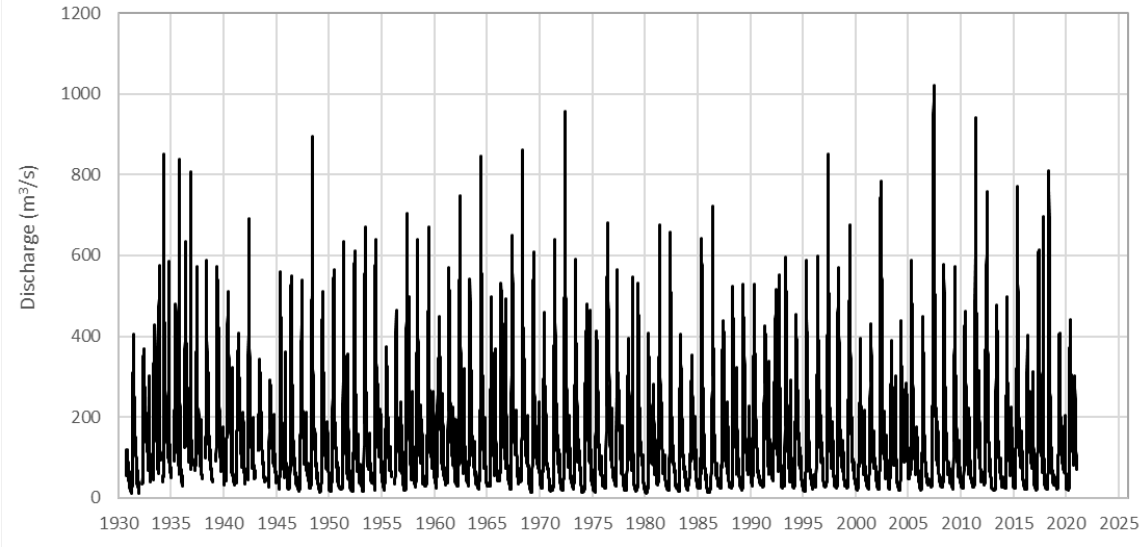

Figure 3-5: Bulkley River At Quick (08EE004) Discharge for 1930-2020

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

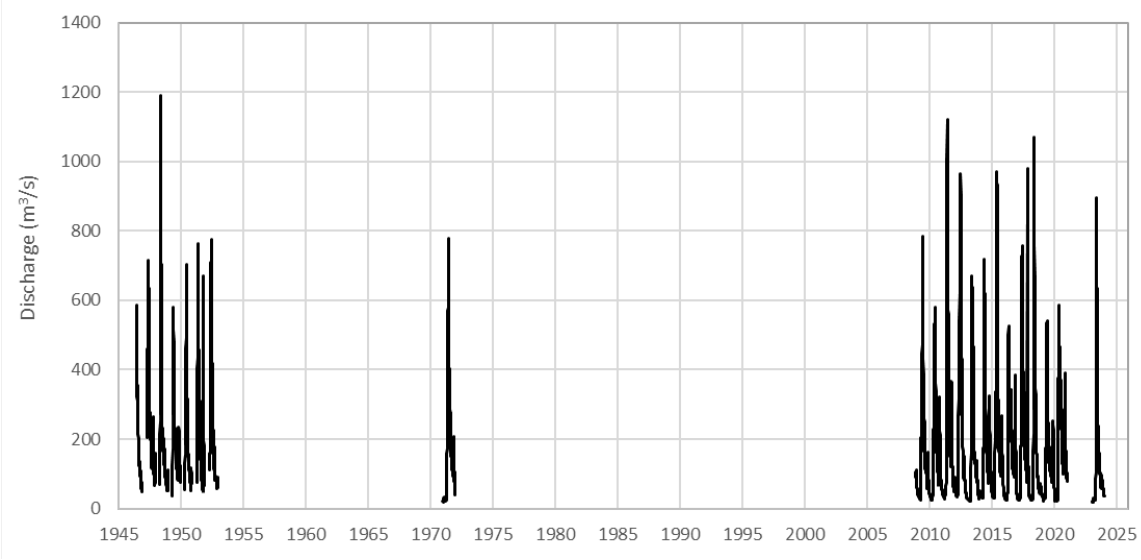

Figure 3-6: Bulkley River Near Smithers (08EE005) Discharge for 1945-2023

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

3.3 Summary of Available Data

3.3.1 Project Hydrometric Monitoring Data

Discharge

Historical Four Creek discharge data for 1997-1998 will not be presented in this section but is summarized in Attachment C. Continuous discharge was generated from water level measurements and rating curves developed for each Project Area hydrometric station for the open water period. Average monthly discharge are presented for each station in Table 3-3 and unit discharge values are presented in Table 3-4 by dividing monthly average flow by the associated catchment area (Table 3-1).

Table 3-3: Average Monthly Discharge for the Open-Water Period (m^3/s)

Station Name	Year	Apr[1]	May[1]	Jun	Jul	Aug	Sep	Oct	Nov[1]
Telkwa-Hydro	2017		121.0*	93.9	37.7	28.3	32.2	51.5	24.5*
	2018		135.5	66.1	34.7	22.3	20.2*	7.7*	5.9*
	2019	16.1*	84.9	56.1	36.3	23.2	18.8	16.5	20.5*
Tenas-Hydro	2017		4.0*	2.4	0.5	0.2*			
Tenas-Hydro B	2018		4.1	1.2	0.5	0.1	0.1	0.1*	0.1*
	2019	0.4*	2.2	1.3	0.6	0.3	0.3	0.3	0.3*
	2020								
	2021							0.2*	
	2022	0.1*	2.0*	3.3	1.2	0.3	0.1	0.1*	
	2017		7.3*	5.1	2.0	1.1	1.3	0.9	

Goathorn-Hydro	2018		8.7	3.7	2.2	1.0	0.9	0.8	0.6
	2019	1.3	4.6	3.3	3.4	1.3	1.3	1.1	1.2*
Four-Hydro	2020	0.321*	0.122	0.030	0.009	0.008	0.011	0.026	0.056*
	2021							0.006*	
	2022	0.118*	0.261	0.122	0.039	0.006	0.003	0.002*	

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

Notes:
1. Measurements in April, May and November were conducted on differing days per month between years and stations.
2. Light grey denotes no measurements.
3. Months with less than 20 measurements are marked with *

Table 3-4: Average Monthly Unit Discharge (L/s/km^2) for the Open-Water Period

Station Name	Catchment Area (km^2)	Year	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Telkwa-Hydro	966.9	2017		121.4*	94.2	37.8	28.4	32.3	51.6	24.5*
		2018		135.9	66.3	34.8	22.4	20.3*	7.7*	5.9*
		2019	16.1*	85.1	56.3	36.4	23.3	18.8	16.5	20.5*
Tenas-Hydro & Tenas-Hydro B	46.8 47.6	2017		85.3*	50.3	11.5	5.2*		5.5	5.3
		2018		86.6	25.3	9.9	2.9	1.9	2.6*	2.6*
		2019	9.2*	45.7	26.4	12.9	5.4	5.3	6.0	7.0*
		2020								
		2021							4.3*	
		2022	2.0*	41.0*	70.3	26.0	6.3	3.1	2.0*	
Goathorn-Hydro	123.5	2017		59.0*	41.3	16.3	9.0	10.5	7.2	
		2018		70.4	30.0	17.5	8.0	7.7	6.6	4.9
		2019	10.6	37.2	26.9	27.3	10.5	10.3	9.0	9.9*
Four-Hydro	11.0	2020	29.2*	11.1	2.7	0.8	0.7	1.0	2.4	5.1*
		2021							0.5*	
		2022	10.7*	23.7	11.1	3.6	0.6	0.3	0.2*	

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

Notes:
1. Light grey denotes no measurements.
2. Months with less than 20 measurements are marked with *

Low Flows

Low flows are critically important parameters due to their low dilution capacity as well as the implications for biological organisms. Low flow statistics are based on available records to estimate the lowest flow within a watercourse over some period of time. Low flow statistics are expressed as an averaging period (e.g., 7 day average) over a recurrence interval where 10 years is common for hydrologically-based flows (7Q10). A low flow calculation requires several years of record as a distribution model (i.e, Log Pearson Type III) is applied to the collected lowest flow event from each year of record. The short length of the Project Area hydrometric records does not allow for a 7Q10 calculation. Low flows were therefore conservatively estimated as the minimum daily average flow for each month for each station (Table 3-5).

Table 3-5: Minimum Instantaneous Discharge (m^3/s)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Telkwa-Hydro	2017					63.7[1]	59.7	24.4	18.0	16.1	15.6	9.8[1]	7.5[2]	7.5
	2018	6.5[2]	2.5[2]	1.7[2]		49.5	34.6	24.7	18.2	5.6[1]	7.7[2]	5.9[2]	4.1[2]	1.7
	2019	3.2[2]	3.4[2]	2.4[2]	13.5[1]	15.9	30.8	21.3	16.5	15.1	14.3	18.0[1]		2.4
Tenas-Hydro & Tenas-Hydro B	2017					54.6[1]	19.4	7.3	3.7[1]		5.5[2]	5.3[2]	3.2[2]	3.2
	2018	1.7[2]	1.2[2]	1.1[2]		34.3[1]	13.4	5.7	1.5	1.2	1.6[1]	2.6[2]	1.4[2]	1.1
	2019	1.3[2]	0.8[2]	0.7[2]	7.4[1]	8.7	12.6	9.2	3.3	2.6	3.8	6.1[1]		0.7
	2020													
	2021		1.4[2]	1.4[2]							4.3[2]		2.5[2]	1.4
	2022	1.2[2]	2.8[2]	1.6[2]	2.0[2]	19.5[1]	39.9	10.0	4.0	2.1	1.7[1]			1.2
Goathorn-Hydro	2017					44.5[1]	23.7	10.8	6.8	6.9[1]	6.8[1]			6.8
	2018	2.4[2]	2.0[2]			23.8	18.6	11.4	7.6	7.4	5.8	4.1	2.5	2.0
	2019	1.3	1.2	1.0	7.3	11.2	14.5	17.5	6.5	5.7	6.1	8.6[1]		1.0
Four-Hydro	2020				29.2[2]	2.7	0.9	0.2	0.2	0.4	1.6[1]	5.1[2]	5.5[2]	0.2
	2021		0.7[2]	1.1[2]							0.5[2]		0.7[2]	0.5
	2022	0.3[2]	1.1[2]	0.5[2]	1.5[1]	18.8	3.8	0.7	0.2	0.1	0.1[1]			0.1

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

Notes:
[1]Incomplete month.
[2]Single measurement.
*Light grey denotes no measurements.

3.3.2 Regional Hydrometric Records

Discharge

Discharge data from Water Survey of Canada compiled for each station was summarized as average monthly and annual discharge for the four regional hydrometric stations (Table 3-6).

Table 3-6: Average Monthly and Mean Annual Discharge (m^3/s)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn Creek near Telkwa (08EE008)	1960-2024	0.2	0.2	0.2	1.1	5.1	5.2	3.2	1.7	1.3	1.4	0.9	0.4	1.7
Telkwa River below Tsai Creek (08EE020)	1975-2023	2.6	2.2	2.1	5.3	27.6	41.0	30.8	21.3	15.4	12.6	7.0	3.4	14.3
Bulkley River at Quick (08EE004)	1930-2020	38.3	31.1	29.2	87.6	315.5	365.1	230.2	142.4	101.4	110.0	102.7	59.2	134.4
Bulkley River near Smithers (08EE005)	1946-2023	35.9	30.9	35.0	129.9	454.7	447.0	260.9	156.0	116.4	124.1	112.9	63.5	163.9

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

Unit Discharge

The monthly average discharge for each regional station was converted to unit discharge, which normalizes discharge per unit area of the catchment (Table 3-7).

Table 3-7: Average Monthly and Annual Unit Discharge (L/s/km^2)

Station Name	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn Creek near Telkwa (08EE008)	1960-2024	0.3	1.4	1.6	9.1	40.8	41.6	25.5	13.4	10.0	10.9	7.2	2.9	13.7
Telkwa River below Tsai Creek (08EE020)	1975-2023	0.7	5.9	5.7	14.3	75.3	111.6	83.9	57.9	42.0	34.3	19.2	9.3	38.3
Bulkley River at Quick (08EE004)	1930-2020	5.2	4.2	4.0	11.9	43.0	49.7	31.4	19.4	13.8	15.0	14.0	8.1	18.3
Bulkley River near Smithers (08EE005)	1946-2023	0.1	3.5	3.9	14.5	50.9	50.0	29.2	17.5	13.0	13.9	12.6	7.1	18.0

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

Lowest 7-Day Average Flow (7Q10)

For the regional records, the 7-day average flow that occurred (on average) once every 10 years was calculated for each regional hydrometric station (Table 3-8).

Table 3-8: 7Q10 Values for Regional Stations (m^3/s)

Station Name	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn Creek near Telkwa (08EE008)	0.1	0.1	0.1	0.1	1.0	2.1	1.2	0.7	0.5	0.4	0.2	0.1	0.1
Telkwa River below Tsai Creek (08EE020)	1.6	1.4	1.2	1.4	4.9	19.7	17.4	11.6	5.9	4.2	2.3	1.7	1.2
Bulkley River at Quick (08EE004)	19.1	17.2	16.2	18.2	77.0	196.9	127.9	84.6	59.3	48.8	36.4	24.7	15.1
Bulkley River near Smithers (08EE005)	26.1	23.5	22.4	23.7	129.8	214.2	141.4	90.0	65.2	50.2	39.5	30.5	22.9

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev09.Rmd

4 Derived Project Parameters

4.1 Derived Meteorological Parameters

Due the the relatively short record of Tenas Deposit Station data, meteorological parameters for the Project are derived by adjusting the patched long-term datasets at Smithers Airport to the site, based on spatial and orographic gradients. Adjustment factors are derived based on trends in regional stations, or when these are not adequate, reanalysis datasets, as described in the following sections.

4.1.1 Air Temperature

Historical Smithers Airport monthly temperatures were compared to the reanalysis datasets for the same location. Of the reanalysis datasets investigated, the PRISM model was determined to provide the best fit for precipitation as described in Section 4.1.2. Figure 4-1 illustrates the monthly temperature regression between measured and modelled PRISM temperatures at the Smithers Airport Station. Given the good correlation, PRISM data for the Project at the Tenas Deposit Station was obtained and monthly correction factors relative to the Smithers Airport station were developed to account for orographic gradients and temperature inversion effects (Table 4-1).

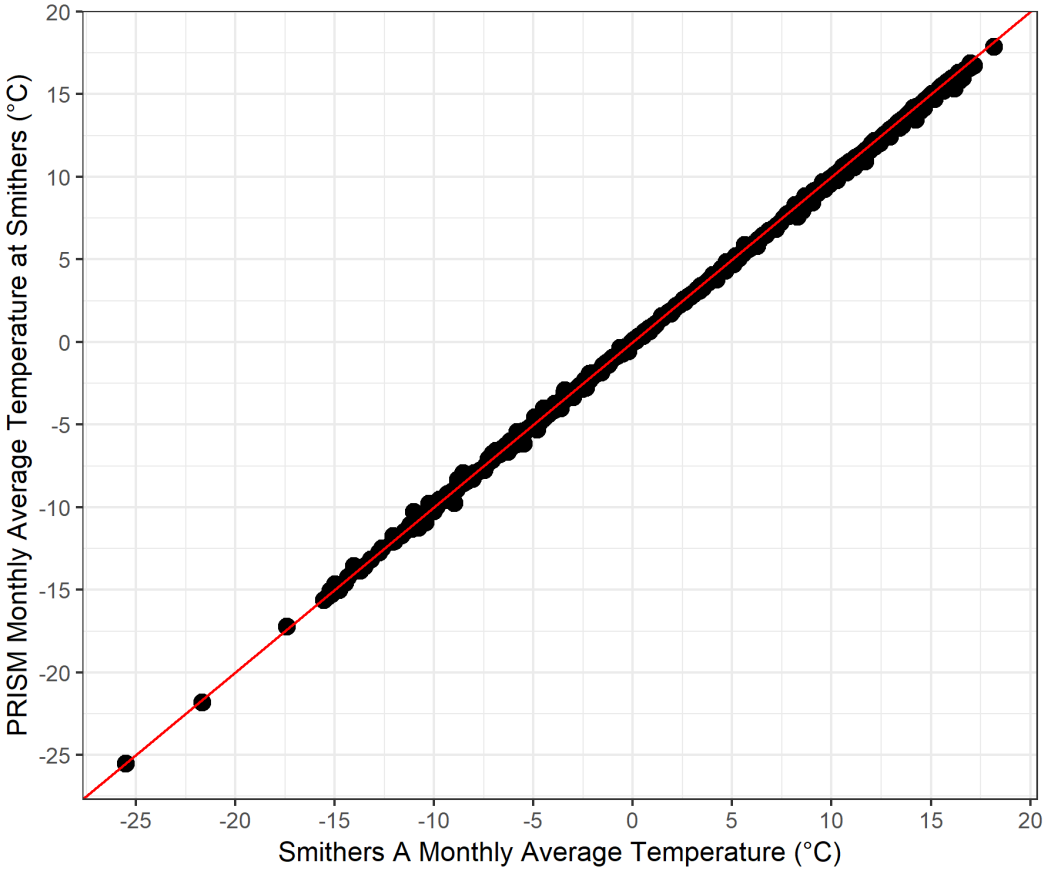

Figure 4-1: Smithers Airport vs PRISM Reanalysis

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

Correction Factors and Expected Project Air Temperature

The correction factors presented in Table 4-1 were applied to the patched Smithers Airport Station temperature record to create a Project-adjusted long-term temperature record for design and modelling.

Table 4-1: Temperature Correction Factors

Month	Minimum Temperature			Average Temperature			Maximum Temperature		
	Smithers Airport (°C)	PRISM at Project (°C)	Absolute Temp. Ratio	Smithers Airport (°C)	PRISM at Project (°C)	Absolute Temp. Ratio	Smithers Airport (°C)	PRISM at Project (°C)	Absolute Temp. Ratio
January	-13.6	-13.5	1.000	-9.5	-9.9	0.998	-5.5	-6.3	0.997
February	-9.5	-10.2	0.997	-4.9	-6.0	0.996	-0.2	-1.7	0.994
March	-5.9	-7.6	0.993	-0.7	-2.8	0.992	4.5	2.0	0.991
April	-1.6	-3.3	0.994	4.3	1.9	0.991	10.1	7.1	0.989
May	2.5	0.3	0.992	8.9	6.3	0.991	15.4	12.3	0.989
June	6.0	4.4	0.994	12.5	10.4	0.992	19.0	16.3	0.991
July	8.1	6.5	0.994	14.7	12.6	0.993	21.1	18.6	0.991
August	7.5	6.1	0.995	14.1	12.1	0.993	20.6	18.1	0.991
September	3.9	2.9	0.996	9.8	8.1	0.994	15.7	13.4	0.992
October	0.1	-1.6	0.994	4.4	2.4	0.993	8.7	6.4	0.992
November	-5.6	-7.2	0.994	-2.5	-4.1	0.994	0.7	-1.1	0.994
December	-10.8	-11.2	0.998	-7.2	-7.9	0.998	-3.7	-4.5	0.997

Source compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

Table 4-2 summarizes the expected monthly air temperatures at the Project and Figure 4-2 illustrates the modelled average monthly temperature compared to measured temperature at the Tenas Deposit Station.

Table 4-2: Expected Project Temperature Summary [°C] From Derived Long-term Time Series

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Maximum	-5.8	-1.8	2.2	7.4	12.9	16.5	19.0	18.6	13.7	6.5	-0.8	-4.6	7.0
Average	-9.2	-6.1	-2.7	2.1	6.8	10.7	13.0	12.5	8.4	2.6	-3.8	-7.9	2.2
Minimum	-12.6	-10.4	-7.5	-3.1	0.8	4.7	6.9	6.4	3.1	-1.4	-6.8	-11.2	-2.6

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

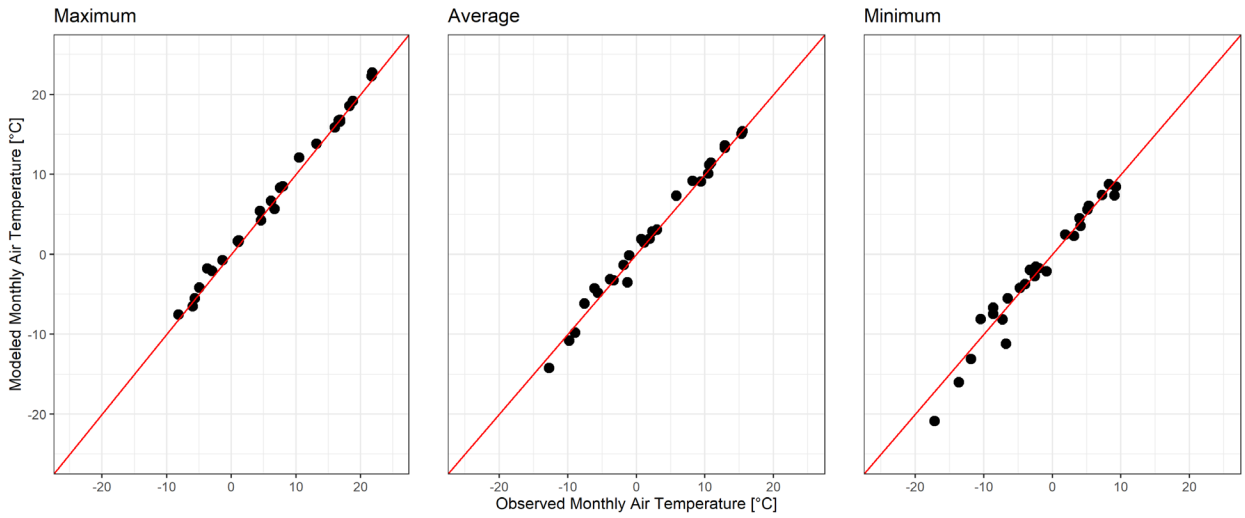

Figure 4-2: Comparison between Observed and Modelled Monthly Average Temperatures for October 2017 to December 2019

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

4.1.2 Precipitation

Figure 4-3 illustrates the monthly precipitation correlation between the 60 months of measured Project precipitation and patched precipitation records at Smithers for the overlapping period from October 2017 to September 2022. The total measured precipitation at the Tenas Deposit Station was approximately 34% greater than that at Smithers A over this period. The monthly precipitation difference ranged between -15 mm to +91 mm for Project data over the 60 months and suggests monthly correction factors are more appropriate to account for seasonality.

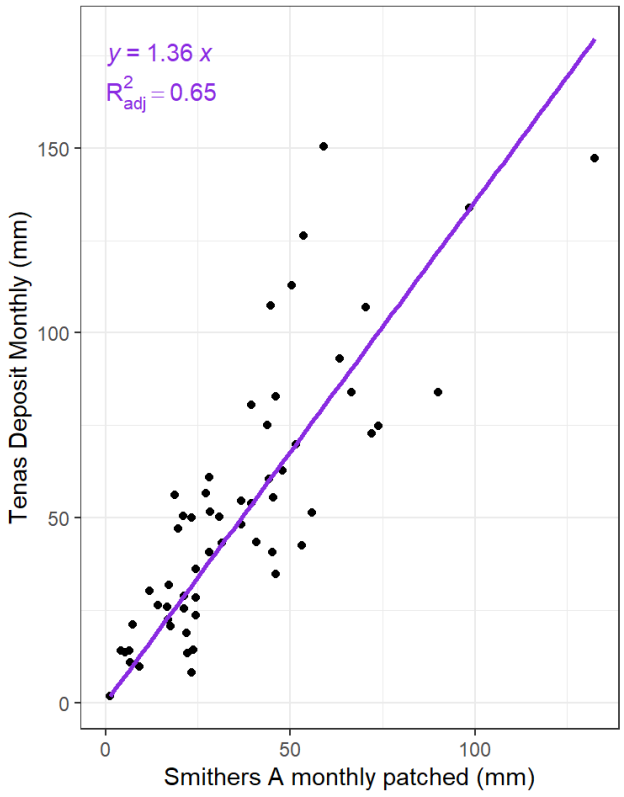

Figure 4-3: Comparison between Observed Total Precipitation at Tenas Deposit Station and Smithers A

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Typically, precipitation depths are expected to be greater at higher elevations. However, as previously demonstrated in Figure 2-10, there is a poor regional correlation between mean annual precipitation and elevation at the regional stations. Therefore, reanalysis datasets were evaluated against the patched Smithers A record to develop transposition factors to adjust the longer-term dataset to site (Table 4-3).

Table 4-3: Smithers A and Reanalysis Mean Monthly and Annual Precipitation Comparison [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Smithers A (patched)	51	28	22	22	35	46	45	41	51	62	54	50	508
ERA 5	62	41	45	45	59	79	70	65	69	86	79	59	760
Merra 2	92	60	76	60	72	101	97	94	94	117	105	92	1059
PRISM	48	23	24	24	34	55	46	46	49	66	54	49	517

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Precipitation_1CT027.003_rev01.Rmd

The PRISM reanalysis data was found to best represent the spatial precipitation distribution across elevations. The PRISM mean annual precipitation for the region surrounding the Project, shown in Figure 4-4, demonstrates the spatial and orographic variability of precipitation in the region.

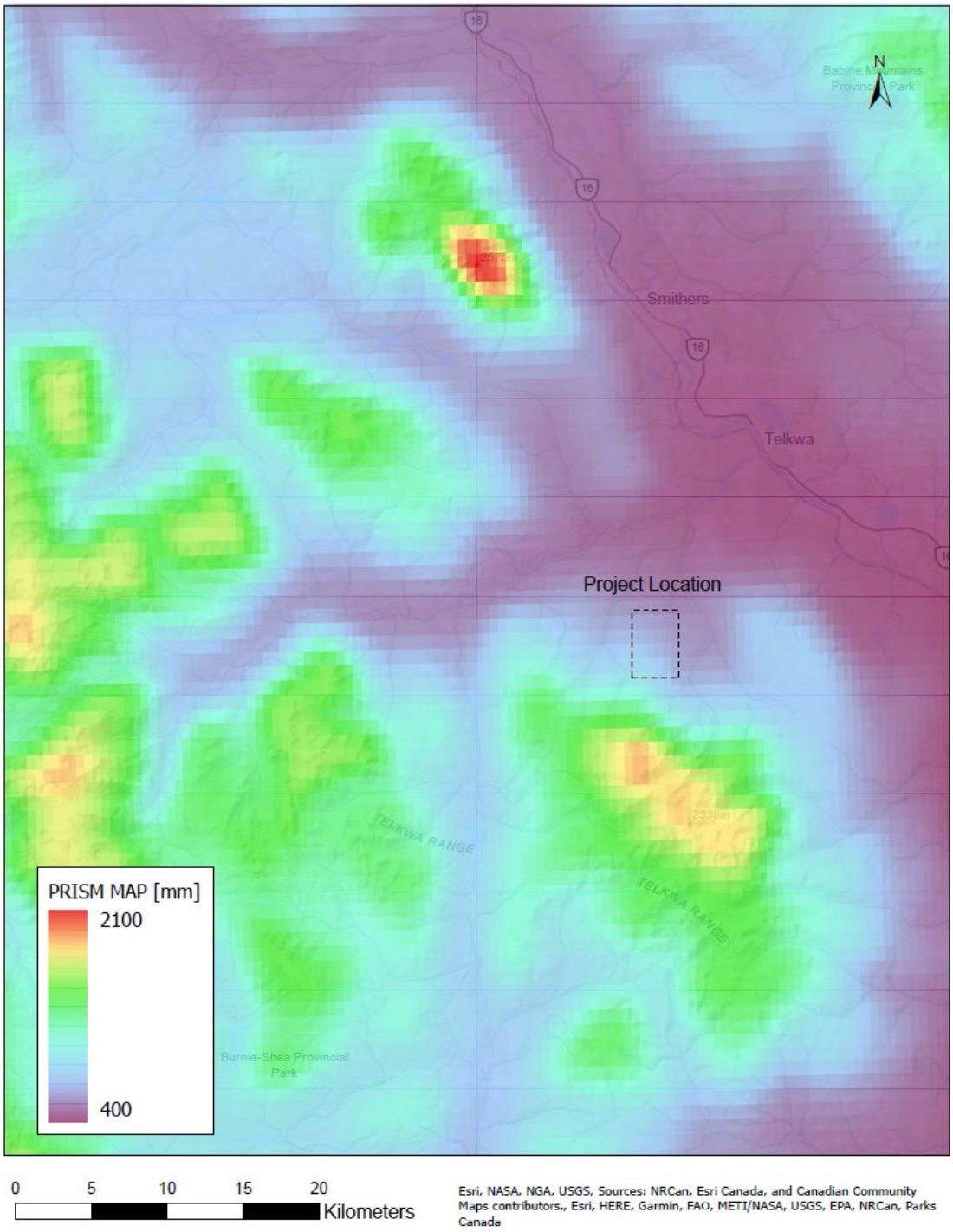

Figure 4-4: PRISM Mean Annual Precipitation in the project Area

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!080_Deliverables\Hydromet Baseline Update\040_Figures\Figure4.4_PRISM_MAP.pdf

4.1.3 Synthetic Extended Project Precipitation

The Smithers A station record was gap-filled using the Smithers Airport Auto station. The Smithers A station was subsequently gap-filled using the Quick station and then a quantile-mapped ERA5 reanalysis product for the Smithers A location to generate a complete time series spanning 1946-2023. The 2017-2022 Tenas Deposit station records were assessed in relation to regional station records on a monthly and daily basis. This assessment was done for hourly, daily, and monthly precipitation totals as well as seasonally by lumping multiple months together. Ultimately, the gap-filled regional time series at Smithers A was adjusted to the Project area using the linear regression provided in Figure 4-3 developed from the monthly precipitation totals (R2 of 0.65). No bias correction was undertaken to avoid overfitting the data due to the length of the overlapping period.

Table 4-4 presents the monthly precipitation measured at the Tenas Deposit station relative to the monthly modelled precipitation using the linear regression with Smithers A.

Table 4-4: Total Precipitation Measured at Tenas Deposit Station and Modelled Precipitation using Linear Regression from Smithers Airport

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2017	Total Measured Precipitation [mm]	M	M	M	M	M	M	M	M	M	147	134	10	291[1]
	Total Modelled Precipitation [mm]	-	-	-	-	-	-	-	-	112	180	134	12	439[1]
2018	Total Measured Precipitation [mm]	50	150	81	14	14	42	50	2	50	54	51	113	672
	Total Modelled Precipitation [mm]	42	81	54	7	32	72	28	2	32	54	76	69	549
2019	Total Measured Precipitation [mm]	60	19	8	13	26	57	83	21	47	93	73	22	522
	Total Modelled Precipitation [mm]	61	30	32	30	19	37	63	24	27	86	98	23	529
2020	Total Measured Precipitation [mm]	126	26	30	14	25	63	35	84	55	84	107	M	647[1]
	Total Modelled Precipitation [mm]	73	23	16	9	29	65	63	122	62	90	61	-	612[1]
2021	Total Measured Precipitation [mm]	M	M	12	14	56	51	61	24	75	31	107	29	460[1]
	Total Modelled Precipitation [mm]	-	-	33	6	26	39	38	33	100	23	96	29	423[1]
2022	Total Measured Precipitation [mm]	17	55	21	28	48	75	41	41	11	M	M	M	337[1]
	Total Modelled Precipitation [mm]	55	49	10	33	49	59	61	37	9	-	-	-	361[1]

Notes:
M denotes a month with greater than 10 (typically 20-25) days of missing data. – indicates that the synthetic data was removed over this period for meaningful comparison with measured Tenas Deposit data.

[1] Indicates that calculated annual total precipitation is for a partial year as one or more months had >10 days of missing data.

Source: compiled in text from \NA CAPR002055 Telkwa Project General EA Support - Internal\Surface Water IR Responses\Updated Responses_20230906\1CT027.003_Telkwa_ITT_SW_IRs_Round2_WaterBalanceOnly_20240603_njs_ccm df.docx

Finally, PRISM correction factors were applied to account for the elevation distribution across the Project Area. The correction factors are presented in section 4.2.5.

Table 4-5 summarizes expected average monthly precipitation at the Project based on the modelled time series. The mean annual precipitation (MAP) is estimated to be 675.9 mm which is approximately 19% greater than average precipitation recorded in the valley at the Smithers Airport station.

Table 4-5: Project Precipitation Summary [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall	4.3	2.6	3.1	15.1	41.7	70.7	58.1	55.8	63.8	42.8	10.2	2.0	370.2
Snowfall	56.6	32.8	24.0	17.5	8.9	0.2	0.0	0.3	4.6	42.7	63.6	54.4	305.6
Total	60.9	35.4	27.2	32.6	50.5	70.9	58.1	56.1	68.4	85.6	73.8	56.4	675.9

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 4-5 illustrates the average monthly precipitation as rain and snow. Precipitation typically falls as snow during the months of November to March. Annually, the average snowfall (306 mm) is approximately 45% of mean annual precipitation.

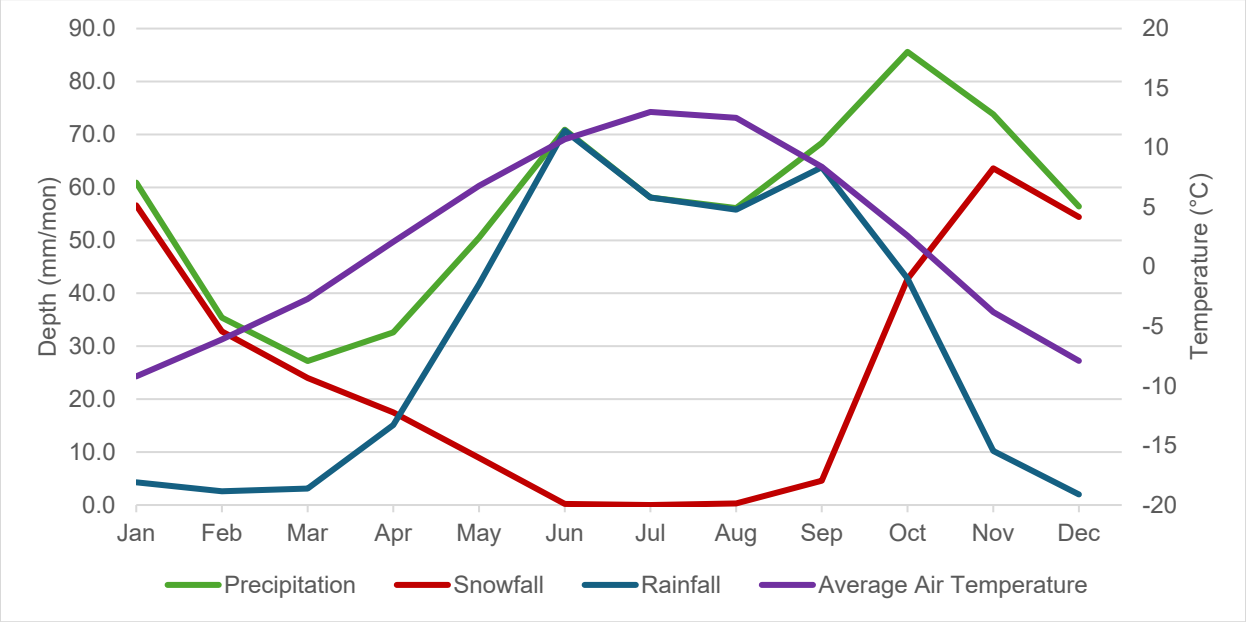

Figure 4-5: Monthly Precipitation as Snow and Rain

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\outputs\CAPR002055_average_climate_1981-2022.xlsx

4.1.4 Extreme Precipitation

4.1.5 Annual Frequency Analysis

A frequency analysis was performed using annual precipitation estimates derived from the long-term Project precipitation time series, developed using adjustments to Smithers Airport Station. The frequency analysis tested a range of probability distributions and found that a normal distribution provides the best fit to the long-term annual precipitation data for the Project.

The results of the annual frequency precipitation analysis are presented in Table 4-6 for extreme conditions ranging from a 1,000-year dry to a 1,000-year wet return periods.

Table 4-6: Annual Precipitation Frequency Analysis

Hydrological Condition	Return Period [years]	Annual Precipitation [mm]
Wet	1000	970.1
	500	950
	200	921.2
	100	897.4
	50	871.5
	25	842.6
	20	832.5
	10	798
	5	756.1
Mean Annual Precipitation (MAP)		676
Dry	5	595.8
	10	553.9
	20	519.4
	25	509.3
	50	480.4
	100	454.5
	200	430.7
	500	401.9
	1000	381.8

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

4.1.6 Short-Duration Extreme Precipitation

The annual maximum daily and 3-day precipitation depths were calculated following the Regional Frequency Analysis framework proposed by Hosking & Wallis (1997). This is a refined approach compared to local frequency analysis (one station) aimed to increase the accuracy of low probability events (e.g., 1,000-year precipitation), fundamental for engineering design and risk assessment. The RFA considered as homogeneous group the following stations:

Within the RFA framework, a range of probability distributions were tested and it was found that a Generalized Extreme Value distribution provided the best fit to both the 24-hour and 72-hour datasets.

Annual maximum 1-day and 3-day precipitations were converted to maximum 24-hour and 72-hour precipitation using a factor of 1.13 and 1.04, respectively (WMO, 2009).

Table 4-7 presents the 24-hour and 72-hour precipitation depths for a range of return periods based on the RFA of the long-term Project precipitation record.

Table 4-7: Extreme Project Precipitation for 24-hour and 72-hour Events

Return Period	24-hour Precipitation [mm]	72-hour Precipitation [mm]
2	41.7	56.2
5	54.8	73.8
10	64.9	87.4
25	79.4	107.0
50	91.7	123.6
100	105.3	141.9
200	120.5	162.4
500	143.2	193.0
1000	162.7	219.3

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

For durations less than 24-hours, the depth-duration-frequency curve data from the Smithers Airport station were obtained and modified to account for the 24-hour results presented in Table 4-7. Sub-daily annual maximum records from Smithers A stations were obtained from the IDF_CC Tool (Version 7.5). An IDF based on GEV distribution (Koutsoyiannis, Kozonis, & Manetas, 1998) was fitted to these records with the same shape parameter estimated in the regional approach described above for consistency. Frequency and duration factors were calculated based on the 24-hour precipitation depths for Smithers Airport, and were applied to the Project 24-hour depths presented in Table 4-7. Table 4-8 summarizes the baseline depth-duration-frequency curve for the Project.

Table 4-8: Project Baseline Precipitation-Duration-Frequency Curve

Storm Duration		Precipitation (mm)						
		Return Period (years)						
min	hours	2	5	10	25	50	100	200
5	0.08	3.5	4.7	5.5	6.7	7.8	9.0	10.2
10	0.17	4.8	6.3	7.5	9.1	10.5	12.1	13.8
15	0.25	5.7	7.5	8.9	10.9	12.6	14.4	16.5
30	0.5	7.7	10.2	12.0	14.7	17.0	19.5	22.3
60	1	10.5	13.7	16.3	19.9	23.0	26.4	30.2
120	2	14.1	18.6	22.0	26.9	31.1	35.7	40.8
360	6	22.8	30.0	35.5	43.4	50.2	57.6	65.9
720	12	30.8	40.5	48.0	58.7	67.8	77.9	89.1
1440	24	41.7	54.8	64.9	79.4	91.7	105.3	120.5
4320	72	56.2	73.8	87.4	107.0	123.6	141.9	162.4

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

4.1.7 Probable Maximum Precipitation

The probable maximum precipitation (PMP) was calculated using the Hershfield methodology (WMO 2009), and the Project-adjusted precipitation record. The Canadian Dam Association Guidelines (2007) recommends evaluating two Probable Maximum Floods (PMF):

Summer/autumn PMF, which is generated by the summer/autumn PMP

Spring PMF is defined as the maximum of two cases:

1. PMF computed with Spring PMP and snow accumulation with frequency of 100 year (Rainfall Dominated)
2. PMF computed with the Probable Maximum Snow Accumulation (PMSA) and a rainstorm with a frequency of 100 year (Snowmelt Dominated)

Two separate PMFs are estimated for the Spring season as it is not reasonable to assume that the PMSA and a Spring PMP, which are two independent phenomena, would occur simultaneously.

Based on the typical hydrograph for the Project (see Section , snow at the Project is expected to be present until as late as June.

Table 4-9 presents the Spring and Summer/Autumn PMPs for the Project where Spring was defined as April to June and summer was defined as July through October.

Table 4-9: Project 24-hour Probable Maximum Precipitation

Season	PMP (mm)
Spring	234
Summer/Autumn	283

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Precipitation_1CT027.003_rev01.Rmd

Results were verified using the British Columbia MetStorm Probable Maximum Precipitation webtool (DTN, 2020), which was developed in support of the BC Extreme Flood Project. This web-based tool provides an indication of potential precipititaion depths based on regionally available datasets at select points across the province. The maximum point PMP estimated from the webtool within the Project vicinity is 218 mm. The results in Table 4-9 are based on Project-specific precipitation datasets and present a more conservative PMP estimate. For this reason, the Project data were used for the purpose of infrastructure design.

4.1.8 Snow Depth and Snowmelt

The SNOW-17 snow accumulation and ablation model developed by the National Weather Service River Forecast System (NWSRFS) was implemented to model snowmelt for the Project. The main processes included in this model are dividing precipitation into rain or snow, accumulation of snowpack, energy exchange, heat deficit in the snowpack, ground melt and snowmelt as a snow water equivalent (Anderson 2006). Model inputs are average temperature and precipitation and input parameters to model a column of snow. The Project weather station recorded an accumulated depth of snow. Data collection at the Project did not include snow courses or snow density to convert snow depth to snow water equivalent (SWE) but regional estimates were used to check the SNOW-17 model accuracy.

Table 4-10 summarizes the model input parameters based on guidelines of initial estimates (Anderson 2002) and validation against the snow water equivalent records at Tsai Creek. Temperature and precipitation time series for the Tsai Creek elevation were developed using PRISM corrections. Figure 4 illustrates the measured and modelled snow water equivalent snow depths at Tsai Creek.

Table 4-10: SNOW-17 Model Input Parameters

Parameter	Description	Value
PXTEMP	Temperature threshold	Linearly interpolated between: 100% snowfall (and 0% rainfall) at 1.5 °C 0% snowfall (and 100% rainfall) at 5 °C
SCF	Loss coefficient during period of snow (i.e. sublimation)	1
UADJ	Average wind function during rain-on-snow events	0.04 mm/mbar/hr
MBASE	Temperature above which melt occurs	0 °C
MFMAX	Maximum melt factor	0.51 mm·°C·6hr^{-1}
MFMIN	Minimum melt factor	0.10 mm·°C·6hr^{-1}

Parameter	Description	Value
TIPM	Antecedent temperature index factor	0.1
NMF	Maximum negative maximum factor	0.25 mm·°C·6hr^{-1}
PLWHC	Percent liquid water holding capacity. Maximum amount of liquid water as a fraction of the ice portion of the snow	4%

Source: from snowmelt calibration model for Tsai Creek. \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Model\SnowmeltModel \ TsaiCreek_Snow17.gsm

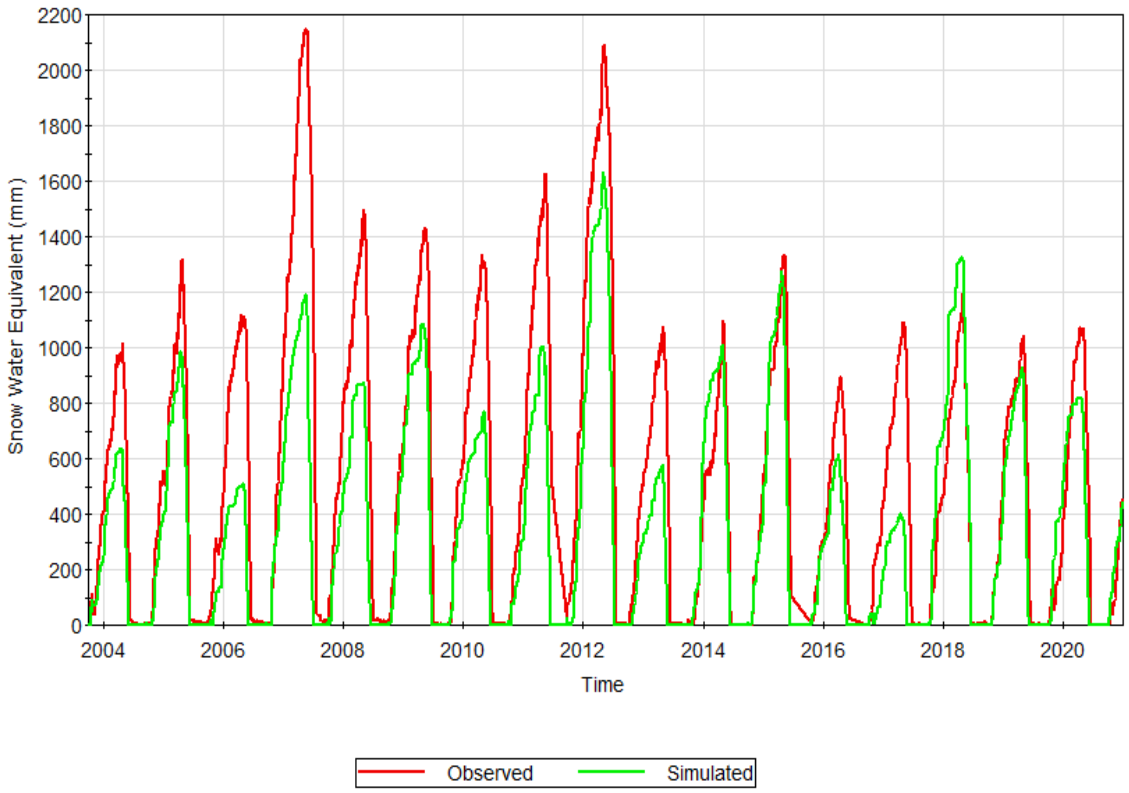

Figure 4-6: Tsai Creek Snowmelt Snow Water Equivalent Calibration

Source: from snowmelt calibration model for Tsai Creek. Z:\01_SITES\Telkwa Coal\1CT027.002 2017-18 permitting Support (Phase 2)\0200_SurfaceWater\Snowmelt Model\ TsaiCreek_Snow17.gsm

The validation with Tsai Creek suggests the snowmelt timing is well captured, with some understimations of maximum snowpack. This may be a result of inaccuracies in the precipitation record estimated for Tsai Creek. For the purpose of water management planning and design and water balance modeling, the SNOW-17 model and inputs were applied to the Project. Figure 4-7 illustrates the average snow water equivalent depths for the Project based on the adjusted precipitation and temperature records from 1942 to 2020.

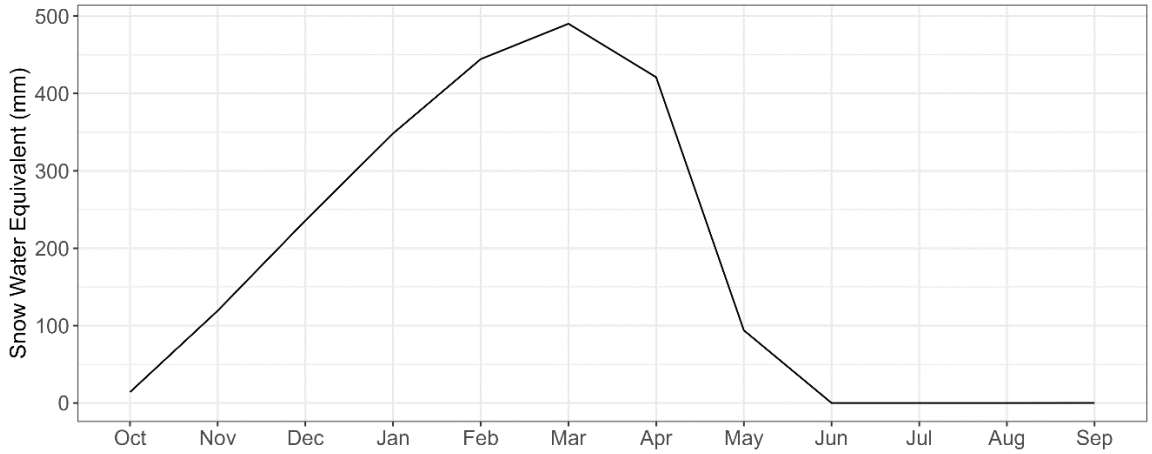

Figure 4-7: Project Snow Water Equivalent

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

In addition to snow-water-equivalent, the snowmelt model produces a daily excess water term, which represents the sum of rainfall and snowmelt and can be interpreted as the daily depth of water available to generate runoff. Table 4-11 presents the monthly average excess water results for the Project, along with the monthly average distribution.

Table 4-11: Project Excess Water Monthly Average Summary [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Total Excess Water	2	3	18	145	184	70	58	54	67	60	9	2	672
Monthly Excess Water Distribution	0%	0%	3%	22%	27%	10%	9%	8%	10%	9%	1%	0%	100%

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

A frequency analysis was performed on the maximum 1-day and 3-day (72-hour) snow water equivalent results from the Project snowmelt model based on the adjusted record from 1981 to 2023. Results for return periods up to the 1000-year snowmelt event are presented in Table 4-12.

Table 4-12: Project Snowmelt Frequency Analysis

Return Period	24-hour Snowmelt [mm SWE]	72-hour Snowmelt [mm SWE]
2	34.0	57.5
5	43.3	73.3
10	50.9	86.1
25	62.8	106.4
50	74.0	125.4
100	87.7	148.5
200	104.4	176.8
500	132.4	224.3
1000	159.4	269.9

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

4.1.9 Solar Radiation

Given the short period of record at the Tenas Deposit Station and large differences to Smithers Airport Station, the FAO model (Allen et al. 1998) was adopted to calculate historical baseline averages of solar radiation using the corrected temperature timeseries developed for the Project (Table 4-13). The appropriateness of the FAO model to approximate incoming solar radiation at the Tenas Deposit Station was illustrated from October 2017 to September 2022 in Figure 4-8.

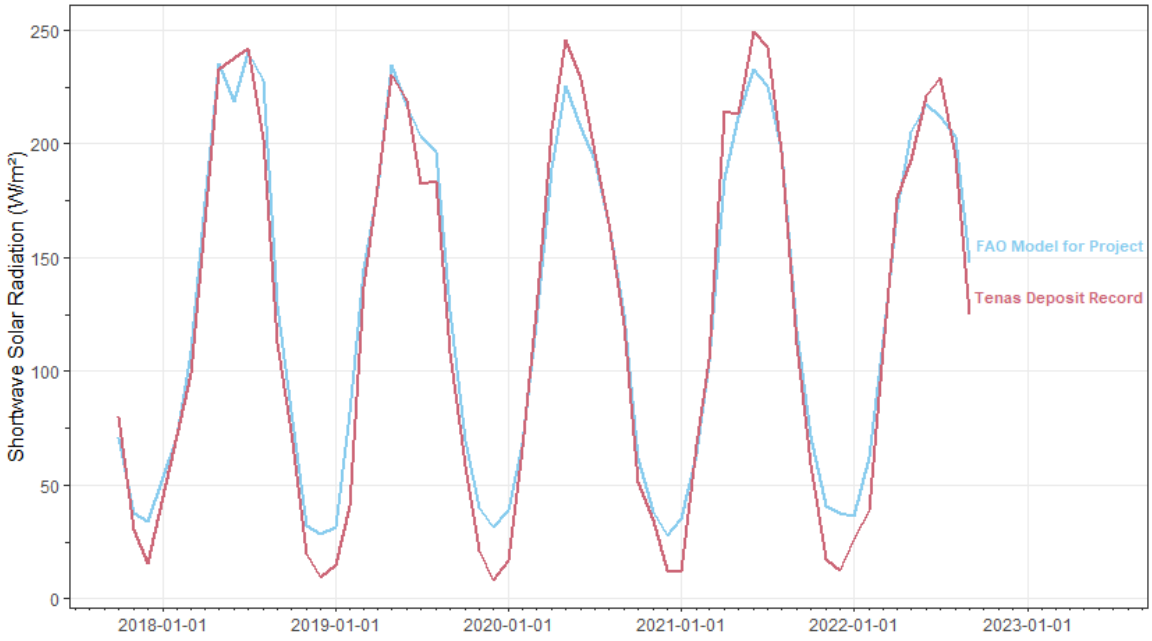

Figure 4-8: Solar Radiation – Modelled versus Measured (October 2017 to September 2022)

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 4-13: Average Monthly Solar Radiation [W/m^2] at Project

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	38	64	114	173	220	224	224	201	134	73	40	34	128

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

4.1.10 Relative Humidity

Given the short period of record at the Tenas Deposit Station and the similarities observed between Smithers Airport Station records presented in Section 2.3.6, Smithers Airport station relative humidity was applied to the Project. Table 4-14 presents the monthly average relative humidity for the Project.

Table 4-14: Average Monthly Relative Humidity [%] at Project

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average (%)	83.6	79.3	71.2	63.3	61.3	65.7	68.8	72.1	79.5	82.1	85.9	85.4	74.8

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

4.1.11 Evaporation

Large and shallow water bodies can experience direct water losses from evaporation. Lake surface evaporation for the Project was estimated using the Morton CRWE shallow lake evaporation method (Morton 1983). Table 2-18 summarizes the input parameters required for this method including the Project-specific solar radiation generated using the FAO model.

Based on the adjusted temperature record, modelled solar radiation and relative humidity and wind speeds from the Smithers Airport station, the estimated mean annual evaporation for the Project is 529 mm. Table 4-15 and Figure 4-9 demonstrate the mean open water evaporation rates for the Project. The potential evaporation estimates generated using the Morton CRWE results for the derived Project timeseries were closest to the Topley Landing Normals.

Table 4-15: Project Monthly Total Lake Evaporation [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Evaporation	0	0	0	60	97	108	116	99	50	0	0	0	529

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Evaporation_rev02.Rmd

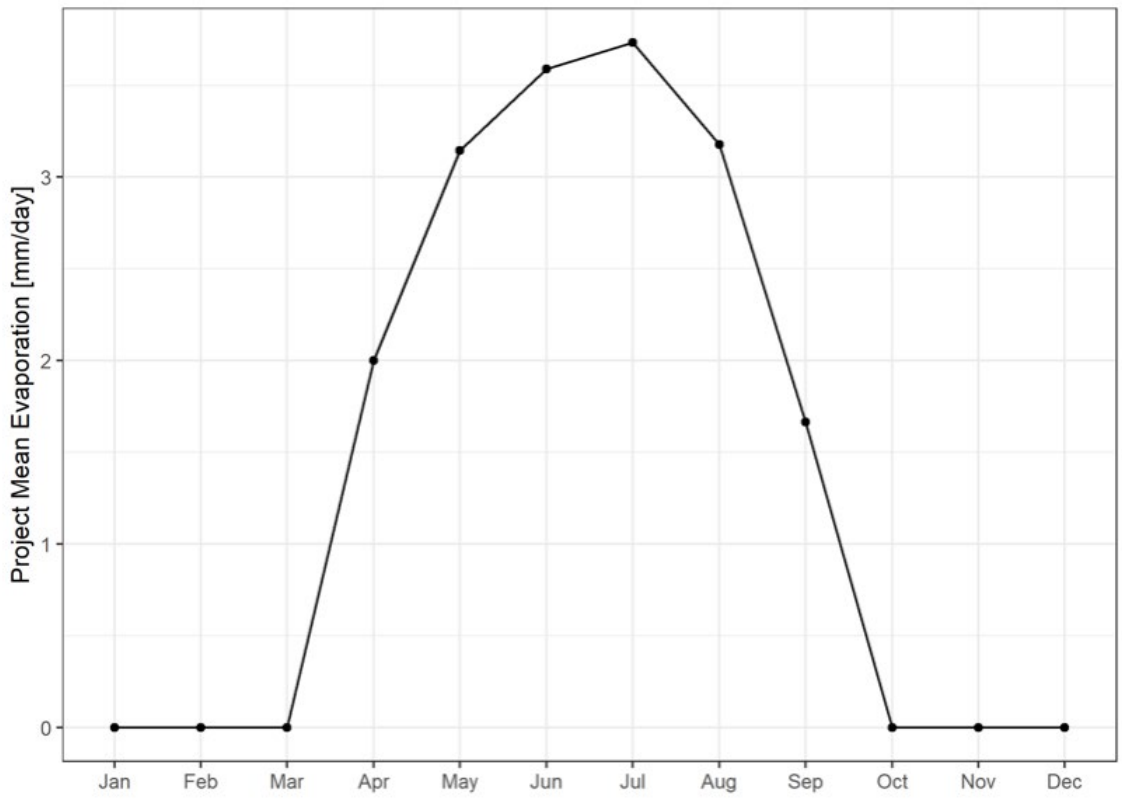

Figure 4-9: Mean Daily Open Water Evaporation Rates

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Evaporation_rev02.Rmd

4.2 Derived Hydrological Parameters

4.2.1 Time Series Comparison

Comparisons of the unit discharge at each Project hydrometric station with regional station data records led to pairing of the Project record with the most appropriate regional analogue (Table 4).

Regression approaches were used for the periods of overlap between each of the Project hydrometric stations and their respective regional analogue. In the case of Goathorn-Hydro, a catchment area scaling approach was used instead of regression methods. Time series of Project Area and regional station unit discharge records for Goathorn-Hydro and Goathorn Creek (08EE008), Telkwa-Hydro and Telkwa River (08EE020) Tenas-Hydro B and Goathorn Creek (08EE008), and Four-Hydro and Goathorn Creek (08EE008) are shown in Figure 4-10, Figure 4-11, Figure 4-12, and Figure 4-13, respectively. Additional comparisons for Four Creek based on 1999 baseline data are also described.

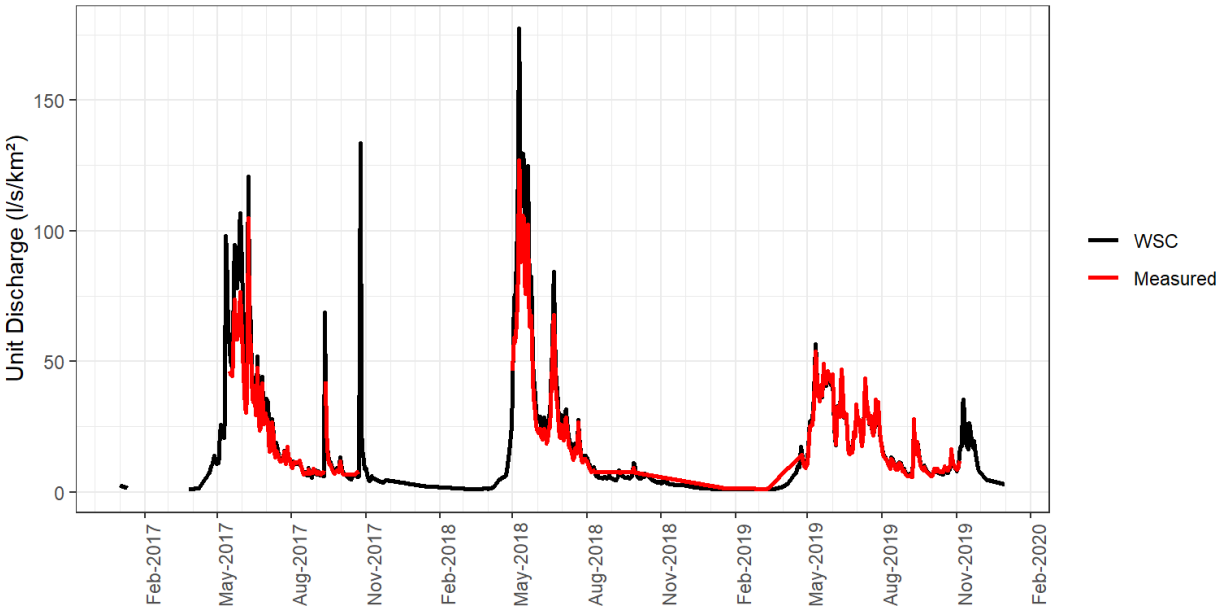

Figure 4-10: Project Hydrometric Station Goathorn-Hydro (red-Measured) and Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) (black-WSC)

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

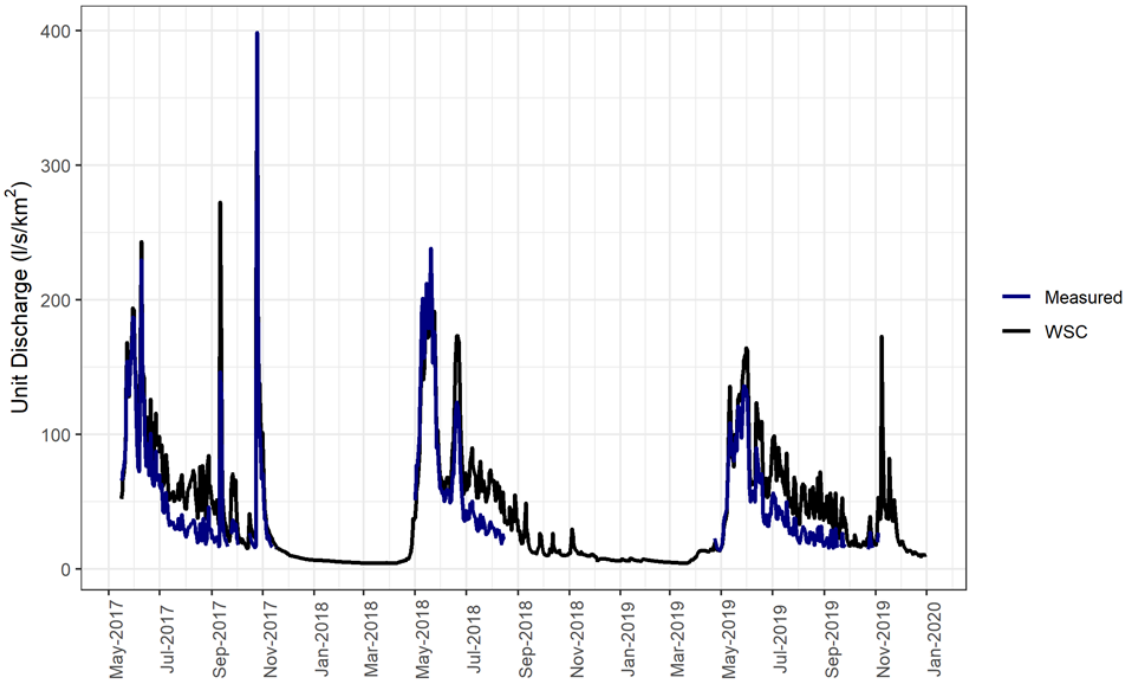

Figure 4-11: Project Hydrometric Station Telkwa-Hydro (blue-Measured) and Water Survey of Canada Telkwa River Below Tsai Creek (08EE020) (black-WSC)

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Telkwa_flows.R

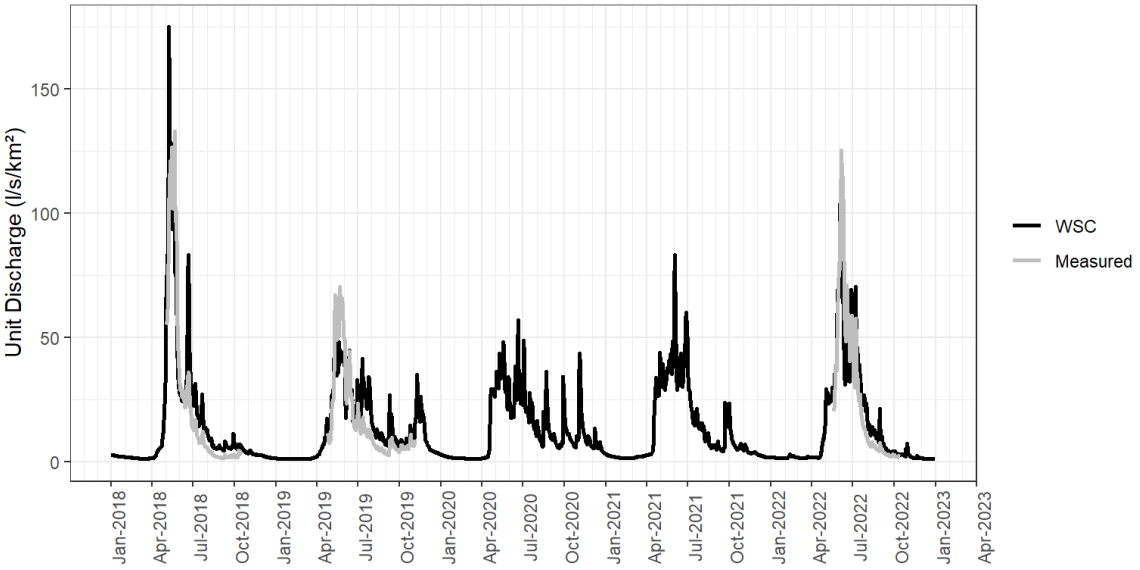

Figure 4-12: Project Hydrometric Station Tenas-Hydro B (grey-Measured) and Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) (black-WSC)

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

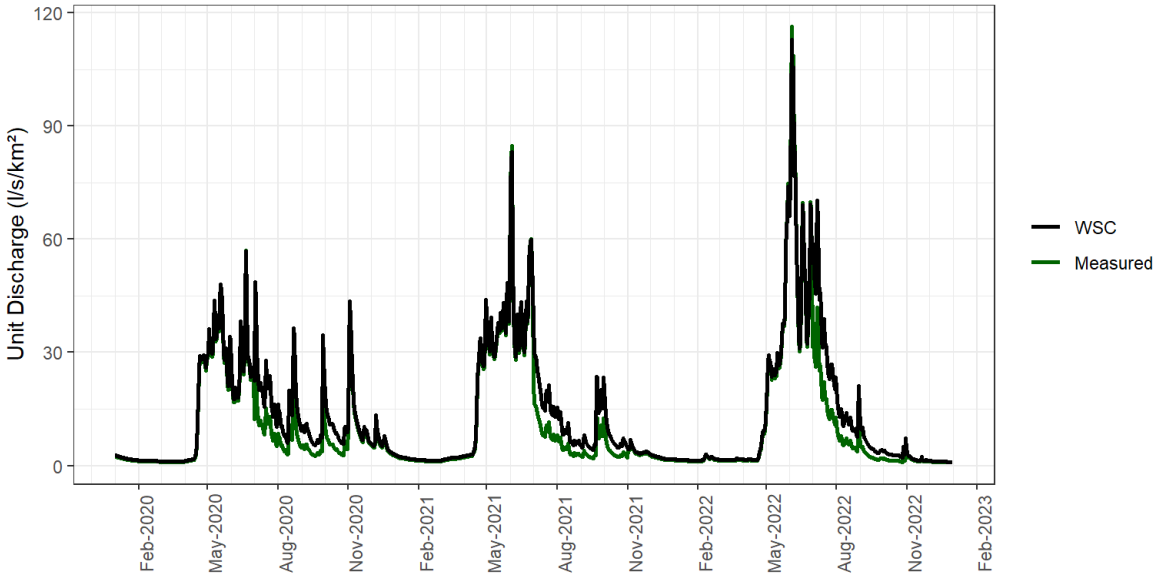

Figure 4-13: Project Hydrometric Station Four-Hydro (green-Measured) and Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) (black-WSC)

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

A previous investigation into the hydrology of Four Creek was completed in 1997 (October to November) to 1998 (June to November) to support the Telkwa Coal Project 1999 Baseline Surface Flow and Water Quality Final Data Report (AGRA, 1999; Attachment A). The precise location of the AGRA hydrometric stations are not known, which limits the transferability of analyses using historical data. Based on the station descriptions in AGRA 1999, approximate locations were estimated and catchment areas were calculated.

Unit flows and monthly runoff rates were calculated based on assumed catchment areas and compared between Tenas, Four and Goathorn creeks, presented in Table 4-16 and Figure 4 and described in Attachment A and in tabular form in Attachment C. Runoff rates by month show a lower yield in Four Creek than in Tenas Creek, and higher rates in Goathorn Creek than in Tenas Creek during summer months of August and September. Unit flows in October 1997 show a storm response peak flow in all three streams, while 1998 records show a consistently lower yield in Four Creek than in Goathorn Creek.

Table 4-16: Comparison of Monthly Runoff Rates based on Hydrometric Data from AGRA 1999 at Goathorn, Tenas and Four Creeks (Attachment A, C)

Stream	Year	Runoff (mm/month)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tenas Creek	1997	ND	ND	ND	ND	ND	ND	ND	22	12	47	ND	ND
	1998	ND	ND	ND	ND	40	ND	ND	5	8	11	ND	ND
Four Creek	1997	ND	ND	ND	ND	ND	ND	ND	ND	ND	9	4	ND
	1998	ND	ND	ND	ND	ND	ND	3	1	1	2	ND	ND
Goathorn Creek	1997	4	5	5	49	166	142	88	54	32	46	16	6
	1998	3	3	4	28	145	68	50	25	16	27	12	6

Notes:
1. Monthly runoff is calculated for months containing greater than 25 days of runoff data
2. ND: No Data or less than 25 days with data in a month

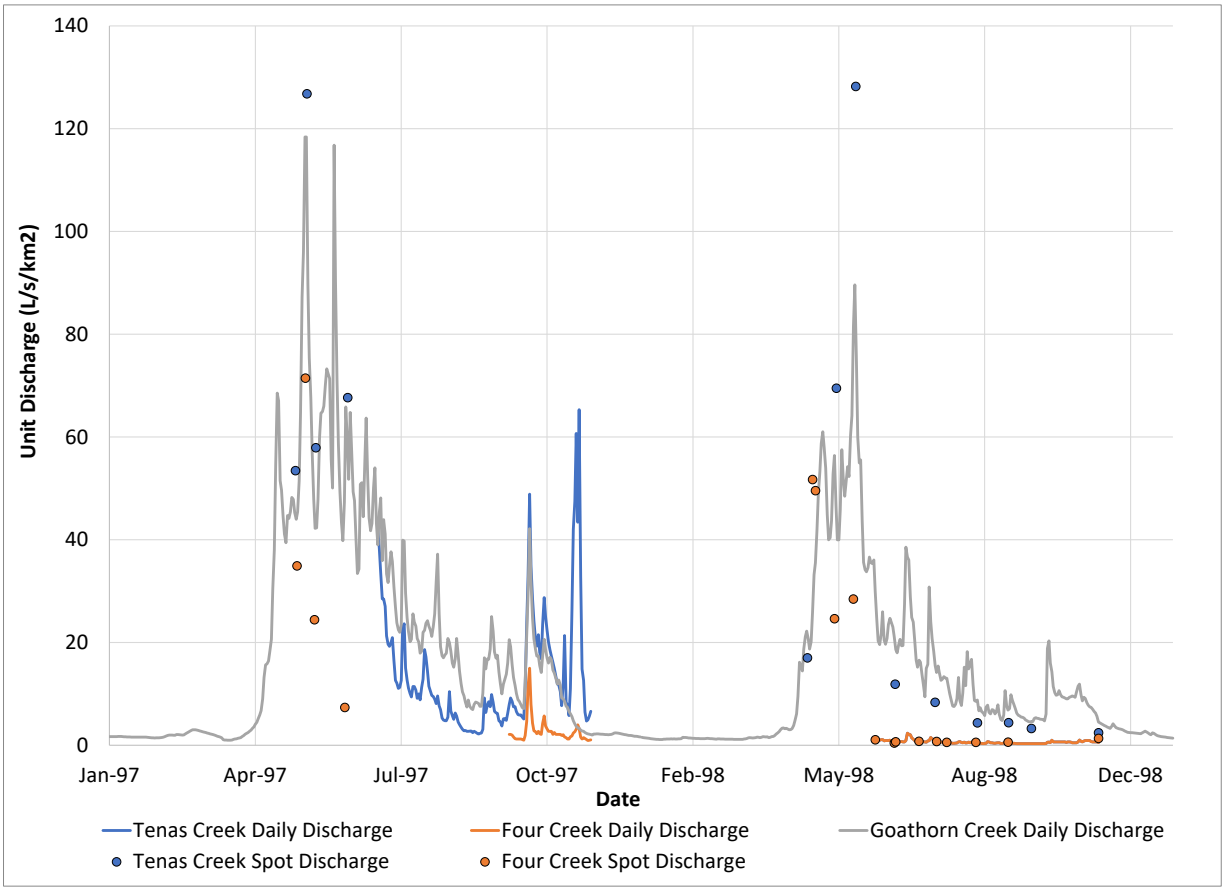

Figure 4-14: Comparison of Unit Flows based on Hydrometric Data from AGRA 1999 at Goathorn, Tenas and Four Creeks (Attachment A, C)

AGRA 1999 describes runoff ratios, based on annual runoff yield and annual precipitation data from Smithers Airport. The runoff ratios for WSC's Goathorn Creek station were calculated as 0.65 and 0.83 in 1997 and 1998, respectively, and 0.28 in both years for Four Creek. Note that results from Section 4.1.2 show that precipitation data from Smithers Airport is expected to be distinct from precipitation that falls near the Telkwa Project Area or within each stream's

catchment, limiting the applicability of these ratios. This discrepancy is also noted in AGRA 1999. AGRA 1999 stated that the difference in runoff ratios between Goathorn and Four Creek could be attributed to potential orographic gradients in precipitation and the difference in the altitude range between Goathorn Creek (1745 m, from 550 to 2295 masl) versus Four Creek (670 m from 700 to 1370 masl). The Four Creek basin generally faces the northeast, where as the Goathorn Creek basin faces northeast and northwest, which is expected to cause differences in snowpack accumulation and ablation (AGRA 1999). AGRA also concluded that groundwater baseflows would be more pronounced in Goathorn Creek as it extends lower in the basin than Four Creek, which may result in an increased occurrence of springs surfacing from fractures.

4.2.2 Model Development

The regression approach ultimately selected to develop regressions between measured, Project hydrometric records and regional analogues was chosen based on: (1) The simplicity of the regression, (2) the Nash-Sutcliffe Efficiency (NSE) between the estimated flows and the measured flows for the period of overlap and (3) the ability of the regression to approximate both high and low flows based on flow duration curves. The regressions were then used to generate synthetic flow records for each Project hydrometric stations using the long-term, regional records from Water Survey of Canada as a foundation. The time series generated from the developed regression equations for each hydrometric station were compared to the measured unit discharges at each station using tables.

In the previous version of the Tenas Project hydrology baseline, provisional data from Goathorn Creek Water Survey of Canada (WSC) (Station ID: 08EE008) had been used to develop regressions between site data and WSC Goathorn data and ultematly generate the site synthetic records. Provisional data previously used in the baseline study has been updated and published data is now available online through December 2021 while the 2018 record has been removed.

Table 4 summarizes the pairings between Project hydrometric stations and the most suitable regional analogue, catchment areas for each station and the NSE from the model. A catchment area scaling approach was used for Goathorn-Hydro instead of regression methods due to both stations measuring the same water course with similar catchment areas.

Table 4-17: Project and WSC Regional Prediction Type and Fit Parameter

Project Station ID	Project Station Catchment Area (km^2)	Regional Station ID	Regional Catchment Area (km^2)	Model	NSE
Goathorn-Hydro	123.5	Goathorn (08EE008)	125	Catchment area scaling	0.94
Tenas-Hydro B	46.8	Goathorn (08EE008)	125	Linear Regression, Chronological Pairing	0.85
Telkwa-Hydro	997.2	TelkwaBTC (08EE020)	367	Ranked Regression, Time-independent	0.96
Four-Hydro	11.0	Goathorn (08EE008)	46.8	Ranked Regression, Time-independent	0.54

Source: Compiled in text.

Goathorn-Hydro

A catchment area scaling approach was pursued to adjust the streamflow from WSC Goathorn station to Goathorn-Hydro station. The catchment area of WSC Goathorn station (125 km²) is 1.2% larger than the catchment area of the site station (123.5 km²), so its flows were reduced by 1.2%. The site data was extended with the adjusted WSC Goathorn data. The event recorded at Goathorn-Hydro on 25 October 2017 event was removed from the dataset as its occurrence was not supported by any similarly large discharge event recorded at the Water Survey of Canada Goathorn station. During the period when both stations had overlapping records, the recorded daily average unit flow at Goathorn-Hydro was 17.1 L/s/km^2 while the WSC Goathorn station recorded 18.5 L/s/km^2. Figure 4-15 shows the regression of the unit discharge between the two Goathorn stations.

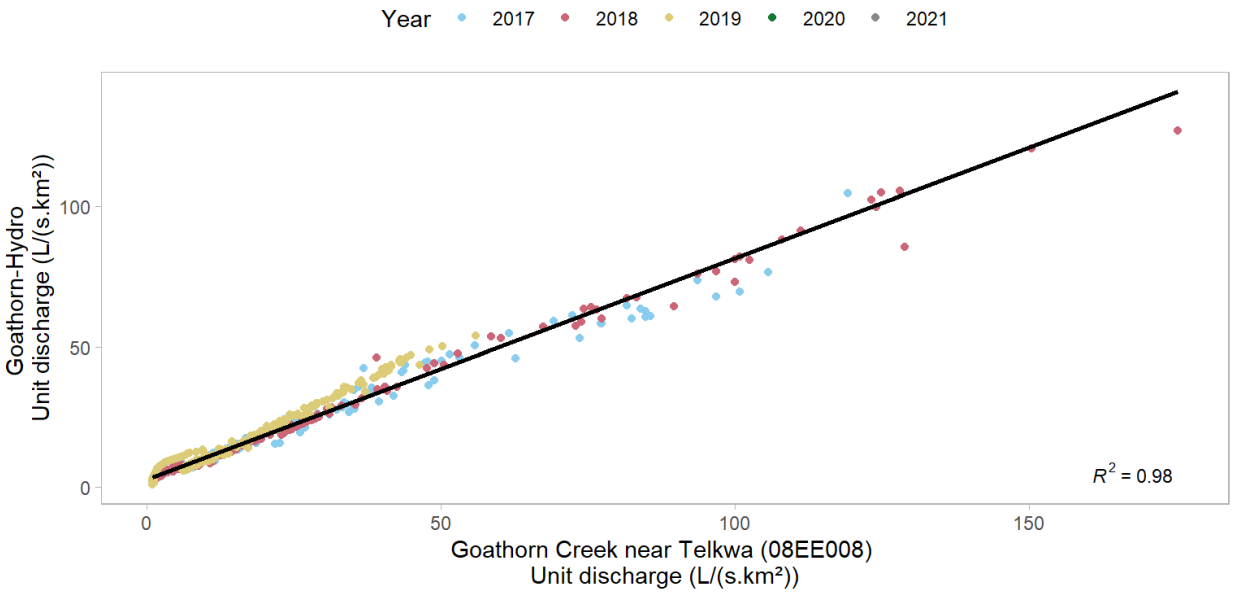

Figure 4-15: Linear regression showing measured Goathorn-Hydro unit discharge relative to WSC Goathorn Creek Near Telkwa (08EE008) unit discharge

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Table 4-18 shows the unit discharge measured at Goathorn Hydro compared to the unit discharge calculated from the area scaling model for the same time period each year. The measured unit discharge and the estimated values are very similar with slight overestimation in 2017 and 2018 and some underestimation in 2019.

Exceedance probabilities of the measured and estimated unit discharge are presented in Figure 4-16, which shows that estimated flows are very similar in magnitude for average and high flows. The estimated unit discharge for high exceedace probabilities (low flows) is lower than the measured values.

Table 4-18: Measured and Estimated Unit Discharge Values at Goathorn-Hydro

Year	Month	Goathorn-Hydro Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Estimated Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
2017	May	59.0	21.2	75.9	24.5
	Jun	41.3		48.8	
	Jul	16.3		18.3	
	Aug	9.0		8.9	
	Sep	10.5		10.6	
	Oct	7.2		6.4	
2018	May	70.4	18.6	87.4	20.7
	Jun	30.0		34.8	
	Jul	17.5		19.2	
	Aug	8.0		7.1	
	Sep	7.7		6.2	
2019	Apr	10.6	13.8	7.5	13.2
	May	37.2		37.3	
	Jun	26.9		26.4	
	Jul	27.3		26.7	
	Aug	10.5		10.9	
	Sep	10.3		10.6	
	Oct	9.0		8.4	
	Nov	9.9		10.1	

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

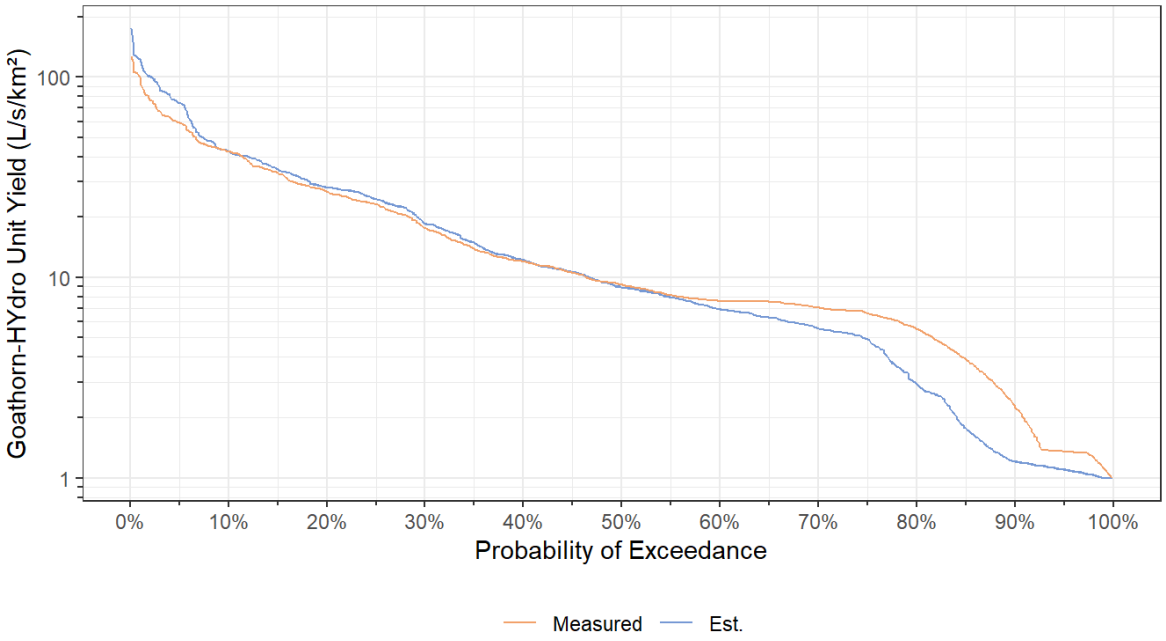

Figure 4-16: Probability Exceedance of Goathorn-Hydro Unit Discharge

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Tenas-Hydro B

The Tenas-Hydro B station was paired with Goathorn Creek Near Telkwa (08EE008) for developing a regression to develop a synthetic time series. The linear regression was separated into two periods, based on the month, as shown in Figure 4-17.

Table 4-19 shows the unit discharge measured at Tenas Hydro compared to the unit discharge calculated from the regression equations for the same time period each year. Each year presents similar annual average flows.

Exceedance probabilities of the measured and regressed unit discharge are presented in Figure 4 which shows that estimate flows are very similar in magnitude for low and high flows, with extreme low flows being slightly overestimated in the synthetic dataset.

Table 4-19: Measured and Regressed Unit Discharge Values at Tenas-Hydro B

Year	Month	Tenas-Hydro B Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Regression Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
2018	May	88.1	22.3	91.7	24.8
	Jun	25.7		34.2	
	Jul	10.0		10.3	
	Aug	2.9		3.5	
	Sep	1.9		3.0	
	Oct	2.7		3.0	
2019	Apr	9.4	16.5	11.5	14.9
	May	46.5		36.7	
	Jun	26.9		25.6	
	Jul	13.1		14.7	
	Aug	5.5		5.6	
	Sep	5.3		5.4	
	Oct	6.1		4..2	
	Nov	7.1		9.4	
2022	May	41.7	25.4	45.7	22.2
	Jun	71.5		60.0	
	Jul	26.4		21.2	
	Aug	6.4		6.4	
	Sep	3.1		2.7	
	Oct	2.1		1.5	

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

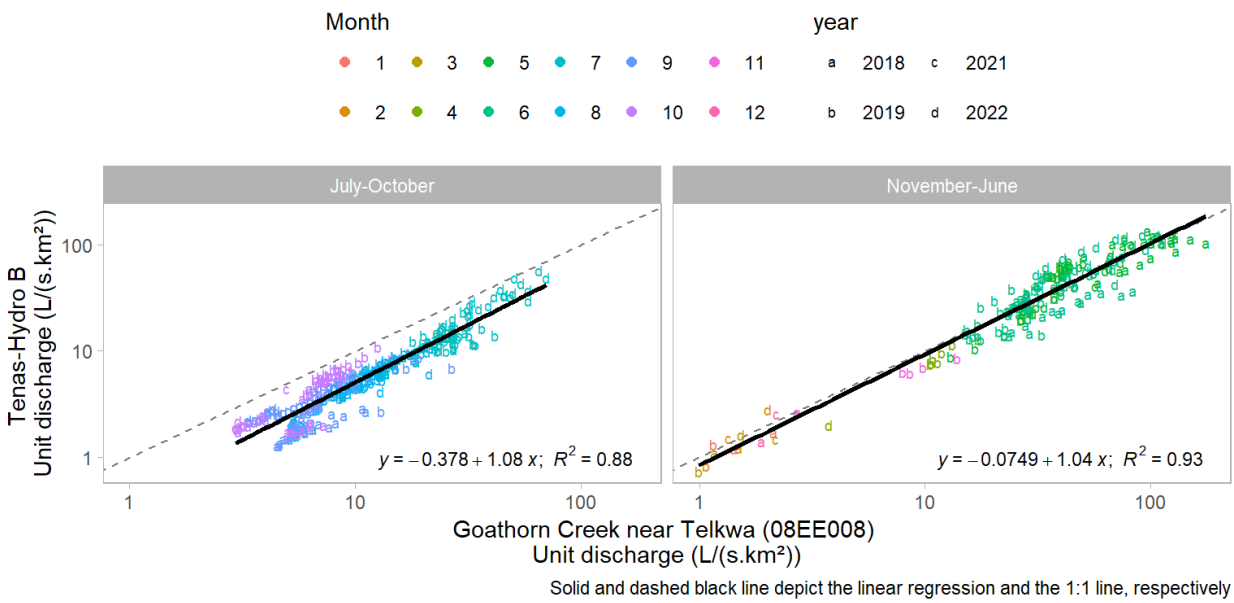

Figure 4-17: Linear regression between WSC Goathorn Creek Near Telkwa (08EE008) station and Tenas-Hydro B for the months of April, May, June, October and November (top) and July to September (bottom)

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

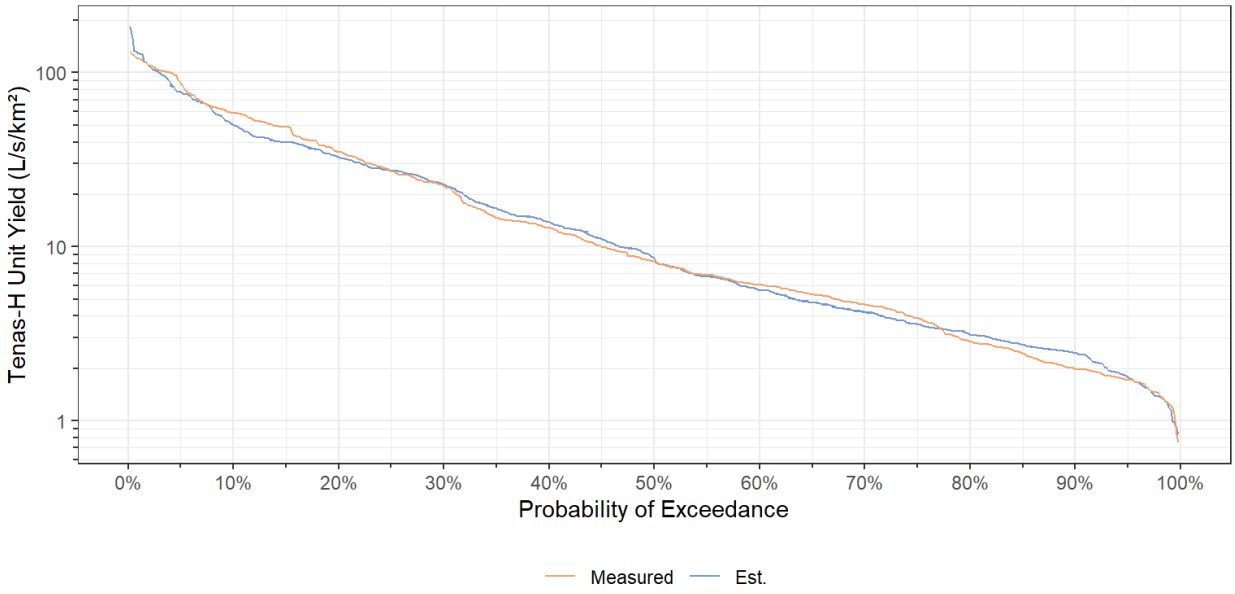

Figure 4-18: Probability Exceedance of Tenas-Hydro Unit Discharge

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html elkwa-Hydro

Telkwa-Hydro

The Telkwa-Hydro hydrometric data was regressed against Water Survey of Canada Telkwa River Below Tsai Creek (08EE020) using ranked regressions, which uses paired discharge records independent of chronological order. Monthly ranked regression results are presented in Figure 4-19, and regression equations with goodness of fit indicators are presented in Table 4-20.

Table 4-21 presents the unit discharge measured at Telkwa Hydro compared to the unit discharge calculated from the monthly regressions with Telkwa River Below Tsai Creek for the same time period each year. The regressed values underestimated flow in 2017 but provided similar results for 2018 and 2019.

Exceedance probabilities of the measured and regressed unit discharge are presented in Figure 4-19 which shows that estimated flows are very similar in magnitude for average and high flows, but less accurate for low flows (higher exceedance probability results), where the estimated results are lower than the measured values.

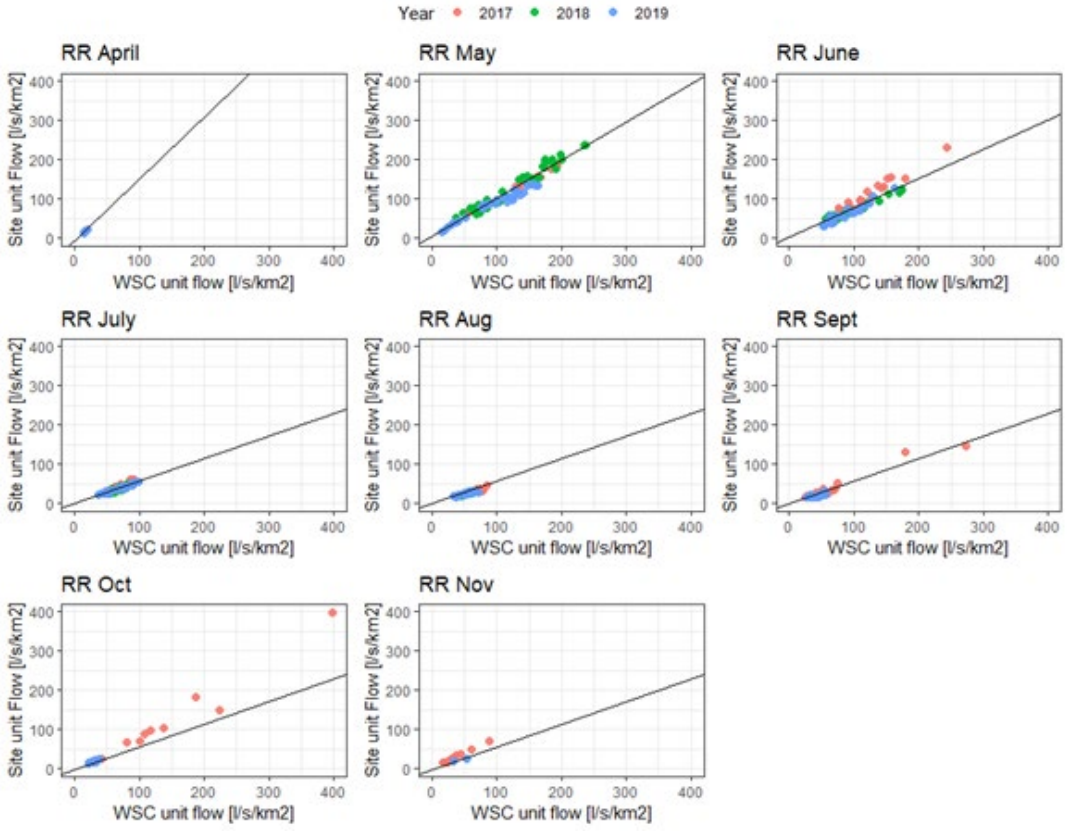

Figure 4-19: Monthly ranked regression between WSC Telkwa River Below Tsai Creek (08EE020) and Telkwa-Hydro stations

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\ Flows_update_rev12_monthlyregr.Rmd

Table 4-20: Monthly Ranked Regression Equations and R-squared Value

Month	April	May	June	July	Aug	Sept	Oct	Nov
Equation	1.58x-7.29	0.97x+4.69	0.75x+2.12	0.57x -0.73	0.43x+2.49	0.55x-1.95	0.96x-8.93	0.79x+0.93
R^2	0.84	0.88	0.81	0.75	0.76	0.83	0.95	0.85

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\ Flows_update_rev12_monthlyregr.Rmd

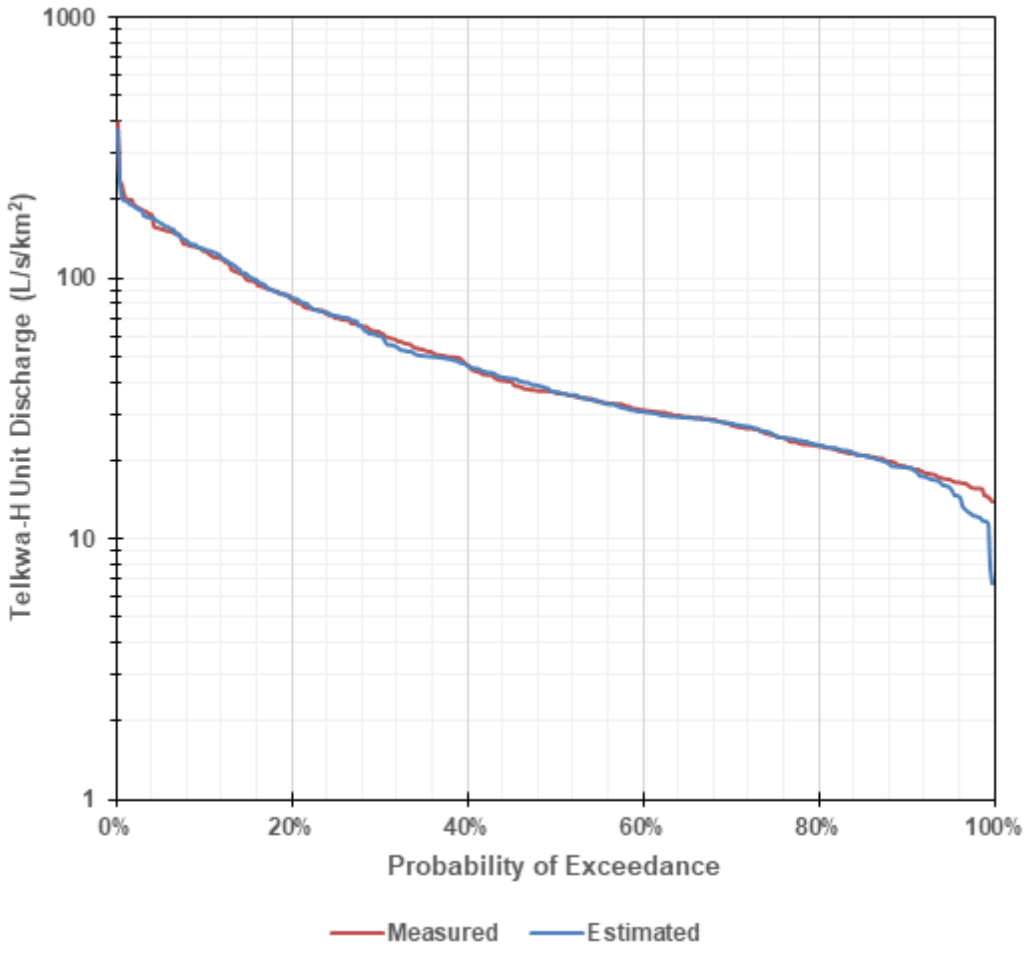

Figure 4-20: Probability Exceedance of Unit Discharge (L/s/km2) at Telkwa-Hydro

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Telkwa_regression_rev00_20200423_njs.xlsx

Table 4-21: Measured and Regressed Unit Discharge Values at Telkwa-Hydro

Year	Month	Telkwa-Hydro Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Regression Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
2017	May	125.2	61	88.9	48
	Jun	97.1		86	
	Jul	38.9		35.2	
	Aug	29.3		28.1	
	Sep	34.7		29.5	
	Oct	75.6		50.3	
	Nov	28.3		16.7	
2018	May	140.1	58.5	135.3	55
	Jun	68.4		69.9	
	Jul	35.9		37.2	
	Aug	25		23	
	Sep	23.1		9.3	
2019	Apr	16.6	36	12.3	38
	May	87.8		98.1	
	Jun	58		63.4	
	Jul	37.6		37.2	
	Aug	24		23.6	
	Sep	20		18.2	
	Oct	19.3		11	
	Nov	23.5		35.9	

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Four-Hydro

The Four-Hydro hydrometric data was regressed against Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) flows using ranked regressions (Figure 4-21), which uses paired discharge records independent of chronological order.

Linear chronological pairing was assessed, but a good relationship with regional stations was not obtained. A ranked regression was then developed without grouping the data by month, as done for Telkwa-Hydro. In fact, the low availability of flow records in some months hindered this more refined type of regression for Four-Hydro station. Despite this, the regression undertaken provides valuable insight that the unit flows measured in Four-Hydro are smaller than the other stations, so assuming other station as analog without a bias correction may impose an overestimation of flows in Four-Hydro.

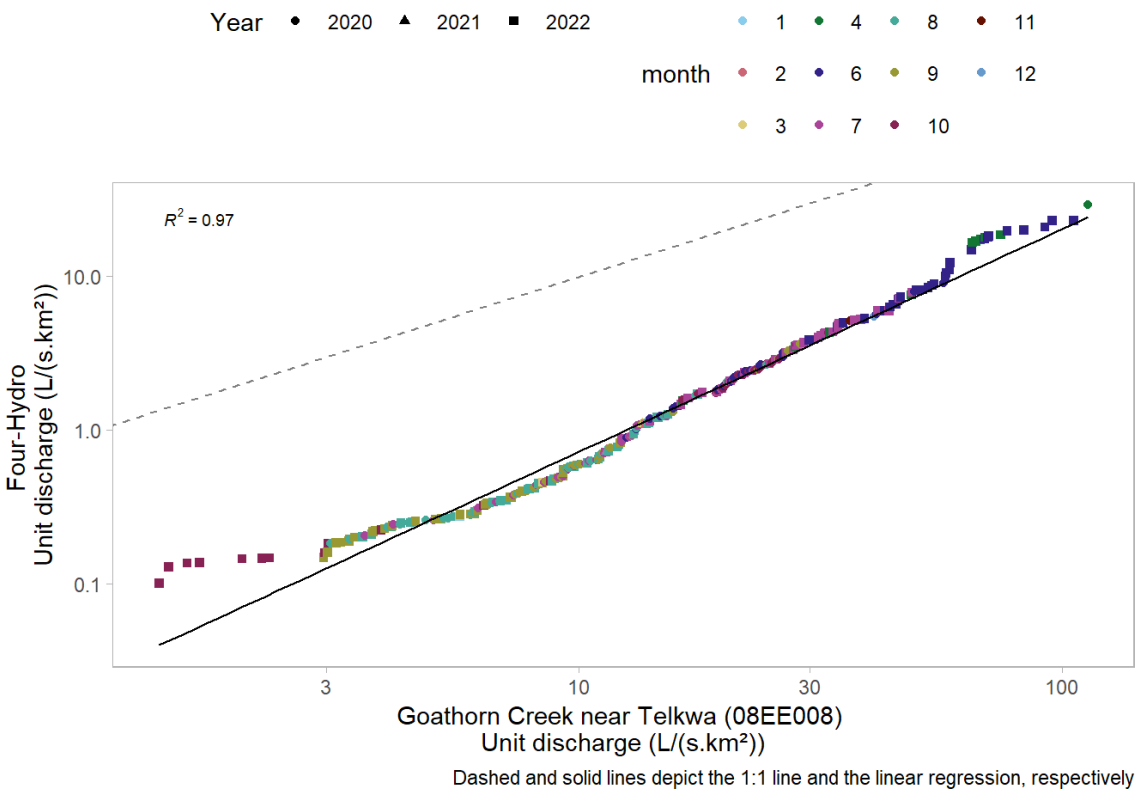

Figure 4-21: Ranked regression between WSC Goathorn Creek Near Telkwa (08EE008) station and Four-Hydro station

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Exceedance probabilities of the measured and regressed unit discharge at Four-Hydro are presented in Figure 4-22, which shows that estimated flows are representing well medium flows, but underpredicting high and low flows.

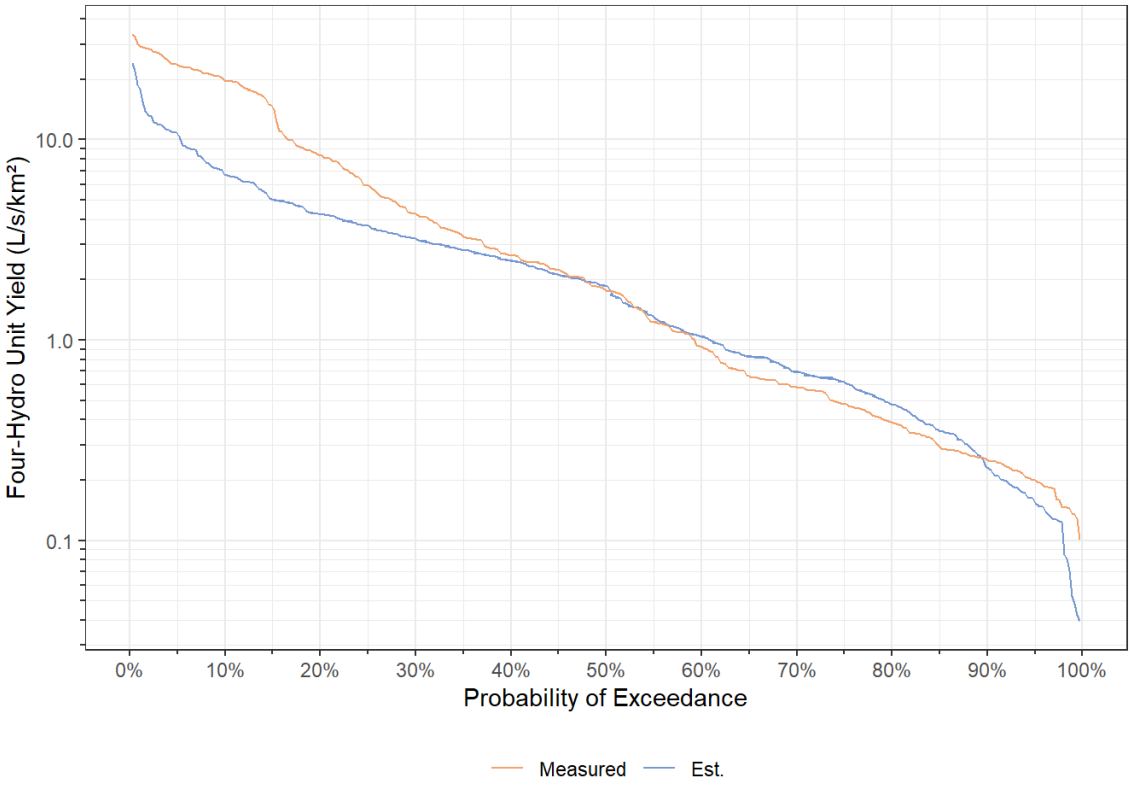

Figure 4-22: Probability Exceedance of Unit Discharge (L/s/km²) at Four-Hydro

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Table 4-22 presents the unit discharge measured at Four Hydro compared to the unit discharge calculated from the regression with WSC Goathorn Creek (08EE008) for the same time period each year. The regressed values underestimated average and high flows, but remained close to the measured low flows.

Table 4-22: Measured and Regressed Unit Discharge Values at Four-Hydro

Year	Month	Four-Hydro Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Regression Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
2020	May	11.1	3.3	4.3	2.1
	Jun	2.7		3.1	
	Jul	0.8		2.2	
	Aug	0.7		1.3	
	Sep	1.0		0.8	
	Oct	2.4		0.8	
2022	Apr	10.7	7.4	0.5	3.6
	May	23.7		4.5	
	Jun	11.1		10.0	
	Jul	3.6		5.1	
	Aug	0.6		1.0	
	Sep	0.3		0.3	
	Oct	0.2		0.1	

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

4.2.3 Extended (Synthetic) Time Series for Project Hydrometric Stations

The regressions developed for Goathorn-Hydro, Telkwa-Hydro, Tenas-Hydro and Four-Hydro were used to generate a long-term, extended (synthetic) time series based on the Water Survey of Canada regional records. The synthetic unit discharge time series are shown in Figure 4-23 for Goathorn-Hydro, Figure 4-24 for Telkwa-Hydro, Figure 4-25 for Tenas-Hydro B and Figure 4-26 for Four-Hydro.

Table 4-23, Table 4-24, and Table 4-25 present the monthly average streamflow, unit flow, and runoff yield for each hydrometric station based on the extended time series results. These averages are based on a 30-year record, frin 1993 to 2022, consistent with best practice.

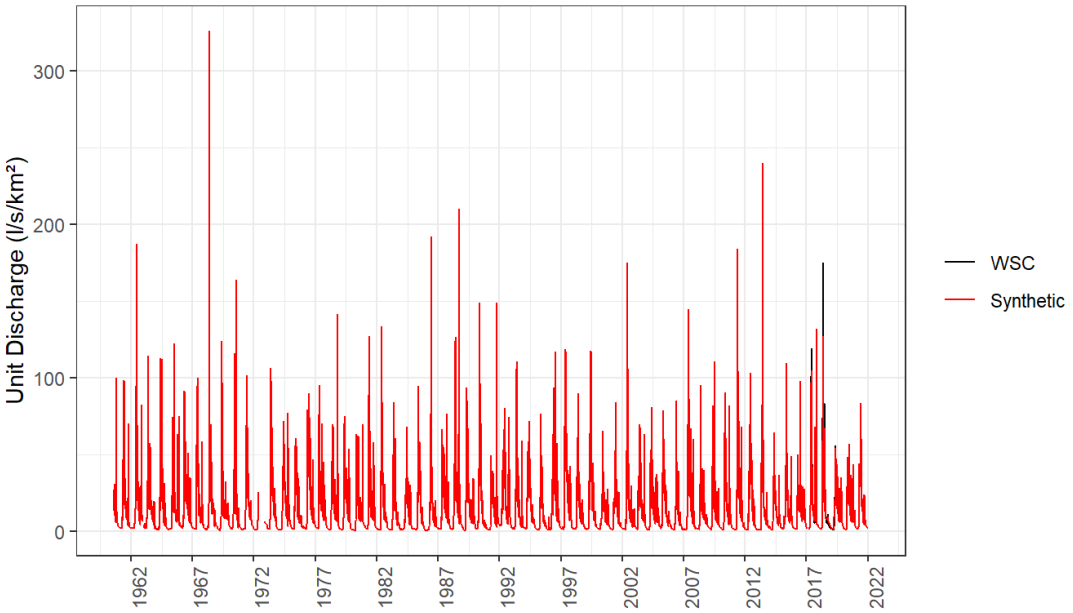

Figure 4-23: Synthetic time series for Goathorn Hydro (red – synthetic) and Water Survey of Canada Goathorn Creek Near Telkwa stations (black)

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

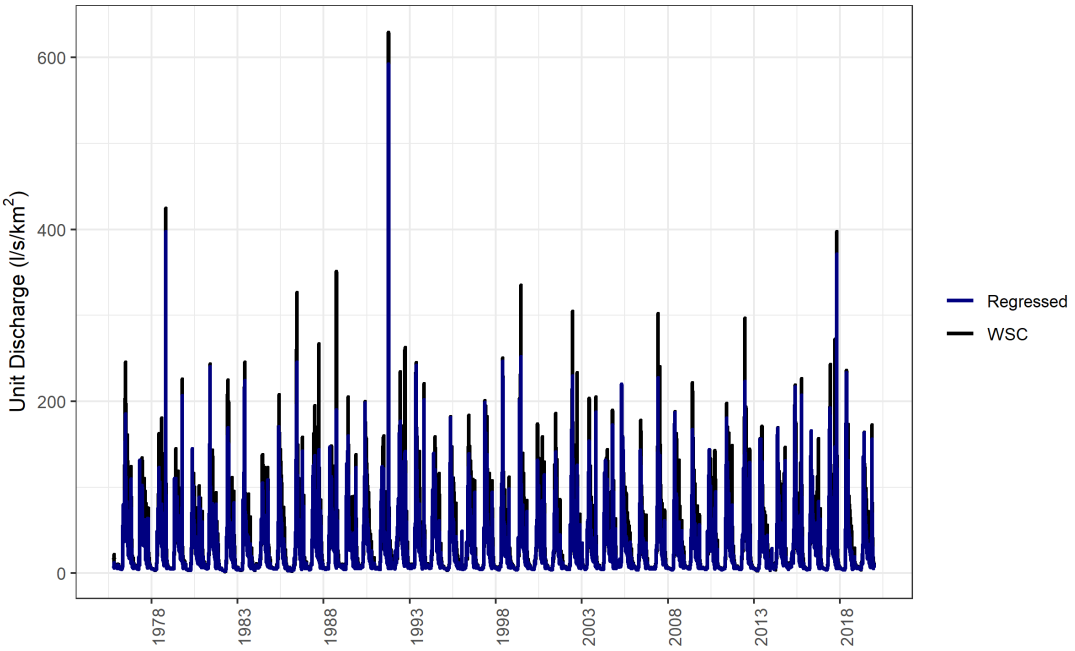

Figure 4-24: Synthetic time series for Telkwa-Hydro (blue-regressed) and Water Survey of Canada Telkwa Below Tsai Creek stations

Source: Compiled in R \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_flows_1CT027003_Plots_njs.R

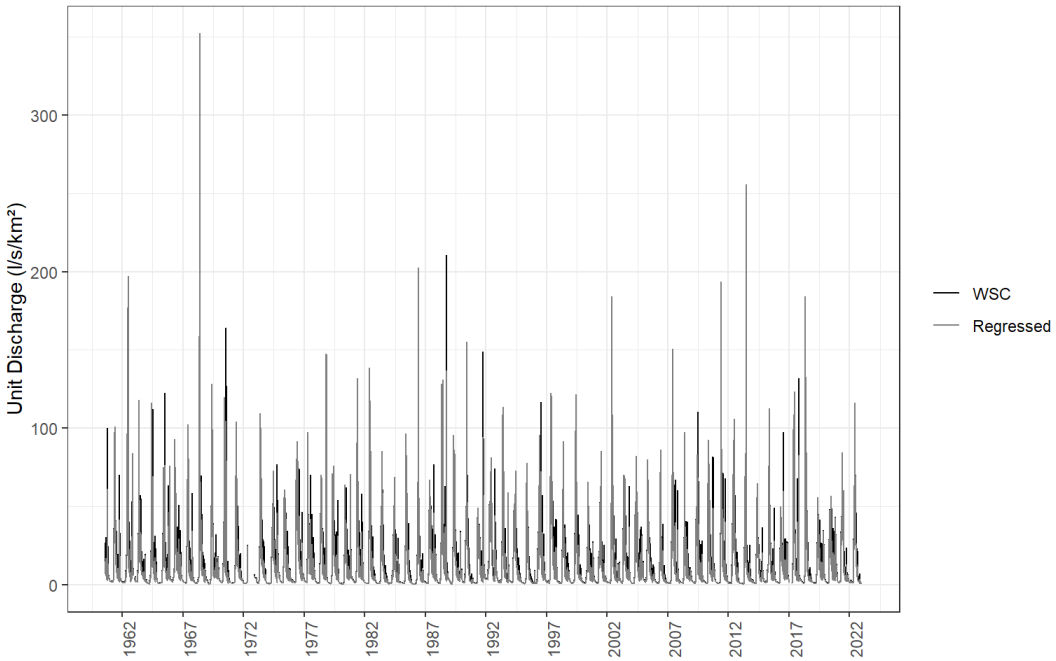

Figure 4-25: Synthetic time series for Tenas-Hydro B (grey-regressed) and Water Survey of Canada Goathorn Creek Near Telkwa stations

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

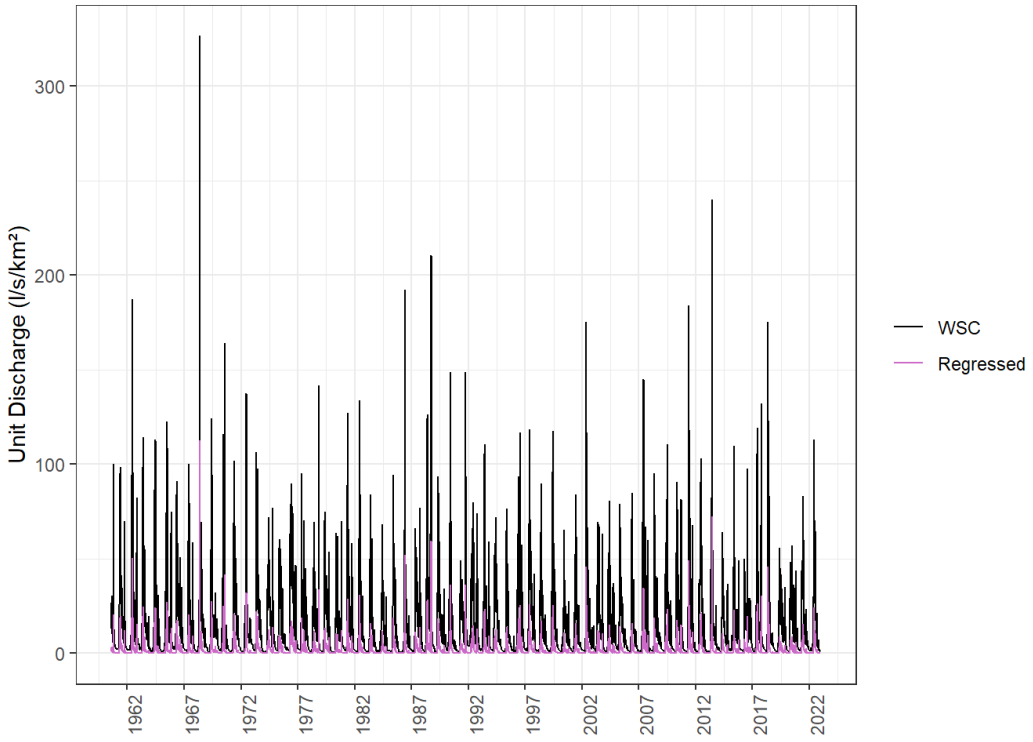

Figure 4-26: Synthetic time series for Four-Hydro (purple-regressed) and Water Survey of Canada Goathorn Creek Near Telkwa stations

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Table 4-23: Average Monthly and Mean Annual Discharge (m^3/s)

Station Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	0.2	0.2	0.2	1.1	5.0	5.2	3.2	1.7	1.3	1.3	0.9	0.4	1.7
Telkwa-Hydro (Synthetic)	6.4	5.3	5.4	16.2	74.1	81.9	45.7	26.5	20.3	24.5	13.2	7.5	27.3
Tenas-Hydro B (Synthetic)	0.075	0.058	0.065	0.41	1.90	1.96	0.67	0.34	0.25	0.27	0.31	0.12	0.54
Four-Hydro (Synthetic)	0.0007	0.0005	0.0007	0.010	0.068	0.069	0.034	0.014	0.0094	0.011	0.0063	0.0015	0.019

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_summaries\Telkwa_1CT027.003_FlowSummaries_Collated_njs.xlsx and NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

Table 4-24: Average Monthly and Annual Unit Discharge ($L/s/km^2$)

Station Name	Area (km^2)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	123.5	1.9	1.5	1.6	9.3	40.5	42.0	25.8	13.7	10.2	10.9	7.1	2.9	14.0
Telkwa-Hydro (Synthetic)	966.9	6.6	5.5	5.6	16.8	76.6	84.7	47.3	27.4	21.0	25.3	13.7	7.8	28.2
Tenas-Hydro B (Synthetic)	46.8	1.6	1.2	1.4	8.8	40.6	41.9	14.3	7.2	5.2	5.7	6.6	2.5	11.4
Four-Hydro (Synthetic)	11.0	0.07	0.05	0.06	0.91	6.20	6.3	3.1	1.2	0.85	1.00	0.58	0.13	1.7

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

Table 4-25: Average Monthly and Annual Runoff Yield (mm)

Station Name	Area (km^2)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	123.5	5.0	3.5	4.4	24.1	108.4	108.9	69.1	36.6	26.3	29.2	18.5	7.7	441.7
Telkwa-Hydro (Synthetic)	966.9	17.7	13.4	15.0	43.4	205.3	219.6	126.6	73.4	54.4	67.9	35.4	20.8	892.8
Tenas-Hydro B (Synthetic)	46.8	4.3	3.0	3.7	22.8	108.9	108.7	38.3	19.2	13.6	15.2	17.2	6.8	361.7
Four-Hydro (Synthetic)	11.0	0.2	0.1	0.2	2.4	16.6	16.3	8.3	3.3	2.2	2.7	1.5	0.4	54.0

Source: NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\External Analysis\EA_Reporting_SummaryResults_rev05_06252025.xlsx

4.2.4 Baseflow separation

The rate at which groundwater discharges into surface streams was characterized using a recursive digital filter to separate baseflow from surface runoff. A single filter parameter, typically ranging from 0.9 to 0.99 based on visual observations was incorporated to separate total streamflow into a baseflow component and surface runoff component for each of the local and regional hydrometric stations. In this method, the filter is passed over the data 1 to 3 times, where the more passes processed results in a more consistent seasonal baseflow value. Flow records from 2000 to 2019 were used in the separation model, and an upper range of filter parameters were incorporated to simulate a uniform baseflow regime with reduced peaks. A series of parameter combinations were tested, and select results are presented in Attachment B, showing baseflow and total flow from 2010 to 2015. A filter parameter of 0.99 was selected with three passes (n=3).

Monthly average baseflows were calculated over the 19-year modelled period for Four-Hydro, Tenas Hydro, Telkwa Hydro, Goathorn Hydro and Bulkley River at Quick (WSC) based on the selected filter parameter inputs. Unit baseflows were calculated by dividing by respective catchment areas and are presented in Table 4-26.

Table 4-26: Unit Baseflows (L/s/km^2) for Each Major Stream within Project Area

Month	Bulkley	Telkwa	Goathorn	Tenas	Four
1	3.24	4.65	1.82	1.50	0.051
2	3.02	4.43	1.42	1.20	0.038
3	2.95	4.38	1.39	1.10	0.031
4	3.06	4.52	2.45	1.90	0.046
5	3.94	5.85	3.88	3.10	1.187
6	6.22	9.41	6.00	4.70	2.469
7	7.94	11.57	7.25	5.00	1.260
8	7.95	10.01	6.81	4.10	0.597
9	6.78	7.49	5.92	3.50	0.433
10	5.78	6.24	5.13	3.30	0.342
11	4.62	5.38	3.89	3.20	0.148
12	3.57	4.97	2.49	2.10	0.068

Source: Compiled in text from Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\BaseflowSeparation\UpdatedBaseflows_07212020_sab.xlsx and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

4.2.5 Rainfall-Runoff Model Configuration

Surface runoff is defined as the total amount of surface water discharged from a watershed and is frequently presented as the depth of water distributed evenly throughout the watershed area. The Project is located within the Goathorn Creek, Tenas Creek and Four Creek watersheds.

A daily rainfall-runoff model was generated to support streamflow estimations in the water and load balance model and to provide Project-specific runoff rates. The runoff model for the Project Area was developed using a snowmelt model (see Section 4.2.4), a minimum baseflow function, a lag time, recession coefficient and monthly runoff coefficients for each of the main catchments. Monthly runoff coefficients were calibrated automatically within GoldSim by optimizing the Nash Sutcliffe Efficiency, based on the difference between observed and modelled daily flow.

The model required long-term precipitation and temperature inputs for the same period as the synthetic streamflow datasets. The long-term Project temperature and precipitation records were adjusted using PRISM datasets to estimate climate parameters for each of the hydrometric stations. An average monthly precipitation for each hydrometric station watershed was derived from the gridded PRISM monthly precipitation model. These monthly precipitation values were compared against the monthly precipitation estimates for the Project, and a ratio was calculated for each month and each station (Table 4-27).

Table 4-27: Monthly Precipitation Correction Factors applied to Project Precipitation based on PRISM

Month	Tenas Hydro	Four-Hydro	Goathorn Hydro	Telkwa Hydro	Bulkley Hydro
Jan	2.26	1.30	1.92	2.07	1.71
Feb	2.05	1.19	1.74	1.89	1.81
Mar	2.45	1.42	2.07	2.29	2.06
Apr	2.15	1.39	1.93	2.05	1.81
May	1.42	1.04	1.25	1.31	1.12
Jun	1.25	1.15	1.27	1.19	1.08
Jul	1.15	1.13	1.20	1.10	1.02
Aug	1.45	1.03	1.29	1.31	1.14
Sep	1.83	1.09	1.55	1.60	1.30
Oct	1.85	1.09	1.59	1.79	1.70
Nov	2.34	1.37	1.97	2.20	1.93
Dec	2.35	1.36	2.00	2.22	1.90

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Summary_Models_20241105_rev0_jls.xlsx

A similar process was employed for temperature. A monthly average temperature for each hydrometric station watershed was derived from the gridded PRISM monthly temperature model. These monthly temperature values were compared against the monthly temperature estimates for the Project, and a correction addend was calculated for each month and each station (Table 4-28).

Table 4-28: Monthly Average Temperature Correction Addends (in degrees Celsius) applied to Project Average Temperature based on PRISM

Month	Tenas Hydro	Four-Hydro	Goathorn Hydro	Telkwa Hydro	Bulkley Hydro
Jan	-0.45	-0.24	-0.57	-0.45	-0.13
Feb	-0.88	-0.37	-1.07	-1.03	-0.69
Mar	-1.27	-0.43	-1.75	-1.66	-0.90
Apr	-1.64	-0.68	-2.21	-2.14	-1.32
May	-1.74	-0.78	-2.25	-2.30	-1.55
Jun	-1.81	-0.74	-2.26	-2.46	-1.41
Jul	-1.77	-0.80	-2.19	-2.34	-1.25
Aug	-1.48	-0.51	-1.89	-2.01	-1.06
Sep	-1.28	-0.43	-1.68	-1.73	-0.62
Oct	-1.17	-0.55	-1.68	-1.50	-0.76
Nov	-0.93	-0.30	-1.21	-1.16	-0.43
Dec	-0.32	-0.04	-0.40	-0.37	-0.28

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Summary_Models_20241105_rev0_jls.xlsx

Using the daily temperature and precipitation time series adjusted for each streamflow station, the remaining runoff model inputs were calibrated in order to mimic the long-term synthetic streamflow records. Calibrated inputs included monthly runoff coefficients, baseflow, lag time and recession value.

Figure 4-27 illustrates the observed and modelled flows at the Goathorn-Hydro station from August 1990 to December 2021. Results produced an average Nash Sutcliffe Efficiency (NSE) of approximately 0.42 . The modelled flow resembles the synthetic record derived from the Water Survey of Canada station flows, however, peaks in modelled flows occasionally exceed the peaks observed in the synthetic and Water Survey of Canada observed flow record.

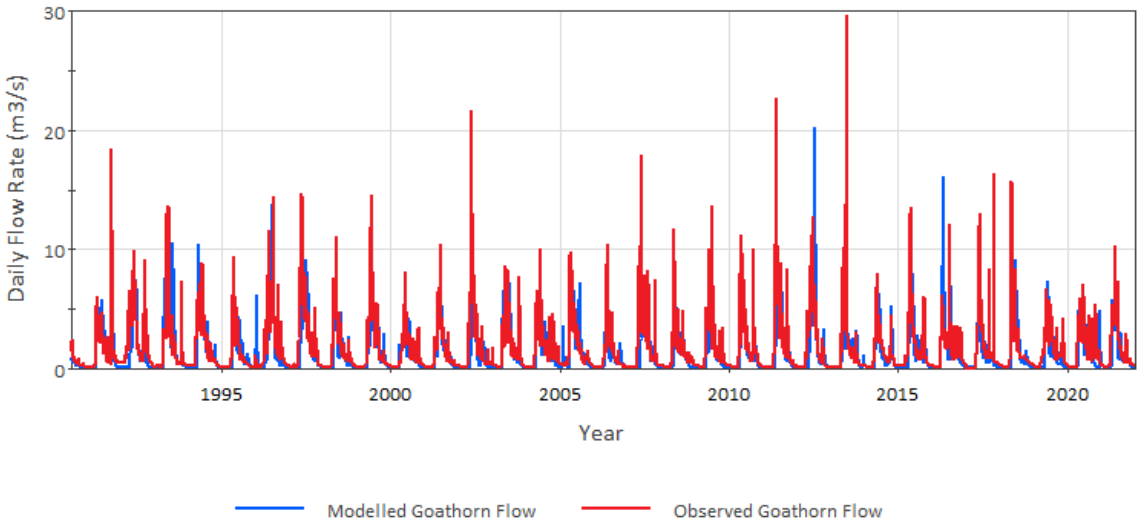

Figure 4-27: Rainfall-Runoff Model Calibration for Goathorn Creek

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Goathorn_v6_20231124

This process was repeated for Tenas Creek. Monthly runoff coefficients were calibrated automatically within GoldSim by optimizing the Nash Sutcliffe Efficiency, based on the difference between observed and modelled daily flow.

Figure 4-28 illustrates the measured and modelled flows at the Tenas-Hydro B station from 2017 to November 2022. Results produced an average Nash Sutcliffe Efficiency (NSE) of approximately 0.47. At this location, observed data is superimposed atop modelled flow with records from Tenas-Hydro and Tenas-Hydro B. The modelled flow record shows an underestimation of synthetic and measured flow at the Tenas-Hydro B location along Tenas Creek. Derivation of runoff coefficients was tested over multiple periods to ensure that the rainfall-runoff model flow results were as representative as possible. The rainfall-runoff model currently underestimates flows and should be revisited once more flow data is available from the Tenas-Hydro station.

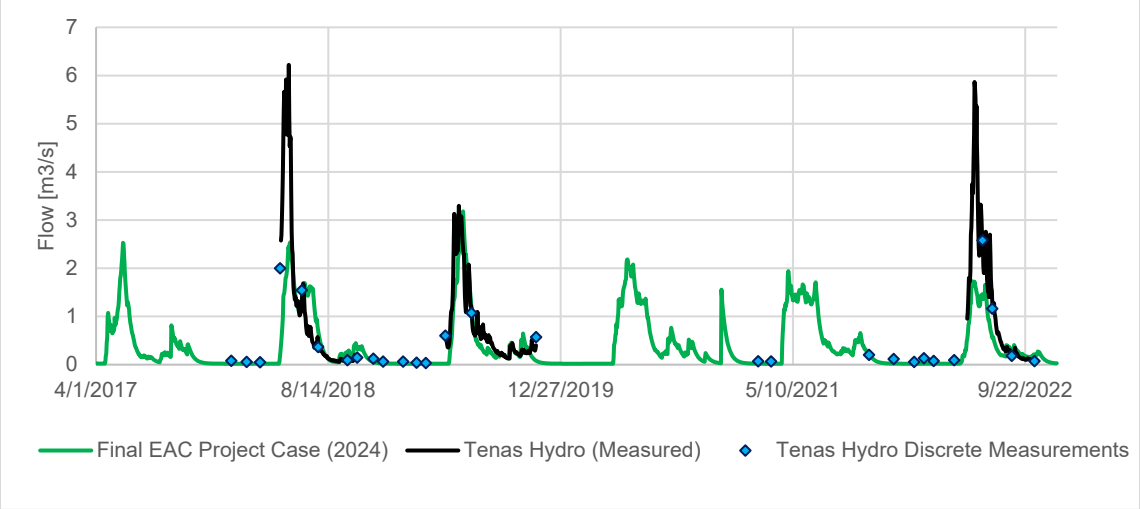

Figure 4-28: Rainfall-Runoff Model Calibration for Tenas-Hydro B

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Updated RainfallRunoff Results_20231124_rev01_njs.xlsx

The Bulkley River rainfall-runoff model for 2000 to 2018 resulted in a NSE value of 0.74 (Figure 4-29). The flows produced by the Bulkley River rainfall-runoff model show good correspondence with the observed flows at the Water Survey of Canada hydrometric station. For most of the observed flow record spanning 2000 to 2018, the modelled flows match or exceed peak flows. In some years, the model underestimates peak flows although the hydrograph shape remains similar despite the difference in magnitudes.

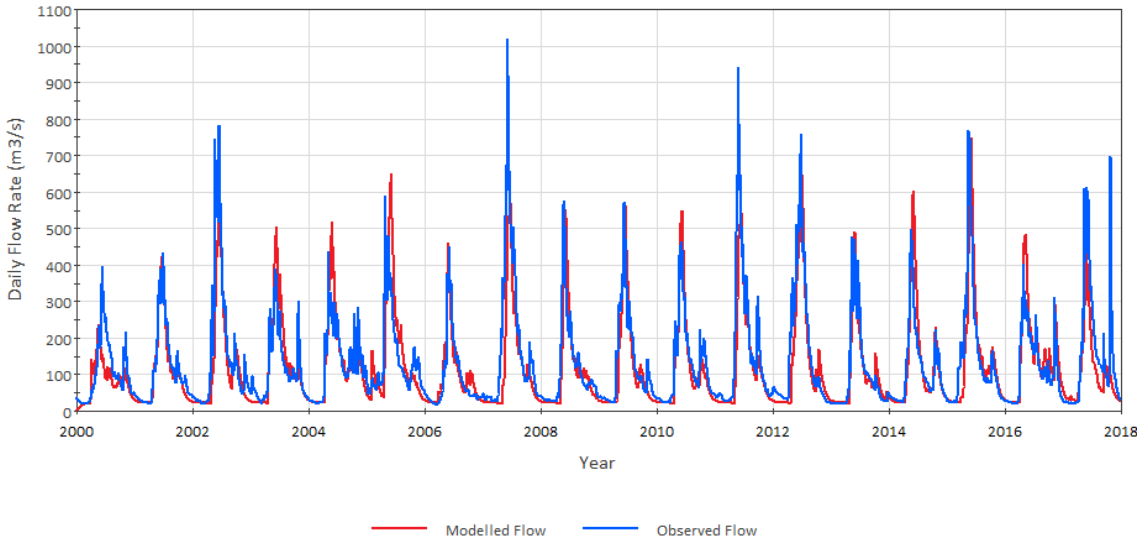

Figure 4-29: Rainfall-Runoff Model Calibration for Bulkley River

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Bulkley_v2_2000-2018_20200421.gsm

The Telkwa-Hydro rainfall-runoff model is shown in Figure 4-30 for 2016 to 2022 with a NSE of 0.55. The modelled flows correspond well with the observed flow record generated for the Telkwa-Hydro station. The observed and modelled flows are typically similar in both magnitude and shape although the modelled flow can recede more quickly post-freshet than the synthetic record leading to lower flows in early summer.

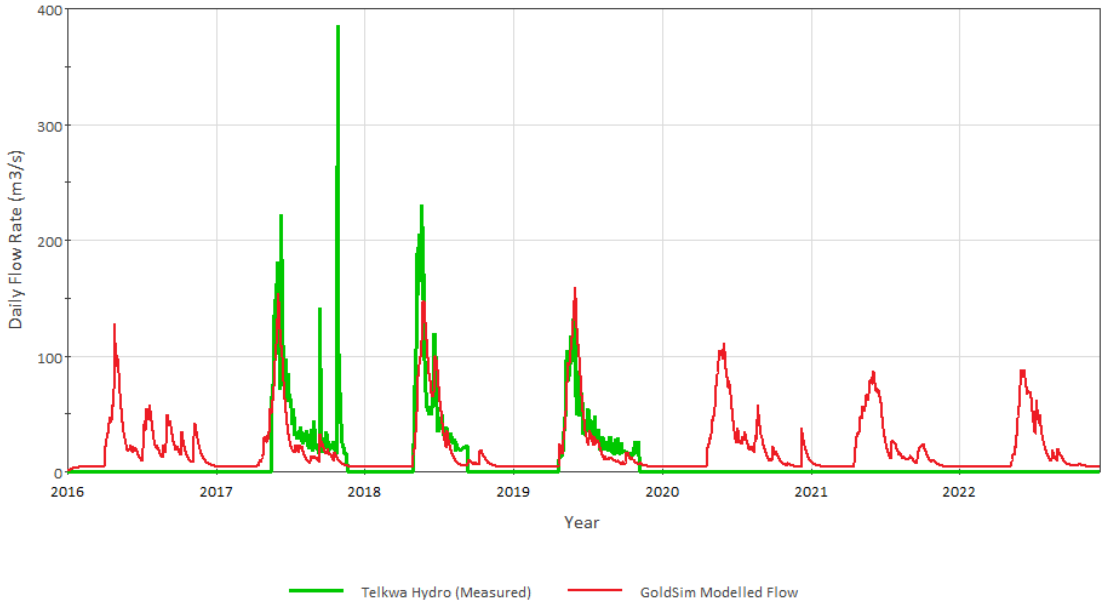

Figure 4-30: Rainfall-Runoff Model Calibration for Telkwa River

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Telkwa-Hydro_v3_20200430_20240211.gsm

Calibration of Four-Hydro was conducted using the available 2020 and 2022 records. The continuous flow record in Four Creek from 1997 and 1998 did not include spring freshet (October and November 1997 and July through October 1998). For this reason, the data was not used in the model calibration. With only few flow records available, the monthly runoff coefficients are specific to the period used for calibration. Figure 4-31 presents the modelled and measured Four-Hydro flows. The calibration resulted in a NSE value of 0.64.

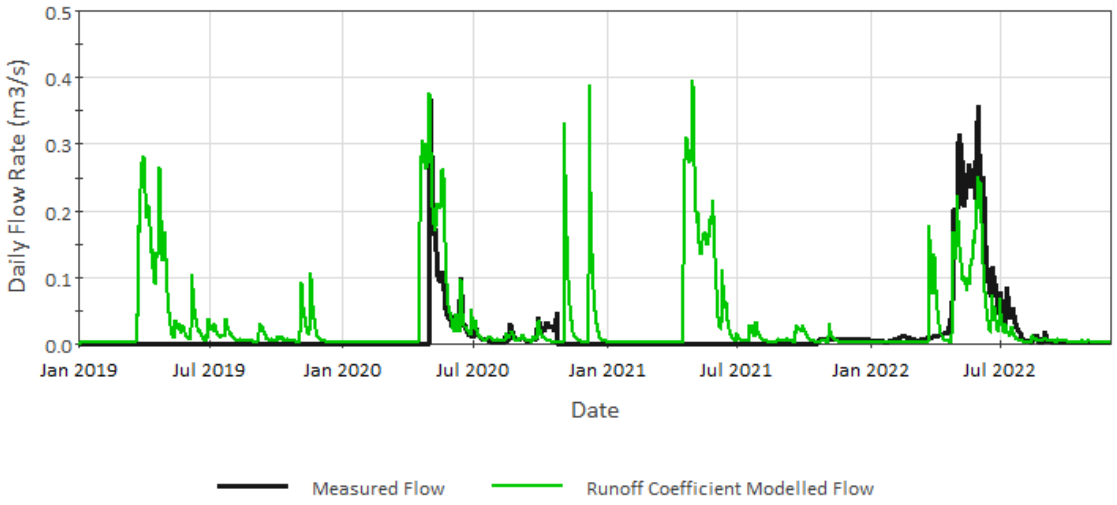

Figure 4-31: Rainfall-Runoff Model Calibration for Four Creek

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Four_v3_20231212.gsm

Table 4-29 presents the calibrated parameters for each catchment with the average of Tenas, Four and Goathorn results for runoff coefficients, recession value and baseflow parameters applied to the Project Area.

Table 4-29: Rainfall-Runoff Model Inputs

Location		Goathorn	Telkwa	Tenas	Bulkley	Four	Project
Minimum Unit Baseflow [L/s/km^2]		1.4	4.1	0.43	3.5	0.3	0.69
Lag Time [days]		1	1	1	1	1	1
Recession		0.90	0.92	0.91	0.96	0.77	0.86
Runoff Coefficient	January	1	1	1	1	1	1
	February	1	1	1	1	1	1
	March	0.45	1	1	1	0.82	1
	April	0.91	1	0.67	0.34	0.75	0.43
	May	0.26	0.78	0.54	0.10	0.22	0.30
	June	0.21	0.28	0.34	0.10	0.14	0.18
	July	0.76	0.92	0.53	0.04	0.31	0.28
	August	0.28	0.54	0.26	0.02	0.17	0.18
	September	0.14	0.28	0.35	0.04	0.09	0.24
	October	0.37	0.49	0.39	0.02	0.18	0.28
	November	0.14	0.98	0.90	0.50	0.51	0.72
	December	1	1	1	0.4	0.80	1

Source:https://srk.sharepoint.com/sites/NACAPR002055/Internal/200_Review%20New%20Climate%20and%20Streamflow%20Data/Runoff%20Models/Rev2_Nov%202023/Summary_Models_20241105_rev0_jls.xlsx

The synthetic long-term Project precipitation and temperature records were incorporated to the snowmelt and runoff model to generate Project-specific runoff rates using the calibrated values from Tenas, Four and Goathorn Creek. Figure 4-32 presents the monthly average runoff distribution based on the 41-year synthetic record (1981-2021), which produced a mean annual runoff (MAR) of 242 mm. Based on the mean annual precipitation calculated for the Project, the annual runoff coefficient is equal to 0.36.

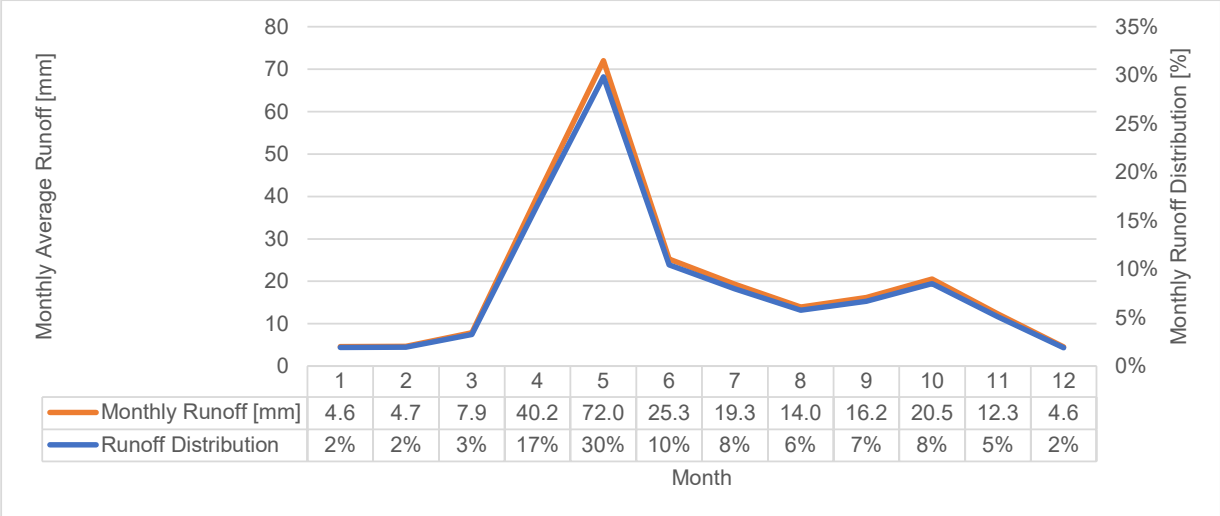

Figure 4-32: Project Area Monthly Average Runoff Depth [mm] and Distribution

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Summary_Models_20241105_rev0_jls.xlsx

A frequency analysis was performed using the time series of annual runoff rates generated from the model, producing annual runoff rates associated with a range of exceedance probabilities. Multiple distributions were tested against the historical data, including the Normal, Log Normal, Gumbel, Gamma, Pearson III, Log Pearson III, and GEV distributions, and the Gamma distribution was selected as the best statistical fit to observed data. Results of annual runoff for a range of return periods are presented in Table 4-30.

Table 4-30: Return Periods Calculated for Mean Annual Runoff

Hydrological Condition	Return Period [years]	Annual Runoff [mm]
Wet	1000	361
	500	351
	200	338
	100	328
	50	316
	25	304
	20	300
	10	286
	5	270
Mean Annual Runoff (MAR)		240
Dry	5	212
	10	199
	20	188
	25	185
	50	177
	100	169
	200	163
	500	155
	1000	150

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

4.2.6 Baseflow Review

The calibrated rainfall-runoff model incorporates a constant baseflow value for each stream. Results of the calibration were compared against the monthly baseflow estimates calculated from the baseflow separation technique described in Section 4.2.4 and are presented in Figure 4-33.

Points on the plot represent the constant and calibrated unit baseflow estimates for each stream, while lines show the monthly results from the baseflow separation model.

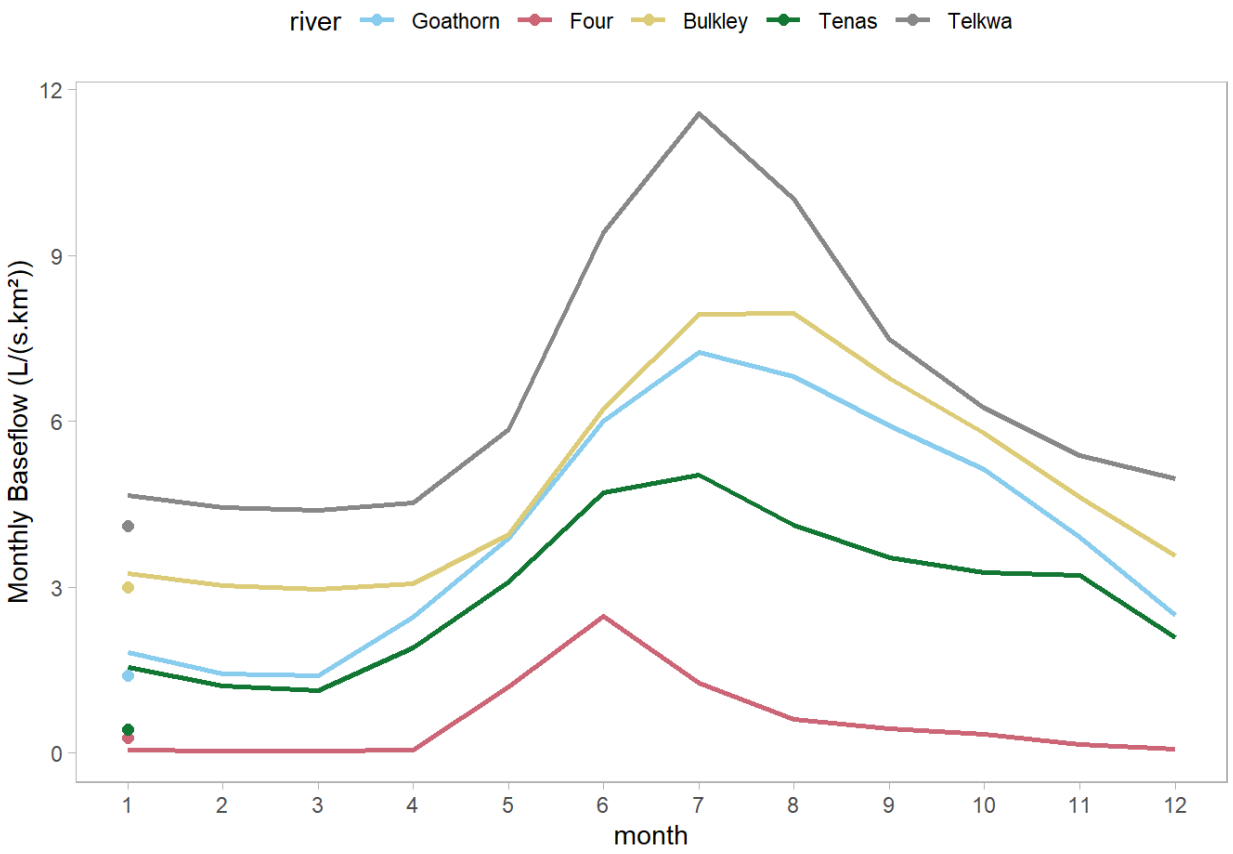

Figure 4-33: Comparison of Calibrated Unit Baseflows and Monthly Baseflow Separation Results

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

The constant calibrated baseflow estimates are representative of the winter and low flow monthly baseflow results from the baseflow separation. Based on the rainfall-runoff model used, the only time of year where the constant baseflow input is used is during winter months without rainfall or snowmelt. This is reasonable since the monthly runoff coefficients are calibrated to match flows in the open water season, and therefore account for baseflow contributions in their development.

The calibrated constant baseflow selected for Four-Hydro was compared against the available low-flow manual measurements collected since 2020 and presented in AGRA 1999, in the development of station rating curves. Measurement statistics are presented in Table 4-31 and show that the selected model baseflow for Four Creek, selected as 0.30 L/s/km^2, is approximately the minimum of winter baseflow measurements collected from Four Creek in 2020-2022.

Table 4-31: Four Creek Baseflow and Available Measurements Comparison

Type	Date	Statistic	Unit Flow [L/s/km^2]
Manual Measurement	All year	Minimum	0.18
Manual Measurement	All year	25th percentile	0.59
Manual Measurement	All year	50th percentile	1.08
Manual Measurement	All year	Average	1.71
Manual Measurement	Winter	Minimum	0.27
Manual Measurement	Winter	25th percentile	0.73
Manual Measurement	Winter	50th percentile	1.18
Manual Measurement	Winter	Average	1.94
SRK Rainfall-Runoff Model	n.a	n.a	**0.30**

Source: Compile in text from \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\2024_FourCreek-GW\data\Telkwa_NACAPR002055_FourCreek_flow_rev02_njs.xlsx

The calibrated constant unit baseflows were used in groundwater modeling calibration to develop base case estimates of baseflow.

4.2.7 Peak Flows

A peak flow analysis was performed for Tenas Creek, Goathorn Creek, Telkwa River and Four Creek based on the synthetic records detailed in section 4.2.3. The Bulkley River peak flow analysis was based on the extended records from WSC Bulkley River at Quick 08EE004 hydrometric station. Table 4-32 presents the unit peak-flows for each identified stream.

Table 4-32: Unit Peak Flows from Extended Records [L/s/km^2]

Return Period [years]	Goathorn-Hydro (Synthetic)	Telkwa-Hydro (Synthetic)	Tenas-Hydro B (Synthetic)	Four-Hydro (Synthetic)	WSC Bulkley River at Quick 08EE004
1000	388	620	506	173	165
500	356	516	441	147	160
200	313	404	363	117	153
100	280	336	311	97	147
50	248	278	264	79	140
25	215	230	221	63	133
20	205	216	208	59	130
10	172	178	171	46	122
5	140	144	137	34	111
2	98	105	96	21	91

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

4.2.8 Low Flows

A low flow analysis was performed for Tenas Creek, Goathorn Creek, Telkwa River and Four Creek based on the synthetic records detailed in section 4.2.8. The Bulkley River low flow analysis was based on the extended records from WSC Bulkley River at Quick 08EE004 station. Table 4-33 presents the day low-flows for each identified stream.

Table 4-33: 7-Day Low Flows from Extended Records [L/s]

Return Period [years]	Goathorn-Hydro (Synthetic)	Tenas-Hydro B (Synthetic)	Telkwa-Hydro (Synthetic)	Four-Hydro (Synthetic)	WSC Bulkley River at Quick 08EE004
2	128.5	40.9	4,220	0.302	22,743
5	95.5	29.5	3,655	0.192	17,373
10	78.2	24.5	3,381	0.145	15,090
20	66.9	20.9	3,166	0.110	13,413
25	63.8	19.9	3,105	0.101	12,955
50	55.6	17.2	2,934	0.075	11,711
100	48.9	15.1	2,785	0.054	10,671
200	43.3	13.3	2,653	0.036	9,778
500	37.1	11.3	2,499	0.015	8,761
1000	33.2	10.0	2,393	0.001	8,087

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Seven-day low flows for a 10 year return period (7Q10) were also computed for Tenas Creek, Goathorn Creek,Telkwa River and Four Creek during each month of the synthetic records. Table 4-34 and Table 4-35 present the 7Q10 results for these series as low flows and unit low flows respectively.

Table 4-34: 7-day Low Flows for 10-year Return Period for Synthetic Records

Station Name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic) (m^3/s)	0.10	0.09	0.08	0.12	1.00	2.02	1.19	0.69	0.47	0.40	0.19	0.12	0.08
Telkwa-Hydro (Synthetic) (m^3/s)	4.2	3.7	3.4	3.7	15	40	25	15	6.7	6.8	5.6	3.4	3.4
Tenas-Hydro B (Synthetic) (m^3/s)	0.032	0.028	0.025	0.037	0.354	0.665	0.232	0.125	0.082	0.070	0.058	0.038	0.025
Four-Hydro (Synthetic) (L/s)	0.21	0.18	0.17	0.25	6.04	16.40	6.70	3.18	1.96	1.40	0.50	0.27	0.14

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Table 4-35: 7-day Unit Low Flows for 10-year Return Period Flows for Synthetic Records (L/s/km^2)

Station Name	Area (km^2)	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	123.5	0.82	0.72	0.63	0.93	8.13	16.36	9.67	5.58	3.85	3.21	1.51	1.00	0.63
Telkwa-Hydro (Synthetic)	966.9	4.34	3.83	3.52	3.83	15.5	41.4	25.9	15.5	6.93	7.03	5.79	3.52	3.52
Tenas-Hydro B (Synthetic)	46.75	0.69	0.60	0.52	0.80	7.56	14.21	4.96	2.67	1.76	1.51	1.25	0.81	0.52
Four-Hydro (Synthetic)	11	0.82	0.72	0.64	0.95	1.59	0.87	0.1	0.08	0.19	0.24	1.43	0.96	0.04

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

5 Climate Change

Climate change is considered one of human civilization's many challenges as it has the potential to impact current social and ecological systems. Estimating potential variation in future climate conditions to identify vulnerability, assess risk and develop adaptive management strategies is in the best interest of mine developers and operators.

The section below discusses climate change trends and effects that may impact the Project. This analysis was completed for temperature and precipitation, and incorporated into the evaporation and streamflow models discussed in Section 4.

5.1 Contextual Framework

While observed historical datasets have traditionally been used to investigate climate patterns and trends, global circulation models (GCMs, aka climate change models) are better suited to generate synthetic datasets with which to investigate the potential range of impacts of climate change into the future on a global or continental scale. GCM results can be scaled to local weather station datasets or gridded climate datasets to provide localized, site-specific projections.

The Coupled Model Intercomparison Project (CMIP) is organized under the support of the World Climate Research Program's (WCRP) working group on coupled modelling. It coordinates experiments on coupling computer-based models of the Earth's climate such as GCMs. The objective of CMIP is to better understand past, present, and future climate change arising from natural unforced variability or in response to changes in radiative forcing in a multi-model context (Eyring 2016). The CMIP is currently in its sixth phase (CMIP6) and its outcomes contribute to the most recent assessments and reports from the International Panel on Climate Change (IPCC, 2023).

CMIP6 includes the most up to date, peer-reviewed models for the simulation and projection of various aspects of climate change. The CMIP6 models include new and better representations of physical, chemical, and biological processes at higher resolution than its previous phases. This has improved the simulation of the recent mean state of most large-scale indicators of climate change and many other aspects across the climate system.

This climate change assessment was based on results from GCMs included in CMIP6 and the corresponding IPCC Sixth Assessment Report (AR6) (IPCC, 2021). The data compilation and subsequent analysis was conducted in the R Software environment.

5.2 Climate Change Methodology

Climate change scenarios were evaluated considering Shared Socioeconomic Pathways (SSP). SSPs are a set of scenarios that describe potential future developments in the absence of climate policy intervention. These pathways are used to explore the possible impacts of different socioeconomic trends on climate change and to assess the challenges associated with mitigation and adaptation strategies. Figure 5-1 shows possible combinations of SSPs with different radiative forcing levels. Four scenarios (Tier 1) are generally recommended for climate change assessments - SSP 1-2.6, SSP 2-4.5, SSP 3-7.0 and SSP 5-8.5 (O'Neill, et al., 2016)-, which span the range of radiative forcing levels and SSPs.

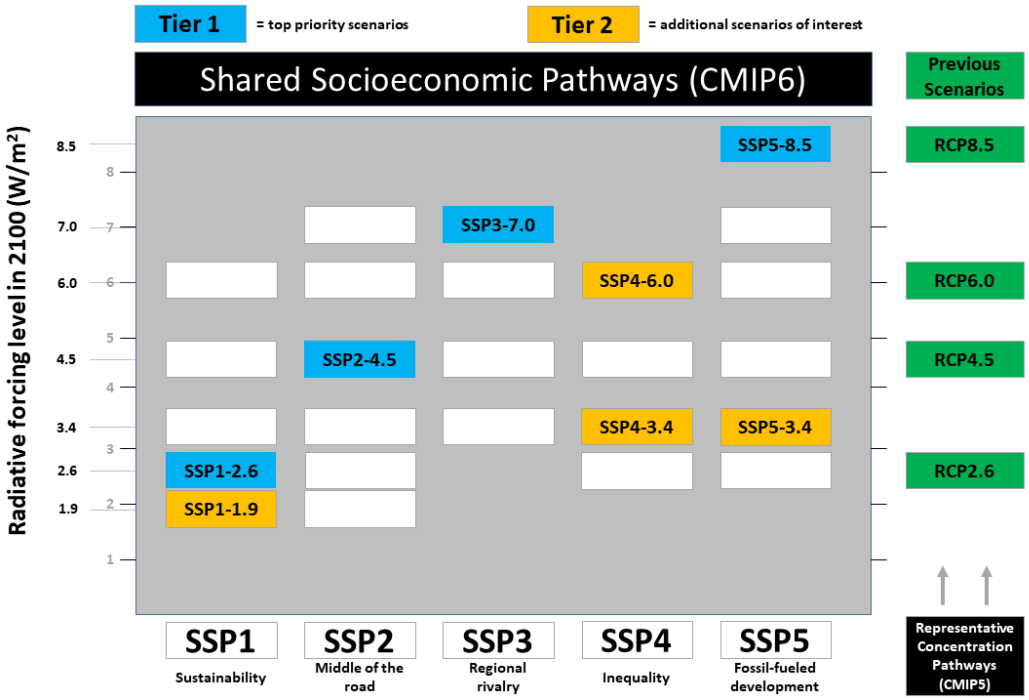

Figure 5-1: Shared Socio-economic Pathways and year 2100 radiative forcing combinations

Source: https://climate-scenarios.canada.ca/?page=cmip6-overview-notes

A short description of these scenarios is provided below.

- SSP5-8.5: With an additional radiative forcing of 8.5 W/m² by the year 2100, this scenario represents the upper boundary of the range of scenarios described in the literature. It can be understood as an update of the CMIP5 scenario RCP8.5, now combined with socioeconomic reasons.
- SSP3-7.0: With 7 W/m² by the year 2100, this scenario is in the upper-middle part of the full range of scenarios. It was newly introduced after the RCP scenarios, closing the gap between RCP6.0 and RCP8.5.
- SSP2-4.5: As an update to scenario RCP4.5, SSP245 with an additional radiative forcing of 4.5 W/m² by the year 2100 represents the medium pathway of future greenhouse gas emissions. This scenario assumes that climate protection measures are being taken.
- SSP1-2.6: This scenario with 2.6 W/m² by the year 2100 is a remake of the optimistic scenario RCP2.6 and was designed with the aim of simulating a development that is compatible with the 2°C target. This scenario, too, assumes climate protection measures being taken.

National Aeronautics and Space Administration (NASA, 2017) provides access to gridded global climate data NEX-GDDP-CMIP6 (Thrasher, et al., 2022), which comprises 26 CMIP6 models for the period of 1950 – 2100, with historical results from 1950 to 2014 and forecast results from 2015 to 2100. Data for the Tenas Project location were obtained and processed by SRK to evaluate predicted trends up to year 2100, deemed the maximum reasonable prediction range (IPCC, 2023).

Once the Global Circulation Models (GCM) are developed in a coarse spatial resolution, a bias correction procedure is required to adjust their estimates to represent local climate conditions of a specific site considering its microclimate. In this work, GCM historical and forecasted data are bias corrected with Quantile Delta Mapping (QDM) referencing the derived historical timeseries introduced in Section 4 as the observed variables. QDM is applied to the meteorological variables grouped by month – i.e., the bias correction preserves month-specific variability.

Each model under each different SSP represents one possible future climate scenario. Summarizing the models' results by the median or average may facilitate the interpretation and provide insights into agreement among models, but it may hinder extreme conditions that are usually of interest to stakeholders for risk assessment. Thus, SRK chose to show the results for four conditions that will encompass extreme cases of high and low water availability, as well as an average case that will represent the midpoint trend of the GCMs.

Projected climate change effects were evaluated relative to a defined baseline period for three consecutive 30-year forecast periods, defined as follows:

- Baseline period from 1985 to 2014 (CMIP6)
- First forecast period from 2015 to 2040 (CMIP6)
- Second forecast period from 2041 to 2070 (CMIP6)
- Third forecast period from 2071 to 2100 (CMIP6)

One model within the GCM/SSP ensamble was selected to represent each of the following four conditions for each forecast period:

- Minimum long term net water balance (precipitation - evaporation) – $min_{(P-E)}$
- Maximum long term net water balance – $max_{(P-E)}$
- Midpoint condition (median precipitation with median evaporation) – $med_P med_E$
- Lowest long term Precipitation – min_P

These conditions were selected based on the critical components of the Project, and aim to cover climate change related uncertainty during the life of the Project.

The following sections present the climate change analysis for mean annual and monthly air temperature as well as mean annual and monthly precipitation. Changes to lake evaporation and streamflow were also assessed based on the climate change forecasts.

5.3 Model Selection

For each time period, the models were assessed by comparing rates of change for precipitation and evaporation in order to identify extreme and average conditions. Figure 5.2 showcases these rates of change envelope for modelled climate outcomes from the GCM's for all scenarios. Models selected by SRK to illustrate the range of climate change outcomes are highlighted (thick circle lines). The selected models are also presented in Table 5-1.

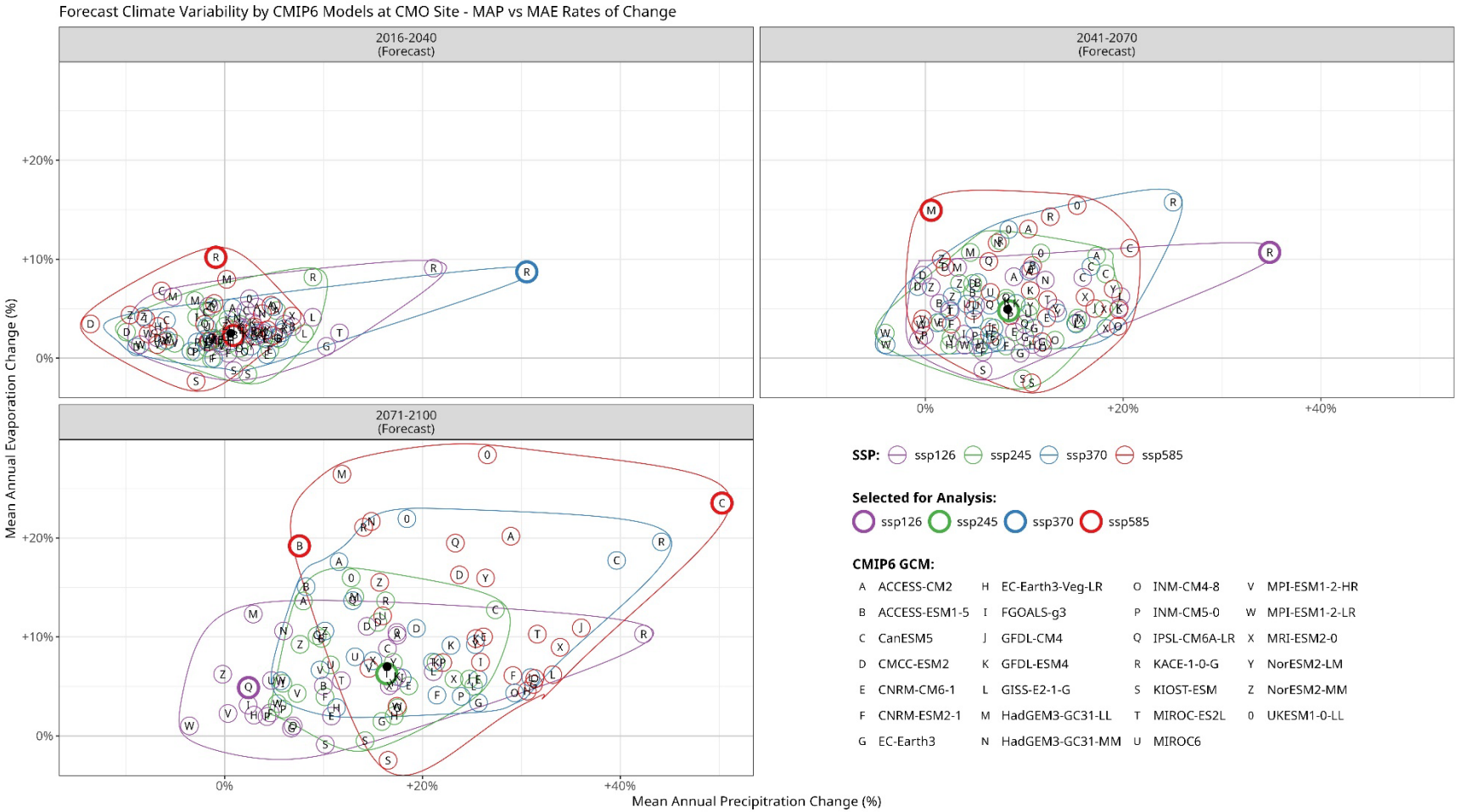

Figure 5.2: Model selection per forecast period

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\figures\cc_model_prcp_evap.tif

Table 5-1: Adopted models for each forecast period

Forecast Period	Condition	Model (SSP)
2015 – 2040	$med_P med_E$	MIROC-ES2L (SSP5-8.5)
	$max_{(P-E)}$	KACE-1-0-G (SSP3-7.0)
	$min_{(P-E)}$	KACE-1-0-G (SSP5-8.5)
	min_P	CMCC-CM2-SR5 (SSP2-4.5)
2051 – 2070	$med_P med_E$	GISS-E2-1-G(SSP2-4.5)
	$max_{(P-E)}$	KACE-1-0-G(SSP1-2.6)
	$min_{(P-E)}$	HadGEM3-GC31-LL(SSP5-8.5)
	min_P	IITM-ESM(SSP3-7.0)
2071 – 2100	$med_P med_E$	MIROC-ES2L(SSP2-4.5)
	$max_{(P-E)}$	CanESM5(SSP5-8.5)
	$min_{(P-E)}$	ACCESS-ESM1-5(SSP5-8.5)
	min_P	IPSL-CM6A-LR(SSP1-2.6)

5.4 Climate Change Effects to Temperature

5.4.1 Annual Temperature Trends

Figure 5-3 presents the mean annual air temperature (MAAT) from the Project record during the baseline period, as well as the historical CMIP6 ensemble results over the same period and the forecasted MAAT for the four different SSPs.

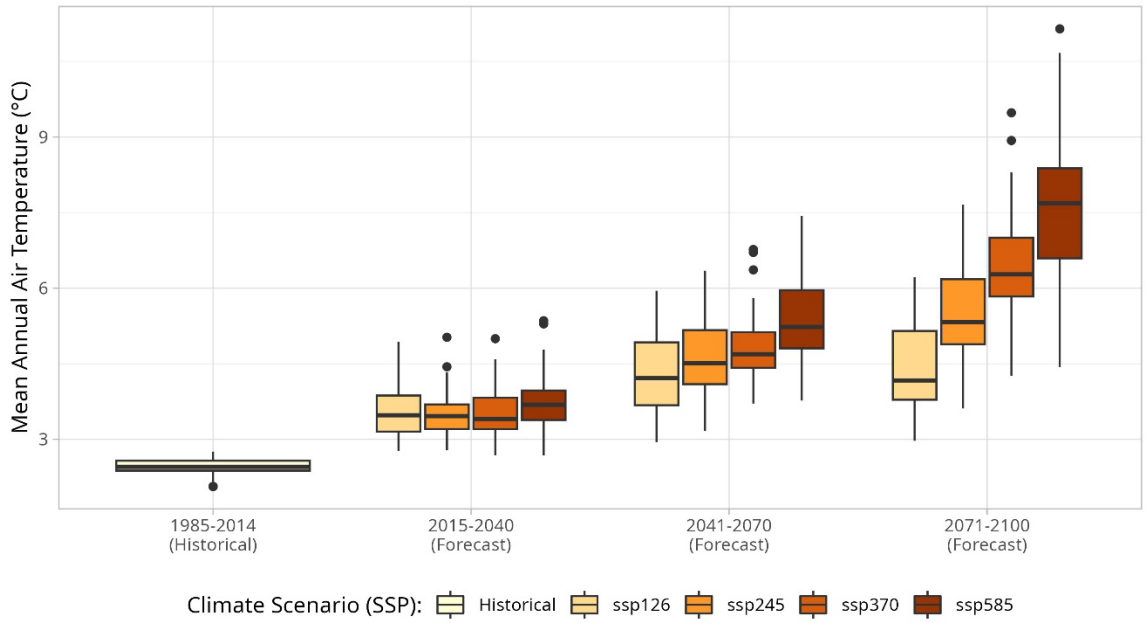

Figure 5-3: Forecast of Climate Change Effect on Mean Annual Air Temperature

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\figures\cc_periods_tavg.tiff

Table 5-2 presents the rates of change relative to the historical results for the four conditions up to year 2100 using CIMP6 data.

Table 5-2: Mean Annual Air Temperature Increase from Baseline (in °C)

Timeframe	$med_P med_E$	$max_{(P-E)}$	$min_{(P-E)}$	min_P
2015-2040	1.0	2.5	2.8	0.4
2041-2070	2.2	3.1	4.1	1.3
2071-2100	2.3	8.2	5.7	1.7

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

Based on the selected scenarios, the mean annual temperature for the Project is expected to increase by 2°C to 8°C by year 2100.

5.4.2 Monthly Temperature Rates of Change

Monthly impacts to temperature as a result of climate change were evaluated using the same methodology as described above. The projections are shown below in Table 5-3 for the four conditions and three time periods.

Table 5-3: Monthly Average Temperature Increase from Baseline (in °C)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
$med_P med_E$													
2015-2040	0.9	1.0	1.0	1.2	1.0	1.5	1.0	0.9	1.0	0.9	1.3	0.1	1
2041-2070	4.0	-0.4	2.4	1.6	1.2	1.6	2.5	3.6	2.4	2.0	2.7	2.3	2.2
2071-2100	2.6	1.9	1.5	2.1	2.0	2.2	2.4	2.4	2.5	1.6	3.3	2.5	2.3
$max_{(P-E)}$													
2015-2040	1.7	2.1	2.4	1.4	1.3	3.3	3.7	3.2	2.3	1.3	3.0	4.8	2.5
2041-2070	3.1	2.5	2.1	1.9	2.4	3.8	4.5	3.8	3.0	2.1	3.5	4.7	3.1
2071-2100	10.8	8.8	6.3	7.1	9.4	8.0	7.6	8.8	8.2	7.8	8.2	7.8	8.2
$min_{(P-E)}$													
2015-2040	1.6	2.5	3.2	2.1	2.2	3.6	3.6	3.4	2.5	1.5	3.3	4.5	2.8
2041-2070	4.4	3.8	3.5	3.4	4.7	4.6	4.9	4.4	3.4	3.9	4.7	3.0	4.1
2071-2100	5.3	5.2	3.9	5.1	6.2	4.6	7.6	7.1	6.4	6.0	4.9	5.5	5.7
min_P													
2015-2040	-1.4	-0.1	-0.4	0.2	0.8	1.2	2.3	1.3	1	0.3	0.8	-1.3	0.4
2041-2070	-0.4	1.4	1.1	1.5	1.3	1.5	1.3	1.2	1.3	1.2	2.0	1.8	1.3
2071-2100	0.4	2.9	1.6	1.5	2.3	2.3	1.6	1.8	1.9	1.6	1.4	1.5	1.7

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.5 Climate Change Effects to Precipitation

5.5.1 Annual Precipitation Trends

Figure 5-4 illustrates the mean annual precipitation (MAP) from the Project record during the baseline period, as well as the historical CMIP6 ensemble results over the same period, and the forecasted forecast MAP for the four different SSPs.

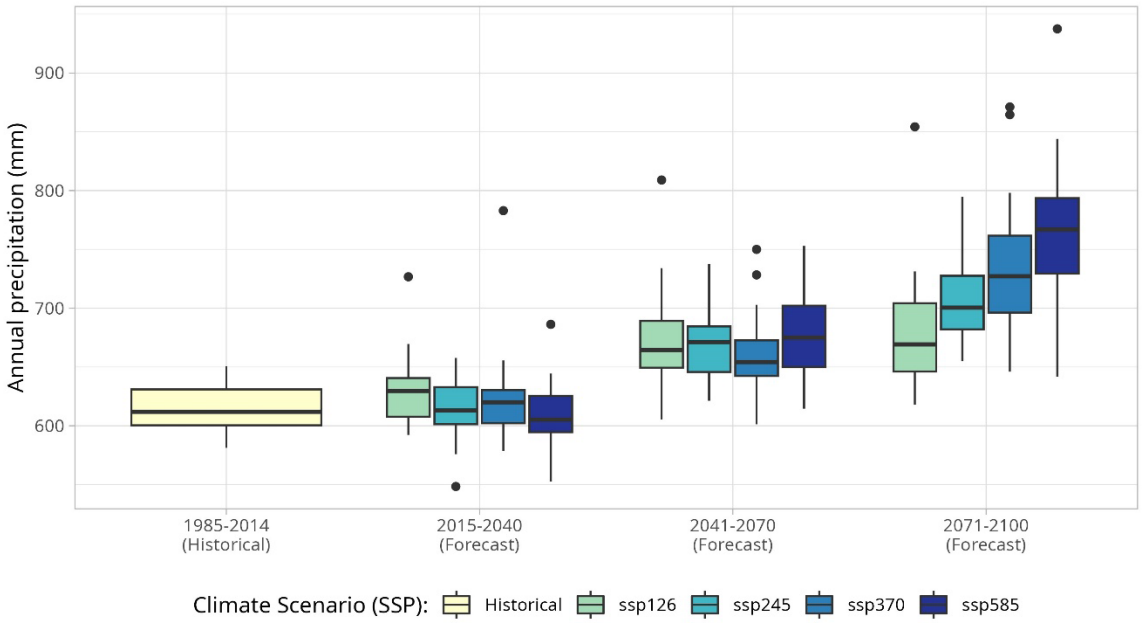

Figure 5-4: Forecast of Climate Change Effect on Mean Annual Precipitation

Source: R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

Table 5-4 presents the percent increase of mean annual precipitation for the three RCPs up to 2100.

Table 5-4: Mean Annual Precipitation Percent Increase from Historical Baseline Average

Timeframe	$med_P med_E$	$max_{(P-E)}$	$min_{(P-E)}$	min_P
2015-2040	1%	31%	-1%	-13%
2041-2070	8%	35%	1%	-5%
2071-2100	16%	50%	8%	2%

Source: R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.5.2 Monthly Precipitation Rates of Change

Monthly impacts to precipitation as a result of climate change were evaluated using the same methodology as described above. The projections are shown below in Table 5-5 for the four conditions and three time periods.

Table 5-5: Monthly Average Precipitation Percent Increase from Baseline

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
$med_P med_E$												
2015-2040	14%	-29%	10%	-21%	3%	13%	-2%	-5%	17%	-2%	-8%	15%
2041-2070	18%	-15%	5%	-2%	16%	13%	3%	-15%	30%	19%	5%	10%
2071-2100	46%	-36%	28%	-8%	29%	28%	17%	4%	33%	2%	16%	30%
$max_{(P-E)}$												
2015-2040	83%	1%	34%	9%	35%	92%	38%	-13%	87%	5%	-5%	4%
2041-2070	69%	18%	69%	17%	80%	103%	38%	-13%	69%	4%	8%	-5%
2071-2100	63%	49%	66%	51%	61%	14%	6%	-8%	49%	75%	85%	62%
$min_{(P-E)}$												
2015-2040	19%	-3%	26%	-26%	-18%	-19%	-15%	-28%	-6%	-6%	22%	15%
2041-2070	0%	15%	-19%	-2%	27%	6%	-18%	-31%	5%	27%	3%	-15%
2071-2100	-4%	-17%	36%	58%	26%	-18%	-47%	1%	32%	1%	49%	8%
min_P												
2015-2040	-8%	-19%	-17%	-5%	-17%	-30%	-6%	1%	-6%	-16%	-5%	-19%
2041-2070	-17%	-22%	-14%	-5%	-10%	-15%	-2%	7%	9%	12%	-13%	6%
2071-2100	-6%	21%	9%	-10%	23%	32%	17%	1%	-18%	8%	-20%	4%

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.5.3 Extreme Precipitation with Climate Change

Rates of change for extreme precipitation under climate change conditions were estimated for each time period. Rates of change are expressed by the ratio between future and historical precipitation for a set of return periods. For this, the Generalized Extreme Value (GEV) distribution was fitted using L-moments method (Hosking, 2023) to bias corrected historical and future annual maximum daily rainfall to represent extreme precipitation frequency under historical and projected future conditions. The rates of change are provided in Table 5-6 in terms of percentiles. Depth-Duration-Frequency can be obtained by multiplying the historical quantiles (Table 4-8) by the rates of change presented in this section.

Table 5-6: Rates of change for Project Depth-Duration-Frequency Curves with Climate Change

Percentile	Return Period							
	2	5	10	25	50	100	200	1000
Period 2015 – 2040								
10	−9%	−12%	−12%	−15%	−18%	−21%	−24%	−30%
25	−4%	−2%	−3%	−6%	−7%	−10%	−12%	−15%
50	4%	5%	4%	6%	7%	6%	4%	4%
75	11%	13%	15%	18%	22%	25%	29%	34%
90	18%	23%	25%	32%	39%	50%	57%	66%
Period 2041 – 2070								
10	−3%	−5%	−5%	−8%	−10%	−14%	−18%	−24%
25	3%	2%	1%	−1%	−5%	−8%	−10%	−12%
50	11%	10%	10%	9%	12%	14%	14%	15%
75	18%	21%	21%	26%	29%	31%	36%	43%
90	28%	33%	35%	40%	46%	56%	62%	82%
Period 2071 – 2100								
10	2%	2%	2%	−1%	−4%	−5%	−9%	−14%
25	11%	9%	10%	10%	9%	8%	6%	3%
50	20%	20%	21%	23%	24%	25%	26%	28%
75	29%	32%	32%	38%	46%	54%	64%	75%
90	38%	43%	47%	56%	65%	74%	87%	118%

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.6 Climate Change Effects to Lake Evaporation

Changes to lake evaporation were assessed by updating the Morton CRWE methodology described in Section 2.3.7 with the temperature changes obtained for RCP 4.5 and presented in Table 5-6. The maximum temperature, minimum temperature and dew temperature Project time series were updated using the same net increase rates. Note that the model did not apply a climate change adjustment to solar radiation. Table 5-7 presents the monthly and annual rates of change relative to the baseline lake evaporation.

Table 5-7: Monthly Lake Evaporation Percentual Variation from Baseline

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
$med_P med_E$													
2015-2040	0%	2%	-1%	3%	2%	5%	3%	2%	3%	1%	2%	-0%	**2%**
2041-2070	2%	-0%	2%	4%	1%	3%	6%	13%	6%	1%	1%	1%	**5%**
2071-2100	2%	3%	3%	7%	5%	6%	8%	9%	5%	2%	2%	2%	**6%**
$max_{(P-E)}$													
2015-2040	2%	3%	1%	-1%	2%	14%	16%	15%	6%	0%	4%	4%	**9%**
2041-2070	3%	3%	-0%	1%	3%	15%	21%	15%	12%	3%	4%	4%	**11%**
2071-2100	9%	13%	4%	9%	22%	25%	30%	34%	30%	39%	4%	6%	**24%**
$min_{(P-E)}$													
2015-2040	2%	4%	-1%	2%	1%	18%	19%	15%	9%	2%	5%	4%	**10%**
2041-2070	3%	6%	10%	7%	8%	18%	24%	22%	14%	3%	7%	3%	**15%**
2071-2100	10%	13%	6%	10%	14%	18%	32%	25%	24%	9%	4%	9%	**19%**
min_P													
2015-2040[1]	1%	2%	6%	1%	4%	2%	4%	5%	6%	3%	2%	2%	**3%**
2041-2070[2]	3%	3%	4%	2%	5%	6%	8%	7%	9%	0%	2%	3%	**6%**
2071-2100	1%	3%	1%	1%	4%	7%	5%	7%	9%	1%	2%	2%	**5%**

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

Notes:
1. Not able to calculate lake evaporation with the selected model. Replaced by the model with second lowest precipitation – CMCC-ESM2 (SSP5-8.5)
2. Not able to calculate lake evaporation with the selected model. Replaced by the model with second lowest precipitation – ACCESS-ESM1-5 (SSP126)

5.7 Climate Change Effects to Streamflow

The calibrated rainfall-runoff model was updated to include the projected rates of change to temperature and precipitation. Calibrated monthly runoff coefficients and baseflow values were incorporated for each major stream. Monthly flows from historic climate were compared against monthly flows projected in 2100 based on the monthly climate change variability.

The runoff model was simulated for 100 realizations under historic conditions and projected climate change conditions (year 2100). The 50th percentile (median), 10th percentile (low flow) and 90th percentile (high flow) statistics were extracted from the realization record, and are compared in each creek for historic conditions versus 2100 climate change conditions.

Historic monthly streamflow for each percentile and both historic and climate change conditions are presented in Figure 5-5 for Goathorn Creek, Figure 5-6 for Tenas Creek, Figure 5-7 for Telkwa River, Figure 5-8 for Bulkley River and Figure 5-9 for Four Creek, where the solid lines represent the median results and dashed lines the 10th and 90th percentiles.

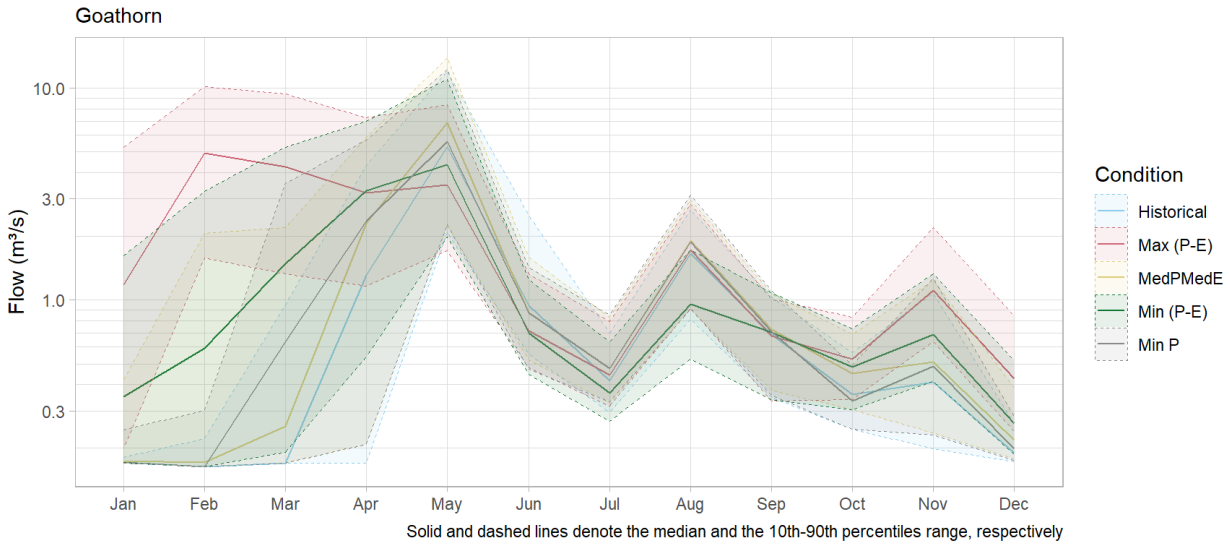

Figure 5-5: Goathorn Creek Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

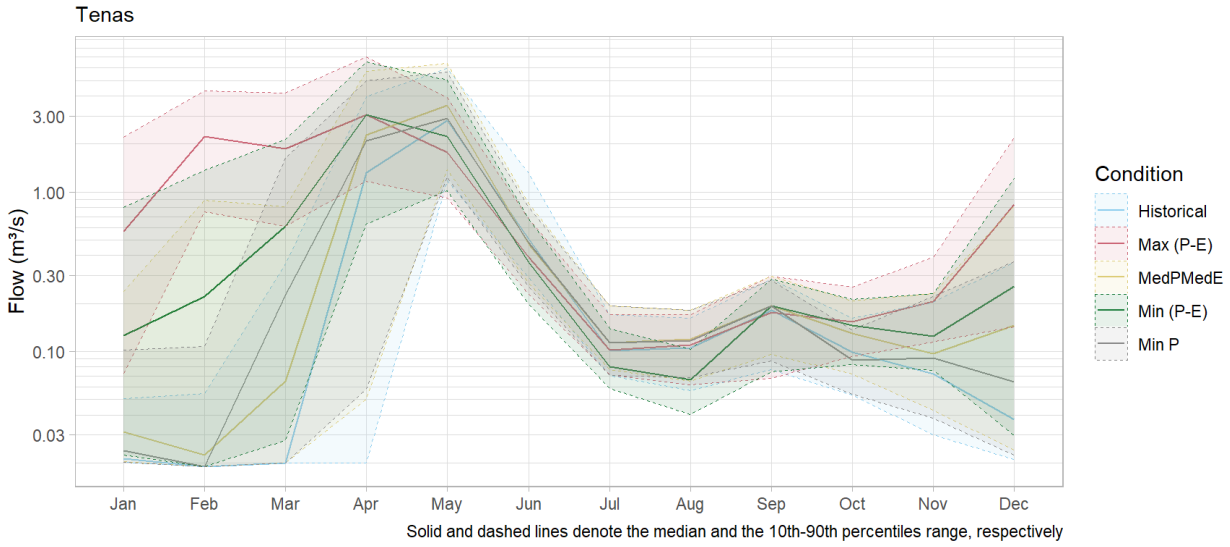

Figure 5-6: Tenas Creek Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

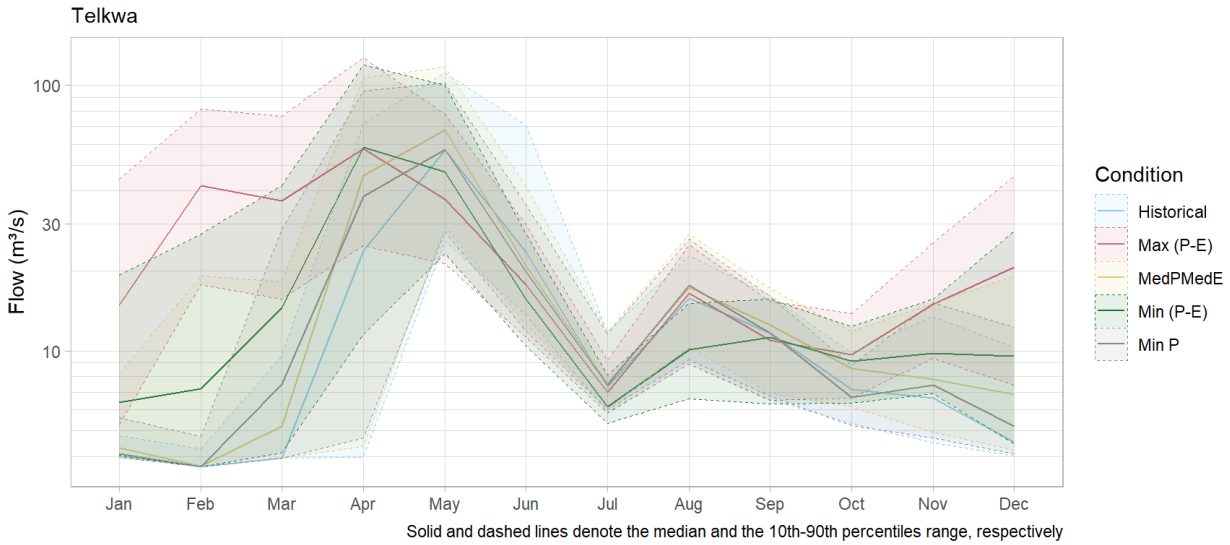

Figure 5-7: Telkwa River Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

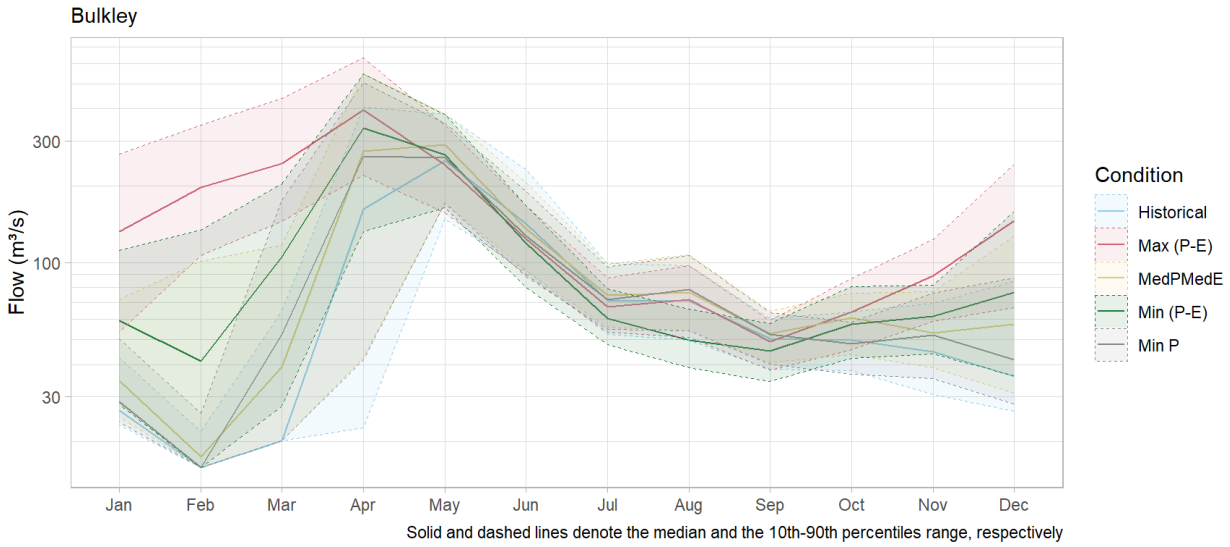

Figure 5-8: Bulkley River Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

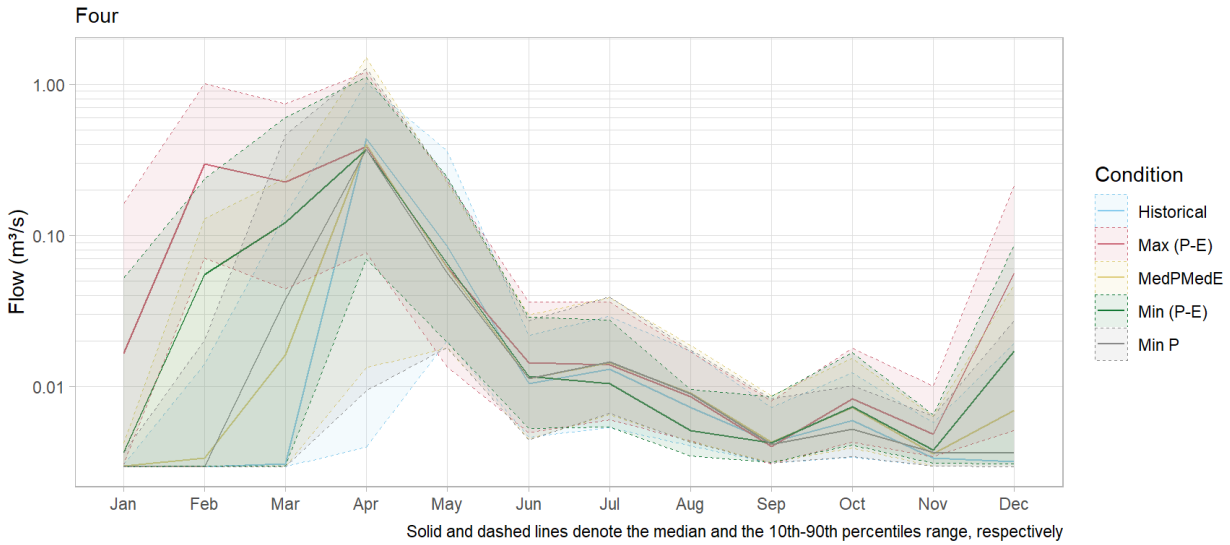

Figure 5-9: Four Creek Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

The general tendency when comparing historic and climate change monthly streamflow is an overall increase in flow magnitude and a shift to an earlier spring freshet. These observations coincide with the climate change projections in Table 5-5, showing even a 2% in annual precipitation by 2100, and a 23% increase in precipitation in May under the model with lowest precipitation increase.

Note that the runoff model relies on a constant unit baseflow value for each river, which was not adjusted for climate change in these predictions. Precipitation is anticipated to decrease during the drier summer months (namely July), which, in combination with the higher evaporation rates in Table 5-7, would be expected to decrease streamflow during the low-flow summer period.

In addition, the changes to seasonality and snowmelt timing would also affect the runoff coefficients. The calibrated runoff coefficients were based on the historical flow regime, which coincides with a spring freshet in May. The monthly runoff coefficients could also be affected by climate change and are an additional limitation of this evaluation approach.

5.7.1 Peak Flow Trends

A trend analysis was carried out by SRK to identify trends and significance of trends for the peak flows from historical records. Ordinary least squares method, and quantile regression method were employed for statistical evaluation of the data. The non-parametric Mann-Kendall (MK) (1945) and Theil-Sen methods, the Prewhitening MK (Zhang 2000) method, and the Prewhitening MK (Yue et al. 2002) method were used for trend analysis. Where a trend was observed (upward or downward), its significance was evaluated. Trends with a significance greater than 95% are accepted as significant.

Goathorn Creek Peak Flow Historical Trend Analysis

Figure 5-10 represents yearly peak flows at the Goathorn WSC station from the extended timeseries, and its linear approximation equation obtained with the ordinary least squares method. Table 5-8 summarizes the results of the Goathorn peak flow trend statistical significance Mann-Kendall tests. No significant trend is observed for all three tests.

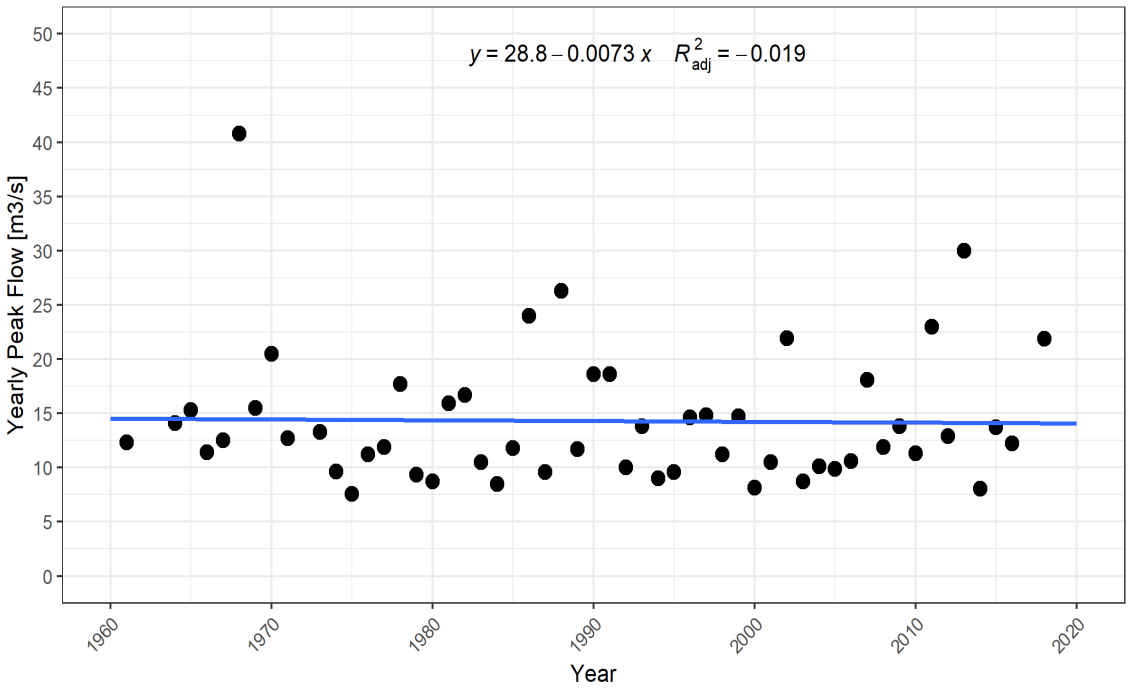

Figure 5-10: Goathorn Peak Flows Trend from 1960 to 2018

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Flows_Climate_Change.html"

Table 5-8: Mann-Kendall Significance test results for Goathorn Peak Flows

Method	Comment	Significance (%)
MK & Theil-Sen	No Significant Trend	53.3
Prewhit. MK, Zhang	No Significant Trend	53.3
Prewhit. MK, Yue & Pilon	No Significant Trend	59.9

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Flows_Climate_Change.html"

Telkwa River Peak Flow Historical Trend Analysis

Figure 5-10 represents yearly peak flows at the Telkwa WSC station from the extended timeseries, and its linear approximation equation obtained with the ordinary least squares method. Table 5-9 summarizes the results of the Telkwa peak flow trend statistical significance Mann-Kendall tests. No significant trend is observed for all three tests.

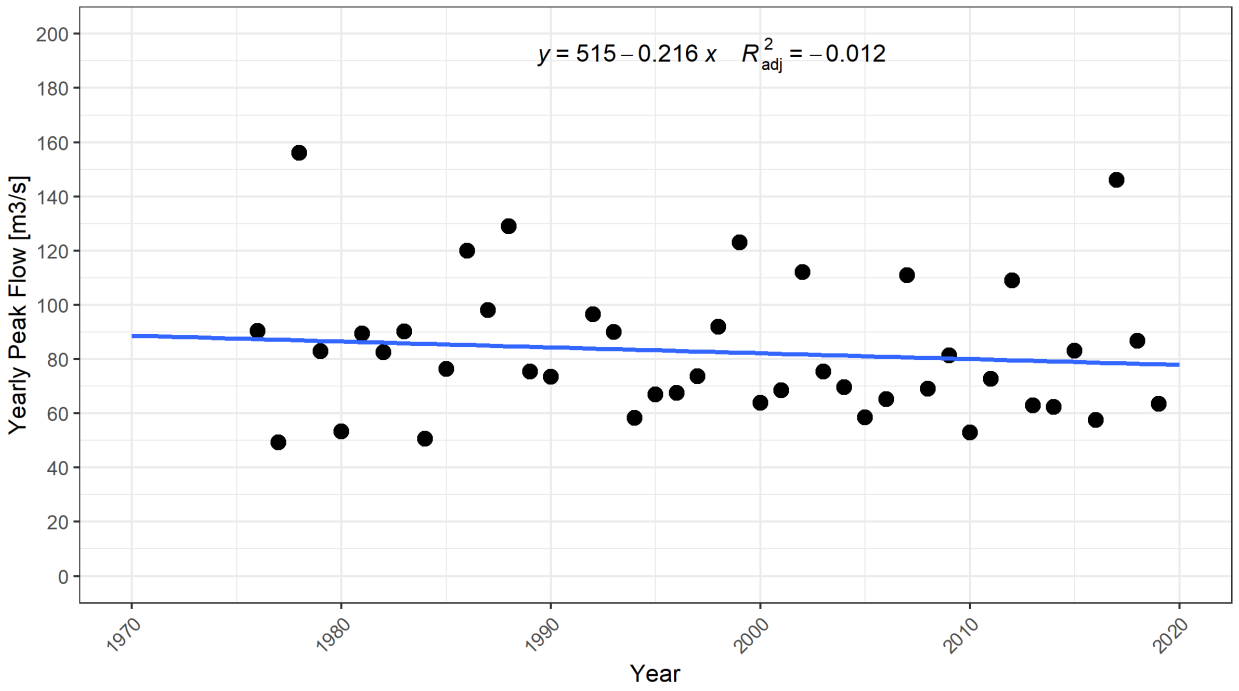

Figure 5-11: Telkwa Peak Flows Trend from 1976 to 2019

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Table 5-9: Mann-Kendall Significance test results for Telkwa Peak Flows

Method	Comment	Significance (%)
MK & Theil-Sen	No Significant Trend	88.4
Prewhit. MK, Zhang	No Significant Trend	88.4
Prewhit. MK, Yue & Pilon	No Significant Trend	83.7

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Bulkley River Creek Peak Flow Historical Trend Analysis

Figure 5-10 represents yearly peak flows at the Bulkley River at Quick WSC station from the extended timeseries, and its linear approximation equation obtained with the ordinary least squares method. Table 5-10 summarizes the results of the Bulkley River peak flow trend statistical significance Mann-Kendall tests. No significant trend is observed for all three tests.

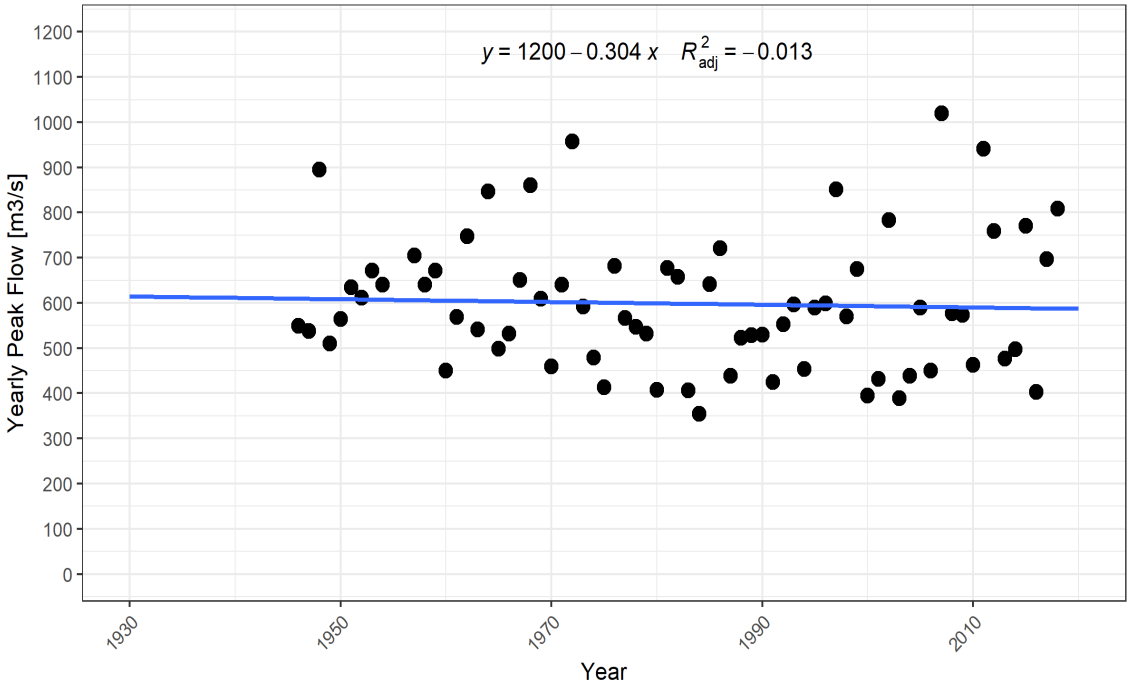

Figure 5-12: Bulkley River Peak Flows Trend from 1976 to 2019

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Table 5-10: Mann-Kendall Significance test results for Bulkley River Peak Flows

Method	Comment	Significance (%)
MK & Theil-Sen	No Significant Trend	77.5
Prewhit. MK, Zhang	No Significant Trend	77.5
Prewhit. MK, Yue & Pilon	No Significant Trend	78.6

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

In all streams evaluated, no significant change in peak flow magnitude has been observed historically. This is not to say that a change in peak flows may not occur with projected climate change. Variations with respect to snowmelt timing and rainfall depth may result in higher peaks in the future, however the effects of a thinner snowpack should also be considered. Peak flow models for the purpose of engineering design should incorporate both snowmelt events and climate change depth-duration-frequency rainfall tables presented in Table 5-6.

6 Conclusions and Limitations

Regional analyses coupled with a compilation of Project-specific meteorological and hydrometric datasets were used to develop Project specific hydrometeorological baseline parameters, including long-term temperature and precipitation records. Climate change analysis was updated with CMIP6 data. Climate change effects on temperature, precipitation, evaporation and streamflow are presented as monthly and annual rates of change for three future periods. Results from this study may be used to further advance Project designs and update EA modeling, including the water and load balance model, groundwater model, and design of water management infrastructure.

Available Four Hydro data for 2020, 2021 and 2022 were analysed, along with data collected as part of baseline monitoring in 1997 and 1998. Due to the limited period of record, there is still significant uncertainty regarding Four Creek hydrology. Ongoing monitoring and validation of presented hydrologic indices is required.

The calibrated rainfall runoff model established to support the water and load balance model and runoff estimates for the hydrometric stations underestimates flows in Tenas Creek. This model should be revisited once more flow data is available at Tenas Hydro. However for the purpose of the EA, an underestimated runoff result is more conservative in terms of dilution capacity. Review of the Four-Hydro regressions with Goathorn Creek (08EE008) and calibration model should be performed after an additional year of monitoring data become available.

It is strongly suggested that this study be revisited and that the model be recalibrated when longer Project data records are available from the meteorological station as well as the hydrometric stations, and when all WSC flow data are published. The correlations between meteorological parameters measured at the Tenas Deposit Station and the regional stations should be improved by assessing a longer period of Project record from the Tenas Deposit Station. An initial analysis of the precipitation record showed that recent years were drier than average, which may create bias in the extended Project precipitation record. Complete water years (from October to September of the following year) are critical in any assessment of the hydrological regime and longer flow data series will improve streamflow regressions and provde a robust calibration dataset.

This report, Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2025), was prepared by

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and reviewed by

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EGBC Permit to Practice Reg. No.: EGBC 1003655

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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Attachment A AGRA 1999 Report

received April 5/2000

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March 28, 2000
KS00076

Luscar Ltd.
1600 Oxford Tower
10235 – 101 Street
Edmonton, A.B. T2P 3V4

Attention: Mr. Allan Flemming

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE SURFACE FLOW AND WATER QUALITY FINAL DATA REPORT

AGRA Earth & Environmental Limited (AGRA) is pleased to submit two copies of the *Telkwa Coal Project 1999 Baseline Surface Flow and Water Quality Final Data Report*. The report presents the results of the 1999 field monitoring program conducted by AGRA for Luscar Ltd. on the proposed Telkwa Coal Project.

AGRA understands that the recent state of the coal industry has put the proposed Telkwa Coal Project on hold. AGRA looks forward to working with Luscar Ltd. on the proposed Telkwa Coal Project when the decision to proceed with the project is made. Should you have any questions or comments regarding this report, or require any support on this, or other projects, please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully submitted,

AGRA Earth & Environmental Limited

Scott Davidson, P.Geo., M.Sc.
Geomorphologist

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March 27, 2000
KS00076

Luscar Ltd.
1600 Oxford Tower
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Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (780) 420-5875

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE DATA REPORT

1.0 INTRODUCTION

AGRA Earth & Environmental Limited is pleased to present the 1999 Baseline Surface Water Flow and Water Quality Monitoring Report for the Telkwa Coal Project (TCP). The TCP is a proposed open pit coal mine located near Telkwa, B.C. and owned by Luscar Inc. (Luscar). The location of the mine is illustrated on Figure 1. This report contains the data collected during the 1999 baseline monitoring program and updates the rating curves for sites where discharge measurements were conducted.

2.0 SCHEDULE OF 1999 SITE VISITS

The schedule of site visits for the 1999 field monitoring program is contained in the March 3, 1999 AGRA proposal to conduct the TCP baseline monitoring. A copy of the AGRA proposal is contained in Appendix A for reference. The dates of actual site visits and a listing of the work conducted during the site visits is contained in Table 1.

TABLE 1: 1999 MONITORING SITE VISITS

Week of:	Feb 1	Aug 1	Sept 19	Nov 14
Telkwa River	WQ		WQ	
Upper Tenas Creek	No site access		SM, WQ, Q	S
Lower Tenas Creek	WQ, Q	S	SM, WQ, Q	S
Bulkley River	WQ		WQ	
Hubert Creek	WQ, S	S	WQ, S	S
Four Creek	WQ	S	WQ, Q	S
Upper Goathorn Creek	WQ, Q		SM, WQ, Q	S
Lower Goathorn Creek	WQ		WQ	

Q = Discharge and stage measurements conducted
S = Stage measurements conducted
WQ = Water quality sampling conducted
SM = Site Maintenance Visit

The purpose of the August field trips was to collect peak flow information from the crest gauges at each site.

3.0 SURFACE WATER MONITORING RESULTS

This section contains a summary of the five sites where surface water monitoring was conducted during the 1999 field season. Summary field data for the site visits is contained in Appendix B.

3.1 LOWER TENAS CREEK SITE

The Lower Tenas Creek site was visited four times as part of the 1999 monitoring program. The station was operated as a manual sampling with no installation of the automated equipment used in previous years.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.041 m^3/s and 0.163 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 2.

An initial crest gauge installed in late 1998 at the site was replaced during the 1999 sampling season. Level surveys conducted at the site during the 1999 field season did not show significant shift of the benchmarks or the staff gauge. There was evidence of sand deposition noted near the gauge during the November 1999 field visit.

3.2 UPPER TENAS CREEK SITE

The upper Tenas Creek was visited twice during the 1999 monitoring program. There was no site access during the February 1999 field trip. As the crest gauge for this site was not checked and reset during February, this site was not visited during the August field trip.

The crest gauge was checked during September and the maximum stage was observed to be 0.70 m. This value would translate to a discharge of 8.43 m^3/s and is expected to be due to the spring freshet which consistently produces greater discharges than the fall peak flows. The low flow measurement from September 20th was 0.134 m^3/s. An updated rating curve for this site is shown in Figure 3.

The September field visit to this site showed that the braces for the staff gauge had snapped but that the staff gauge did not appear to have shifted (based on a review of previous site photographs). Braces at the site were replaced and a third benchmark was added on the right bank side of the stream. Levelling checks showed that there was no significant shift of the benchmarks or the staff gauge during 1999. The breakage of the braces resulted in slight downstream leaning of the staff gauge mounting but this was corrected during the site maintenance visit.

3.3 UPPER GOATHORN CREEK SITE

The Upper Goathorn Creek site was visited four times during the 1999 monitoring program. The station was monitored as a manual station with a staff gauge and crest gauge.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.097 m^3/s and 0.337 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 4.

Maintenance of the gauge equipment was conducted during the September visit. The bracing for the staff gauge was reinforced and the staff gauge was lowered by a distance of 0.19 m. A second staff gauge was added to the top of the first staff gauge to allow for visual measurement of peak flow levels during the freshet period. The level check of benchmarks showed that there were no changes in the elevations of the benchmarks. The staff gauge did not show any significant shift during the 1999 season.

3.4 FOUR CREEK SITES

Two sampling locations were operated on Four Creek during the 1999 field season. The low flow discharge measurements were made at the lowest culvert crossing of Four Creek on the 120 Road. Other stage measurements and water quality sampling were conducted at the original stream flow sampling site located approximately 1,800 m upstream of the culvert crossing on Four Creek.

Discharges for the low flow periods were determined by calculation of the discharge through the culvert based on the known inlet water levels and the culvert characteristics. The February low flow measurement revealed that there was only a small quantity of baseflow (< 1L/min) during the sampling trip. The culvert was almost completely iced up. The September low flow discharge for the culvert was calculated to be 0.077 m^3/s.

3.5 HUBERT CREEK SITE

The Hubert Creek site was visited four times during the 1999 monitoring program. Readings for the staff gauge are available from two of the site visits. Visits conducted during September and November did not yield useful data on flow levels due to numerous partial blockages of the culvert inlet by debris.

The crest gauge at the site indicated that there was a recorded stage greater than 1.23 m during the spring 1999 freshet period. This high stage is believed to be partially due to beaver debris blockage of the inlet of the Hubert Creek culvert.

4.0 WATER QUALITY MONITORING RESULTS

In 1999, baseline water chemistry was sampled during the two low flow periods at ten sites in the proposed Telkwa Coal Project area. The data for the February 1999 water quality monitoring was forwarded directly to Luscar as previously arranged. The laboratory results for

the September water quality trip are included in Appendix C of this report. No analysis of the testing data, other than to identify specific stations where the BC Water Quality Criteria (Nagpal, 1995) were exceeded. A summary of metals and stations where exceedances occurred are summarized in Table 2. Due to operator error, no replicate sampling was conducted during the September water quality monitoring trip.

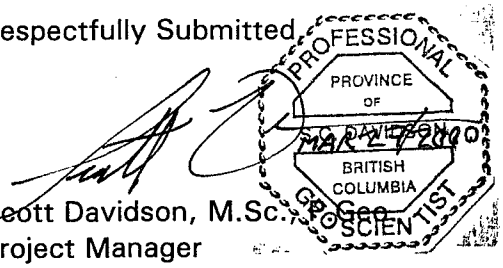
TABLE 2: B.C. WATER QUALITY CRITERIA EXCEEDANCE INFORMATION FOR THE SEPTEMBER 20, 1999 SAMPLING TRIP

METAL	B.C. WATER QUALITY CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS GREATER THAN THE B.C. CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS EQUAL TO THE B.C. CRITERIA
Cr	2.0 ug/L	Telkwa River (2.5)	Upper Goathorn Creek, Lower Goathorn Creek, Bulkley River, Hubert Creek, Lower Tenas, Four Creek
Cu	2.0 ug/L	Telkwa River (2.4)	
Fe	0.3 mg/L	Telkwa River (0.8), Hubert Creek (1.03), Bulkley River (0.33)	
Zn	3.0 ug/L	Telkwa River (3.5)	

5.0 CLOSURE

AGRA Earth Environmental Limited is pleased to present this 1999 data summary to Luscar Ltd. AGRA looks forward to continuing to work with Luscar on the Telkwa Coal project over the 2000 season. Should you have any questions concerning this project please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully Submitted,

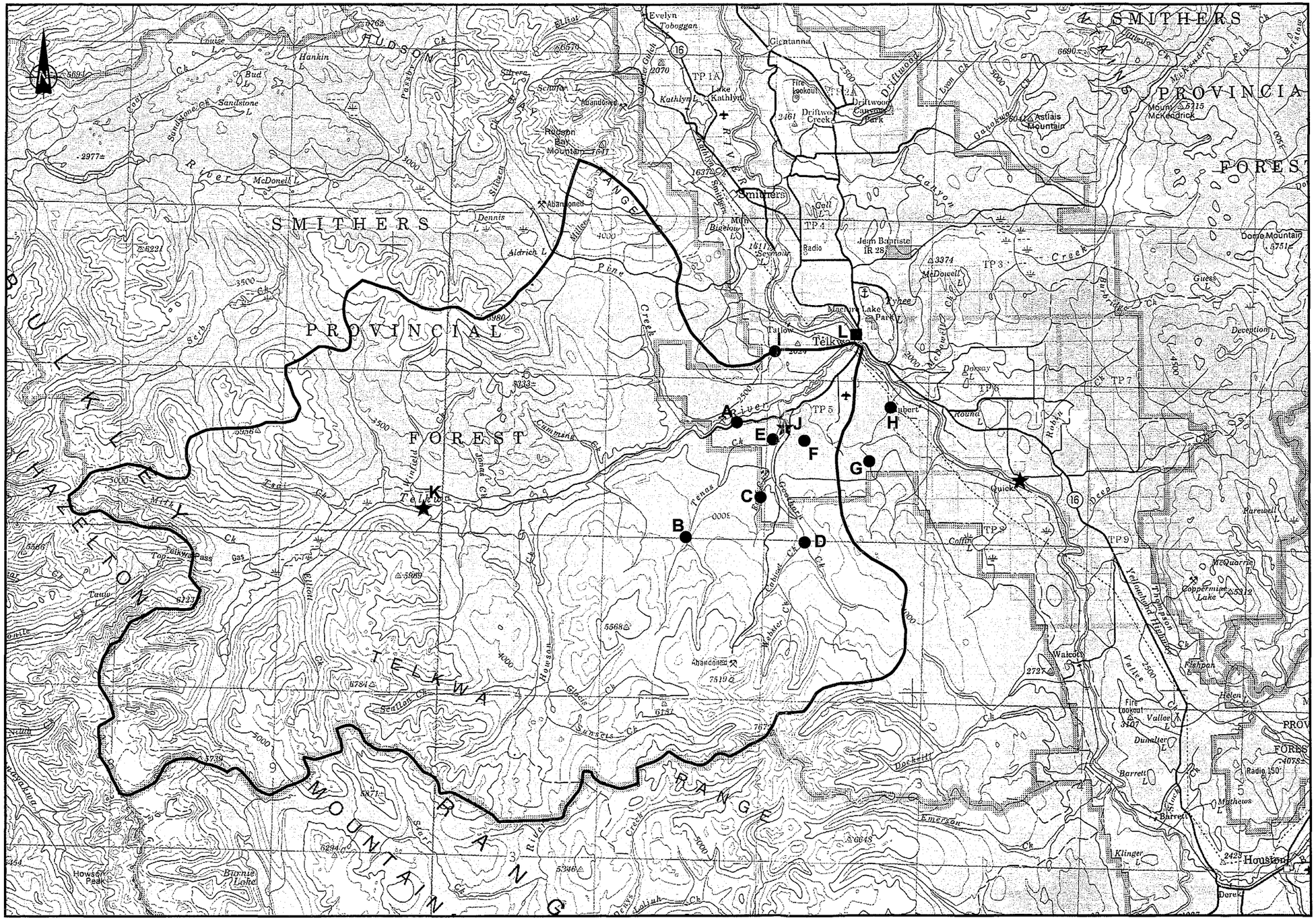


Scott Davidson, M.Sc., Geo.
Project Manager

Reviewed by,

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

C:\Files\Reports\Smithers\KS00076.rpt
SCD\SCD



0 5 10 15 20 25 Kilometres

Scale 1 : 250 000

LEGEND

- Telkwa River Watershed
- ★ Existing WSC Station
- ■ Water Quality Station
- ● Hydrometric & Water Quality Site
  - A Lower Telkwa River
  - B Upper Tenas Creek
  - C Four Creek
  - D Upper Goathorn Creek
  - E Lower Tenas Creek
  - F Tailings Pond Drainage
  - G Helps Creek
  - H Hubert Creek
  - I North Site
  - J Lower Goathorn Creek
  - K Upper Telkwa River
  - L Bulkley River

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

CLIENT:	LUSCAR LTD.
PROJECT:	TELKWA COAL PROJECT

APPROXIMATE LOCATIONS HYDROMETRIC AND WATER QUALITY SITES

DATE:	MAR. 2000
JOB No.:	KS00076
COREL FILE:	N/A
FIGURE 1	REV. -

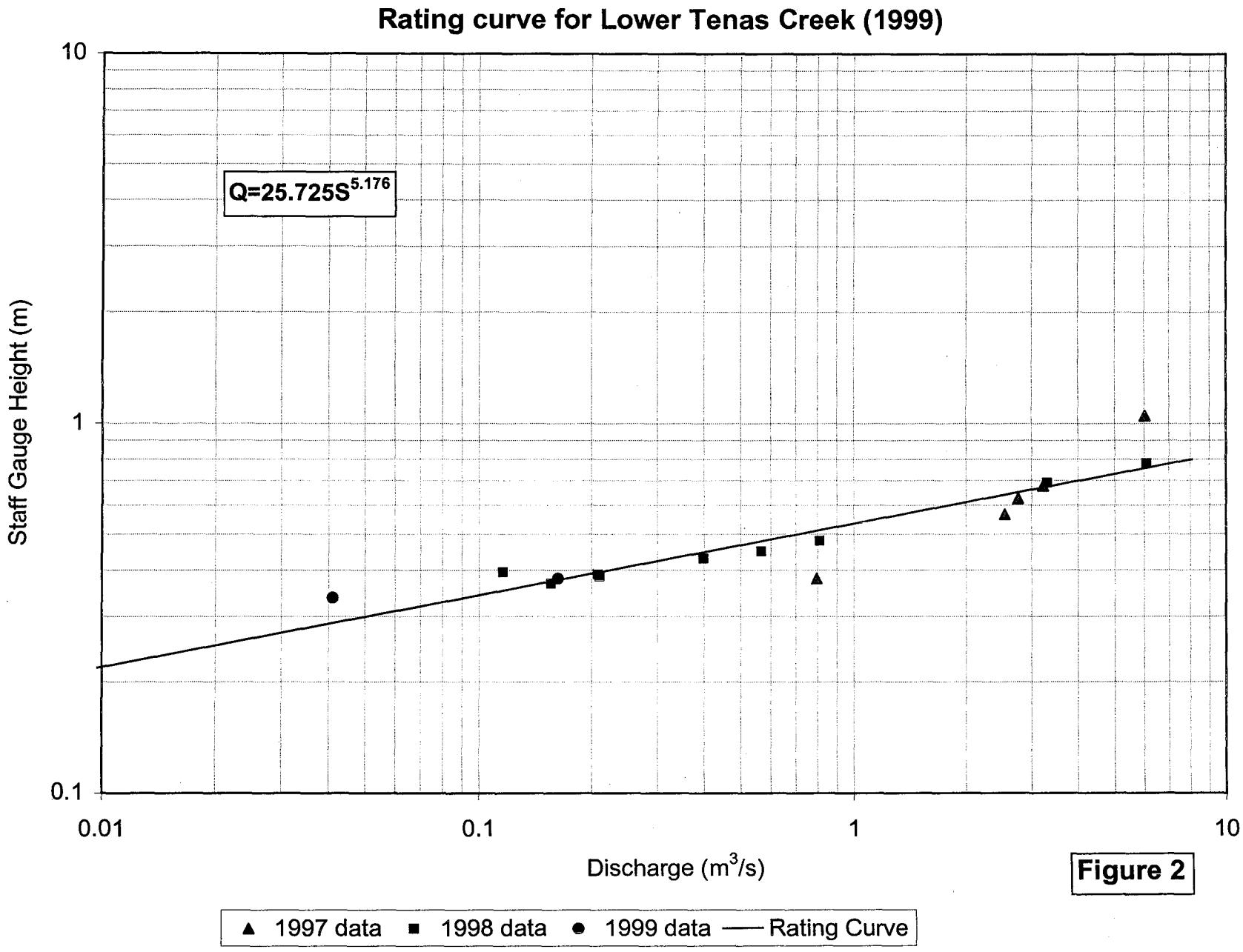

Rating curve for Lower Tenas Creek (1999)
Q=25.725S^5.176
Staff Gauge Height (m)
10
1
0.1
0.01
0.1
1
10
Discharge (m3/s)
1997 data
1998 data
1999 data
Rating Curve

Figure 2

Rating Curve for Upper Tenas Creek (1999)

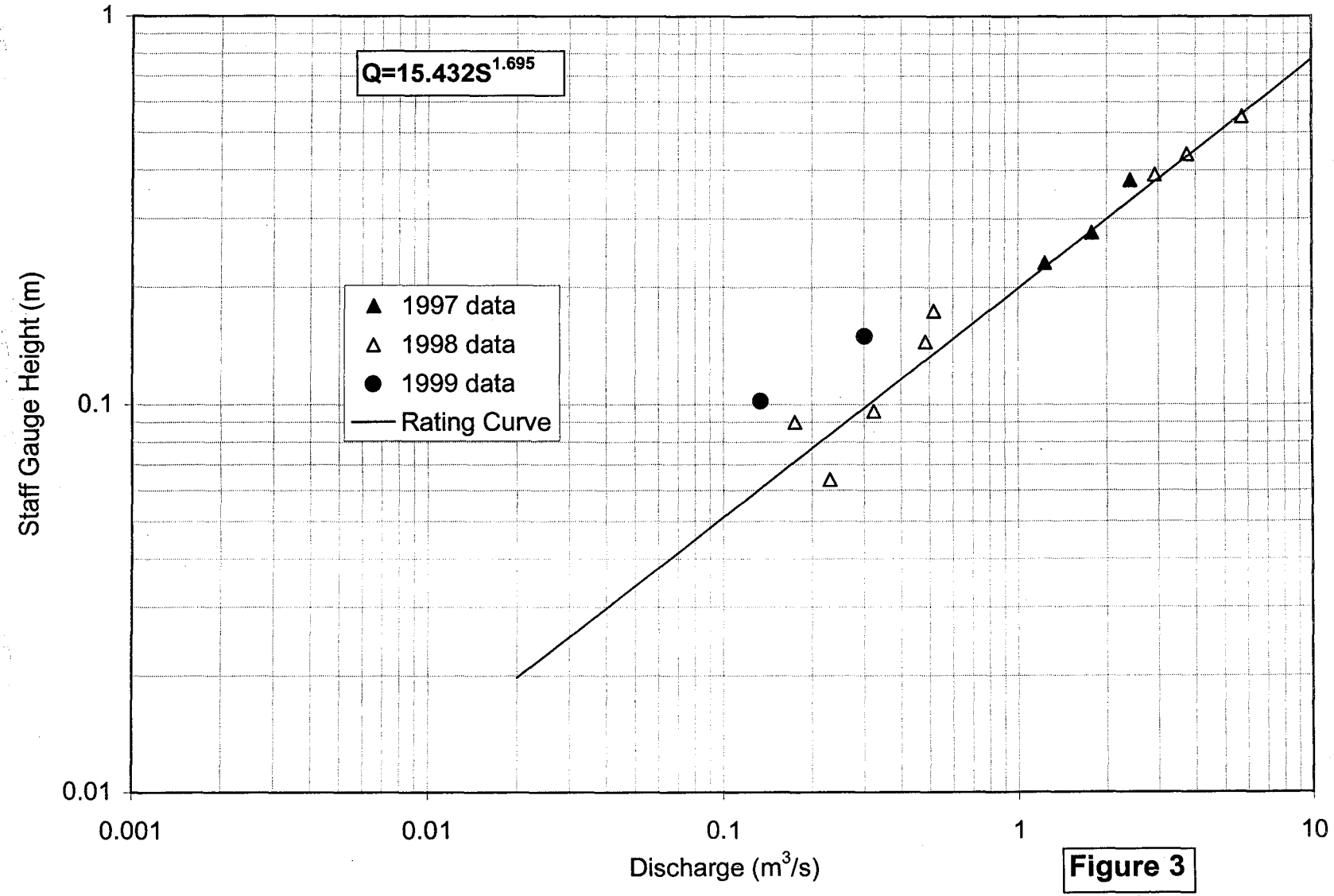


Figure 3

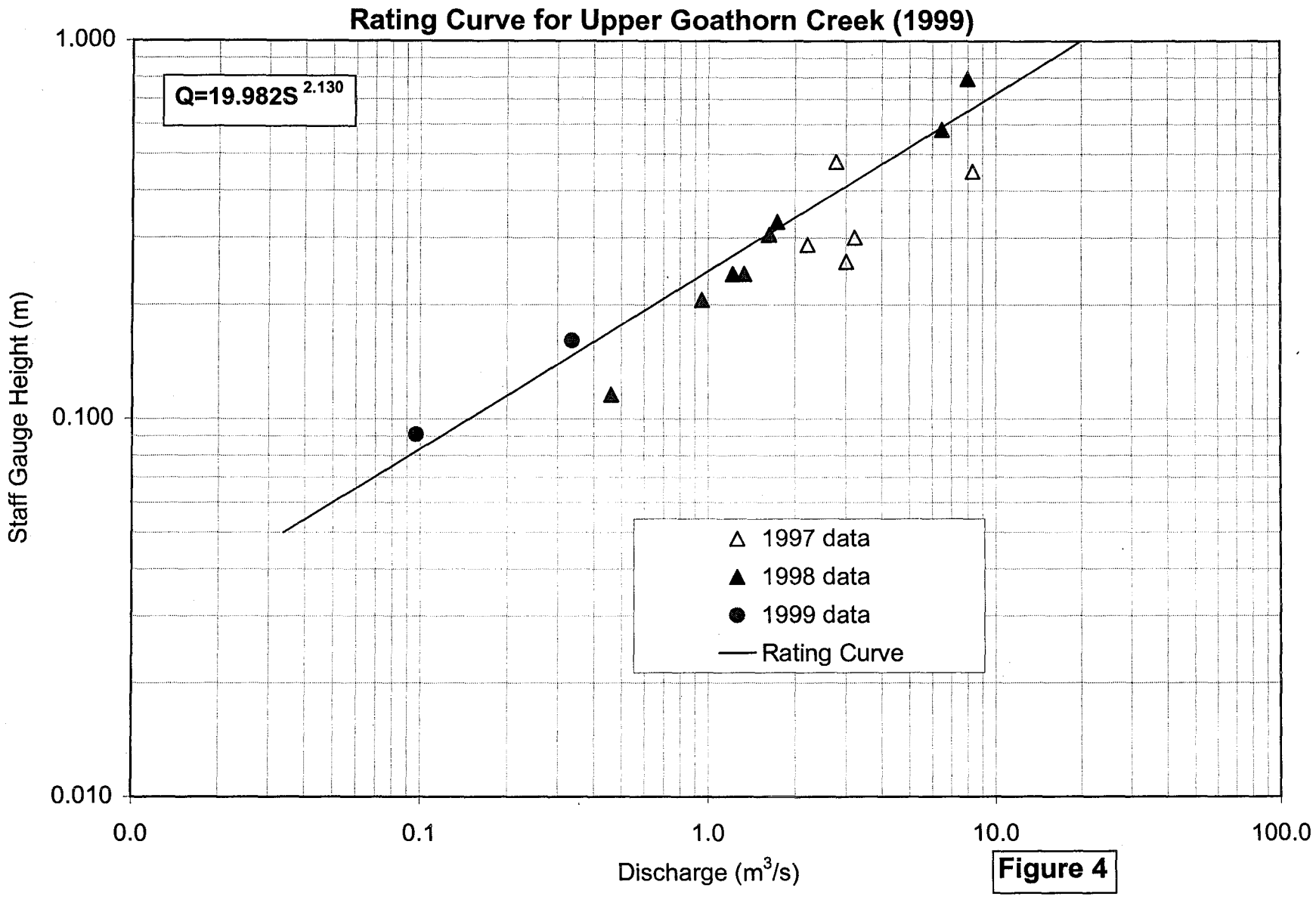


Figure 4

AGRA ENGINEERING GLOBAL SOLUTIONS

APPENDIX A

AGRA PROPOSAL FOR 1999
TELKWA COAL MONITORING PROGRAM

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ENGINEERING GLOBAL SOLUTIONS

March 2, 1999
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-5875

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE DATA REPORT

1.0 INTRODUCTION

AGRA Earth & Environmental Limited is pleased to present this proposal to conduct the 1999 Baseline Surface Water Flow and Water Quality Monitoring Report for the Telkwa Coal Project (TCP). The TCP is a proposed open pit coal mine located near Telkwa, B.C. and owned by Luscar Inc. (Luscar). This report contains the data collected during the 1999 baseline monitoring program and updates the rating curves for sites where discharge measurements were conducted.

2.0 SCHEDULE

SURFACE WATER MONITORING

AEE is pleased to present this revised budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program may need to be revised to meet the construction plan for the mine.

2.0 WORK PROGRAM AND BUDGET

The work program proposed for 1999 is as follows:

Surface Water Flow

- Concentration of the base program on the winter and summer low flow periods.
- Monitoring of low flows on Four Creek, Hubert Creek, Tenas Creek, Upper Goathorn Creek and Lower Goathorn Creek. No monitoring will be conducted on Helps Creek, Telkwa River, and the Bulkley River. Low flow monitoring will result in two site visits. To reduce cost to Luscar, AEE has scheduled the summer low flow period measurement trip to

coincide with site visit #3 described below.

- Monitoring of peak flows at the streams using crest gauges already installed at all of the existing sites. To conduct this portion of the required work, AEE will conduct a total of four sites visits planned as follows:

1. Pre-freshet to set up crest and staff gauges and survey to local bench marks (April),
2. Post freshet to record peak flow during period and survey to local bench marks (June),
3. Pre fall high flow period to re-survey benchmarks and survey to local bench marks (late August to early September),
4. Post fall high flow to record peak flow and survey to local bench marks (November).

Water Quality

- Sampling of baseline parameters for the two low flow periods only.

Data Analysis

AEE proposes to conduct data analysis and reporting for the 1999 sampling program following each monitoring trip. A data analysis period has been allowed following each of the five surface flow site visits (one low flow and four peak flow visits) described above. The information reports from each trip will assist Luscar in public meetings by providing the most up to date information on the project.

Project Management

Project management involves dealing with items such as cost control, client liaison, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. For the 1999 sampling program, AEE proposes to conduct project management on a cost plus basis. The totals for this item in the attached Table 1 represent estimates of the total budget required for project management. AEE will make every effort to ensure that it conducts stringent cost control on the project management for Luscar. Project management for the 1999 program will be conducted by Mr. Scott Davidson, M.Sc., P.Geo. of the Smithers office. Mr. Gary Beckstead, M.Sc., P.Eng. and Mr. Dennis Trotter will provide technical input and review to the project as required.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. If you have any questions or require further information concerning this project, please call Scott Davidson at (250) 847-8783 or Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Reviewed by

Scott Davidson, M.Sc., P.Geo.
Project Manager

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

C:\files\working\Luscar\1999\revised budget99.wpd
cc. Gary R.E. Beckstead, AEE - Calgary

APPENDIX B

SUMMARY OF 1999 FIELD DATA

Telkwa Coal Project Field Note Summary for 1999 Sampling Season

Hubert Creek

Date	Aug 3/99	12:47	Sept 21/99		Nov 18/99
SG	0.1		0.945		
Crest	>1.23				
		Diff to SG			
HI	1.65				
Top SG	2.463		Culvert Blocked by Beaver Debris		Culvert Blocked by Beaver Debris
Top Crest	2.464				
Telephone Pole	1.221	-1.242			
Top Box	0.5	-1.963			

Four Creek

			Site					
Date	Aug 3/99	13:25	Sep-20	11:40	Nov 18/99	12:15		
SG	0.18		0.182		0.185			
Crest	0.4		0.55		0.2			
		Diff to SG					Diff to SG	
HI	1.63				1.5621	1.5367		
Top SG	0.754				0.687	0.692		
Top Crest	0.506			Set up 1		0.444	Set up 2	
BM1	0.005	-0.749		-0.72	-0.033	0.038	-0.654	
BM2	0.215	-0.539		-0.54	0.147	0.151	-0.541	
			Culvert depth	0.08	Culvert depth	0.1		
			Sept 21/99	10:15	Nov 18/99	11:45		

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Lower Tenas Creek

	Aug 3/99	14:30	Sept 20/99	15:15		Nov 18/99	13:15	
SG	0.43		0.38			0.37		
Crest						0.25		
		Diff to SG		Diff to SG				Diff to SG
HI	1.6					1.6129		
Top SG	3.778		3.765			3.78	3.815	
Top Crest			3.275		Set up 1		3.325	Set up 2
BM1	1.18	-2.598	1.162	-2.603	-2.613	1.167	1.203	-2.612
BM2	1.227	-2.551	1.215	-2.55	-2.559	1.221	1.255	-2.56

Comments: Sand deposition near gauge

Upper Goathorn Cr.

	Sept 20/99	Sept 21/99	14:35		Nov 18/99	10:15	
SG	-0.03	0.12			0.075		
Crest					frozen shut		
			Diff to SG				Diff to SG
HI					1.6891	1.65735	
SG (to 1 m mark)		0.843			0.916	0.881	
Top Crest		1.546		Set up 1		1.585	Set up 2
BM1		0.185	-0.658	-0.659	0.257	0.221	-0.66
BM2		1.399	0.556	0.553	1.469	1.433	0.552

Comments: SG lowered 0.191 m
CG lowered 0.11 m

4" snow on ground
SG surveyed to 2 m mark

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Upper Tenas Cr.

		Sept 20/99				Nov 18/99		11:30	
SG		0.15				0.08			
Crest		0.18	0.7 read previous day			0.25			
			Diff to SG						Diff to SG
HI		1.71				1.651			
Top SG		1.035	1.035			0.972		1.022	
Top Crest	Set up 1	0.821		Set up 2	Set up 1			0.823	Set up 2
BM1	-0.969	0.066	0.066	-0.969	-0.967	0.005		0.071	-0.951
BM2	-0.97	0.065	0.065	-0.97	-0.967	0.005		0.07	-0.952
BM3	-0.755	0.28	0.28	-0.755	-0.737	0.235		0.285	-0.737

Site Maintenance Trip
Values for SG and Crest arer post-fix
BM3 added ~ 12m downstream of BM1 and BM2

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Discharge MeasurementDeterminations

Site: Lower Tenas 21-Sep-99 15:15
Staff Gauge: 0.38

LOC	REVS	SEC	VEL	DEPTH	Q
3.300	0	0		0.000	0.000
3.600	0	0		0.060	0.000
3.900	2	36.1		0.140	0.000
4.200	3	41.9	0.048	0.200	0.003
4.500	7	44.5	0.106	0.220	0.007
4.800	9	41.7	0.145	0.260	0.011
5.100	13	38.9	0.224	0.280	0.019
5.400	12	42	0.192	0.320	0.018
5.700	17	41.2	0.277	0.330	0.027
6.000	21	43.1	0.327	0.340	0.033
6.300	21	44.5	0.317	0.260	0.025
6.600	18	41.9	0.288	0.220	0.019
6.900	20	41.4	0.324	0.18	0.018
7.200	17	42.4	0.269	0.140	0.011
7.500	16	42.2	0.255	0.12	0.009
7.8	14	40.1	0.234	0.1	0.007
8.1	0	0		0.04	0
8.4	0	0		0.04	0
8.7	0	0		0.08	0
9	0	0		0.08	0
9.3	0	0		0.03	0
9.6	0	0		0	0
				Sum Q:	0.163

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Site: Upper Goathorn Cree 20-Sep-99 13:05
Staff Gaug -0.03

LOC	REVS	SEC	VEL	DEPTH	Q
8.700	0	0		0.000	0.000
9.000	0	0		0.030	0.000
9.300	0	0		0.070	0.000
9.600	0	0		0.100	0.000
9.900	12	40	0.201	0.190	0.011
10.200	27	42	0.432	0.220	0.028
10.500	23	45	0.343	0.280	0.029
10.800	35	45	0.522	0.380	0.060
11.100	32	40	0.537	0.320	0.052
11.400	19	42	0.304	0.420	0.038
11.700	29	40	0.487	0.370	0.054
12.000	33	40	0.554	0.390	0.065
12.300	21	41	0.344	0.39	0.040
12.600	38	40	0.638	0.330	0.063
12.900	35	40	0.588	0.35	0.062
13.2	52	41	0.852	0.31	0.079
13.5	48	40	0.806	0.29	0.070
13.8	40	40	0.672	0.24	0.048
14.1	26	42	0.416	0.26	0.032
14.4	23	40	0.386	0.3	0.035
14.7	49	40	0.823	0.24	0.059
15	12	40	0.201	0.26	0.016
15.3	0	0		0	0.000
15.6	0	0		0.07	0.000
15.9	11	40	0.185	0.09	0.005
16	0	0		0	0.000
				Sum Q:	0.337

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Site: Upper Tenas 20-Sep-99 11:30
Staff Gauge: 0.102

LOC	REVS	SEC	VEL	DEPTH	Q	
0.400	0	0		0.000	0.000	WW R/B
0.800	0	0		0.000	0.000	behind big rock
1.200	26	42	0.416	0.080	0.013	
1.600	21	42	0.336	0.100	0.013	
2.000	21	41	0.344	0.100	0.014	
2.400	22	42	0.352	0.120	0.017	
2.800	0	0		0.050	0.000	behind big rock
3.200	23	45	0.343	0.090	0.012	
3.600	0	0		0.140	0.000	back eddy behind roc
4.000	14	43	0.219	0.120	0.010	
4.400	41	40	0.688	0.120	0.033	
4.800	27	45	0.403	0.130	0.021	
5.200	28	44	0.427	0.15	0.026	
5.600	15	41	0.246	0.180	0.018	
6.000	16	40	0.269	0.18	0.019	
6.4	30	45	0.448	0.18	0.032	
6.8	22.5	43	0.351	0.14	0.020	
7.2	0	0		0.1	0.000	
7.6	0	0		0.02	0.000	
8	0	0		0		
8.1	0	0		0		L/B
				Sum Q:	0.134	

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Upper Tenas 21-Sep-99 11:30
0.15

LOC	REVS	SEC	VEL	DEPTH	Q	
3.500	0	0		0.000	0.000	WW L/B
3.900	0	0		0.070	0.000	Too Shallow to Measure
4.300	17	41		0.080	0.000	
4.700	24	43.9	0.367	0.130	0.019	
5.100	30	43	0.468	0.170	0.032	
5.500	24	40.2	0.401	0.190	0.030	
5.900	34	45.1	0.506	0.220	0.045	
6.300	30	43.4	0.464	0.170	0.032	
6.700	35	38.8	0.606	0.180	0.044	
7.100	35	36.6	0.642	0.180	0.046	
7.500	30	37.1	0.543	0.200	0.043	
7.900	12	41.5	0.194	0.140	0.011	
8.300	15	38.8	0.260	0.14	0.015	
8.700	0	0		0.070	0.000	Too Shallow to Measure
9.100	45	40.6	0.744	0.13	0.039	
9.5	31	41.7	0.499	0.14	0.028	
9.9	20	42.5		0.12	0.000	
10.3	0	0		0.08	0.000	
10.7	0	0		0	0.000	WW R/B
				Sum Q:	0.302	

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APPENDIX C

SEPTEMBER WATER QUALITY MONITORING TRIP RESULTS

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221 FAX: 604-984-0218

To: AGRA EARTH & ENVIRONMENTAL LIMITED ~*

BOX 3966, #3 - 3167 TATLOW ROAD
SMITHERS, BC
V0J 2N0

Project : KS00076
Comments: ATTN: SCOTT DAVIDSON

Certificate Date: 05-OCT-1999
Invoice No. : I9929585
P.O. Number :
Account : OXF

* PLEASE NOTE

CERTIFICATE OF ANALYSIS A9929585

PARAMETER DESCRIPTIONS	SAMPLE LOWER TENAS	SAMPLE TRIP BLANK	SAMPLE UPPER TENAS	SAMPLE FOUR CREEK	SAMPLE UPPER GOATHORN	SAMPLE LOWER GOATHORN	SAMPLE TELKWA RIVER	SAMPLE HUBERT CREEK	SAMPLE BULKLEY RIVER	
Sample preparation code	221	221	221	221	221	221	221	221	221	
Sample preparation code	---	---	---	---	---	---	---	---	---	
pH	8.0	7.9	7.7	8.0	7.9	7.8	7.8	7.3	7.7	
Conductivity (umhos/cm)	147	2	138	230	124	132	63	215	62	
Total Susp Solids (mg/L)	< 5	< 5	< 5	< 5	< 5	< 5	14	< 5	6	
SO4 mg/L - Ion Chrom.	2.9	< 0.1	2.5	1.5	27.4	26.6	4.8	0.5	4.6	
Alkalinity (mg/L CaCO3)	78	< 1	72	130	33	41	29	117	28	
Ammonia (mg/L N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Nitrates (mg/L N)	< 0.05	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrites (mg/L N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Tot Organic Carbon(mg/L)	2.0	< 1.0	2.0	7.0	< 1.0	1.0	< 1.0	15.0	1.0	
Tot Hardness(mg/L CaCO3)	74.3	0.4	67.7	121.0	57.8	62.8	31.6	119.0	30.4	
Tot phosphates (mg/L P)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	0.04	0.03	
Chloride (mg/L)	0.2	< 0.1	0.1	0.4	0.1	0.2	0.1	0.7	0.2	

CERTIFICATION:

* pH ANALYSED SEPTEMBER 23, 1999, @ 14:15 HRS.

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221 FAX: 604-984-0218

To: AGRA EARTH & ENVIRONMENTAL LIMITED ~*

BOX 3966, #3 - 3167 TATLOW ROAD
SMITHERS, BC
V0J 2N0

Project : KS00076
Comments: ATTN: SCOTT DAVIDSON

Page Number : 1-A
Total Pages : 1
Certificate Date: 11-OCT-1999
Invoice No. : I9929588
P.O. Number :
Account : OXF

CERTIFICATE OF ANALYSIS A9929588

SAMPLE	PREP CODE	Ag ug/L	Al mg/L	As ug/L	Ba ug/L	Be ug/L	Bi ug/L	Ca mg/L	Cd ug/L	Co ug/L	Cr ug/L	Cu ug/L	Fe mg/L	Hg ug/L	K mg/L	Mg mg/L	Mn ug/L	Mo ug/L	Na mg/L	Ni ug/L
LOWER TENAS-TOT	221 2393	< 0.05	0.029	< 1	28.2	< 0.5	< 0.05	21.9	< 0.1	0.08	2.0	1.8	0.14	< 1	0.25	4.09	5.75	< 0.1	3.15	< 0.2
LOWER TENAS-DIS	221 --	< 0.05	0.006	< 1	27.2	< 0.5	< 0.05	21.7	< 0.1	0.08	3.0	2.0	0.10	< 1	0.25	4.04	3.65	< 0.1	3.10	< 0.2
TRIP BLANK-TOT	221 2393	< 0.05	0.027	< 1	< 0.05	< 0.5	< 0.05	0.05	< 0.1	< 0.02	2.0	0.6	0.04	< 1	< 0.05	< 0.001	0.15	< 0.1	< 0.05	< 0.2
TRIP BLANK-DIS	221 --	< 0.05	0.001	< 1	< 0.05	< 0.5	< 0.05	< 0.05	< 0.1	< 0.02	< 0.5	0.3	< 0.01	< 1	< 0.05	0.005	< 0.05	< 0.1	< 0.05	< 0.2
UPPER TENAS-TOT	221 2393	< 0.05	0.018	< 1	25.0	< 0.5	< 0.05	21.1	< 0.1	0.06	0.5	0.8	0.11	< 1	0.20	3.52	0.95	< 0.1	2.95	< 0.2
UPPER TENAS-DISS	221 --	< 0.05	0.009	< 1	23.4	< 0.5	< 0.05	19.45	< 0.1	0.06	0.5	2.0	0.11	< 1	0.20	3.25	0.80	0.1	2.95	< 0.2
FOUR CREEK-TOT	221 2393	< 0.05	0.061	< 1	79.5	< 0.5	< 0.05	25.6	< 0.1	0.10	2.0	1.2	0.16	< 1	0.50	11.85	0.95	0.1	5.95	0.4
FOUR CREEK-DISS	221 --	< 0.05	0.041	< 1	78.7	< 0.5	< 0.05	25.2	< 0.1	0.08	4.5	1.3	0.13	< 1	0.50	11.75	0.60	0.2	6.45	0.2
UPPER GOATHORN-T	221 2393	< 0.05	0.019	< 1	24.5	< 0.5	< 0.05	18.40	< 0.1	0.08	2.0	1.7	0.12	< 1	0.40	2.03	1.35	0.7	1.40	< 0.2
UPPER GOATHORN-D	221 --	< 0.05	0.010	< 1	23.5	< 0.5	< 0.05	17.80	< 0.1	0.06	0.5	1.8	0.10	< 1	0.35	2.01	1.10	0.7	1.40	0.2
LOWER GOATHORN-T	221 2393	< 0.05	0.018	< 1	50.3	< 0.5	< 0.05	17.75	< 0.1	0.18	2.0	1.1	0.13	< 1	0.40	2.83	2.85	0.5	1.65	< 0.2
LOWER GOATHORN-D	221 --	< 0.05	0.029	< 1	50.1	< 0.5	< 0.05	18.50	< 0.1	0.06	0.5	1.3	0.09	< 1	0.40	3.03	2.00	0.5	2.00	0.2
TELKWA RIVER-TOT	221 2393	< 0.05	0.583	< 1	41.2	< 0.5	< 0.05	9.50	< 0.1	0.40	2.5	2.4	0.80	< 1	0.40	1.490	35.7	0.5	1.00	0.6
TELKWA RIVER-DIS	221 --	< 0.05	0.048	< 1	26.9	< 0.5	< 0.05	9.35	< 0.1	0.04	< 0.5	0.9	0.08	< 1	0.30	1.215	11.60	0.5	0.95	< 0.2
HUBERT CREEK-TOT	221 2393	< 0.05	0.049	< 1	49.6	< 0.5	< 0.05	30.2	< 0.1	0.26	2.0	0.7	1.03	< 1	0.85	7.79	290	0.1	3.25	0.6
HUBERT CREEK-DIS	221 --	< 0.05	0.030	< 1	48.1	< 0.5	< 0.05	30.9	< 0.1	0.22	1.5	1.1	0.69	< 1	0.90	8.11	267	0.3	3.70	0.6
BULKLEY R.-TOT	221 2393	< 0.05	0.217	< 1	27.7	< 0.5	< 0.05	9.10	< 0.1	0.16	2.0	1.6	0.33	< 1	0.35	1.270	14.10	0.4	1.00	< 0.2
BULKLEY R.-DIS	221 --	< 0.05	0.048	< 1	22.7	< 0.5	< 0.05	9.50	< 0.1	0.02	< 0.5	1.6	0.08	< 1	0.35	1.300	5.55	0.6	1.70	< 0.2

CERTIFICATION:

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221 FAX: 604-984-0218

To: AGRA EARTH & ENVIRONMENTAL LIMITED ~*

BOX 3966, #3 - 3167 TATLOW ROAD
SMITHERS, BC
V0J 2N0

Project : KS00076
Comments: ATTN: SCOTT DAVIDSON

Certificate Date: 11-OCT-1999
Invoice No. :I9929588
P.O. Number :
Account :OXF

CERTIFICATE OF ANALYSIS A9929588

SAMPLE	PREP CODE	P mg/L	Pb ug/L	Sb ug/L	Se ug/L	Sn ug/L	Sr ug/L	Ti ug/L	Tl ug/L	U ug/L	V ug/L	Zn ug/L
LOWER TENAS-TOT	221 2393	0.4	< 2	0.20	< 1	< 0.5	89.4	< 1	< 0.05	0.05	< 1	< 0.5
LOWER TENAS-DIS	221 --	< 0.1	10	0.15	< 1	< 0.5	86.7	< 1	< 0.05	0.05	1	< 0.5
TRIP BLANK-TOT	221 2393	0.4	< 2	< 0.05	< 1	< 0.5	< 0.05	< 1	< 0.05	< 0.05	< 1	< 0.5
TRIP BLANK-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	< 0.05	< 1	< 0.05	< 0.05	< 1	< 0.5
UPPER TENAS-TOT	221 2393	0.3	< 2	0.15	< 1	< 0.5	85.6	< 1	< 0.05	0.05	1	< 0.5
UPPER TENAS-DISS	221 --	< 0.1	< 2	0.15	< 1	< 0.5	80.7	< 1	< 0.05	0.05	< 1	0.5
FOUR CREEK-TOT	221 2393	0.4	< 2	< 0.05	< 1	< 0.5	147.5	< 1	< 0.05	0.05	< 1	< 0.5
FOUR CREEK-DISS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	141.5	< 1	< 0.05	0.05	1	1.5
UPPER GOATHORN-T	221 2393	0.5	< 2	0.05	< 1	< 0.5	52.8	1	< 0.05	< 0.05	< 1	0.5
UPPER GOATHORN-D	221 --	< 0.1	< 2	0.05	< 1	< 0.5	51.4	< 1	< 0.05	< 0.05	< 1	1.0
LOWER GOATHORN-T	221 2393	0.4	< 2	0.05	< 1	< 0.5	56.4	1	< 0.05	< 0.05	< 1	< 0.5
LOWER GOATHORN-D	221 --	< 0.1	< 2	0.05	< 1	< 0.5	57.0	< 1	< 0.05	< 0.05	< 1	0.5
TELKWA RIVER-TOT	221 2393	0.5	< 2	< 0.05	< 1	< 0.5	44.2	20	< 0.05	0.05	< 1	3.5
TELKWA RIVER-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	41.3	< 1	< 0.05	< 0.05	< 1	< 0.5
HUBERT CREEK-TOT	221 2393	0.4	< 2	< 0.05	< 1	< 0.5	108.0	2	< 0.05	0.05	< 1	< 0.5
HUBERT CREEK-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	106.5	< 1	< 0.05	0.05	< 1	1.0
BULKLEY R.-TOT	221 2393	0.5	< 2	< 0.05	< 1	< 0.5	37.9	8	< 0.05	< 0.05	< 1	< 0.5
BULKLEY R.-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	37.5	< 1	< 0.05	< 0.05	< 1	1.0

CERTIFICATION:

I called Scott and requested edits. He will forward final copies + email electronic. No work in 2000.
ALLAN, 7 PAGES Feb 29/00. .ab
DRAFT 1999 REPORT
SORRY FOR THE DELAYS.
APP. A + FIELD DATA SUMMARY APPENDIX TO BE ADDED

February 15, 2000
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

780
Attention: **Mr. Allan Flemming, P.Eng.** Fax: ~~403~~ 420-5875

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE DATA REPORT

1.0 INTRODUCTION

AGRA Earth & Environmental Limited is pleased to present the 1999 Baseline Surface Water Flow and Water Quality Monitoring Report for the Telkwa Coal Project (TCP). The TCP is a proposed open pit coal mine located near Telkwa, B.C. and owned by Luscar Inc. (Luscar). The location of the mine is illustrated on Figure 1. This report contains the data collected during the 1999 baseline monitoring program and updates the rating curves for sites where discharge measurements were conducted.

2.0 SCHEDULE OF 1999 SITE VISITS

The schedule of site visits for the 1999 field monitoring program is contained in the March 3, 1999 AGRA proposal to conduct the TCP baseline monitoring. A copy of the AGRA proposal is contained in Appendix A for reference. The dates of actual site visits and a listing of the work conducted during the site visits is contained in Table 1. The discharge measurement focus was on the low flow periods.

TABLE 1
1999 Monitoring Site Visits

Week of:	Feb 1	Aug 1	Sept 19	Nov 14
Telkwa River	WQ		WQ	
Upper Tenas Creek	No site access		SM, WQ, Q	S
Lower Tenas Creek	WQ, Q	S	SM, WQ, Q	S
Bulkley River	WQ		WQ	
Hubert Creek	WQ, S	S	WQ, S	S
Four Creek	WQ	S	WQ, Q	S
Upper Goathorn Creek	WQ, Q		SM, WQ, Q	S
Lower Goathorn Creek	WQ		WQ	

Q = Discharge and stage measurements conducted
S = Stage measurements conducted
WQ = Water quality sampling conducted
SM = Site Maintenance Visit

The purpose of the August field trips was to collect peak flow information from the crest gauges at each site and to survey the equipment and benchmarks at each site for the low flow period.

3.0 SURFACE WATER MONITORING RESULTS

This section contains a summary of the five sites where surface water monitoring was conducted during the 1999 field season. Summary field data for the site visits is contained in Appendix B.

3.1 LOWER TENAS CREEK SITE

The lower Tenas Creek site was visited four times as part of the 1999 monitoring program. The station was operated as a manual sampling with no installation of the automated equipment used in previous years.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.041 m^3/s and 0.163 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 2.

An initial crest gauge installed in late 1998 at the site was replaced during the 1999 sampling season. Level surveys conducted at the site during the 1999 field season did not show significant shift of the benchmarks or the staff gauge. There was evidence of sand deposition noted near the gauge during the November 1999 field visit.

3.2 UPPER TENAS CREEK SITE

The upper Tenas Creek was visited twice during the 1999 monitoring program. There was no site access during the February 1999 field trip. As the crest gauge for this site was not checked and reset during February, this site was not visited during the August field trip.

The crest gauge was checked during September and the maximum stage was observed to be 0.70 m. This value would translate to a discharge of 8.43 m^3/s and is expected to be due to the spring freshet which consistently produces greater discharges than the fall peak flows. The low flow measurement from September 20th was 0.134 m^3/s. An updated rating curve for this site is shown in Figure 3. The two 1999 data points plot above the current stage-discharge relation. AGRA proposes that one high flow measurement be conducted at this site during the 2000 field season to determine whether the rating curve should be shifted upwards.

The September field visit to this site showed that the braces for the staff gauge had snapped but that the staff gauge did not appear to have shifted (based on a review of previous site photographs). Braces at the site were replaced and a third benchmark was added on the right bank side of the stream. Levelling checks showed that there was no significant shift of the benchmarks or the staff gauge during 1999. The breakage of the braces resulted in slight downstream leaning of the staff gauge mounting but this was corrected during the site

maintenance visit.

3.3 UPPER GOATHORN CREEK SITE

The upper Goathorn Creek site was visited four times during the 1999 monitoring program. The station was monitored as a manual station with a staff gauge and crest gauge.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.097 m^3/s and 0.337 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 4.

Maintenance of the gauge equipment was conducted during the September visit . The bracing for the staff gauge was reinforced and the staff gauge was lowered by a distance of 0.19 m. A second staff gauge was added to the top of the first staff gauge to allow for visual measurement of peak flow levels during the freshet period. The level check of benchmarks showed that there were no changes in the elevations of the benchmarks. The staff gauge did not show any significant shift during the 1999 season.

problem with chart

3.4 FOUR CREEK SITES

Two sampling locations were operated on Four Creek during the 1999 field season. The low flow discharge measurements were made at the lowest road culvert crossing of Four Creek. Other stage measurements and water quality sampling were conducted at the original stream flow sampling site located approximately 1,800 m upstream of the culvert crossing on Four Creek.

Discharges for the low flow periods were determined by calculation of the discharge through the culvert based on the known inlet water levels and the culvert characteristics. The February low flow measurement revealed that there was only a small quantity of baseflow (< 1L/min) during the sampling trip. The culvert was almost completely iced up. The September low flow discharge for the culvert was calculated to be 0.077 m^3/s.

3.5 HUBERT CREEK SITE

The Hubert Creek site was visited four times during the 1999 monitoring program. Readings for the staff gauge are available from two of the site visits. Visits conducted during September and November did not yield useful data on flow levels due to numerous partial blockages of the culvert inlet by debris.

The crest gauge at the site indicated that there was a recorded stage greater than 1.23 m during the spring 1999 freshet period. This high stage is believed to be partially due to beaver debris blockage of the inlet of the Hubert Creek culvert.

4.0 WATER QUALITY MONITORING RESULTS

In 1999, baseline water chemistry was sampled during the two low flow periods at ten sites in the proposed Telkwa Coal Project area. The data for the February 1999 water quality monitoring was forwarded directly to Luscar as previously arranged. The laboratory results for the September water quality trip are included in Appendix C of this report. No analysis of the testing data, other than to identify specific stations where the BC Water Quality Criteria (Nagpal, 1995) were exceeded. A summary of metals and stations where exceedances occurred are summarized in Table 2. Due to operator error during the September 1999 water quality field trip, triplicate sampling was not conducted. A blank sample obtained from Chemex did not have any exceedances.

77
↖ QA/QC not done properly

TABLE 2: B.C. WATER QUALITY CRITERIA EXCEEDANCE INFORMATION FOR THE SEPTEMBER 20, 1999 SAMPLING TRIP

METAL	B.C. WATER QUALITY CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS GREATER THAN THE B.C. CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS EQUAL TO THE B.C. CRITERIA
Cr	2.0 ug/L	Telkwa River (2.5)	Upper Goathorn Creek, Lower Goathorn Creek, Bulkley River, Hubert Creek, Lower Tenas, Four Creek
Cu	2.0 ug/L	Telkwa River (2.4)	
Fe	0.3 mg/L	Telkwa River (0.8), Hubert Creek (1.03), Bulkley River (0.33)	
Zn	3.0 ug/L	Telkwa River (3.5)	

5.0 CLOSURE

AGRA Earth Environmental Limited is pleased to present this 1999 data summary to Luscar Ltd. AGRA looks forward to continuing to work with Luscar on the Telkwa Coal project over the 2000 season. Should you have any questions concerning this project please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully Submitted,

Reviewed by,

Scott Davidson, M.Sc., P.Geo.
Project Manager

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

Dennis Trotter
Senior Toxicologist

02/16/00 WED 11:55 FAX 250 847 9049 AGRA SMITHERS 009/009

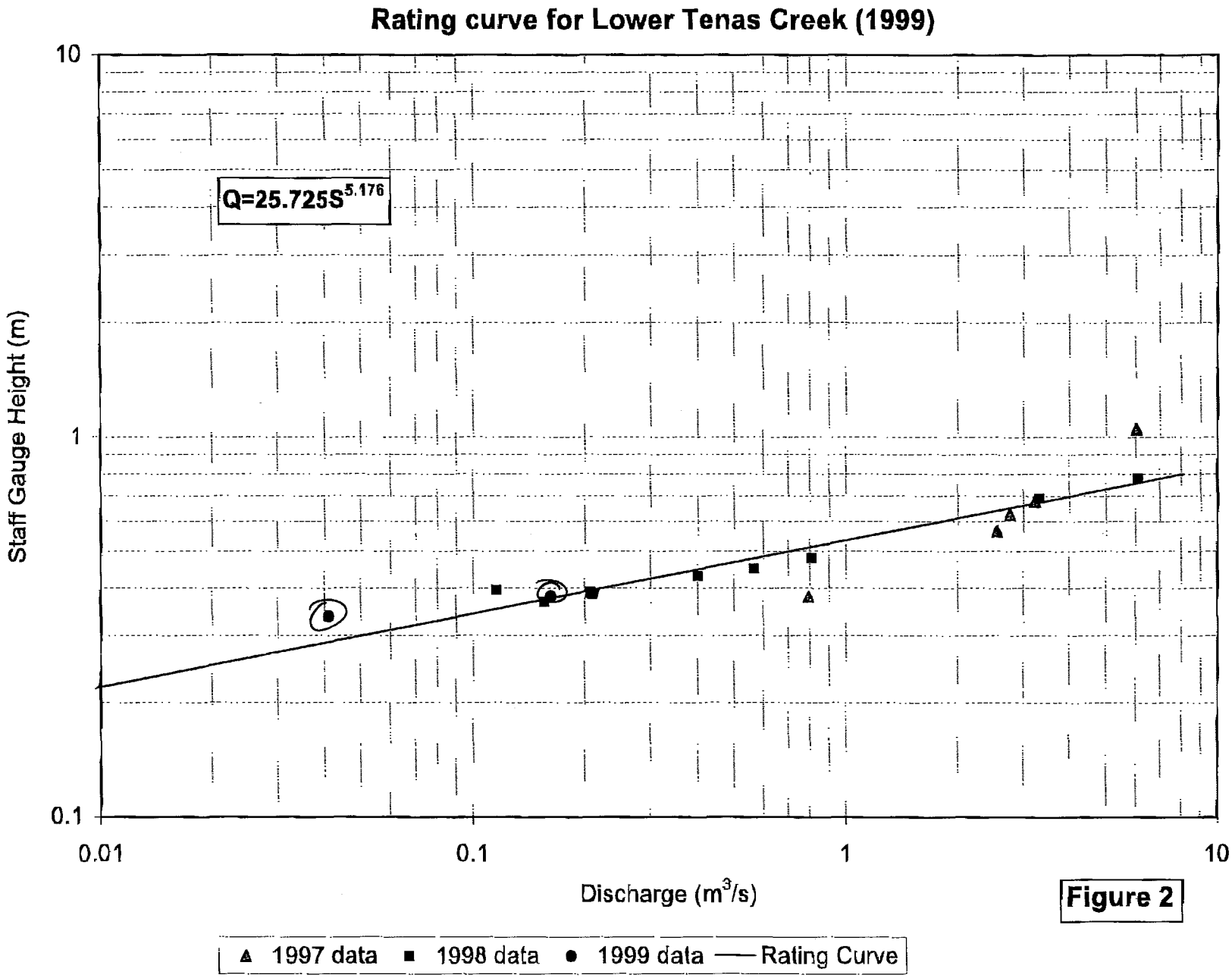

Figure 2

02/16/00 WED 11:55 FAX 250 847 9049 AGRA SMITHERS 005

Rating Curve for Upper Tenas Creek (1999)

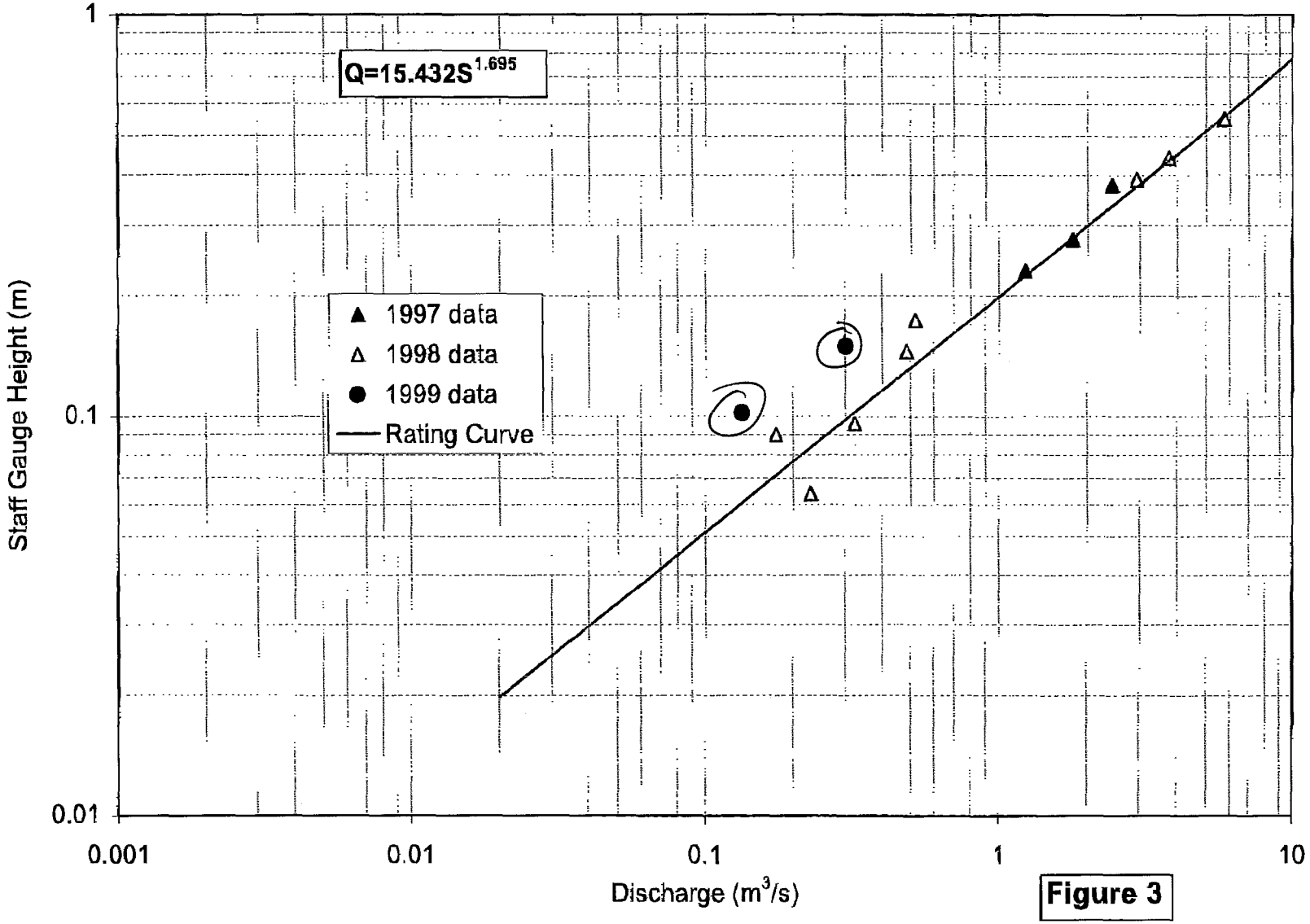

Figure 3

Graph. Did not change from 1998
(slope/intercept

rcurve-98.xls

15/02/2000

02/16/00 WED 11:56 FAX 250 847 9049 AGRA SMITHERS

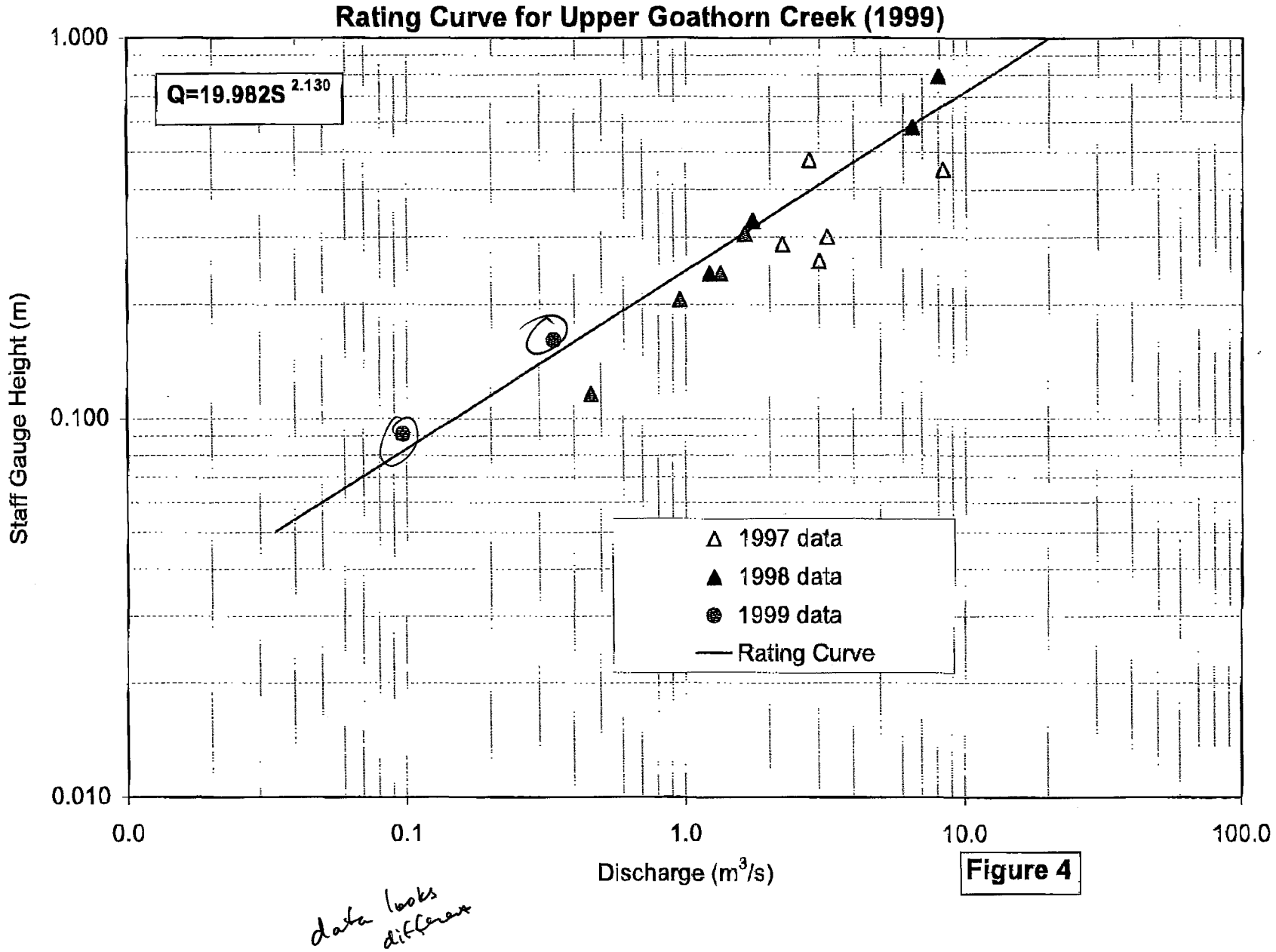

Figure 4

data looks different

AGRA
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
Box 3966
#3-3167 Tatlow Road
Smithers, B.C. V0J 2N0
Tel (250) 847-8783
Fax (250) 847-9049

June 8, 1999

KS00076

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton,AB. T5J 3G1

Attention: Allan Flemming, P.Eng.
Project Engineer

RE: 1999 DATA REPORT UPDATE

Dear Mr. Flemming,

AGRA Earth & Environmental Limited (AGRA) is pleased to present LuscarLtd. (Luscar) with this report containing data collected as part of the 1999 Telkwa Coal Surface Water and Water Quality Baseline Monitoring Program. The data presented in this report includes low flow data from February 1999 and the results of the site visits conducted during April and May to re-establish the crest gauges at selected sites.

LOW FLOW MONITORING TRIP

Low flow monitoring was conducted at sites on February 16th and 17th, 1999. During this trip water quality sampling was also completed; the data was directly forwarded from Chemex Labs to Luscar. The list of sites and the sampling completed is presented in Table 1.

Table 1. Low Flow Monitoring Trip Summary

SITE	FLOW CONDITIONS	WATER QUALITY SAMPLING
Telkwa River	Water level was 45 cm below the level of the main staff gauge located on the old bridge pilings.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Lower Goathorn Creek	There was some flow in the creek below approximately 30 cm of ice.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Four Creek	No evidence of flow at the lower culvert crossing.	No samples collected.
Upper Goathorn Creek	Water level was 0.1 m below the staff gauge. Discharge was measured to be 0.097 m^3/s.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Lower Tenas Creek	Staff gauge reading 0.337 m. Discharge was measured to be 0.041 m^3/s.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Hubert Creek	Staff gauge iced up; Unable to estimate water level. Discharge estimated from outlet velocity and depth to be 0.024 m^3/s.	Samples for total metals, dissolved metals and general nutrient analysis were collected.

RE-ESTABLISHMENT OF CREST GAUGES AND BENCHMARKS

The monitoring program was revised to meet Luscar's request to monitor peak flows at the study streams using only crest gauges. The crest gauges were visited at accessible sites to add cork and to check the relative elevations of staff gauges and crest gauges to site benchmarks. Table 2 contains a summary of the work completed in re-establishing the monitoring gauges.

As a result of weather conditions during April and May, the re-establishment of crest gauges required that multiple field trips be made. The two upper sites on Goathorn Creek and Tenas Creek were not accessable during May due to snow and road conditions. Therefore, AGRA did not re-establish these upper two sites, but chose instead to collect peak flow information from the lower sites on these streams. This was deemed to be the most effective use of available resources and budget given ground conditions. Peak flow levels will be determined during a field trip to be made to sites during July 1999. No crest stage readings for the Upper Goathorn and Upper Tenas sites until the july visit.

Table 2. Site Re-establishment for Peak Flow Determination

SITE	DATE VISITED	WORK COMPLETED
Telkwa River	April 14th, 1999	Water level was 45 cm below the level of the staff crest gauges at the site.
Hubert Creek	April 14th, 1999	Cork added to the crest gauge at the site. Staff gauges and benchmarks leveled for determining offsets.
Tailings Pond	April 16th, 1999	Cork added to the crest gauge at the site. Weir face, staff gauge and benchmarks leveled for determining offsets.
Four Creek	May 12th, 1999	Cork added to the crest gauge at the original site. Staff gauge and benchmarks leveled for determining offsets.
Lower Tenas Creek	May 12th, 1999	Cork added to the crest gauge at the site. Staff gauge and benchmarks leveled for determining offsets.
Lower Goathorn Creek	No work conducted at the site maintained by the WSC .	
Upper Tenas Creek	(May 12th, 1999)	No access to site because of snow and road conditions.
Upper Goathorn Creek	(May 12th, 1999)	No access to site because of snow and road conditions.

AGRA Earth & Environmental Limited is pleased to present this summary of data collection and work completed to date on the Telkwa Coal Project. Digital copies of the collected data will be forwarded to Luscar. Should you require any further information on this project please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully submitted,

AGRA Earth & Environmental Limited

Scott Davidson, M.Sc., P.Geo.
Project Manager

Reviewed by

Gary R.E. Beckstead, Msc., P.Eng.
Senior Project Manager

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
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March 2, 1999
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-5875

Dear Mr. Flemming:

Re: Telkwa Coal Mine
Revised 1999 Budget

1.0 SURFACE WATER MONITORING

AEE is pleased to present this revised budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program may need to be revised to meet the construction plan for the mine.

2.0 WORK PROGRAM AND BUDGET

The work program proposed for 1999 is as follows:

<u>Surface Water Flow</u>

- Concentration of the base program on the winter and summer low flow periods.
- Monitoring of low flows on Four Creek, Hubert Creek, Tenas Creek, Upper Goathorn Creek and Lower Goathorn Creek. No monitoring will be conducted on Helps Creek, Telkwa River, and the Bulkley River. Low flow monitoring will result in two site visits. To reduce cost to Luscar, AEE has scheduled the summer low flow period measurement trip to coincide with site visit #3 described below.
- Monitoring of peak flows at the streams using crest gauges already installed at all of the existing sites. To conduct this portion of the required work, AEE will conduct a total of four sites visits planned as follows:

1. Pre-freshet to set up crest and staff gauges and survey to local bench marks (April),
2. Post freshet to record peak flow during period and survey to local bench marks (June),
3. Pre fall high flow period to re-survey benchmarks and survey to local bench marks (late August to early September),

4. Post fall high flow to record peak flow and survey to local bench marks (November).

Water Quality

- Sampling of baseline parameters for the two low flow periods only.

Data Analysis

AEE proposes to conduct data analysis and reporting for the 1999 sampling program following each monitoring trip. A data analysis period has been allowed following each of the five surface flow site visits (one low flow and four peak flow visits) described above. The information reports from each trip will assist Luscar in public meetings by providing the most up to date information on the project.

Project Management

Project management involves dealing with items such as cost control, client liaison, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. For the 1999 sampling program, AEE proposes to conduct project management on a cost plus basis. The totals for this item in the attached Table 1 represent estimates of the total budget required for project management. AEE will make every effort to ensure that it conducts stringent cost control on the project management for Luscar. Project management for the 1999 program will be conducted by Mr. Scott Davidson, M.Sc., P.Geo. of the Smithers office. Mr. Gary Beckstead, M.Sc., P.Eng. and Mr. Dennis Trotter will provide technical input and review to the project as required.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. If you have any questions or require further information concerning this project, please call Scott Davidson at (250) 847-8783 or Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Reviewed by

Scott Davidson, M.Sc., P.Geo.
Project Manager
C:\files\working\Luscar\1999\revised budget99.wpd
cc. Gary R.E. Beckstead, AEE - Calgary

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

Table 1
Budget Estimate for 1999 Hydrometric Monitoring and Water Quality Sampling
Telkwa Coal Project

Task	Assumptions	Month												Total
		Jan	Feb	Mar.	Apr.	May	June	Jul.	Aug	Sept.	Oct	Nov.	Dec.	
Surface Flow Monitoring	1,3,4,6													
Labour		$ -	$ 3,240.00	$ -	$1,350.00	$ -	$ 1,284.00	$ -	$1,284.00	$ -	$ -	$1,080.00	$ -	$ 6,238.00
Disbursements		$ -	$ 378.00	$ -	$ 189.00	$ -	$ 189.00	$ -	$ 189.00	$ -	$ -	$ 189.00	$ -	$ 1,134.00
Water Quality	1,5,6,7													
Sampling		$1,115.00	$ 2,838.00	$ -	$ -	$ -	$ -	$ -	$ 428.00	$ -	$ -	$ -	$ -	$ 4,381.00
Disbursements		$ 310.20	$ 645.00	$ -	$ -	$ -	$ -	$ -	$ 100.00	$ -	$ -	$ -	$ -	$ 1,055.20
Data Analysis	1													
Labour		$ -	$ -	$ 970.00	$ 970.00	$ -	$ 970.00	$ -	$ -	$ 970.00	$ -	$ 970.00	$ -	$ 4,850.00
Disbursements		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	1,2													
Labour		$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 1,800.00
Disbursements		$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 300.00
Total (Required Work)		$1,600.20	$ 7,276.00	$ 1,145.00	$2,684.00	$ 175.00	$ 2,616.00	$ 175.00	$2,176.00	$ 1,145.00	$ 175.00	$2,414.00	$ 175.00	$ 21,758.20

Assumptions:
1 The above budget is based on the Fw rate schedule
2 Project Management is quoted as an estimated maximum budget and will be billed on a cost plus basis.
3 The summer low flow period extends over August and September
4 The winter low flow period extends over February and March
5 The January water quality sampling costs represent the Selenium sampling
6 Disbursements listed under Water Flow and Water Quality are estimates for sampling equipment and vehicle expenses and do not include 10% handling charge
7 All Laboratory Analysis is to be directly billed to Luscar Ltd.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

Faxed to JED at NDM.
For your comment
al J.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
Box 3966
#3, 3167 Tatlow Road
Smithers, BC
Canada V0J 2N0
Tel (250) 847-8783
Fax (250) 847-9049

January 29, 1999
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-5875

Dear Mr. Flemming:

Re: Telkwa Coal Mine
Revised 1999 Budget

1.0 SURFACE WATER MONITORING

As per the January 26th, 1999 discussion between Gary Beckstead of AGRA Earth & Environmental Limited (AEE) and Allan Flemming of Luscar Ltd. (Luscar), AEE is pleased to present this revised budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program may need to be revised to meet the construction plan for the mine.

2.0 WORK PROGRAM AND BUDGET

The revised budget presented in Table 1 is based on the scope of services requested by Luscar at the January 26th, 1999 meeting. The work program proposed for 1999 is as follows:

Surface Water Flow

- Concentration of the base program on the winter and summer low flow periods.
- Monitoring of low flows on Four Creek, Hubert Creek, ~~Holps Creek~~, Upper Goathorn Creek and Lower Goathorn Creek. No monitoring will be conducted on Tenas Creek, Telkwa River, and the Bulkley River.
- Monitoring of peak flows at the streams using crest gauges already installed at all of the existing sites. To conduct this portion of the required work, AEE must visit all sites during April to ensure that the sites are ready for the peak flow period (i.e. Checking of staff gauges and crest gauges). During November time has been allocated for conducting a final site visit to all sites to determine their condition prior to winter.
- A cost option has been prepared to operate the data loggers and pressure transducers at the continuous monitoring sites and to conduct a single high flow discharge measurement.

Water Quality

- Sampling of baseline parameters for the two low flow periods only.
- Sampling of metals for the two low flow periods.

Selenium sampling was requested to be deleted from the scope of work for 1999, however, the sampling for this was completed prior to receiving notification from Luscar. It is the expectation of AEE that the costs of this sampling will be paid by Luscar as the work was conducted at the request of Mr. Jerry Demchuck, the environmental coordinator for the Telkwa Coal Project. All future requests for increased sampling will not be initiated by AEE until a signed order to proceed with the work has been received from Luscar.

Not true.

Reporting

AEE proposes to conduct reporting for the 1999 sampling program following each monitoring trip. A data memo will be issued to Luscar presenting the results of the monitoring trip. This information will assist Luscar in public meetings by providing the most up to date information on the project. The costs of reporting for the optional water flow monitoring program are included in Table 1 as an additional cost of approximately $530.00 per monthly report.

Project Management

Project management involves dealing with items such as cost control, client liaison, responding to requests for extra work, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. For the 1999 sampling program, AEE proposes to conduct each portion of the project as separate tasks. On receiving a request for extra work, AEE will issue to Luscar for approval, a change of work order along with an expected budget to complete the extra work. Project management for the 1999 program will be conducted by Mr. Scott Davidson, M.Sc., P.Geo. of the Smithers office. Mr. Gary Beckstead and Mr. Dennis Trotter will provide technical input and review to the project as required.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. If you have any questions or require further information concerning this project, please call Scott Davidson at (250) 847-8783 or Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Scott Davidson, M.Sc., P.Geo.
Project Manager
C:\files\working\Luscar\1999\revised budget99.wpd

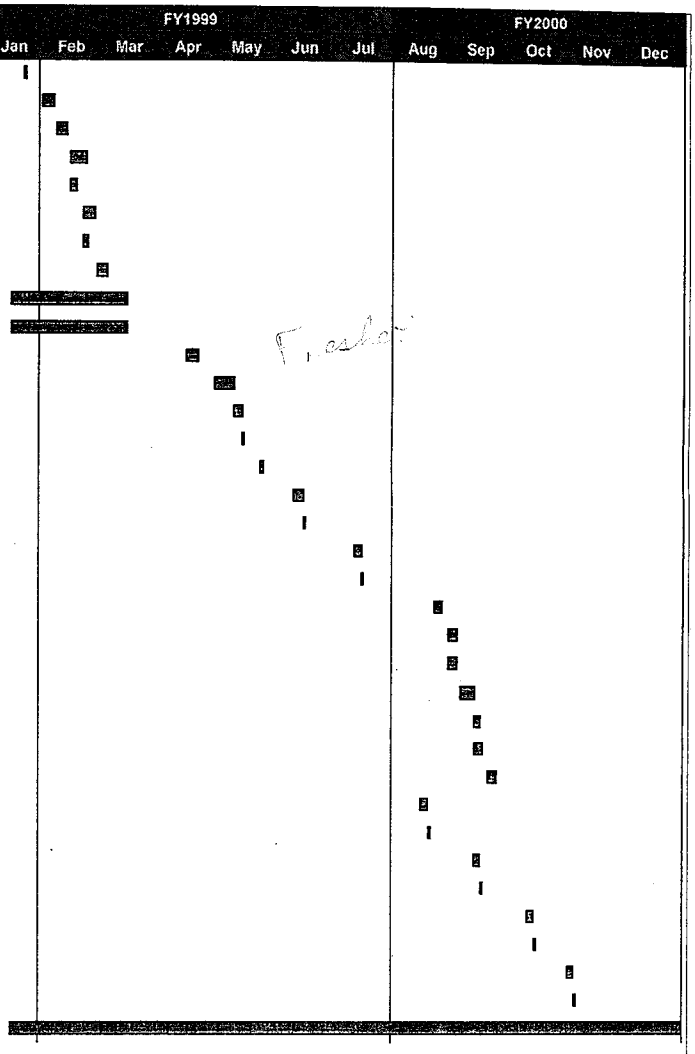
Reviewed by

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

cc. Gary R.E. Beckstead, AEE - Calgary
Jerry Schmidt, AEE - Prince George

CW1537.00 Task 1999 Luscar Ltd.

Task Name	Start Date	Effort	End Date
Selenium Sampling Trip	1/21/99	2.00d	1/21/99
Winter Water Quality Trip	1/31/99	3.00d	2/5/99
Winter Revised Metals Sampling Trip	2/7/99	1.13d	2/12/99
Winter Revised Metals Sampling Trip	2/14/99	1.13d	2/22/99
Winter Low Flow Discharge Measurement	2/14/99	3.00d	2/17/99
Winter Revised Metals Sampling Trip	2/21/99	1.13d	2/26/99
Winter Low Flow Discharge Measurement	2/21/99	3.00d	2/23/99
Winter Revised Metals Sampling Trip	2/28/99	1.13d	3/5/99
Lab Calibration of Pressure Transducers	1/15/99	2.00d	3/15/99
Other Lab Prep Time Associated with Equipment Preparation	1/15/99	4.00d	3/15/99
All Sites Visit	4/15/99	4.00d	4/21/99
Installation of Automated Sites	4/30/99	2.00d	5/10/99
All Sites Visit, Data Download	5/10/99	3.00d	5/14/99
Data Analysis	5/14/99	1.00d	5/14/99
High Flow Discharge Measurement	5/24/99	4.00d	5/25/99
All Sites Visit and Data Download	6/10/99	3.00d	6/15/99
Data Analysis	6/15/99	1.00d	6/15/99
All Sites Visit and Data Download	7/12/99	3.00d	7/15/99
Data Analysis	7/16/99	1.00d	7/16/99
Summer Water Quality Trip	8/23/99	3.00d	8/26/99
Summer Revised Metals Sampling Trip	8/30/99	0.75d	9/3/99
Low Flow Discharge Measurement	8/30/99	3.00d	9/3/99
Summer Revised Metals Sampling Trip	9/6/99	0.75d	9/13/99
Summer Revised Metals Sampling Trip	9/13/99	0.75d	9/16/99
Low Flow Discharge Measurement	9/13/99	3.00d	9/17/99
Summer Revised Metals Sampling Trip	9/20/99	0.75d	9/24/99
All Sites Visit and Data Download	8/16/99	3.00d	8/19/99
Data Analysis	8/20/99	1.00d	8/20/99
All Sites Visit and Data Download	9/13/99	3.00d	9/16/99
Data Analysis	9/17/99	1.00d	9/17/99
All Sites Visit, Data Download	10/11/99	5.00d	10/14/99
Data Analysis	10/15/99	1.00d	10/15/99
Decommissioning of Sites/All Sites Visit	11/1/99	2.00d	11/4/99
Data Analysis	11/5/99	1.00d	11/5/99
Project Management	1/15/99	5.75d	12/31/99



Hobart
Four Creek (contd)
LT
UG
LG quality (WSC) did

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

Table 1
Budget Estimate for 1999 Hydrometric Monitoring and Water Quality Sampling
Telkwa Coal Project

Task	Assumptions	Month												Total
		Jan	Feb	Mar.	Apr.	May	June	Jul.	Aug	Sept.	Oct	Nov.	Dec.	
Required Flow Monitoring	1,2,3,4,8,9													
Labour		$ -	$ 3,240.00	$ -	$2,160.00	$ -	$ -	$ -	$1,284.00	$ 1,284.00	$ -	$ 856.00		$ 8,824.00
Disbursements		$ -	$ 378.00	$ -	$ 189.00	$ -	$ -	$ -	$ 189.00	$ 189.00	$ -	$ 69.30		$ 1,014.30
Optional Flow Monitoring	1,4,7,8,9													
Labour		$ -	$ -	$ -	$1,560.00	$ 3,974.00	$ 1,814.00	$ 1,814.00	$1,814.00	$ 1,814.00	$1,814.00	$1,376.00		$ 15,980.00
Disbursements		$ -	$ -	$ -	$ 300.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00		$ 2,043.00
Water Quality	1,2,3,5,8,9,10													
Sampling		$1,115.00	$ 2,838.00	$ 493.00	$ -	$ -	$ -	$ -	$1,674.00	$ 1,545.00	$ -	$ -	$ -	$ 7,665.00
Disbursements		$ 310.20	$ 645.00	$ 169.00	$ -	$ -	$ -	$ -	$ 407.00	$ 407.00	$ -	$ -	$ -	$ 1,938.20
Reporting	1,6,7													
Labour		$ -	$ 785.00	$ 635.00	$ 472.50	$ -	$ -	$ -	$ 597.50	$ 1,232.50	$ -	$ 472.50	$ -	$ 4,195.00
Disbursements		$ -	$ 100.00	$ 100.00	$ 100.00	$ -	$ -	$ -	$ 100.00	$ 100.00	$ -	$ 100.00	$ -	$ 600.00
Project Management	1,8													
Labour		$ 780.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 5,235.00
Disbursements		$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 1,200.00
Total (Required Work)		$2,305.20	$ 8,491.00	$ 1,902.00	$3,426.50	$ 505.00	$ 505.00	$ 505.00	$4,756.50	$ 5,262.50	$ 505.00	$2,002.80	$ 505.00	$ 30,671.50
Total (Optional Work)		$ -	$ -	$ -	$1,860.00	$ 4,223.00	$ 2,063.00	$ 2,063.00	$2,063.00	$ 2,063.00	$2,063.00	$1,625.00	$ -	$ 18,023.00

Assumptions:

1 The above budget are based on the Fw rate schedule
2 The summer low flow period extends over August and September
3 The winter low flow period extends over February and March
4 The Optional Water Flow Sampling would result in 1 monthly monitoring visit per month and 1 discharge measurement during May 1999
5 The January water quality sampling costs represent the Selenium sampling
6 Reporting costs are for the preparation of summary reports following completion of required project tasks
7 Reporting Costs from the Optional Water Flow program would be approximately $530.00 per monthly update report
8 Internal Disbursements are to be billed at Cost Plus 10% with information on these disbursements provided to Luscar Ltd..
9 Disbursements listed under Water Flow and Water Quality are estimates for sampling equipment and vehicle expenses and do not include 10% handling charge.
10 All Laboratory Analysis is to be directly billed to Luscar Ltd.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

CC: JED for comment

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

January 21, 1999
CW1537.901.1

DRAFT

Way, way too much.

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-4089

Dear Mr. Flemming:

Re: Telkwa Coal Mine
1999 Budget

1.0 SURFACE WATER MONITORING

As per the January 19th, 1999 discussion between Gary Beckstead of AGRA Earth & Environmental Limited (AEE) and Allan Flemming of Luscar Ltd. (Luscar), AEE is pleased to present this "**draft**" budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. This draft will be discussed with you at your office on January 26th, 1999. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program will need to be revised.

2.0 WORK PROGRAM AND BUDGET

AEE's proposed 1999 work program is intended to allow for revision of the program during the year. Table 1 presents the monthly budget breakdown for 1999.

The work program proposed for 1999 is as follows:

Surface Water Flow

- Three winter low flow discharge measurements on the Telkwa River;
- Five free flow period discharge measurements at all sites[1];
- An initial site visit during spring followed by an installation trip to sites; and
- Seven trips to perform routine maintenance and downloading of continuous sites.

---

[1] The Telkwa River will only be measured during three of the five free flow discharge measurement trips

Water Quality

- Four trips are scheduled for seasonal baseline water quality sampling;
- One sediment collection trip is included with the seasonal baseline trips; and
- High frequency revised metals sampling program started in 1998 is currently scheduled for continuation in 1999[2].

Reporting

AEE proposes to conduct reporting for the 1999 sampling program at approximately four month intervals. By separating the reporting into smaller pieces, AEE expects to be able to realize cost savings over the previous annual report preparation costs. The issuing of three data reports during 1999 will also allow for easier revision of the sampling program following submittal of the Final Project Report and project certification.

Project Management

Project management involves dealing with items such as cost control, client liaison, responding to requests for extra work, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. AEE has found that the project management required for the proposed Telkwa Coal Mine exceeded the original budget estimate. Based on an analysis of previous work, AEE has revised its method of project management for the 1999 sampling program. AEE feels that the revisions made to project management will simplify tracking of costs for each phase of the project.

Previous requests for extra work conducted by AEE on the Telkwa Coal project were often accompanied by a directive to bill the work to the existing sampling program budget. For the 1999 sampling program, AEE proposes to conduct each portion of the project as separate tasks. On receiving a request for extra work, AEE will issue to Luscar for approval, a change of work order along with an expected budget to complete the extra work.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. It is the understanding that AEE and Luscar will discuss this draft budget during

---

[2] The revised sampling program is intended to determine the optimum sampling frequency for project. Following the winter and spring sampling trips, AEE should have sufficient data to determine the optimum sampling frequency allowing for modification of the water quality program.

a meeting scheduled for Tuesday, January 26th, 1999. Other items which I would like to discuss with you on Tuesday include:

- miscellaneous disbursement charge (% of fees); and
- possible shift of Project Manager to Scott Davidson in Smithers.

If you have any questions or require further information prior to this meeting, please call Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Scott Davidson, M.Sc., P.Geo.
Smithers Office Manager

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

GREB/km

attach.

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(Low (2)
① Four
② Hubert/Helps
③ Goathorn (2)

Staff guages for high flow
+ option for datalogger

low flow (2 times)
high flow (2 times)

Quality winter low flow

data reports after low flow
Not big reports

Purchase Order

Tenas
Telkwa
Bulkley

— no % of disbursements
itemize

DRAFT

Table 1
Budget Estimate for 1999 Hydrometric Monitoring and Water Quality Sampling
Telkwa Coal Project

Task	Personnel	Month												Total
		Jan	Feb	Mar.	Apr.	May	June	Jul.	Aug	Sept	Oct	Nov.	Dec.	
Flow Monitoring														
Labour		$ -	$ 4,425.00	$ 3,160.00	$ 2,160.00	$ 3,546.00	$ 4,036.00	$ 3,088.00	$ 3,088.00	$ 1,802.00	$ 2,660.00	$ 1,376.00		$ 29,341.00
Disbursements		$ -	$ 501.60	$ 165.00	$ 69.30	$ 396.00	$ 522.50	$ 737.00	$ 440.00	$ 69.30	$ 289.30	$ 69.30		$ 3,259.30
Water Quality														
Sampling		$ 1,115.00	$ 3,013.00	$ 743.00	$ -	$ 1,265.00	$ 2,160.00	$ 2,332.00	$ 835.00	$ 1,940.00	$ -	$ -	$ -	$ 13,403.00
Disbursements		$ 310.20	$ 4,442.90	$ 675.40	$ -	$ 5,183.20	$ 1,350.80	$ 4,901.60	$ 1,350.80	$ 5,989.50	$ -	$ -	$ -	$ 24,204.40
Reporting														
Labour		$ -	$ -	$ -	$ -	$ 1,350.00	$ -	$ -	$ -	$ 2,600.00	$ -	$ -	$ 3,620.00	$ 7,570.00
Disbursements		$ -	$ -	$ -	$ -	$ 120.00	$ -	$ -	$ -	$ 120.00	$ -	$ -	$ 120.00	$ 360.00
Project Management														
Labour		$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 9,360.00
Disbursements		$ -	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$ 660.00
Total		$ 2,205.20	$ 13,222.50	$ 5,583.40	$ 3,089.30	$ 12,700.20	$ 8,909.30	$ 11,898.60	$ 6,553.80	$ 13,360.80	$ 3,789.30	$ 2,285.30	$ 4,580.00	$ 88,157.70
Personnel		$ 1,895.00	$ 8,218.00	$ 4,683.00	$ 2,940.00	$ 6,941.00	$ 6,976.00	$ 6,200.00	$ 4,703.00	$ 7,122.00	$ 3,440.00	$ 2,156.00	$ 4,400.00	$ 59,674.00
Disbursements		$ 310.20	$ 5,004.50	$ 900.40	$ 129.30	$ 5,759.20	$ 1,933.30	$ 5,698.60	$ 1,850.80	$ 6,238.80	$ 349.30	$ 129.30	$ 180.00	$ 28,483.70

Assumptions:
The above budget is based on the Fw rate schedule
$60.00/month Unit 1292 taptop computer charge will be applied to this project from February to December
Project Management is based on an average of 3 hours per month for each of Scott Davidson, Jessy Harper, & Gary Beckstead
Water quality analysis costs following the Revised Metals Sampling Analysis are expected to drop in total costs to ~15K/year

Allan: For Your Info.:
Incidental Disbursements

If 5% of fees	94.75	410.9	234.15	147	347.05	348.8	310	235.15	356.1	172	107.8	220	$ 2,983.70
If 3% of fees	56.85	246.54	140.49	88.2	208.23	209.28	186	141.09	213.66	103.2	64.68	132	$ 1,790.22

NOTE:
No. : OPERATION NUMBER 48 : 4800BPS SELECTED EC : ERROR CORRECT G2 : G2 COMMUNICATION
PD : POLLED BY REMOTE SF : STORE & FORWARD RI : RELAY INITIATE RS : RELAY STATION
MB : SEND TO MAILBOX PG : POLLING A REMOTE MP : MULTI-POLLING RM : RECEIVE TO MEMORY

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No.	REMOTE STATION	START TIME	DURATION	#PAGES	MODE	RESULTS
1	403 777 4150	1-26-99 8:59	1'58"	4/ 4		COMPLETED 9600

*** SEND ***

TOTAL PAGES CONFIRMED : 4
TOTAL PAGES SCANNED : 4
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THIS DOCUMENT WAS CONFIRMED
(REDUCED SAMPLE ABOVE - SEE DETAILS BELOW)

TRANSMISSION REPORT

cc: Jerry

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

January 21, 1999
CW1537.901.1

DRAFT

Way, way too much.

To: Jerry Demchuk

For Comment

Allan Z

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: Telkwa Coal Mine
1999 Budget

1.0 SURFACE WATER MONITORING

As per the January 19th, 1999 discussion between Gary Beckstead of AGRA Earth & Environmental Limited (AEE) and Allan Flemming of Luscar Ltd. (Luscar), AEE is pleased to present this "draft" budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. This draft will be discussed with you at your office on January 26th, 1999. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program will need to be revised.

2.0 WORK PROGRAM AND BUDGET

AEE's proposed 1999 work program is intended to allow for revision of the program during the year. Table 1 presents the monthly budget breakdown for 1999.

The work program proposed for 1999 is as follows:

Surface Water Flow

- Three winter low flow discharge measurements on the Telkwa River;
- Five free flow period discharge measurements at all sites[1];
- An initial site visit during spring followed by an installation trip to sites; and
- Seven trips to perform routine maintenance and downloading of continuous sites.

---

[1] The Telkwa River will only be measured during three of the five free flow discharge measurement trips

cc: JED at Norecol, (403) 777-4150 FYI

6 pages

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
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Fax (403) 248-1590

January 29, 1999
CW1537.101

FAXED 1/29/99

Luscar Ltd.
1600 Oxford Tower
Edmonton, AB T5J 3G1

Attention: **Mr. Allan Flemming, P.Eng.**
Manager, Special Projects

Dear Mr. Flemming:

Re: **Lakewood and Geneq Dataloggers in Relation to the Y2K Problem** (Telkwa)

We have recently been in contact with Lakewood Systems Ltd. and Geneq Inc. with regard to the problems which may occur as a result of the operation of their dataloggers into the year 2000. The status of each datalogger make is discussed below.

Lakewood has indicated that there will be no hardware modifications required. However, new software will be required to run the Lakewood dataloggers. The current LS-4 software will not allow the datalogger to be programmed correctly, nor will it allow the datalogger's time clock to be set correctly. All users must update their software to LS-4 Version 4.5 prior to the year 2000. This software will be posted on the Lakewood website (http://www.lakewood.com) in the near future and can be downloaded free of charge.

The Unidata Starloggers supplied by Geneq will not have a date problem with the year 2000 as the Starloggers calculate dates based on the number of scans from 1980. Therefore, the year will be calculated correctly. More specific information is available from the Unidata web site (http://www.unidata.com.au). Version 2 and 3 of the Starlog software are Y2K compliant. These programs are updated on a continual basis and are available on the website.

AEE will continue to monitor the progress made with the Y2K software at Lakewood. We will also ensure that the most current software is downloaded from each of these websites and used in future flow monitoring at Telkwa.

Should additional information be required with regard to this problem, you can contact Doug Calvert at Lakewood ((403)462-9110) or via e-mail at mail@lakewood.com or Steve Biduk at Geneq ((604)739-0889).

Sincerely,

AGRA Earth & Environmental Limited

Kristi McKay, M.Sc., P.Eng.
Water Resources Engineer

Reviewed by:

Gary R.E. Beckstead, M.Sc., P.Eng.
Reviewer

cc. Scott Davidson, AEE - Smithers

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AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
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January 19, 1999
CW1537.901

Luscar Ltd.
1600, Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: Telkwa Coal Mine
Hydrological Analyses

Further to our letter of October 6, 1998, and our discussions, some additional costs have appeared which were not included in that letter. These costs are as follows:

1. Chemex Labs water quality analyses ($4,788.30, as per the subsequent October 30, 1998 invoice).

2. Fees for Westmacott, McKay, Dick, Beckstead ($823.75) for completion of the 200 year flood assessment that Jerry Demchuk had commissioned. This report was finalized on September 28, 1998, immediately prior to the October 6 letter.

3. A significant portion of the 36 hours of Dennis Trotter's time in the October 30, 1998 invoice concerned ongoing discussions and data analysis in response to requests from Steve Day.

These subsequent costs of $9,212.05 plus GST had not been included in the forecast total. We should not require the entire amount to complete the outstanding deliverable, namely the 1998 monitoring report. For preliminary budgeting purposes, let us say that the total budget be increased to $210,000 from $203,853.64.

The 1998 monitoring report is nearing completion. It will be ready for internal technical review by January 20. It should be ready for final issue by January 29, 1999.

Scott Davidson and I are preparing an outline of tasks and associated costs for the 1999 program, as discussed with you earlier. We hope to have a draft ready by January 22, 1999. We can discuss the draft when we meet in your office on January 26, 1999.

We thank you for the opportunity to provide engineering and environmental services to this project. If you have any questions or require further information, please call the undersigned at 235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

GREB/km

cc: Scott Davidson, AEE - Smithers

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AGRA Earth & Environmental

FACSIMILE TRANSMITTAL

#221 - 18 Street S.E.
CALGARY, ALBERTA, CANADA T2E 6J5
Phone NO. (403) 248-4331
FAX NO. (403) 248-1590
DIRECT 235-8118

TO: AL FLEMING
COMPANY: LUSCAR LTD.
FAX NO.: 1-403-420-5875
SENDER: GARY BECKSTEAD FILE NO.: 1537.101-3
FAX OPERATOR: GREB DATE: 98 1125
NO. OF PAGES: 5 (including this page)

This transmission is intended only for the Addressee. It may contain privileged or confidential information. Any unauthorized disclosure is strictly prohibited. If you have received this transmission in error, please notify us immediately (collect) so that we may correct our transmission. Please then destroy the original. Thank you.

AL:

(1) DRAFT RESPONSE LETTER TO OBEDKOFF re: 1997 MONITORING PROGRAM IS ATTACHED, FOR YOUR REVIEW & COMMENT.

(2) STATUS REPORT FROM OUR SMITHERS OFFICE ATTACHED, FYI.

(3) THAT INVOICE WAS PAID NOV. 23/98 THANKS!

REGARDS,

Gary

November 9, 1998
CW1537.101

DRAFT

Luscar Ltd./Manalta Coal Ltd.
7th Floor, 700 - 9th Avenue SW
Calgary, Alberta T2P 3V4

Attention: Mr. Al Fleming, P.Eng.

Dear Mr. Fleming:

Re: Response to BC Ministry of Environment Lands and Parks letter
July 23, 1998
Telkwa Coal Mine Surface Water Monitoring Program 1997

Further to our discussions with Jerry Demchuk, Environmental Advisor to Luscar/Manalta on November 5, 1998, AGRA Earth & Environmental Limited (AEE) is pleased to respond to the comments presented in the above-noted letter. We appreciate Mr. Obedkoff's comments and suggestions in the spirit of improving the quality of the surface water monitoring program where it is required. Many of his concerns relate to the volume of data available following the first year of the program. Where possible these comments will be considered in the analysis and assessment of the year 2 monitoring report, which will be prepared soon.

AEE has tried to purchase the Manual of Standard Operating Procedures for Hydrometric Surveys in British Columbia through our contacts in Prince George and Smiths over the past year; however the document has not been available until recently. We have now ordered copies and will use this publication for reference. Thanks to Mr. Obedkoff for the "heads up" that the publication is now available.

The responses to each of the individual comments for specific sections of the 1997 Surface Water Monitoring Report are presented below.

1.2 *Federal Water Survey of Canada (WSC) and Resources Inventory Branch (RIB) personnel should also be consulted for advice on hydrometric data collection procedures.*

AEE has established communications Ed Link of the WSC office in Terrace. We have discussed procedures with him and will continue to use him as a resource, when and if required.

It is our understanding that the RIB is located only in Victoria. Subject to your consent AEE will make contact with Mr. Obedkoff of the RIB.

2.1 *Include the WSC hydrometric station on Simpson Creek (08EE012). Is site C below the Tenas North Pit? If not, it should be below its outflow.*

DRAFT

AEE used data for Simpson Creek in the derivation of a regional flood frequency relationship. Otherwise, to date the data for this stream has not been used extensively as the Simpson Creek drainage basin lies outside the basin draining the Telkwa Project area. However, we will consider the use of the data further should the need arise.

Site C is located on Four Creek east of north tip of North Tenas pit. The location of the outflow point from the pit is unknown at this time. (get pit design from Al/Jerry and find out where outflow is.) Gaugung site locations will be reviewed critically to ensure location provides useful/reliable information once the project reaches the Certificate level.

3.1.3 *Stage-discharge curves must be based on measured points only.*

Only 7 months duration of data were available at the time the year one data report was prepared. IN the preparation of the 2nd year monitoring report, additional measurements from the 1998 field season will be available and used to confirm the results from the previous year. AS such it may prove necessary to evaluate and revise some of the data from the previous year based on the results from 1998. We appreciate the comment on this particular data plot, and will check the data again.

3.1.4 *The datalogger record is not coincident with staff gauge readings, except for three points; the calculated discharges are thus questionable. The datalogger must be calibrated at the site with hydrometric levelling of staff gauges and benchmarks. The datalogger and staff gauge level readings must be coincident, if not, an error must be applied to form corrected gauge heights before discharges are calculated.*

The data logger was tied in to local benchmarks. These surveys were conducted in 1997 and 1998. At this site there is a possibility that some stage readings may be relative to one staff gauge and some to another staff gauge. (Two staff gauges were established att he site to cover low and high stages. The data will be reviewed to ensure that the proper staff gauge was referenced and so that the transducer and staff gauge records correlate properly.

3.1.5 *Consult WSC or RIB personnel for a cost estimate of a cableway.*

WSC staff in Terrace have been consulted regarding the construction of a cableway across the Telkwa River. Cost estimates have been prepared, and were provided to MCL/LL on date. Long term site location needs to be determined relative to planned discharge (outfalll) points at which time a cableway will be considered. In the meantime the discharge data from the Telkwa River gauge can be added to the WSC Gaothorn Creek gauge data to give estimates of river discharges in the lower reach of the river.

3.3.4 *As per comments for 3.1.4*

DRAFT

AEE will take a second look at the data for Four Creek.

3.9.1 *What is the hydrologic purpose of an ephemeral stream hydrometric station for this project? If the gauge is for mines operations or water management, then it has a purpose.*

The Tailings Pond gauge was established on the ephemeral stream (called Tailings Pond Creek) below the proposed pond outlet and approximately 500 m downstream of present tailings disposal area. The intent of the data gathering for this station was to provide discharge data to facilitate the derivation of a water balance. for the proposed tailings pond. It should be noted that as the design of the facility has progressed, the size of the proposed tailings pond has shrunk from 100 ha to 30 ha

5.0 *Delete the last sentence of the third paragraph. The stage data collected may not lead to good quality discharge data.*

AEE will take under advisement the comments provided relative to sections 3.1.4 and 3.3.4. These items will be reviewed as discussed above. Also, as more discharge data is obtained, the rating curves will be improved. This will provide an opportunity to review previous estimates of discharge from the historical stream gauge height records.

We thank you for the opportunity to provide engineering and environmental services to this project. If you have any questions or require further information, please call the undersigned at 235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

Scott Davidson, M.Sc., P.Geo.
Geomorphologist

DRAFT

SCD/GREB/km

Attach.

cc: Jerry Demchuk, Norecol Dames & Moore

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Manalta Coal / Luscar mine site Fall 1998

Upper Goathorn - XS Nov 10. Staff gauge @ site

Upper Tenas - XS Nov 10 Staff gauge @ site

Four Creek - automated depth logger removed Nov 9
Staff gauge at site
no XS, waters level too low.

Lower Tenas - XS Nov 10. Staff gauge @ site
- automated depth logger removed Nov 10

Helps Cr - automated depth logger removed Nov 24
- Staff gauge @ site

Telkwa R - automated depth logger removed Nov 24
- staff gauge at site

North Site - logger downloaded Nov 9. Plans to remove Nov 25.

Tailings Pond - logger not re-installed after June 10 (dry).
Little/No fall flows at site

Water Chemistry at all sites Nov 9/10

Metals sampling at Lower Goathorn Lower Tenas + Telkwa R on Nov 9, Nov 16, Nov 24 with two weeks of metals sampling remaining.

Please call Jessy Harper 847-8783 (area code 250) if you have any questions.

AGRA
Earth & Environmental Limited
Box 3966
#3, 3167 Tatlow Road
Smithers, B.C. V0J 2N0

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

October 6, 1998
CW1537.901

Manalta Coal Ltd./Luscar Ltd.
7th Floor, 700 - 9th Avenue SW
Calgary, Alberta T2P 3V4

Attention: Mr. Al Fleming, P.Eng. Fax: 269-8075

Dear Mr. Fleming:

Re: Budget Update
Telkwa Coal Mine
Hydrological Analyses

Further to our telephone conference call on October 2, 1998 with you and Jerry Demchuk, AGRA Earth & Environmental Limited (AEE) is pleased to provide you with a summary of the hydrological work you requested for the remainder of the calendar year. It is understood that Manalta Coal Ltd. (MCL, and/or its present owner, Luscar Ltd.) wish to have a single amendment to the existing contract for the remainder of this year's work related to the Telkwa Coal Mine Project.

A total of $25,182 is required to complete activities presently authorized by MCL for 1998. Table 1, attached, summarizes the individual tasks.

This estimate reflects the present monitoring program and does not include provision for changes to stations or station locations that may be required following granting of the Project Certificate.

The present contract value is $170,697.05, as amended by Change Order #5 (Oct. 2, 1997). Billings under this contract have totalled $178,671.64. As discussed October 2, 1998, the project is therefore over-billed $7,974.59. The outstanding work presented in Table 1 totals $25,182.00. The required adjustment to the contract is therefore $33,156.59. The resultant contract value following the revision is therefore $203,853.64.

If the program is continued to February 1999, the following additional components would be required: metals sampling ($8,720), regular monitoring and water quality sampling and analysis ($4,622 or less, depending on access and whether streams are flowing or frozen solid) , low-flow discharge measurements on the Telkwa River (potentially 2 measurements at $1,200 per

measurement) and additional data analysis and reporting ($4,000). The total for extending the program to February, 1999 is estimated at $19,742 (on top of the 1998 budget discussed above).

2.0 SCHEDULE

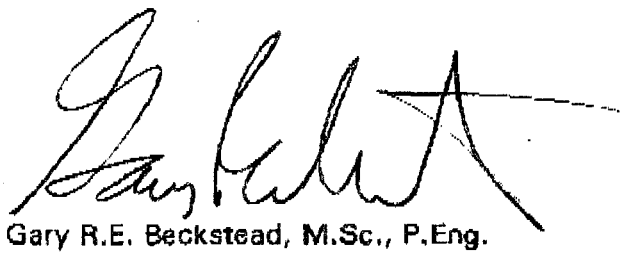
AEE will complete the work (i.e., reporting) by January 31, 1999. The actual field work will be completed by the end of November or the first week of December, 1998.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project. If you have any questions or require further information, please call the undersigned at 235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited



Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

GREB/km

Attach.

cc: Scott Davidson, AEE - Smithers

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TABLE 1
Remaining Tasks and Costs for 1998
Surface Water Monitoring Program

Task	Description	Cost
1	Metals Sampling. Additional metals sampling program, scheduled for late October and early November, 1998[1], as per the June 16, 1998 letter.	$8720
2	Regular flow Monitoring. Flow measurement, water quality sampling and analysis and data download from dataloggers[1] at the end of October as per October 24, 1997 fax to J. Demchuk.	$4622
3	Regular flow Monitoring. Flow measurement data download from dataloggers and removal of water level transducers and dataloggers for the winter season at the end of November or the first week of December as per October 24, 1997 fax to J. Demchuk.	$1190
4	Reporting. Preparation of annual data report to the end of December, 1998 and incorporate the 1997 and 1998 data into a single summary report, as directed.	$10,000
5	Project Management. QA/QC and financial management of the work, as per October 24, 1997 fax to J. Demchuk..	$2190
Total		**$25,182**

1 The work for Tasks 1 and 2 will be scheduled at the same time to reduce travel and time expenditures. Special laboratory analyses of water quality samples are included in Tasks 1 and 2.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

NOTICE OF TRANSMITTAL

221 - 18 Street SE
Calgary, Alberta T2E 6J5
Phone: (403) 235-8118
Fax: (403) 248-1590
E-mail: gbeckstead@agraee.com

TO: Luscar Ltd.
1600 Oxford Tower,
10235 - 101 St.
Edmonton , AB
T2P 3V4

DATE: February 11, 1999
OFFICE: Calgary
PROJECT NO.: CW1537
PROJECT NAME: Telkwa Coal Mine

ATTENTION: Mr. Al Fleming **PHONE:** (780) 420-4080

THE ENCLOSED DOCUMENTS AND/OR DRAWINGS ARE SUBMITTED:

☐ FOR YOUR APPROVAL ☑ AS REQUESTED ☐ FOR YOUR REVIEW AND COMMENT
☐ FOR YOUR INFORMATION ☐ FOR YOUR SIGNATURE ☐

DELIVERED BY: ☐ MAIL ☑ COURIER ☐ HAND

COPIES	DRAWING NO.	DESCRIPTION
2	Bound Copies	Reports entitled "Telkwa Coal Mine Surface Water Monitoring Program 1998"
1	Unbound Copy	Report entitled "Telkwa Coal Mine Surface Water Monitoring Program 1998"

REMARKS: Please find the above mentioned reports enclosed. A CD with the report and figures will be sent in tomorrow's courier. One copy of the report has been forwarded to Mr. Jerry Demchuk at his request.

SUBMITTED BY: for: Gary Beckstead, M.Sc., P.Eng.

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AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

NOTICE OF TRANSMITTAL

221 - 18 Street SE
Calgary, Alberta T2E 6J5
Phone: (403) 235-8118
Fax: (403) 248-1590
E-mail: gbeckstead@agraee.com

TO: Luscar Ltd.
1600 Oxford Tower,
10235 - 101 St.
Edmonton , AB
T2P 3V4

DATE: February 11, 1999
OFFICE: Calgary
PROJECT NO.: CW1537
PROJECT NAME: Telkwa Coal Mine

ATTENTION: Mr. Al Fleming **PHONE:** (780) 420-4080

THE ENCLOSED DOCUMENTS AND/OR DRAWINGS ARE SUBMITTED:

❑ FOR YOUR APPROVAL ☑ AS REQUESTED ❑ FOR YOUR REVIEW AND COMMENT
❑ FOR YOUR INFORMATION ❑ FOR YOUR SIGNATURE ❑

DELIVERED BY: ❑ MAIL ☑ COURIER ❑ HAND

COPIES	DRAWING NO.	DESCRIPTION
1	CD	Report and Figures for Telkwa Surface Water Monitoring 1998

SUBMITTED BY: _____
for Gary Beckstead, M.Sc., P.Eng.

cc: Mr. Jerry Demchuk
1610, 734 - 7 Avenue SW
Calgary, AB T2P 3P8

P:\PROJECT\Cw\1537\tn021299.wpd

PITEAU ENGINEERING LTD.

HYDROGEOLOGICAL AND GEOTECHNICAL CONSULTANTS
Suite 100, 4500 - 16th Avenue NW
Calgary, Alberta, Canada T3B 0M6

Telephone: *(403) 286-2522*
Facsimile: *(403) 247-4811 / (403) 247-0779*
E-mail: *komex@komex.com*

TO FAX #: 269-8075
COMPANY: Manalta Coal Ltd.
ATTENTION: Al Vanderputten

Fleming

DATE: June 27, 1997
PROJ. #: 3773-13
FROM: Bob Clarkson
NO. OF PAGES: 10
(INCLUDING COVER PAGE)

Al,

Please find attached a draft copy of our proposed workplan/cost estimate for the 1997 geotechnical/hydrogeological program at Telkwa. Figure 1 has not been included, but the piezometer locations are the same as identified during the meeting.

Once you have had a chance to review, please give either Fred or myself a call to discuss.

Regards,

Bob Clarkson

J:\3773\3773-13\CORR\FAX1.DOC

PITEAU ENGINEERING LTD.
HYDROGEOLOGICAL AND GEOTECHNICAL CONSULTANTS

SUITE 100, 4500 - 16TH AVENUE N.W.
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TELEPHONE (403) 286-2522
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e-mail: komex@komex.com

June 24 1997

OUR FILE: KI97-3773-13

Manalta Coal Ltd.
7th Floor, 700 - 9th Ave. SW
Calgary, Alberta
T2P 3V4

Attention: Mr. Allan Vanderputten, P.Eng.

Dear Sir:

Re: ***Work Plan for Geotechnical and Hydrogeological Services 1997 Program, Tenas Creek Area, British Columbia***

1.0 INTRODUCTION

Piteau Engineering Ltd. (Piteau) is pleased to present our draft proposal and workplan for the above project. This proposal addresses the 1997 geotechnical, hydrogeologic and hydrologic workplans for the Tenas Pit and Pit 3 areas, and was developed in consultation with Manalta Coal Ltd. (Manalta) based on our meeting of June 13, 1997. These workplans fulfill the groundwater and water quality information requirements outlined on the draft project specifications for the Telkwa Coal project provided to us by Manalta.

The purpose of the 1997 geotechnical work program is to assess geotechnical conditions in the area of the Pit 3 waste dumps, the coal processing plant, and at the proposed location of the bridge crossing of the Telkwa River. The overall objective of the 1997 hydrogeological work program is to improve the level of understanding of baseline groundwater conditions in the areas of Tenas Pit and particularly Pit 3. The hydrological work will focus on development of a water balance for the post mining condition at Tenas Pit and Pit 3.

Information and data from previous investigations (Klohn Leonoff, 1985, Piteau 1994a and 1994b, Piteau 1995, Piteau 1996a and 1996b, and Piteau 1997a, 1997b, and 1997c) shall be referenced as much as possible to assist in attaining these objectives.

2.0 PROPOSED FIELD INVESTIGATIONS

The field investigations proposed within each facility area are briefly discussed below. As in previous geotechnical/hydrogeological investigations completed for the Telkwa coal project, the rotary drill to be used by Manalta for their coal exploration program will be adapted for the deep borehole drilling and proposed monitoring well installations. Moreover, piezometers will be installed within coal exploration boreholes. A backhoe will be utilized for the geotechnical investigations at the Pit 3 waste dumps, plant site and bridge crossing, coupled with interpretation of general overburden type and depth to bedrock from exploration holes.

Proposed hydrogeological borehole/monitoring well locations are shown in Figure 1.

2.1 PIT 3

2.1.1 GEOTECHNICAL INVESTIGATION OF WASTE DUMPS

The objective of the geotechnical investigation is to determine the lithology and basic soil parameters of the dump foundation. The investigation shall consist of the following:

- reconnaissance of the dump sites to verify terrain conditions, map surface water and springs, and to examine soil and rock exposures;
- excavation of approximately 5 test pits, up to 5 m deep, along the existing road in the central area of the dump to log soil units and collect soil samples; and,
- laboratory testing of soil samples, including moisture content, Atterberg limits, grain size and penetrometer strengths.

Depth to bedrock will be determined from exploration drill holes.

A brief report will be prepared documenting the investigations, geotechnical conditions, overall suitability of the site, and any limitations on dump development.

2.1.2 HYDROGEOLOGICAL INVESTIGATION

In view of the fairly complex hydrogeological setting at Pit 3, and in particular the potential importance of faults and fractures on groundwater flow, it is proposed that the groundwater monitoring network be expanded with the installation of six double piezometer nests (site # 3, 10, 15, 24, 28, and 52, see Figure 1). If possible, at one or two piezometer nest locations, efforts will be made to install a piezometer(s) directly within or adjacent to an identified fault zone.

The deeper piezometer will be completed in coal seam 2 while the shallow piezometer will be installed in coal seam 4. However at sites # 28 and #52, it is anticipated the deeper piezometer will be installed in seam 1. Following piezometer development, hydraulic conductivity testing will be performed. The piezometers will be sampled to determine groundwater quality, as well as to assess horizontal groundwater flow patterns, and vertical hydraulic gradients between the two coal seams.

Groundwater quality monitoring will be also be completed at the other existing piezometers (5 in total) completed within the Pit 3 area (i.e., T96R series piezometers). Groundwater samples will be analyzed for the same suite of chemical parameters previously analyzed for, and as specified by the B.C. Ministry of Environment.

Results from the 1997 hydrogeological program, together with hydrogeological information gathered from the aquifer test (discussed below) will be used to develop a better conceptual understanding of groundwater flow and groundwater quality within Pit 3.

2.1.3 AQUIFER TESTING PROGRAM

One of the key hydrogeological issues pertaining to the Telkwa Coal project is the potential influence of regional faults and fractures on groundwater flow. Moreover, related to this is the potential for impact of mining activities on local water wells. To address these issues, it is recommended that an aquifer test be conducted at a test well located within a suitable area of Pit 3 (location to be finalized).

Although the final design of the test well will be determined in the field, based on hydrogeological conditions, it is recommended that the pilot hole be drilled to a diameter of 200 mm (8"). This borehole diameter will permit installation of 150 mm (6") diameter water well casing and use of a submersible pump (5 or 7 hp) sufficient to adequately stress the aquifer. The decision as to whether to install well screen (compared with open hole) will be assessed during the borehole drilling. It is our understanding the test well will be drilled using a local water well contractor and that Manalta will be responsible for overseeing drilling activities. Consequently, we have not included costs for supervision of the drilling of the test hole.

It is recommended that the aquifer test consist of a 48 hour constant rate drawdown component followed by a 48 hour recovery component. In the event aquifer boundary conditions are identified, the drawdown component of the test would be extended to at least 72 hours. The constant rate test should be preceded by a 4 hour step drawdown test to evaluate well efficiency and to determine a suitable rate for the constant yield test. During the aquifer test, groundwater levels will be monitored in selected observation wells in Pit 3 and if possible, in domestic wells located within 2 km of the test well. Groundwater levels will be monitored manually using electric water level tapes as well as using pressure transducers and data loggers. A turbine and digital flow meter would be used to monitor groundwater pumping rates.

policy! require

Results from the aquifer test will permit determination of the hydraulic properties (i.e., transmissivity and storativity) of coal seam 2. This information will be used to refine estimates of the groundwater flow velocity in the coal seams and may provide insight into the role and importance of fractures and faults within the Pit 3 area. Potential effects of mining activities on nearby domestic wells will also be assessed.

2.1.4 GEOTECHNICAL LOGGING OF ROCK CORE

There is an opportunity for collection of geotechnical information of rock core during exploration drilling operations. It is thus proposed that a geotechnical engineer from Piteau (Vancouver)

spend one day on-site with Manalta geologists to provide training for the collection of geotechnical data (as required) during their drilling and logging operations.

Tamas ✓ missing?

2.1.5 HYDROLOGICAL ASSESSMENT

Sect 2.4

A preliminary water balance will be developed for Pit 3. The pit water balance methodology will be based on the procedures previously developed for Pits 7 and 8 (Piteau, 1994a). Estimates of groundwater inflows will be combined with estimates of surface water runoff to establish filling rates. As was the case for Pits 7 and 8, a sensitivity analysis will be conducted to establish the range of possible filling rates, taking into account uncertainties in groundwater inflow rates and wet/dry year scenarios.

2.2 COAL PROCESSING PLANT - GEOTECHNICAL INVESTIGATION

The objective of the geotechnical investigation is to provide data for confirming the feasibility of two potential sites and to develop preliminary designs. The investigation will consist of the following:

- excavation of approximately 6 test pits, 5 m deep, to be located along the perimeter of the 43 m x 16 m plant site configuration - log soil units and collect soil samples; and,
- laboratory testing of soil samples, comprising moisture content, Atterberg limits, grain size and penetrometer strengths, and if softer clay soils are found unconsolidated undrained triaxial and consolidation tests.

Depth to bedrock will be determined from exploration drill holes.

A brief report will be prepared documenting geotechnical conditions, and discussing options and providing relevant design parameters for the plant foundation.

2.3 BRIDGE ON TELKWA RIVER - GEOTECHNICAL INVESTIGATION

The objective of the geotechnical investigation is to confirm the geotechnical feasibility of crossing the river and to provide data for preliminary foundation design. The investigation will consist of the following:

- excavation of approximately 6 tests pits, 5 m deep, at 2 or 3 locations on each side of the river crossing to log soil units and collect soil samples;
- drilling 2 boreholes with the exploration rig: one on each bank (to bedrock or to 30 m deep in gravel, or 50 m deep in clay), logging of drill cuttings to determine soil type (gravels vs. sand vs. silt/clay); and,
- laboratory testing of soil samples, comprising moisture content, Atterberg limits, grain size and penetrometer strengths, and if softer clay soils are found, perform unconsolidated undrained triaxial and consolidation tests.

A brief report will be prepared on the investigation and geotechnical conditions encountered, and providing relevant foundation design parameters.

2.4 TENAS PIT

2.4.1 HYDROGEOLOGICAL INVESTIGATION

It is proposed that the groundwater monitoring network be expanded with the installation of two double piezometer nests near the north end of Tenas Pit (Figure 1). The deeper piezometer will be completed in coal seam 1 while the shallow piezometer will be installed in coal seam "c". Following piezometer development, hydraulic conductivity testing will be performed. The piezometers will be sampled to determine groundwater quality, and to estimate horizontal groundwater flow patterns, and vertical hydraulic gradients between the two coal seams.

Groundwater quality monitoring shall also be completed at all other existing piezometers (19 in total) completed within the Tenas Pit area (i.e., T95R, T96R, and TOB96 series piezometers).

Information garnered from the 1997 hydrogeological program will augment the existing hydrogeological database that exists for the Tenas Pit.

2.4.2 HYDROLOGICAL ASSESSMENT

A preliminary water balance will be developed for the Tenas Pit. The approach for the water balance will be the same as described for Pit 3 in Section 2.1.5.

3.0 COST ESTIMATE

The estimated cost of the investigation program is $118,405, exclusive of the GST. A detailed cost breakdown is provided on Table 1.

In developing these costs the following assumptions were made:

- all survey work (i.e., ground surface and top of piezometer casing elevation) will be arranged by Manalta;
- costs for borehole drilling, piezometer construction materials and excavation of test pits are not included;
- contractor costs for the drilling/installation of the test well and aquifer testing are not included; and,
- Piteau only charges for costs actually incurred. Any cost savings generated through more rapid program completion would be passed onto Manalta; conversely any additional costs due to unexpected or difficult subsurface conditions or down time from poor weather, would be charged at extra cost at the units rate listed in Table 1.

Additional assumptions in the cost estimate are presented in Table 1.

4.0 SCHEDULE AND REPORTING

The schedule of the work will coincide with Manalta's exploration program, which is presently understood to consist of a 3 week on/3 week off rotation, beginning July 15, 1997. Therefore, it

is anticipated scheduling for the geotechnical/hydrogeological field work and reporting will be as follows:

- July 21 to August 2, - Borehole drilling and piezometer installations (Pit 3 area); geotechnical investigations;
- Late-August to mid-September, - borehole drilling and piezometer installations (Tenas Pit area); aquifer testing program; groundwater sampling; and,
- October 30, - submission of draft reports summarizing results from the hydrogeological and geotechnical programs completed in 1997.

It is our understanding that results from the hydrogeological/hydrological investigations will form the basis for a stand alone report summarizing baseline hydrogeological conditions at the Tenas Pit and Pit 3. The reports will essentially augment the previous detailed baseline report prepared by Piteau (1997a). Information from the geotechnical investigations will be presented under separate cover.

5.0 CLOSURE

We trust this cost proposal is suitable for your present needs. If you have any questions, please do not hesitate to contact either of the undersigned or Dr. Tad Dabrowski.

Respectfully,

PITEAU ENGINEERING LTD.

Frederic B. Claridge, M.S., P.Eng.

Robert S. Clarkson, M.Sc., P.Geol.

REFERENCES

Klohn Leonoff Consulting Engineers, 1985. *Crows Nest Resources Ltd., Telkwa Coal Project, Stage II Geotechnical, Hydrogeological & Hydrological Design Report.*

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DRAFT

TABLE 1
COST ESTIMATE

FACILITY/WORK TASK	PRINCIPAL ENGINEERS		HYDROGEOLOGIST/ENGINEER			TECHNOLOGIST	DRAFTING/ CLERICAL	DISBURSEMENTS	TOTAL ($)
	F. Claridge $100.00/hr	T. Dabrowski $110.00/hr	B. Clarkson $80.00/hr	M. Fitch $77.50/hr	R. Armstrong $65.00/hr	$55.00/hr	$50.00/hr		
1. Pit #1 Waste Dumps									
Reconnaissance and Test Pits					12			350	1,130
Geotech Lab Tests								600	600
Stability Analysis					8				520
Reporting	4				15		5	400	2,025
Vehicle Rental (assume 1 day)								150	150
Living Expenses (assume 1 day)								110	110
Travel Expense								1,200	1,200
Sub-total	4				35		5	2,810	5,735
2. Plant Site									
Test Pits					12			200	980
Lab Tests								600	600
Reporting	4				25		5	200	2,475
Vehicle Rental (assume 2 days)								300	300
Living Expenses (assume 2 days)								220	220
Sub-total	4				37		5	1,520	4,575
3. Bridge Crossing of Telkwa River									
Test Pits and Drilling					20				1,300
Lab Tests								600	600
Reporting	4				30		10	400	3,250
Vehicle Rental (assume 2 days)								300	300
Living Expenses (assume 2 days)								220	220
Sub-total	4				50		10	1,520	5,670
4. Geotechical Logging of Rock Core									
Training/on-site supervision						14			770
Vehicle Rental (1 day)								150	150
Living Expenses (1 day)								110	110
Travel Expense								1,000	1,000
Sub-total						14		1,260	2,030
5.1 Pit 3 - Hydrogeological/Hydrological Investigations									
Piezometer Installations (6 double piezometer nests; 12 piezometers in total)									
Supervision			72						5,760
K Tests (12 piezometers)			24			24		250	3,480
Groundwater Sampling/Analysis (1996 and 1997 piezometers; 23 in total)			20			20		10,925	13,625
Water Balance			10	30		6	4	100	1,540
Reporting		6	50			26	30	500	6,035
Vehicle Rental (14 days)								2,100	2,100
Living Expenses (16 man days)								1,780	1,780
Travel Expense (assume 1 person mob/demob in July; assume 2 persons mobile/demob in August)								3,600	3,600
Sub-total		6	176	30		77	34	19,235	39,910
5.2 Pit 3 - Aquifer Test									
Step/drawdown Test			8						480
Aquifer Test (assume 48 hour drawdown and 48 hour recovery)			40			40		2,000	7,400
Groundwater Sampling/Analysis (2 samples from test well)								900	900
Equipment Rentals(Pressure transducers, data loggers, field parameter kit, water level, etc.)									0
Reporting			40			10	6	200	4,250
Vehicle Rental (5 days)								750	750
Living Expenses (10 man days)								1,100	1,100
Travel Expense (NC, assume mob during August program)								2,400	2,400
Sub-total			88			50	6	7,350	17,280

JUN-27-1997 08:42 KOMEX INTERNATIONAL LTD. 403 247 4811 P.09/10

DRAFT

TABLE 1
COST ESTIMATE

FACILITY/WORK TASK	PRINCIPAL ENGINEERS		HYDROGEOLOGIST/ENGINEER			TECHNOLOGIST	DRAFTING/ CLERICAL	DISBURSEMENTS	TOTAL ($)
	F. Claridge $100.00/hr	T. Dabrowski $110.00/hr	B. Clarkson $80.00/hr	M. Fitch $77.50/hr	R. Armstrong $65.00/hr	$55.00/hr	$50.00/hr		
5.3 Tenas Pit - Hydrogeological/Hydrological Investigations									
Piezometer Installations (2 double piezometer nests; 4 piezometers in total)									
Supervision			22						1,760
K Tests (4 piezometers)			8			8			1,080
Groundwater Sampling/Analysis (1995, 1996 and 1997 piezometers; 19 in total)			25			25		11,000	14,375
Water Balance			8	30		8	4	100	1,380
Reporting		2	30			10	12		3,770
Vehicle Rental (5 days)								750	750
Living Expenses (10 man days)								1,100	1,100
Travel Expense (NC, assume mob during August program)									
Sub-total		2	93	30		51	16	12,950	24,215
5. REPORTING AND MANAGEMENT									
Reporting (Final/Review)	16	16	35		10	8	20	500	8,750
Management/Coordination	16	4	16					200	3,520
Field Program Preparation			16						1,280
Meetings	8	6	16				4	300	3,240
Computer Usage								2,200	2,200
Sub-total	40	26	83		10	8	24	3,200	18,990
TOTAL	***52***	***34***	***438***	***60***	***132***	***200***	***100***	***49,845***	***118,405*** +GST

Notes:
1. Vehicle Expense = $150/day
2. Living Expense (accommodation and meals) = $110/day
3. Groundwater chemical analysis (as per B.C. Environment requirements) = $475/sample.
4. Geotechnical laboratory analysis moisture content = $4/sample; Atterberg limits = $65/sample; grain size and hydrometer = $160/sample; standard proctor density = $145/sample.
5. It is assumed the drilling rig for the coal exploration program will be available for deep borehole drilling, geotechnical sampling, and monitoring well installations in the Tenas Creek Pit area; therefore drilling costs have not been included.
6. Costs for the backhoe and drill rig required for Tasks 1, 2, and 3 are not included.
7. Piezometer installation assumes the boreholes have been drilled and a drill rig is available to install construction materials. Any delays in the piezometer installation outside of Komex's control will be charged at the unit rates listed.
8. It is assumed that all survey work (i.e., ground surface elevation, top of piezometer casing elevation, and piezometer stick-up will be the responsibility of Manalta.

(403)-420-4089 ATTN: ALLAN FLEMMING

PITEAU ENGINEERING LTD.

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TO: Jerry Demchuk
COMPANY: Norecol
FAX #: 777-4150

FROM: Rob Armstrong
DATE: January 12, 1999
PROJ. #: 3773-17
NO. OF PAGES: 3
(Including Cover Page)

rarmstrong@calgary.komex.com

Re: Telkwa Coal Project: Remaining Issues

This fax is to describe the scope of work developed in our January 8, 1999, meeting. The scope of work for the three issues we discussed is as follows:

Hydrology of Four Creek
There is concern over diversions on the ecosystem (most importantly fish) on Four Creek. The hydrology component will examine the pre- and post-development flows in the creek. Discussions with Dave Bustard will be required to determine the sensitivity of the aquatic community to these flow changes.

The hydrology for the Telkwa project collected to date has largely ignored the hydrology data collected on-site, since this data was previously too sporadic and of insufficient duration to answer questions concerning long-term hydrology (such as 1:200 year low flow events). However, given that a question specific to Four Creek has been posed, it will be necessary to integrate the regional flow information and the Four Creek monitoring data provided by Agra. Using this information, estimated monthly average and low flows (pre- and post-development) will be calculated. ← Luscar to do stats.

If the proposed diversions are likely to cause problems for the fishery, it may be necessary to examine alternate filling scenarios for the Tenas pits. For example, a structure could be constructed which would divert water to the pit only when a minimum flow level was achieved. This will require recalculation of the filling times for the Tenas pits.

Residual Moisture Content of Haul Road Surface No. Cirmac consulted
An estimate of the residual moisture content of the Haul road surface (soil surface) is required for the dust fall modelling. At present the model has been performed for a moisture content range of 4 to 11%, and the predicted dust fall has proven to be sensitive within that range. A literature review is required, along with some preliminary analysis specific to the weather conditions at the Telkwa area, to refine the data input.

Weathering Characteristics of Waste Rock
There is empirical evidence that the waste rock that will be generated at Telkwa is susceptible to breakdown due to weathering. It has therefore been suggested that the waste rock dumps will be self sealing as the waste rock weathers, resulting in surface water running off the dumps, rather than infiltrating them. A review of all current data available on the waste rock is required, with the purpose

of predicting the breakdown of the waste rock dump faces, the resulting permeability of the dump surface, and the resistance of the dump face to erosion.

Closure

Since these issues are all significantly different, we suggest that three separate letter reports would be suitable. We propose to issue a draft of the reports by February 5, 1999. Final copies to be issued 1 week after comments are received back from yourself. The cost estimate to perform this work is attached. Since this scope of work is a bit loose we emphasize that it is only an estimate, and believe that the cost will range between $5,000 and $10,000.

PITEAU ENGINEERING LTD.	ESTIMATE OF ENGINEERING COSTS	FILE: Telkwa
	Residual Moisture Content of Road Material and Weathering of Waste Rock Dump Desk Top Investigation	DATE: 12-Jan-99
CLIENT: Luscar		BY: RCA
PROJECT NO.: 3773-17		REV: A
LOCATION: Telkwa		

ITEM	DESCRIPTION	ENGINEERING QTY	UNITS	RATE	EXTENSION		
1	**RESIDUAL MOISUTRE CONTENT IN ROAD MATERIAL**						
	Literature Review	15	Hours	$60	$900		
	Report	8	Hours	$75	$600		
	Sr. Review	4	Hours	$110	$440		
	Client Support	8	Hours	$75	$600		
		35			SUB TOTAL	$2,540	2540
2	**WASTE ROCK WEATHERING**						
	Review Existing Data	10	Hours	$60	$600		
	Review Other Mine Experience	10	Hours	$60	$600		
	Report	8	Hours	$75	$600		
	Sr. Review	4	Hours	$110	$440		
		32			SUB TOTAL	$2,240	2240
3	**HYDROLOGY OF FOUR CREEK (Junior Hydrologist: $60, Senior Hydrologist: $85, Principal Water Resources Engineer: $110)**						
	Review Existing Data	4	Hours	$85	$340		
		2	Hours	$60	$120		
	Integration of regional data and Agra data	8	Hours	$85	$680		
		4	Hours	$60	$240		
	Examine diversion alternatives (if fisheries problem)	8	Hours	$85	$680		
		8	Hours	$60	$480		
	Report	8	Hours	$60	$480		
		4	Hours	$85	$340		
	Sr. Review	4	Hours	$110	$440		
		38			SUB TOTAL	$3,800	3800
	COMPUTER OVERHEAD	70	Hours	$2.50	$293		293
	SECRETARY (5%)				$429		429
	Subtotals	117	Hours		$9,302		5551
	Contingency (10%)				$930		555
	GRAND TOTAL				$10,232		6106

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TO FAX #: 780. (403) 420-5878
COMPANY: Luscar
ATTENTION: Allan Flemming

DATE: Jan 26, 1999
PROJ. #: 3773-17
FROM: Murray Fitch
NO. OF PAGES: 18.
(INCLUDING COVER PAGE)

JED
(403) 777-4150

Re: ***Final Draft Letter - Four Creek Hydrology***

Allan,

Please find attached a final draft of the letter. It is basically complete – lacking only the unfaxable (because of size) Figure 1. If this meets your requirements, I can courier it out whenever you say the word. If not, please call me at (403)286-2522.

Murray

\\CENTRAL\DATA3\X\PROJECTS\3773\3773-17\CORR\fltr156.doc

⇒ Jerry).

PITEAU ENGINEERING LTD.
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February 26, 1999

OUR FILE: 3773-17

Luscar Coal Ltd.
10235 - 101 St.
Edmonton, AB
T5J 3G1

(fax) 780.420.5878
(tel) 780.420.4080

Attention: Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: Hydrology of Four Creek

INTRODUCTION

A previous report, *Water Management for the Telkwa Coal Project* (Piteau 1998, henceforward referred to as WMTCP), addressed the issue of hydrology in and around the proposed Telkwa Coal Project. In order to ensure the rapid filling of abandoned pits, the diversion of a number of creeks is anticipated. One of these, Four Creek, was identified by the British Columbia Ministry of Environment, Lands and Parks (MELP) as being of concern from a fisheries perspective. This letter addresses the issue of the hydrologic implications of the diversion of a portion of the upper drainage of Four Creek.

HYDROLOGY OF FOUR CREEK

Figure 1 shows the drainage sub-basins of Four Creek[1]. For analysis purposes, flows have been considered at the following locations:

---

[1] A discrepancy exists between the drainage area used in this report and that used in the WMTCP report. Previously, a drainage area of 13 km^2 was calculated using 1:50,000 topographical maps - 1:20,000 scale maps used in this report suggest a 10 km^2 drainage area.

1: the proposed diversion location into the Tenas Main Pit
2: two thirds of the drainage area
3: the mouth of Four Creek (confluence with Goathorn Creek)

Four Creek flow data was collected in 1997 (October-November) and 1998 (June-November). Of greatest hydrologic (and fisheries) concern are the relatively rare low flow events. The data record for Four Creek is not sufficiently long to permit the calculation of low-flow statistics, and thus the record must be supplemented by longer-term precipitation data and/or regional hydrologic data. These are discussed below.

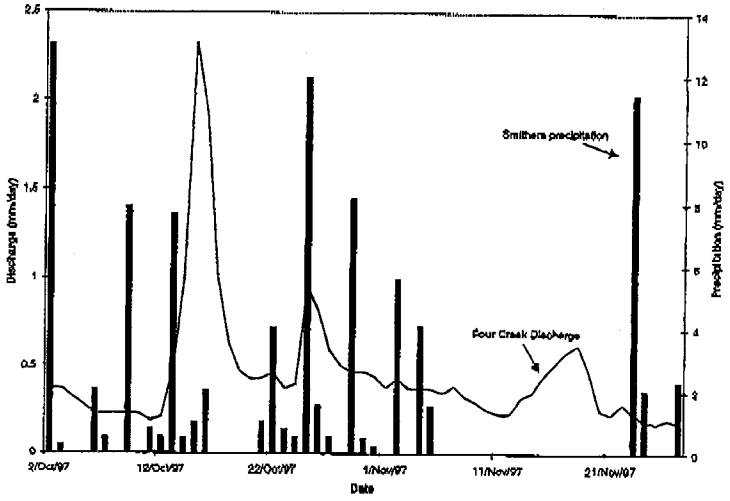

Figure 2: Four Creek discharge and Smithers Precipitation for 1997

CORRELATION OF TELKWA AREA RUNOFF AND SMITHERS PRECIPITATION

In general, the correlation between precipitation recorded at Smithers Airport and discharges in Simpson, Goathorn and Four Creeks is only fair. The discrepancy is more pronounced in the 1997 record than in 1998. Figure 2 and Figure 3 show the relationship between Four Creek discharges and Smithers precipitation for 1997 and 1998. Large precipitation events are not reflected in the discharge record, particularly after October 22. In addition, discharge in Four Creek increased in mid-November when no precipitation was recorded at Smithers.

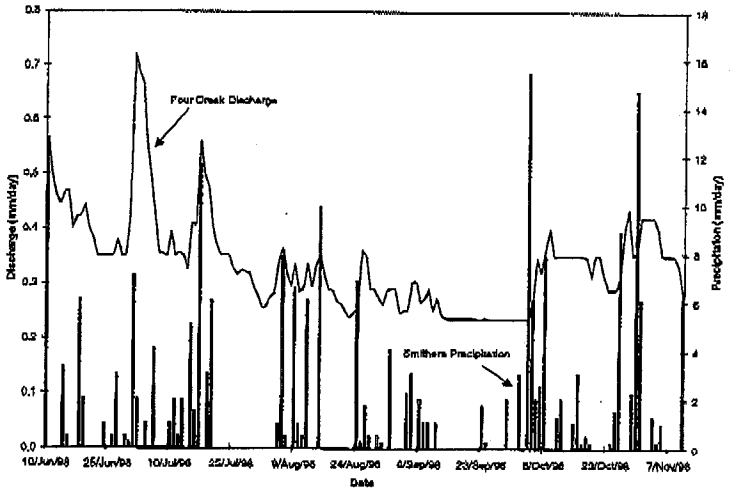

Figure 3: Four Creek Discharge and Smithers Precipitation for 1998

The timing of runoff and precipitation events for 1998 have a closer relationship than in 1997. Storm events in Smithers are generally reflected in the Four Creek discharge record. However, the magnitude of runoff response to precipitation is not well represented. Several large late-season precipitation events only result in minor increases in Four Creek discharge, as compared to early July where runoff is at its peak with only moderate precipitation recorded at Smithers. The record suggests that, at least on a daily time scale, precipitation recorded at Smithers is not representative of the precipitation received at Telkwa.

Over the longer-term (monthly or annually), however, the precipitation, however, the Smithers and Telkwa precipitation data appeared to correlate reasonably well. In the WMTCP report, precipitation recorded at Smithers (elevation 523 masl; 55 years of data) was compared to precipitation recorded at Telkwa (elevation 683 masl; 26 years of data) and Telkwa Coal Mine Road (elevation 670 masl; 3 years of data). Both Telkwa stations were discontinued over 10 years ago, however, the data suggests that the Telkwa area receives roughly 11% less precipitation than Smithers. Thus, the Smithers precipitation data was reduced by 11%, which was used to estimate precipitation, surface runoff and infiltration into the coal pits.

COMPARISON OF HYDROLOGY OF FOUR AND GOATHORN CREEKS

The WMTCP report identified four key gauged drainages in the Telkwa area:

- Canyon Creek Near Smithers (Environment Canada station #08EE014)
- Kathlyn Creek above Simpson Creek (08EE010)
- Simpson Creek at the Mouth (08EE012)
- Goathorn Creek near Telkwa (08EE008)

Two of Environment Canada's gauging stations, Canyon Creek and Kathlyn Creek, have been discontinued. Flow data for Goathorn, Simpson, and Four Creek are presented in Figure 4 and Figure 5. The data are presented as unit runoff (in mm). Thus, flows in the creeks have been corrected for drainage basin size.

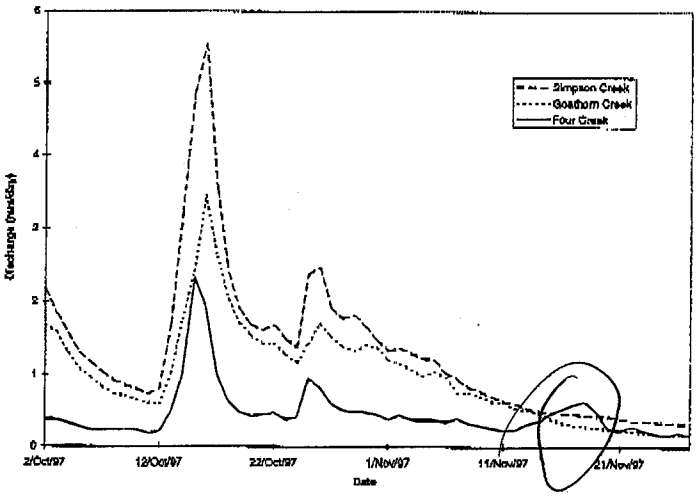

Figure 4: Comparison of Four, Simpson and Goathorn Creek average daily discharge for 1997

Data from Simpson Creek suggest that this basin is very "peaky" - a trait which was less marked in the Goathorn and Four Creek data. Thus, it appears that Goathorn Creek is a more appropriate comparison for Four Creek, and will be used in subsequent analyses.

Thus, to transform long-term Goathorn Creek data for use at the Four Creek site, a comparison of the 1997 data at the two sites was made[2]. The cumulative runoff at the Four Creek station was 23 mm, and at Goathorn Creek, 54 mm. This gives a ratio of 22.9/54.2 = 0.42. For 1998, the cumulative runoff for Four and Goathorn Creeks were 52 and 156 mm respectively, yielding a ratio of 0.33. The ratios for the 1997 and 1998 discharge records were averaged to produce a value of 0.38, which was applied to the Goathorn Creek data as a transformation.

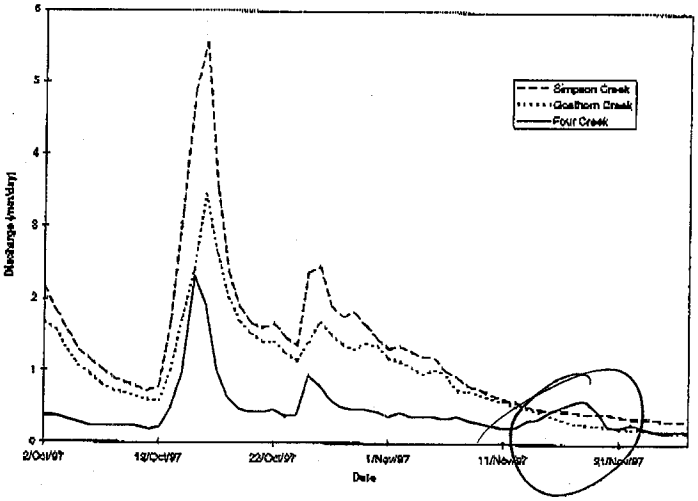

Figure 5: Comparison of Four, Simpson and Goathorn Creek average daily discharge for 1997

Table 1 shows the runoff coefficients for Goathorn and Four Creeks. These coefficients were calculated using Smithers precipitation data (decreased by 11% to account for differences between Smithers and Telkwa, as described previously). Runoff coefficients for Four Creek do not change from 1997 to 1998, remaining at 28%. In the WMTCP report, a runoff coefficient of 30% was adopted. This latter figure was challenged by the BC MELP, as 30% is a lower coefficient than has been determined in nearby gauged basins. However, the limited Four Creek flow data

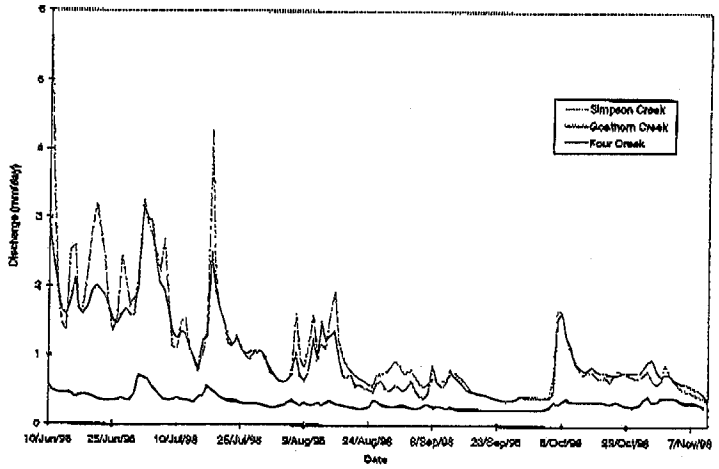

Figure 6: Comparison of Four, Goathorn and Simpson Creek Average Daily Discharge for 1998

Table 1 – Runoff coefficients for Four Creek and Goathorn Creek.

	1997			*1998*		
Basin	****Smithers Precipitation***	***Runoff***	***Runoff Coefficient***	****Smithers Precipitation***	***Runoff***	***Runoff Coefficient***
Four Creek	82 mm	23 mm	0.28	187 mm	52 mm	0.28
Goathorn Creek	82 mm	54 mm	0.65	187 mm	156 mm	0.83

Notes: Period of record for 1997 is October 2 to November 27.
Period of record for 1998 is June 10 to November 10.
* Decreased by 11% to transform to Telkwa area.

available suggest that a 30% runoff coefficient is indeed reasonable. The runoff coefficients for Goathorn Creek (relative to Smithers rainfall data) vary from 65% in 1997 to 83% in 1998. Our experience and knowledge of the area suggests that these figures are too high, since they imply that the Goathorn basin produces almost three times as much runoff (per square kilometre) as Four Creek. There are a number of potential sources for this discrepancy.

First, both basin aspect and elevation are expected to have a significant effect on discharge. The Goathorn Creek Basin has an altitude range of 1745 m (from 550 to 2295 masl) whereas the Four Creek basin has a range of only 670 m (from 700 to 1370 masl). If an orographic precipitation enhancement factor of roughly 40% per 1000 m is assumed (an average value for the Canadian Rocky Mountains, Quick and Pipes, 1996), then the Goathorn Creek watershed should receive significantly more precipitation. In addition, the Four Creek basin generally faces the northeast, where as the Goathorn Creek Basin faces both the northeast and the northwest. This variance in aspect will cause differences in snowpack accumulation and ablation.

Secondly, the influence of groundwater may be more pronounced in Goathorn Creek as it extends lower in the basin. Springs surfacing from fractures may augment flows in Goathorn Creek at elevations below the Goathorn/Four Creek confluence (700 masl).

Another factor is that Goathorn Creek is augmented by glacial runoff where as Four Creek is non-glaciated. Although the ice melt contribution during October and November is not expected to be great, there should be some water coming from glaciers due to pressure melting and perhaps internal storage.

TIMING OF RUNOFF

In general, the timing of the discharge record for Goathorn and Four Creeks compare favourably, as is illustrated in Figures 5 through 7. This suggests that the basins respond to meteorological events in a similar fashion, and thereby justifies the use of transformed Goathorn Creek discharge data as a surrogate for Four Creek data. Applying a time lag (at the daily scale) to the discharge does not improve this relationship.

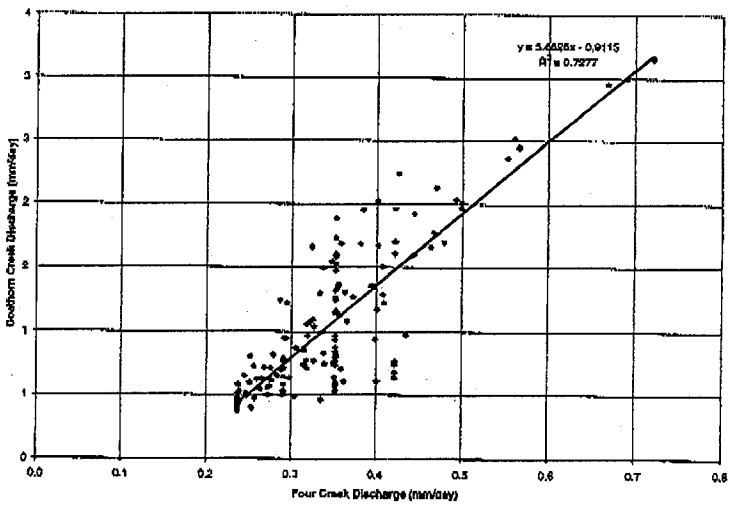

Figure 7: Relationship between Goathorn Creek and Four Creek average daily discharge

LOW FLOW ANALYSIS

Figure 8 shows the probabilities of mean annual low flows in Goathorn Creek. The data plotted are the lowest mean daily flows in Goathorn Creek (one mean daily flow for each year of record). For subsequent analysis purposes, the 1 in 10 year (10% probability) mean daily runoff of 0.045 mm/day was used as the reference. The runoff ratio of 0.38 was applied to estimate the 1 in 10 year low flow for Four Creek, giving a value of 0.017 mm/day. The average daily discharge for Goathorn Creek is 1.15 mm/day. Applying the ratio gives an estimated average daily runoff of 0.43 mm/day for Four Creek.

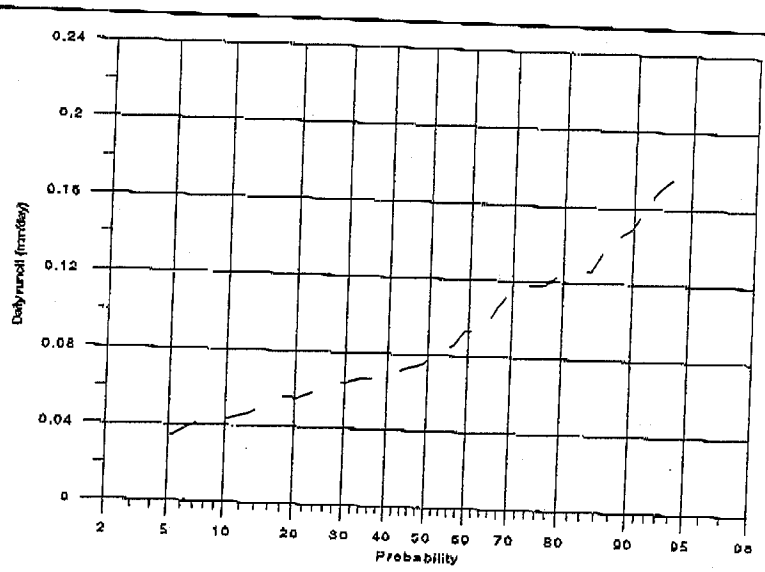

Figure 8: Mean daily low flow distribution in Goathorn Creek

The proposed diversion of the Four Creek tributary results in a reduction of roughly 18% of the total discharge area of Four Creek. Assuming that all areas of the basin behave in the same manner hydrologically, it can be assumed that the total discharge of Four Creek would also be reduced by 18%. Table 1 shows the estimated average daily and 1 in 10 year low flow for Four Creek at three stream locations assuming pre- and post-diversion scenarios. The influence of the proposed diversion on the flow of Four Creek is displayed graphically in the Appendix.

Table 2 - Estimated discharges for various locations along Four Creek.

Location	*% of original drainage area*	*Estimated Minimum 1 in 10 year Discharge (L/s)*		*Estimated Average Daily Discharge (L/s)*	
		with diversion	*without diversion*	*with diversion*	*without diversion*
At diversion	58	0.7	0.6	8.4	15
2/3 of basin length	74	0.9	1.3	22	30
At mouth	82	1.6	1.9	40	49

CONCLUSION

The use of Goathorn Creek data as a surrogate for Four Creek is reasonable provided that a transformation is applied (a value of 0.38 was used in this analysis). The two basins respond in a similar fashion in terms of timing, however, the Goathorn basin produces greater unit runoff. This may be a result of elevation, aspect, groundwater and/or icemelt.

The impact of the diversion on flows in Four Creek varies between the upper reaches and the mouth. At the mouth, only 18% of the original drainage is removed by diversion. At the point of diversion, however, 42% of the drainage (and hence flow) is removed. It is important to note that there is significant natural variability in the creek, ranging from a 1 in 10-year minimum of 1.9 L/s (assuming no diversion) to an average of 49 L/s.

It is possible to construct a diversion structure, which would guarantee a minimum flow in the creek. Only flows exceeding this minimum would be diverted into the pits. Withdrawals to the pits could therefore be restricted to higher flow periods, making the impact of the diversion relatively minor compared to natural creek variability.

Respectfully,

PITEAU ENGINEERING LTD.

Murray Fitch, M.A.Sc., P.Eng.
Senior Hydrologist

REFERENCES

Piteau, 1998. *Water Management for the Telkwa Coal Project.* Unpublished report prepared for Manalta Coal Ltd. Project #3773-16.

Quick, M.C, and Pipes, A.P., 1996. *U.B.C. Watershed Model Manual, Version 4.0,* Department of Civil Engineering, University of British Columbia.

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E-mail: *komex@komex.com*
Website: *www.komex.com*

TO FAX #: 780.420.5878
COMPANY: Luscar
ATTENTION: Allan Flemming

DATE: Feb. 16, 1999
PROJ. #: 3773-17
FROM: Murray Fitch
NO. OF PAGES: 5
(INCLUDING COVER PAGE)

Allan,

Please find attached our first cut at a report on the effects of diversions of Four Creek. I recommend that the report be passed on to David Bustard for comments on potential fisheries impacts.

As I mentioned in our telephone conversation, there remains the issue of 1998 Four Creek monitoring data, which would give us a way to assess the relationship between low flows in Goathorn and Four Creeks. I believe that it is prudent that we wait for Agra to review this data prior to finalizing the report.

We have not included a map of the site, which is in production but was delayed due to problems in assessing drainage areas. Agra originally established the Four Creek gauge basin area using 1:50,000 topographic maps - the more recent maps provided by Manalta/Luscar have allowed us to more precisely define the drainage area. The upshot is some of the notes on the map are incorrect. I should also add that some of the numbers in the report will also change slightly, but I thought it more important to get you the report now despite the minor errors.

The major conclusion of the report should not change. In brief, the impact of the diversion will be relatively small in the lower watershed, and could be further minimized through the construction of a structure which would allow diversions only during higher flows. In the upper watershed, the effects of the diversion on flows are more substantial - it remains for the aquatics people to determine if these are changes would be significant for fish. Certainly, the natural variability of flows in the creek would appear to be a significant stressor for fish, particularly in the upper reaches.

If you have questions, please do not hesitate to call me or Alexi Zawadzki at (403)247-0200.

Murray Fitch

new release to come out by Feb 24/99

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February 16, 1999

OUR FILE: 3773-17

Luscar Coal Ltd.
10235 - 101 St.
Edmonton, AB
T5J 3G1
(fax) 780.420.5878 (tel) 780.420.4080

Attention: Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: ***Hydrology of Four Creek***

Introduction

We have reviewed the hydrology of Four Creek, and have reached the following preliminary findings. The following is intended for your review. We would be happy to incorporate the findings into a letter which would be suitable for dissemination to other parties such as BC MELP.

Figure 1 shows the drainage sub-basins of Four Creek. For analysis purposes, we have considered flows at the following locations:

1: the proposed diversion location into the Tenas Main Pit
2: two thirds of the drainage area
3: the mouth of Four Creek (confluence with Goathorn Creek)

Hydrology of Four Creek

The Telkwa Report (official name) presented a detailed analysis of the hydrology of the Telkwa region. Four key watercourses were identified in this work:

- Canyon Creek Near Smithers - 08EE014
- Kathlyn Creek above Simpson Creek - 08EE010

- Simpson Creek at the Mouth - 08EE012
- Goathorn Creek near Telkwa - 08EE008

Piteau has subsequently received flow measurement data from Agra for 1997 (Oct. 2-Nov. 27) and 1998 (Jun. 9-Oct. 19). Ideally this short-term data could be used in conjunction with regional flow data to accurately characterize the hydrology of Four Creek. However, our analysis of the Four Creek data shows that the 1997 data appears generally plausible, but the 1998 discharges are too low to be credible[1].

thurs/Fri of last week revised rating curve. re-issue 4-Creek

Comparison of hydrology of Four and Goathorn Creeks (1997)

Two of the Environment Canada gauging stations, Canyon Creek and Kathlyn Creek, have been discontinued. Flow data for Goathorn, Simpson, and Four Creek are presented in Figure 1. The data are presented as unit runoff (in mm). Thus, flows in the creeks have been corrected for drainage basin size. Basins with identical runoff coefficients (the percentage of precipitation which runs off into a creek) would plot as identical lines, regardless of basin size.

Data from Simpson Creek suggest that this basin is very "peaky" - a trait which was less marked in the Goathorn and Four Creek data. Thus, it appears that Goathorn Creek is a more appropriate comparison for Four Creek, and will be used in subsequent analyses.

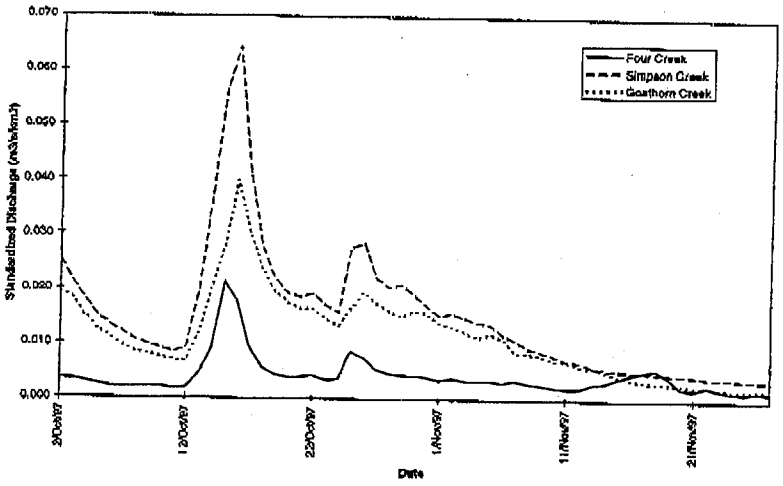

Figure 1: Comparison of Four Creek, Goathorn Creek and Simpson Creek Average Daily Discharge

Flow data for Goathorn Creek in 1997 was reported to be unreliable after November 15 due to ice conditions. Thus, to transform long-term Goathorn Creek data for use at the Four Creek site, a comparison of the 1997 data at the two sites was made. The cumulative runoff at the Four Creek station was 22.9 mm, and at Goathorn Creek, 54.2 mm. Thus, a ratio of 22.9/54.2 = 0.42 was applied to Goathorn data as a transformation. This implies that the Goathorn basin produces more than three times as much runoff (per square kilometre). There are a number of ~~potential sources of error~~ reasons for this discrepancy in this estimate.

First, Goathorn Creek is augmented by glacial runoff where as Four Creek is ice-free (termed *nival*). Although the ice melt contribution during October and November is not expected to be great, there will be some water coming from glaciers due to pressure melting and perhaps internal storage. A second source of error may be from the estimation of drainage area. Agra had

[1] Agra has indicated to us that the 1998 data had not been quality controlled (Kristi McKay, pers. comm.). This quality control is in process.

which is correct

estimated the drainage area of Four Creek as being 13 km^2 using 1:50,000 topographical maps. Komex had estimated the drainage area as being 10 km^2 using 1:20,000 maps provided by Manalta Coal Ltd/Luscar. The ramifications of an overestimation of drainage area are that discharge per unit area is underestimated. This may be the case as it is estimated that Four Creek produces three times less runoff than neighbouring Goat Creek. Goathorn.

Figure 2 shows the probabilities of mean annual low flows in Goathorn Creek. The data plotted are the lowest mean daily flows in Goathorn Creek (one mean daily flow for each year of record). For subsequent analysis purposes, the 1 in 10 year (10% probability) mean daily runoff of 0.045 mm/day was used as the reference. The runoff ratio of 0.32 was applied to estimate the 1 in 10 year low flow for Four Creek, giving a value of 0.012 mm/day. The average daily discharge for Goathorn Creek is 1.15 mm/day. Applying the ratio gives an estimated average daily discharge of 0.373 mm/day for Four Creek.

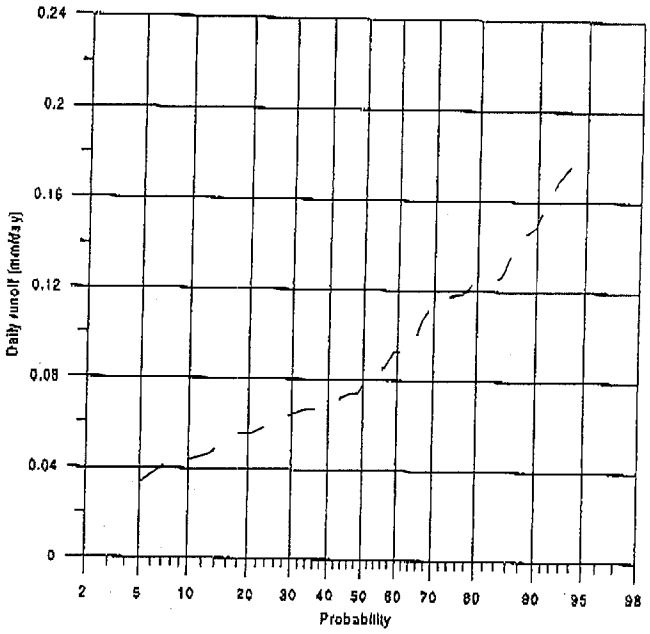

Figure 2: Mean Daily Low Flow Distribution in Goathorn Creek

The proposed diversion of the Four Creek tributary results in a reduction of roughly 18% of the total discharge area of Four Creek. Assuming that all areas of the basin behave in the same manner hydrologically, it can be assumed that the total discharge of Four Creek would also be reduced by 17%. Table 1 shows the estimated average daily and 1 in 10 year low flow for Four Creek at three stream locations assuming pre- and post-diversion scenarios.

or 18%

Table 1 - Estimated discharges for various locations along Four Creek.

Location	*% of original drainage area*	*Estimated Minimum 1 in 10 year Discharge (L/s)*		*Estimated Average Daily Discharge (L/s)*	
		with diversion	*without diversion*	*with diversion*	*without diversion*
At diversion	58	0.35	0.60	8.00	13.80
2/3 of basin length	74	0.89	1.20	21.20	28.65
At mouth	82	1.48	1.80	37.76	46.05

Conclusion

The impact of the diversion on flows in Four Creek varies between the upper reaches and the mouth. At the mouth, only 18% of the original drainage is removed by diversion. At the point of diversion, however, 42% of the drainage (and hence flow) is removed. It is important to note that there is significant natural variability in the creek, ranging from a 1 in 10 year minimum of 1.8 L/s (assuming no diversion) to an average of 46 L/s.

It is possible to construct a diversion structure which would guarantee a minimum flow in the creek. Only flows exceeding this minimum would be diverted into the pits. Withdrawals to the pits could therefore be restricted to higher flow periods, making the impact of the diversion relatively minor compared to natural creek variability.

Respectfully,

PITEAU ENGINEERING LTD.

Murray Fitch

Murray Fitch, M.A.Sc., P.Eng.
Senior Hydrologist

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Attachment B Baseflow Separation Results

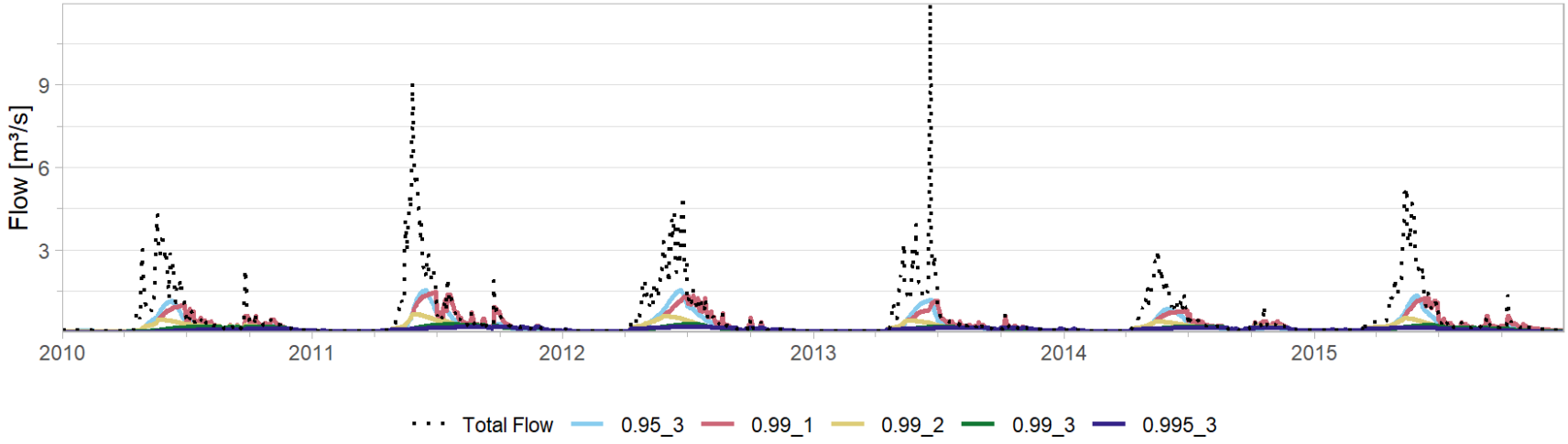


Figure A- 1: Tenas Creek Baseflow Separation results with varied Filter Parameter and Number of Passes

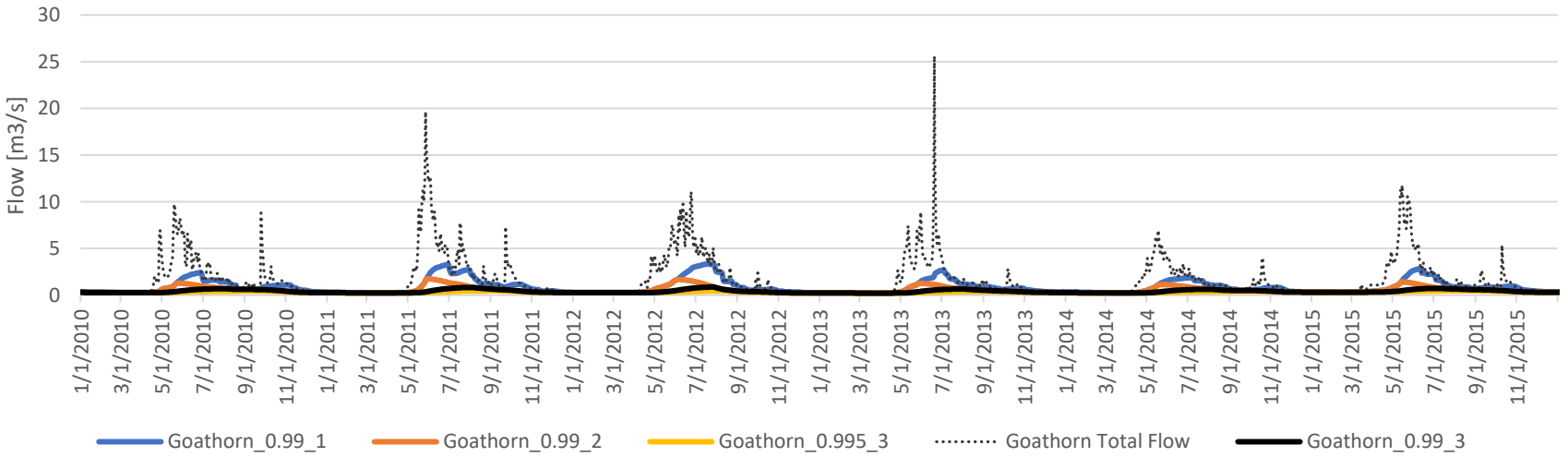


Figure A- 2: Goathorn Creek Baseflow Separation results with varied Filter Parameter and Number of Passes

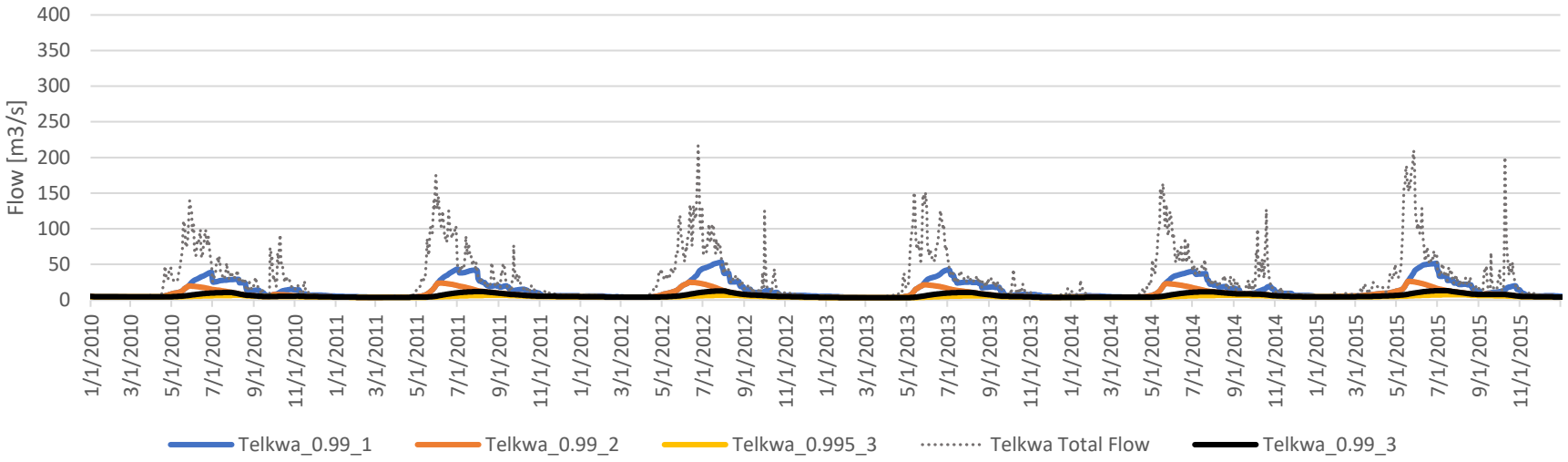


Figure A- 3: Telkwa River Baseflow Separation results with varied Filter Parameter and Number of Passes

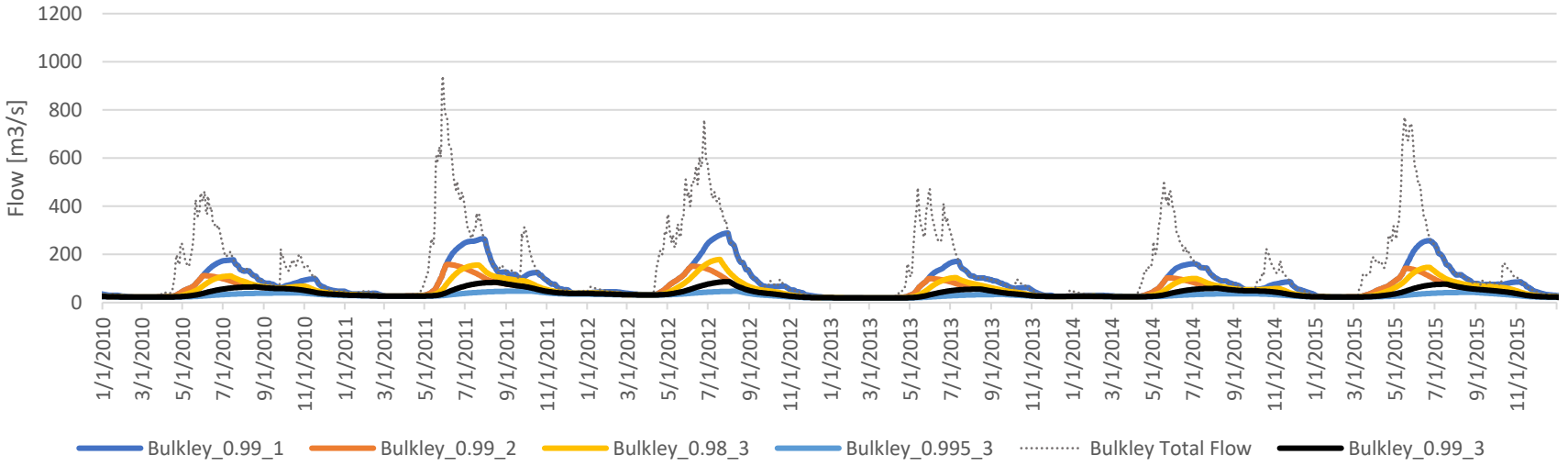


Figure A- 4: Bulkley River Baseflow Separation results with varied Filter Parameter and Number of Passes

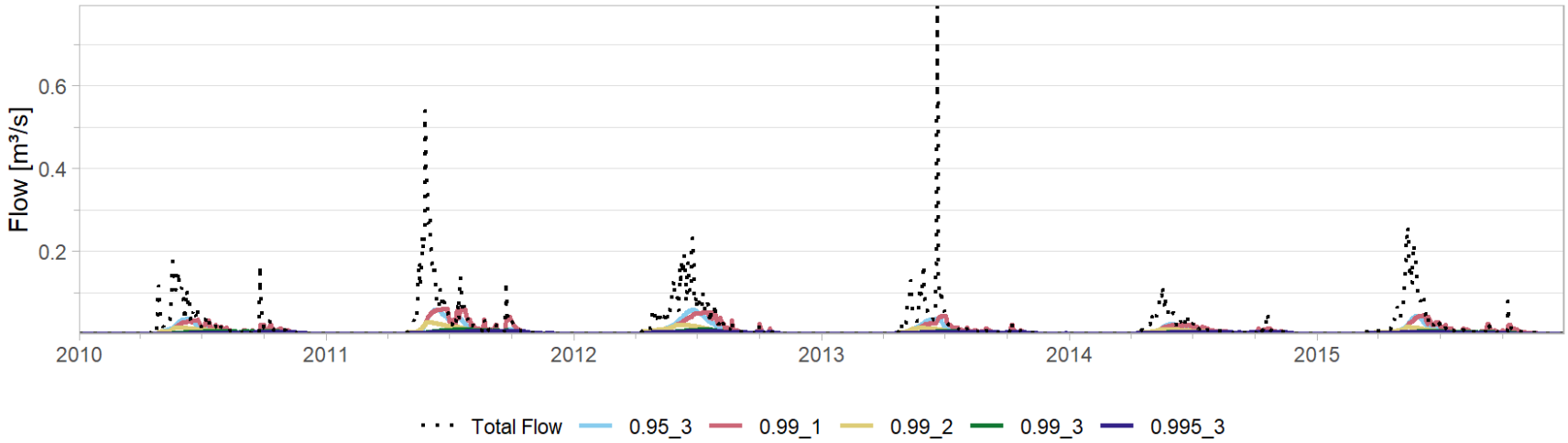


Figure A- 5: Four River Baseflow Separation results with varied Filter Parameter and Number of Passes

Attachment C AGRA 1999 Data Summaries

Table C-1. Tenas Creek Summary Sheet

Description: Lower Tenas Creek downstream of the Tenas Pit

Site ID:	Lower Tenas Ck	Start Date:	08-May-97
Operator:	TELKWA COAL	End Date:	10-Nov-98
Frequency:	DISCONTINUOUS	Discharge:	In Stream
Monitored:	YES	Water Level:	Level Survey

Comments:

The continuous discharge times series was calculated from 1-hour interval water level recordings.

1997 and 1998 Spot Measurement Summary

Date & Time	Discharge (m^3/s)	Staff Gauge (m)	Flow Measurement Method
08-May-1997	2.55	0.566	Current meter
16-May-1997	6.04	1.05	Current meter
22-May-1997	2.76	0.624	Current meter
13-Jun-1997	3.22	0.676	Current meter
24-Apr-1998	0.810	0.480	Current meter
14-May-1998	3.31	0.690	Current meter
27-May-1998	6.10	0.780	Current meter
23-Jun-1998	0.566	0.450	Current meter
21-Jul-1998	0.399	0.430	Current meter
19-Aug-1998	0.208	0.390	Current meter
09-Sep-1998	0.210	0.385	Current meter
25-Sep-1998	0.156	0.368	Current meter
10-Nov-1998	0.116	0.395	Current meter

ND: No Data

Figure: 1997 - 1998 Spot Discharge and Daily Discharge in Lower Tenas Creek

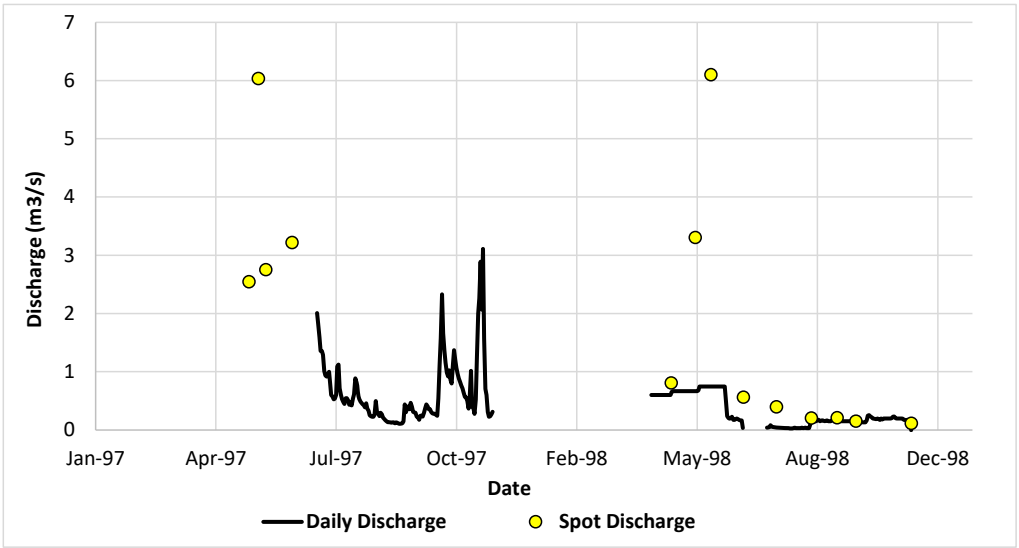


Table C-2. Four Creek Summary Sheet

Description: Four Creek above the confluence with Goathorn Creek

Site ID:	Lower Four Ck	Start Date:	09-May-97
Operator:	TELKWA COAL	End Date:	10-Nov-98
Frequency:	DISCONTINUOUS	Discharge:	In Stream
Monitored:	YES	Water Level:	Level Survey

Comments:

The continuous discharge times series was calculated from 1-hour interval datalogger recordings.

1997 and 1998 Spot Measurement Summary

Date & Time	Discharge (m^3/s)	Staff Gauge (m)	Flow Measurement Method
09-May-1997	0.384	0.336	Current meter
15-May-1997	0.786	0.421	Current meter
21-May-1997	0.269	0.268	Current meter
11-Jun-1997	0.0810	0.193	Current meter
28-Apr-1998	0.569	0.375	Current meter
30-Apr-1998	0.545	0.372	Current meter
13-May-1998	0.271	0.326	Current meter
26-May-1998	0.313	0.335	Current meter
10-Jun-1998	0.0117	0.180	Current meter
23-Jun-1998	0.00495	0.153	Current meter
24-Jun-1998	0.00739	0.165	Current meter
10-Jul-1998	0.00865	0.170	Current meter
22-Jul-1998	0.00813	0.168	Current meter
29-Jul-1998	0.00628	0.160	Current meter
18-Aug-1998	0.00628	0.160	Current meter
09-Sep-1998	0.00670	0.162	Current meter
10-Nov-1998	0.01474	0.188	Current meter

ND: No Data

Figure: 1997 - 1998 Spot Discharge and Daily Discharge in Lower Four Creek

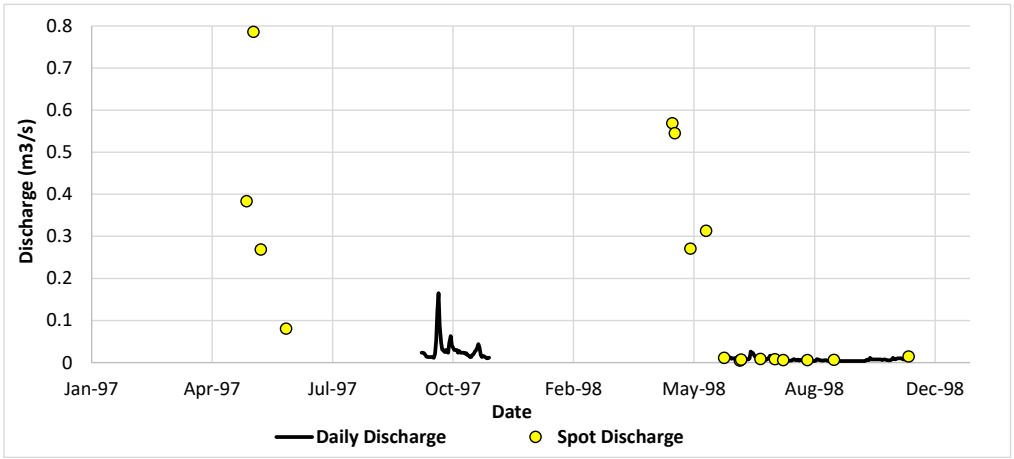


Table C-3. Goathorn Creek Summary Sheet

Description: Goathorn Creek near Telkwa

Site ID:	WSC 08EE008	Start Date:	01-Jan-97
Operator:	WATER SURVEY OF CANADA	End Date:	31-Dec-98
Frequency:	CONTINUOUS	Discharge:	In Stream
Monitored:	YES	Water Level:	Level Survey

Comments:

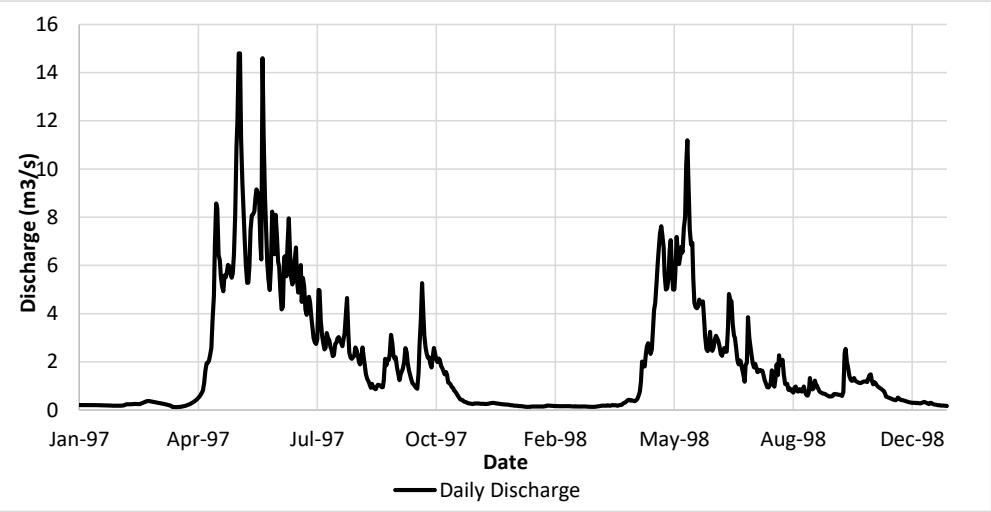
Continuous daily discharge time series generated by WSC.

1997 and 1998 Spot Measurement Summary

Date & Time	Discharge (m^3/s)	Staff Gauge (m)	Flow Measurement Method
ND	ND	ND	ND

ND: No Data (Data provided by Water Survey of Canada)

Figure: 1997 - 1998 Daily Discharge in Goathorn Creek (WSC 08EE008)



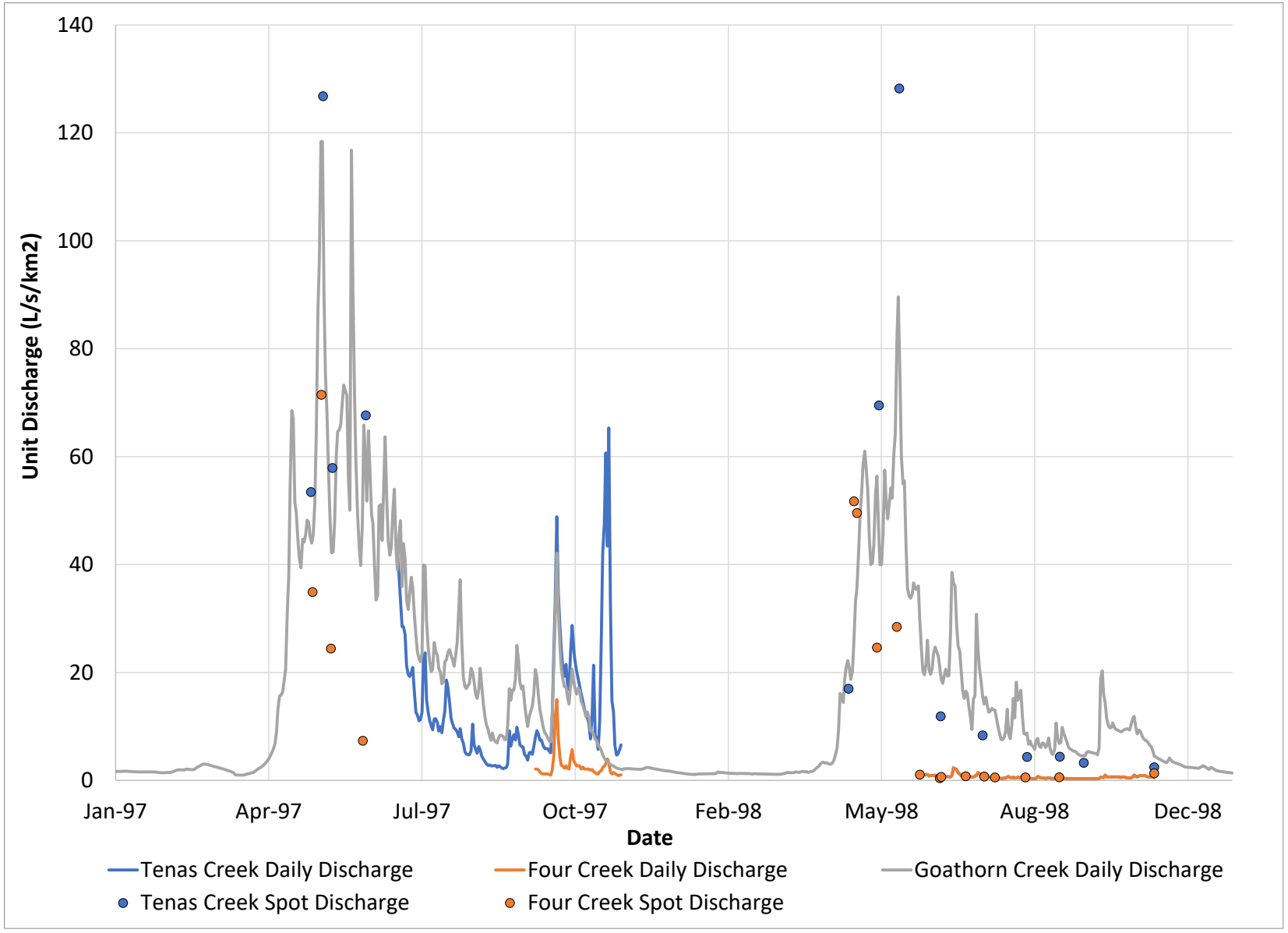


Figure C-1. Daily and Spot Unit Discharge at Each Station

Table C-4. Time Series of Daily Discharge at Each Station

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
01-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
02-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
03-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
04-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
05-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
06-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
07-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.71
08-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.72
09-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.73
10-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
11-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.67
12-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
13-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.64
14-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
15-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
16-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
17-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
18-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
19-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
20-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
21-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
22-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
23-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
24-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.59
25-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
26-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
27-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
28-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.54
29-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
30-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
31-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.45
01-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44
02-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.45
03-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
04-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
05-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
06-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.52
07-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
08-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
09-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.23	1.84
10-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.92
11-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
12-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.99
13-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.98
14-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.98
15-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.97
16-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
17-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
18-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.07
19-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.04
20-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
21-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.04
22-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
23-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
24-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.32	2.56
25-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.34	2.72
26-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.36	2.88
27-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.38	3.04
28-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.38	3.04
01-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.38	3.04
02-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.37	2.94
03-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.36	2.88
04-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.35	2.80
05-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.34	2.72
06-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.33	2.64
07-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.32	2.56
08-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.31	2.48
09-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
10-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.32
11-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
12-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
13-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
14-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.98
15-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.90
16-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.76
17-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.68
18-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
19-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
20-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.14	1.10
21-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.04
22-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.02
23-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.12	0.99
24-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.00
25-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.00
26-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.04
27-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.15	1.16
28-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
29-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
30-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.17	1.36
31-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44
01-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.48
02-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.72
03-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.88
04-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
05-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.32
06-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.31	2.48
07-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.34	2.72
08-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.37	2.96
09-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.41	3.28
10-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.45	3.60
11-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.51	4.08
12-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.56	4.48
13-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.65	5.20
14-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.74	5.92
15-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.84	6.74
16-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.13	9.04
17-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.65	13.20
18-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.96	15.68
19-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.98	15.84
20-Apr-97	ND	ND	ND	ND	ND	ND	0.00	2.05	16.40
21-Apr-97	ND	ND	ND	ND	ND	ND	0.00	2.29	18.32
22-Apr-97	ND	ND	ND	ND	ND	ND	0.00	2.58	20.64
23-Apr-97	ND	ND	ND	ND	ND	ND	0.00	3.80	30.40
24-Apr-97	ND	ND	ND	ND	ND	ND	0.00	4.75	38.00
25-Apr-97	ND	ND	ND	ND	ND	ND	0.00	6.81	54.48
26-Apr-97	ND	ND	ND	ND	ND	ND	0.00	8.57	68.56
27-Apr-97	ND	ND	ND	ND	ND	ND	0.00	8.38	67.04
28-Apr-97	ND	ND	ND	ND	ND	ND	0.00	6.44	51.52

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
29-Apr-97	ND	ND	ND	ND	ND	ND	0.00	6.21	49.68
30-Apr-97	ND	ND	ND	ND	ND	ND	0.00	5.58	44.64
01-May-97	ND	ND	ND	ND	ND	ND	0.00	5.14	41.12
02-May-97	ND	ND	ND	ND	ND	ND	0.00	4.93	39.44
03-May-97	ND	ND	ND	ND	ND	ND	0.00	5.59	44.72
04-May-97	ND	ND	ND	ND	ND	ND	0.00	5.52	44.16
05-May-97	ND	ND	ND	ND	ND	ND	0.00	5.68	45.44
06-May-97	ND	ND	ND	ND	ND	ND	0.00	6.03	48.24
07-May-97	ND	ND	ND	ND	ND	ND	0.00	5.98	47.84
08-May-97	ND	ND	ND	ND	ND	ND	0.00	5.66	45.28
09-May-97	ND	ND	ND	ND	ND	ND	0.00	5.50	44.00
10-May-97	ND	ND	ND	ND	ND	ND	0.00	5.68	45.44
11-May-97	ND	ND	ND	ND	ND	ND	0.00	6.43	51.44
12-May-97	ND	ND	ND	ND	ND	ND	0.00	8.09	64.72
13-May-97	ND	ND	ND	ND	ND	ND	0.00	10.90	87.20
14-May-97	ND	ND	ND	ND	ND	ND	0.00	12.00	96.00
15-May-97	ND	ND	ND	ND	ND	ND	0.00	14.80	118.40
16-May-97	ND	ND	ND	ND	ND	ND	0.00	14.80	118.40
17-May-97	ND	ND	ND	ND	ND	ND	0.00	11.20	89.60
18-May-97	ND	ND	ND	ND	ND	ND	0.00	9.42	75.36
19-May-97	ND	ND	ND	ND	ND	ND	0.00	8.46	67.68
20-May-97	ND	ND	ND	ND	ND	ND	0.00	7.13	57.04
21-May-97	ND	ND	ND	ND	ND	ND	0.00	5.99	47.92
22-May-97	ND	ND	ND	ND	ND	ND	0.00	5.28	42.24
23-May-97	ND	ND	ND	ND	ND	ND	0.00	5.29	42.32
24-May-97	ND	ND	ND	ND	ND	ND	0.00	5.99	47.92
25-May-97	ND	ND	ND	ND	ND	ND	0.00	7.49	59.92
26-May-97	ND	ND	ND	ND	ND	ND	0.00	8.08	64.64
27-May-97	ND	ND	ND	ND	ND	ND	0.00	8.12	64.96
28-May-97	ND	ND	ND	ND	ND	ND	0.00	8.25	66.00
29-May-97	ND	ND	ND	ND	ND	ND	0.00	8.77	70.16
30-May-97	ND	ND	ND	ND	ND	ND	0.00	9.16	73.28
31-May-97	ND	ND	ND	ND	ND	ND	0.00	9.03	72.24
01-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.92	71.36
02-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.95	55.60
03-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.26	50.08
04-Jun-97	ND	ND	ND	ND	ND	ND	0.00	14.60	116.80
05-Jun-97	ND	ND	ND	ND	ND	ND	0.00	11.30	90.40
06-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.87	70.96
07-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.33	58.64

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
08-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.17	49.36
09-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.41	43.28
10-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.98	39.84
11-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.92	47.36
12-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.23	65.84
13-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.43	59.44
14-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.47	51.76
15-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.10	64.80
16-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.20	57.60
17-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.17	49.36
18-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.95	47.60
19-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.99	39.92
20-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.18	33.44
21-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.29	34.32
22-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.35	50.80
23-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.39	51.12
24-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.56	44.48
25-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.86	54.88
26-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.96	63.68
27-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.51	52.08
28-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.53	44.24
29-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.22	41.76
30-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.40	43.20
01-Jul-97	ND	ND	ND	ND	ND	ND	0.00	6.26	50.08
02-Jul-97	ND	ND	ND	ND	ND	ND	0.00	6.75	54.00
03-Jul-97	ND	ND	ND	ND	ND	ND	0.00	5.39	43.12
04-Jul-97	0.58	2.01	42.22	ND	ND	ND	0.00	4.88	39.04
05-Jul-97	0.57	1.82	38.2	ND	ND	ND	0.00	5.67	45.36
06-Jul-97	0.56	1.59	33.47	ND	ND	ND	0.00	6.02	48.16
07-Jul-97	0.54	1.36	28.5	ND	ND	ND	0.00	4.49	35.92
08-Jul-97	0.54	1.36	28.49	ND	ND	ND	0.00	5.49	43.92
09-Jul-97	0.53	1.29	27.06	ND	ND	ND	0.00	5.14	41.12
10-Jul-97	0.51	1.01	21.29	ND	ND	ND	0.00	4.17	33.36
11-Jul-97	0.5	0.94	19.65	ND	ND	ND	0.00	3.96	31.68
12-Jul-97	0.5	0.92	19.25	ND	ND	ND	0.00	4.36	34.88
13-Jul-97	0.5	0.95	20	ND	ND	ND	0.00	4.71	37.68
14-Jul-97	0.51	1	20.98	ND	ND	ND	0.00	4.47	35.76
15-Jul-97	0.49	0.79	16.53	ND	ND	ND	0.00	3.86	30.88
16-Jul-97	0.46	0.6	12.63	ND	ND	ND	0.00	3.36	26.88
17-Jul-97	0.46	0.58	12.11	ND	ND	ND	0.00	2.98	23.84

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
18-Jul-97	0.45	0.53	11.08	ND	ND	ND	0.00	2.81	22.48
19-Jul-97	0.45	0.54	11.29	ND	ND	ND	0.00	2.75	22.00
20-Jul-97	0.46	0.6	12.65	ND	ND	ND	0.00	2.94	23.52
21-Jul-97	0.51	1.09	22.9	ND	ND	ND	0.00	4.99	39.92
22-Jul-97	0.52	1.13	23.65	ND	ND	ND	0.00	4.97	39.76
23-Jul-97	0.48	0.72	15.04	ND	ND	ND	0.00	3.70	29.60
24-Jul-97	0.46	0.6	12.69	ND	ND	ND	0.00	3.10	24.80
25-Jul-97	0.45	0.53	11.13	ND	ND	ND	0.00	2.77	22.16
26-Jul-97	0.44	0.48	10.1	ND	ND	ND	0.00	2.52	20.16
27-Jul-97	0.43	0.45	9.41	ND	ND	ND	0.00	2.58	20.64
28-Jul-97	0.45	0.55	11.46	ND	ND	ND	0.00	3.20	25.60
29-Jul-97	0.45	0.55	11.46	ND	ND	ND	0.00	3.00	24.00
30-Jul-97	0.45	0.51	10.74	ND	ND	ND	0.00	2.90	23.20
31-Jul-97	0.43	0.44	9.16	ND	ND	ND	0.00	2.60	20.80
01-Aug-97	0.44	0.48	10.02	ND	ND	ND	0.00	2.51	20.08
02-Aug-97	0.43	0.42	8.85	ND	ND	ND	0.00	2.24	17.92
03-Aug-97	0.45	0.54	11.3	ND	ND	ND	0.00	2.29	18.32
04-Aug-97	0.46	0.61	12.88	ND	ND	ND	0.00	2.75	22.00
05-Aug-97	0.5	0.89	18.64	ND	ND	ND	0.00	2.80	22.40
06-Aug-97	0.49	0.82	17.19	ND	ND	ND	0.00	2.97	23.76
07-Aug-97	0.47	0.69	14.4	ND	ND	ND	0.00	3.03	24.24
08-Aug-97	0.45	0.55	11.51	ND	ND	ND	0.00	2.90	23.20
09-Aug-97	0.44	0.5	10.54	ND	ND	ND	0.00	2.80	22.40
10-Aug-97	0.44	0.46	9.72	ND	ND	ND	0.00	2.65	21.20
11-Aug-97	0.43	0.45	9.49	ND	ND	ND	0.00	2.90	23.20
12-Aug-97	0.43	0.43	8.97	ND	ND	ND	0.00	3.20	25.60
13-Aug-97	0.42	0.39	8.13	ND	ND	ND	0.00	4.00	32.00
14-Aug-97	0.44	0.46	9.63	ND	ND	ND	0.00	4.65	37.20
15-Aug-97	0.42	0.37	7.7	ND	ND	ND	0.00	3.20	25.60
16-Aug-97	0.41	0.33	6.96	ND	ND	ND	0.00	2.40	19.20
17-Aug-97	0.39	0.25	5.32	ND	ND	ND	0.00	2.18	17.44
18-Aug-97	0.38	0.23	4.92	ND	ND	ND	0.00	2.13	17.04
19-Aug-97	0.38	0.23	4.8	ND	ND	ND	0.00	2.20	17.60
20-Aug-97	0.38	0.23	4.78	ND	ND	ND	0.00	2.24	17.92
21-Aug-97	0.39	0.26	5.48	ND	ND	ND	0.00	2.60	20.80
22-Aug-97	0.44	0.5	10.43	ND	ND	ND	0.00	2.50	20.00
23-Aug-97	0.41	0.32	6.69	ND	ND	ND	0.00	2.30	18.40
24-Aug-97	0.39	0.28	5.8	ND	ND	ND	0.00	2.00	16.00
25-Aug-97	0.38	0.24	5.06	ND	ND	ND	0.00	1.90	15.20
26-Aug-97	0.4	0.3	6.28	ND	ND	ND	0.00	2.10	16.80

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
27-Aug-97	0.39	0.27	5.68	ND	ND	ND	0.00	2.60	20.80
28-Aug-97	0.38	0.22	4.53	ND	ND	ND	0.00	2.20	17.60
29-Aug-97	0.37	0.19	4.02	ND	ND	ND	0.00	1.80	14.40
30-Aug-97	0.36	0.17	3.52	ND	ND	ND	0.00	1.50	12.00
31-Aug-97	0.35	0.15	3.12	ND	ND	ND	0.00	1.30	10.40
01-Sep-97	0.34	0.13	2.81	ND	ND	ND	0.00	1.20	9.60
02-Sep-97	0.34	0.14	2.88	ND	ND	ND	0.00	1.05	8.40
03-Sep-97	0.34	0.13	2.74	ND	ND	ND	0.00	0.93	7.44
04-Sep-97	0.34	0.13	2.72	ND	ND	ND	0.00	1.10	8.80
05-Sep-97	0.34	0.13	2.76	ND	ND	ND	0.00	0.95	7.60
06-Sep-97	0.34	0.13	2.78	ND	ND	ND	0.00	0.90	7.20
07-Sep-97	0.33	0.12	2.45	ND	ND	ND	0.00	0.87	6.96
08-Sep-97	0.34	0.13	2.73	ND	ND	ND	0.00	0.99	7.94
09-Sep-97	0.34	0.12	2.55	ND	ND	ND	0.00	1.05	8.40
10-Sep-97	0.33	0.11	2.36	ND	ND	ND	0.00	1.04	8.32
11-Sep-97	0.33	0.11	2.21	ND	ND	ND	0.00	1.02	8.16
12-Sep-97	0.33	0.11	2.34	ND	ND	ND	0.00	0.95	7.60
13-Sep-97	0.33	0.11	2.38	ND	ND	ND	0.00	0.95	7.62
14-Sep-97	0.35	0.15	3.14	ND	ND	ND	0.00	1.27	10.16
15-Sep-97	0.43	0.44	9.23	ND	ND	ND	0.00	2.13	17.04
16-Sep-97	0.4	0.3	6.38	ND	ND	ND	0.00	1.86	14.88
17-Sep-97	0.42	0.37	7.76	ND	ND	ND	0.00	2.10	16.80
18-Sep-97	0.43	0.4	8.48	ND	ND	ND	0.00	2.09	16.72
19-Sep-97	0.42	0.36	7.51	ND	ND	ND	0.00	2.34	18.72
20-Sep-97	0.44	0.47	9.87	ND	ND	ND	0.00	3.13	25.04
21-Sep-97	0.42	0.4	8.38	ND	ND	ND	0.00	2.78	22.24
22-Sep-97	0.4	0.31	6.6	ND	ND	ND	0.00	2.27	18.16
23-Sep-97	0.4	0.3	6.33	ND	ND	ND	0.00	2.12	16.96
24-Sep-97	0.4	0.3	6.23	ND	ND	ND	0.00	2.19	17.52
25-Sep-97	0.38	0.23	4.75	ND	ND	ND	0.00	1.78	14.24
26-Sep-97	0.38	0.22	4.6	ND	ND	ND	0.00	1.51	12.08
27-Sep-97	0.36	0.18	3.76	ND	ND	ND	0.00	1.25	10.00
28-Sep-97	0.38	0.24	5.14	ND	ND	ND	0.00	1.49	11.92
29-Sep-97	0.39	0.25	5.22	ND	ND	ND	0.00	1.60	12.80
30-Sep-97	0.38	0.23	4.86	ND	ND	ND	0.00	1.73	13.84
01-Oct-97	0.4	0.3	6.21	ND	ND	ND	0.00	2.00	16.00
02-Oct-97	0.42	0.38	7.94	0.21	0.02	2.12	0.00	2.57	20.56
03-Oct-97	0.43	0.44	9.21	0.21	0.02	2.12	0.00	2.40	19.20
04-Oct-97	0.43	0.41	8.56	0.2	0.02	1.99	0.00	1.96	15.68
05-Oct-97	0.41	0.36	7.48	0.2	0.02	1.63	0.00	1.65	13.20

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
06-Oct-97	0.42	0.36	7.51	0.19	0.01	1.28	0.00	1.46	11.68
07-Oct-97	0.4	0.31	6.55	0.19	0.01	1.23	0.00	1.26	10.08
08-Oct-97	0.4	0.29	5.99	0.19	0.01	1.23	0.00	1.11	8.88
09-Oct-97	0.4	0.28	5.9	0.19	0.01	1.23	0.00	1.07	8.56
10-Oct-97	0.4	0.28	5.92	0.19	0.01	1.23	0.00	0.99	7.92
11-Oct-97	0.39	0.26	5.49	0.18	0.01	1.11	0.00	0.92	7.34
12-Oct-97	0.38	0.24	5.12	0.18	0.01	1.01	0.00	0.89	7.15
13-Oct-97	0.44	0.54	11.38	0.2	0.02	1.89	0.00	1.55	12.40
14-Oct-97	0.52	1.13	23.72	0.24	0.05	4.67	0.00	2.68	21.44
15-Oct-97	0.55	1.57	33.06	0.28	0.13	11.39	0.00	3.69	29.52
16-Oct-97	0.6	2.33	48.89	0.3	0.16	14.99	0.00	5.27	42.16
17-Oct-97	0.56	1.66	34.87	0.26	0.09	7.99	0.00	4.00	32.00
18-Oct-97	0.54	1.36	28.52	0.23	0.05	4.31	0.00	3.10	24.80
19-Oct-97	0.52	1.15	24.21	0.22	0.03	2.82	0.00	2.59	20.72
20-Oct-97	0.51	0.99	20.74	0.21	0.03	2.65	0.00	2.34	18.72
21-Oct-97	0.5	0.92	19.31	0.21	0.02	2.27	0.00	2.17	17.36
22-Oct-97	0.51	1.03	21.54	0.22	0.03	2.72	0.00	2.18	17.44
23-Oct-97	0.49	0.86	18.05	0.21	0.02	2.27	0.00	1.94	15.52
24-Oct-97	0.49	0.8	16.85	0.21	0.02	2.12	0.00	1.77	14.16
25-Oct-97	0.52	1.12	23.57	0.23	0.05	4.26	0.00	2.17	17.36
26-Oct-97	0.54	1.37	28.73	0.25	0.06	5.73	0.00	2.58	20.64
27-Oct-97	0.53	1.19	25.1	0.23	0.04	3.76	0.00	2.33	18.64
28-Oct-97	0.52	1.06	22.33	0.22	0.04	3.19	0.00	2.12	16.96
29-Oct-97	0.5	0.96	20.14	0.22	0.03	2.72	0.00	2.00	16.00
30-Oct-97	0.5	0.88	18.52	0.22	0.03	2.72	0.00	2.14	17.12
31-Oct-97	0.49	0.83	17.35	0.22	0.03	2.72	0.00	2.08	16.64
01-Nov-97	0.48	0.77	16.14	0.21	0.02	2.14	0.00	1.83	14.64
02-Nov-97	0.48	0.71	14.98	0.21	0.03	2.5	0.00	1.76	14.08
03-Nov-97	0.47	0.64	13.46	0.21	0.02	2.12	0.00	1.63	13.04
04-Nov-97	0.46	0.57	11.95	0.21	0.02	2.12	0.00	1.49	11.92
05-Nov-97	0.45	0.56	11.73	0.21	0.02	2.12	0.00	1.59	12.72
06-Nov-97	0.44	0.5	10.49	0.21	0.02	2.12	0.00	1.47	11.76
07-Nov-97	0.42	0.37	7.72	0.2	0.02	1.93	0.00	1.15	9.20
08-Nov-97	0.45	0.57	11.93	0.2	0.02	2.06	0.00	1.13	9.04
09-Nov-97	0.51	1.02	21.37	0.2	0.02	1.63	0.00	1.07	8.56
10-Nov-97	0.42	0.4	8.35	0.19	0.02	1.51	0.00	0.95	7.62
11-Nov-97	0.42	0.37	7.87	0.19	0.01	1.23	0.00	0.92	7.39
12-Nov-97	0.39	0.28	5.79	0.19	0.01	1.23	0.00	0.82	6.56
13-Nov-97	0.44	0.52	11.01	0.2	0.02	1.66	0.00	0.77	6.16
14-Nov-97	0.53	1.25	26.19	0.2	0.02	1.81	0.00	0.70	5.60

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
15-Nov-97	0.58	2	42.02	0.21	0.03	2.38	0.00	0.60	4.80
16-Nov-97	0.6	2.26	47.52	0.21	0.03	2.67	0.00	0.52	4.16
17-Nov-97	0.63	2.89	60.68	0.22	0.03	3.13	0.00	0.46	3.68
18-Nov-97	0.59	2.07	43.43	0.23	0.04	4	0.00	0.43	3.44
19-Nov-97	0.64	3.11	65.32	0.22	0.04	3.26	0.00	0.42	3.32
20-Nov-97	0.55	1.57	32.98	0.19	0.02	1.6	0.00	0.37	2.96
21-Nov-97	0.47	0.71	14.83	0.19	0.01	1.23	0.00	0.35	2.80
22-Nov-97	0.46	0.6	12.66	0.19	0.02	1.48	0.00	0.34	2.72
23-Nov-97	0.4	0.31	6.49	0.19	0.01	1.31	0.00	0.31	2.48
24-Nov-97	0.38	0.23	4.73	0.18	0.01	1.13	0.00	0.29	2.32
25-Nov-97	0.38	0.24	4.95	0.18	0.01	0.92	0.00	0.28	2.24
26-Nov-97	0.39	0.27	5.71	0.18	0.01	1	0.00	0.27	2.16
27-Nov-97	0.96	0.32	6.63	0.18	0.01	1.05	0.00	0.26	2.08
28-Nov-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
29-Nov-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.20
30-Nov-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.20
01-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.22
02-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
03-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.20
04-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
05-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
06-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.14
07-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.10
08-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
09-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.07
10-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.10
11-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.14
12-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
13-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
14-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.31	2.44
15-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
16-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.34
17-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.30
18-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
19-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.17
20-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
21-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.06
22-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
23-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.94
24-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.92

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
25-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.90
26-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.23	1.84
27-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.78
28-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.76
29-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.74
30-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
31-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
01-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.55
02-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
03-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
04-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.42
05-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.38
06-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.35
07-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.31
08-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
09-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
10-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.19
11-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.16
12-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.15
13-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.14
14-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.14
15-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.14
16-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
17-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.21
18-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
19-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
20-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
21-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.25
22-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
23-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.25
24-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
25-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
26-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
27-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
28-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.28
29-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
30-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.54
31-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.52
01-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.48
02-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
03-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.42
04-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.39
05-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.38
06-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.36
07-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
08-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
09-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.32
10-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.31
11-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.30
12-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.30
13-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.31
14-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
15-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.36
16-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
17-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.30
18-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.28
19-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
20-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
21-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.21
22-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
23-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.25
24-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
25-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
26-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
27-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.21
28-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.20
01-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
02-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
03-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
04-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
05-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
06-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
07-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
08-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
09-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
10-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
11-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
12-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
13-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
14-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.33

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Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
15-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
16-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.49
17-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
18-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.42
19-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
20-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
21-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
22-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.55
23-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.48
24-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
25-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
26-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
27-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.63
28-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.65
29-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.49
30-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.56
31-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.68
01-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.22	1.74
02-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.24	1.89
03-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.27	2.19
04-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.41
05-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.33	2.65
06-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.38	3.02
07-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.42	3.33
08-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.42	3.39
09-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.40	3.22
10-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.42	3.32
11-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.39	3.15
12-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.38	3.03
13-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.38	3.05
14-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.41	3.27
15-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.48	3.86
16-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.61	4.87
17-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.77	6.13
18-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	1.19	9.52
19-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.02	16.16
20-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	1.94	15.52
21-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	1.81	14.48
22-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.34	18.72
23-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.64	21.12

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
24-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.78	22.24
25-Apr-98	0.47	0.66	13.88	ND	ND	ND	0.00	2.59	20.72
26-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	2.34	18.72
27-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	2.52	20.16
28-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	3.22	25.76
29-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	4.15	33.20
30-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	4.44	35.52
01-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.23	41.84
02-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.11	48.88
03-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.66	53.28
04-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.34	58.72
05-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.63	61.04
06-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.25	58.00
07-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.74	53.92
08-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.62	44.96
09-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.00	40.00
10-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.05	40.40
11-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.46	43.68
12-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.60	52.80
13-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.05	56.40
14-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.85	46.80
15-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.00	40.00
16-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.00	40.00
17-May-98	0.47	0.68	14.26	ND	ND	ND	0.00	5.73	45.84
18-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	7.19	57.52
19-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.52	52.16
20-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.06	48.48
21-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.40	51.20
22-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.78	54.24
23-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.54	52.32
24-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	7.54	60.32
25-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	8.02	64.16
26-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	10.20	81.60
27-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	11.20	89.60
28-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	9.42	75.36
29-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	7.50	60.00
30-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.87	54.96
31-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.94	55.52
01-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	5.46	43.68
02-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.45	35.60

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
03-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.27	34.16
04-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.22	33.76
05-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.32	34.56
06-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.58	36.64
07-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.44	35.52
08-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.42	35.36
09-Jun-98	0.43	0.48	10.13	ND	ND	ND	0.00	4.51	36.08
10-Jun-98	0.38	0.24	5.06	0.19	0.02	1.54	0.00	3.74	29.92
11-Jun-98	0.37	0.2	4.3	0.19	0.01	1.23	0.00	3.07	24.56
12-Jun-98	0.37	0.19	4.04	0.18	0.01	1.09	0.00	2.54	20.32
13-Jun-98	0.37	0.21	4.33	0.18	0.01	1.01	0.00	2.45	19.60
14-Jun-98	0.38	0.23	4.75	0.18	0.01	1.1	0.00	2.71	21.68
15-Jun-98	0.36	0.18	3.75	0.18	0.01	1.11	0.00	3.25	26.00
16-Jun-98	0.36	0.17	3.66	0.17	0.01	0.85	0.00	2.56	20.48
17-Jun-98	0.36	0.18	3.88	0.18	0.01	0.92	0.00	2.46	19.68
18-Jun-98	0.37	0.2	4.2	0.18	0.01	0.92	0.00	2.60	20.80
19-Jun-98	0.36	0.19	3.91	0.18	0.01	0.92	0.00	2.94	23.52
20-Jun-98	0.36	0.17	3.66	0.18	0.01	1.01	0.00	3.09	24.72
21-Jun-98	0.36	0.16	3.45	0.17	0.01	0.85	0.00	2.99	23.92
22-Jun-98	0.36	0.16	3.45	0.17	0.01	0.78	0.00	2.88	23.04
23-Jun-98	0.26	0.04	0.78	0.17	0.01	0.67	0.00	2.64	21.12
24-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.33	18.64
25-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.25	18.00
26-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.45	19.60
27-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.58	20.64
28-Jun-98	ND	ND	ND	0.17	0.01	0.77	0.00	2.42	19.36
29-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.43	19.44
30-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	3.42	27.36
01-Jul-98	ND	ND	ND	0.18	0.01	0.95	0.00	4.82	38.56
02-Jul-98	ND	ND	ND	0.21	0.03	2.36	0.00	4.58	36.64
03-Jul-98	ND	ND	ND	0.21	0.02	2.17	0.00	4.51	36.08
04-Jul-98	ND	ND	ND	0.2	0.02	2.06	0.00	3.61	28.88
05-Jul-98	ND	ND	ND	0.19	0.02	1.48	0.00	3.11	24.88
06-Jul-98	ND	ND	ND	0.18	0.01	1.2	0.00	3.00	24.00
07-Jul-98	ND	ND	ND	0.18	0.01	0.92	0.00	2.58	20.64
08-Jul-98	ND	ND	ND	0.17	0.01	0.69	0.00	2.07	16.56
09-Jul-98	ND	ND	ND	0.17	0.01	0.68	0.00	1.90	15.20
10-Jul-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.07	16.56
11-Jul-98	ND	ND	ND	0.17	0.01	0.82	0.00	2.02	16.16
12-Jul-98	ND	ND	ND	0.16	0.01	0.67	0.00	1.72	13.76

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
13-Jul-98	0.27	0.04	0.86	0.17	0.01	0.69	0.00	1.48	11.84
14-Jul-98	0.28	0.04	0.94	0.16	0.01	0.67	0.00	1.18	9.44
15-Jul-98	0.28	0.05	0.98	0.16	0.01	0.59	0.00	1.87	14.96
16-Jul-98	0.31	0.08	1.72	0.17	0.01	0.87	0.00	1.97	15.76
17-Jul-98	0.29	0.06	1.21	0.17	0.01	0.89	0.00	3.85	30.80
18-Jul-98	0.28	0.05	1.08	0.19	0.02	1.52	0.00	3.01	24.08
19-Jul-98	0.28	0.05	1.01	0.19	0.01	1.23	0.00	2.60	20.80
20-Jul-98	0.27	0.04	0.91	0.18	0.01	1.15	0.00	2.30	18.40
21-Jul-98	0.27	0.04	0.86	0.17	0.01	0.86	0.00	1.94	15.52
22-Jul-98	0.27	0.04	0.87	0.17	0.01	0.74	0.00	1.77	14.16
23-Jul-98	0.27	0.04	0.84	0.17	0.01	0.67	0.00	1.93	15.44
24-Jul-98	0.27	0.04	0.81	0.16	0.01	0.67	0.00	1.75	14.00
25-Jul-98	0.27	0.04	0.79	0.16	0.01	0.67	0.00	1.58	12.64
26-Jul-98	0.26	0.04	0.76	0.16	0.01	0.59	0.00	1.61	12.88
27-Jul-98	0.26	0.03	0.72	0.16	0.01	0.57	0.00	1.67	13.36
28-Jul-98	0.26	0.03	0.71	0.16	0.01	0.59	0.00	1.64	13.12
29-Jul-98	0.26	0.03	0.7	0.16	0.01	0.58	0.00	1.63	13.04
30-Jul-98	0.26	0.03	0.66	0.16	0.01	0.57	0.00	1.45	11.60
31-Jul-98	0.26	0.03	0.65	0.16	0.01	0.49	0.00	1.25	10.00
01-Aug-98	0.25	0.03	0.62	0.15	0	0.45	0.00	1.11	8.88
02-Aug-98	0.25	0.03	0.62	0.15	0	0.39	0.00	0.96	7.66
03-Aug-98	0.25	0.03	0.6	0.15	0	0.4	0.00	0.94	7.55
04-Aug-98	0.26	0.03	0.64	0.15	0	0.45	0.00	1.00	7.99
05-Aug-98	0.27	0.04	0.82	0.15	0.01	0.46	0.00	1.14	9.12
06-Aug-98	0.26	0.03	0.7	0.16	0.01	0.65	0.00	1.65	13.20
07-Aug-98	0.26	0.03	0.69	0.17	0.01	0.72	0.00	1.09	8.72
08-Aug-98	0.26	0.03	0.71	0.16	0.01	0.57	0.00	0.97	7.75
09-Aug-98	0.26	0.03	0.69	0.16	0.01	0.5	0.00	1.27	10.16
10-Aug-98	0.25	0.03	0.64	0.16	0.01	0.63	0.00	1.90	15.20
11-Aug-98	0.27	0.04	0.84	0.15	0.01	0.47	0.00	1.45	11.60
12-Aug-98	0.26	0.03	0.71	0.15	0.01	0.49	0.00	2.28	18.24
13-Aug-98	0.26	0.04	0.77	0.16	0.01	0.62	0.00	1.86	14.88
14-Aug-98	0.27	0.04	0.8	0.16	0.01	0.49	0.00	1.98	15.84
15-Aug-98	0.26	0.03	0.71	0.16	0.01	0.62	0.00	2.09	16.72
16-Aug-98	0.26	0.03	0.71	0.17	0.01	0.68	0.00	1.48	11.84
17-Aug-98	0.26	0.03	0.7	0.16	0.01	0.57	0.00	1.09	8.72
18-Aug-98	0.31	0.1	2.13	0.16	0.01	0.48	0.00	1.07	8.56
19-Aug-98	0.35	0.15	3.23	0.15	0.01	0.48	0.00	1.10	8.80
20-Aug-98	0.35	0.16	3.29	0.15	0	0.42	0.00	0.84	6.72
21-Aug-98	0.35	0.15	3.17	0.15	0	0.41	0.00	0.92	7.33

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
22-Aug-98	0.35	0.15	3.17	0.15	0	0.37	0.00	0.81	6.50
23-Aug-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.79	6.31
24-Aug-98	0.36	0.17	3.62	0.15	0	0.36	0.00	0.73	5.80
25-Aug-98	0.36	0.18	3.73	0.15	0	0.39	0.00	0.93	7.43
26-Aug-98	0.35	0.15	3.17	0.17	0.01	0.72	0.00	0.98	7.82
27-Aug-98	0.35	0.16	3.37	0.16	0.01	0.67	0.00	0.80	6.42
28-Aug-98	0.36	0.17	3.54	0.16	0.01	0.48	0.00	0.77	6.14
29-Aug-98	0.35	0.16	3.33	0.16	0.01	0.48	0.00	0.87	6.96
30-Aug-98	0.35	0.15	3.23	0.15	0	0.44	0.00	0.86	6.86
31-Aug-98	0.35	0.16	3.35	0.15	0	0.41	0.00	0.76	6.11
01-Sep-98	0.36	0.17	3.47	0.15	0.01	0.48	0.00	0.82	6.56
02-Sep-98	0.35	0.15	3.17	0.15	0.01	0.48	0.00	0.99	7.90
03-Sep-98	0.35	0.15	3.17	0.15	0.01	0.48	0.00	0.75	6.02
04-Sep-98	0.35	0.15	3.17	0.15	0	0.37	0.00	0.63	5.02
05-Sep-98	0.36	0.16	3.47	0.15	0	0.38	0.00	0.60	4.82
06-Sep-98	0.36	0.18	3.69	0.15	0	0.42	0.00	0.74	5.90
07-Sep-98	0.36	0.16	3.43	0.16	0.01	0.57	0.00	1.33	10.64
08-Sep-98	0.35	0.15	3.19	0.15	0	0.42	0.00	0.97	7.73
09-Sep-98	0.36	0.17	3.66	0.15	0	0.43	0.00	0.86	6.84
10-Sep-98	0.36	0.18	3.72	0.15	0.01	0.48	0.00	0.90	7.17
11-Sep-98	0.36	0.17	3.66	0.15	0	0.45	0.00	1.23	9.84
12-Sep-98	0.36	0.17	3.6	0.15	0	0.38	0.00	1.09	8.72
13-Sep-98	0.35	0.15	3.23	0.15	0	0.4	0.00	1.00	8.00
14-Sep-98	0.35	0.15	3.17	0.15	0	0.36	0.00	0.89	7.12
15-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.78	6.26
16-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.73	5.86
17-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.72	5.72
18-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.69	5.50
19-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.68	5.46
20-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.66	5.30
21-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.62	4.97
22-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.60	4.79
23-Sep-98	0.35	0.15	3.17	0.14	0	0.34	0.00	0.58	4.61
24-Sep-98	0.35	0.14	2.96	0.15	0	0.34	0.00	0.57	4.56
25-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.58	4.62
26-Sep-98	0.34	0.14	2.85	0.15	0	0.34	0.00	0.58	4.63
27-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.65	5.21
28-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.68	5.40
29-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.66	5.27
30-Sep-98	0.34	0.14	2.87	0.15	0	0.34	0.00	0.65	5.21

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
01-Oct-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.64	5.08
02-Oct-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.63	5.06
03-Oct-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.63	5.02
04-Oct-98	0.36	0.17	3.48	0.15	0	0.34	0.00	0.59	4.75
05-Oct-98	0.39	0.25	5.2	0.15	0	0.36	0.00	0.76	6.09
06-Oct-98	0.39	0.26	5.38	0.16	0.01	0.58	0.00	2.36	18.88
07-Oct-98	0.38	0.23	4.92	0.16	0.01	0.63	0.00	2.54	20.32
08-Oct-98	0.38	0.22	4.65	0.16	0.01	0.52	0.00	2.00	16.00
09-Oct-98	0.37	0.2	4.2	0.18	0.01	1	0.00	1.79	14.32
10-Oct-98	0.37	0.2	4.18	0.16	0.01	0.67	0.00	1.43	11.44
11-Oct-98	0.37	0.19	3.97	0.16	0.01	0.67	0.00	1.28	10.24
12-Oct-98	0.37	0.19	3.93	0.16	0.01	0.67	0.00	1.22	9.76
13-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.23	9.84
14-Oct-98	0.36	0.18	3.86	0.16	0.01	0.67	0.00	1.33	10.64
15-Oct-98	0.36	0.17	3.66	0.16	0.01	0.67	0.00	1.23	9.84
16-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.18	9.44
17-Oct-98	0.36	0.18	3.84	0.16	0.01	0.67	0.00	1.17	9.36
18-Oct-98	0.37	0.2	4.13	0.16	0.01	0.67	0.00	1.15	9.20
19-Oct-98	0.37	0.2	4.2	0.16	0.01	0.57	0.00	1.13	9.04
20-Oct-98	0.37	0.2	4.2	0.16	0.01	0.65	0.00	1.13	9.04
21-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.17	9.36
22-Oct-98	0.37	0.2	4.2	0.16	0.01	0.64	0.00	1.18	9.44
23-Oct-98	0.37	0.2	4.2	0.16	0.01	0.5	0.00	1.20	9.60
24-Oct-98	0.37	0.2	4.2	0.16	0.01	0.48	0.00	1.19	9.52
25-Oct-98	0.37	0.21	4.35	0.16	0.01	0.48	0.00	1.17	9.36
26-Oct-98	0.38	0.23	4.87	0.16	0.01	0.48	0.00	1.30	10.40
27-Oct-98	0.38	0.23	4.89	0.16	0.01	0.65	0.00	1.44	11.52
28-Oct-98	0.37	0.2	4.22	0.18	0.01	1.03	0.00	1.49	11.92
29-Oct-98	0.37	0.2	4.2	0.17	0.01	0.79	0.00	1.23	9.84
30-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.08	8.64
31-Oct-98	0.37	0.2	4.2	0.17	0.01	0.82	0.00	1.17	9.36
01-Nov-98	0.37	0.2	4.2	0.18	0.01	0.92	0.00	1.14	9.12
02-Nov-98	0.37	0.2	4.2	0.18	0.01	0.92	0.00	1.04	8.32
03-Nov-98	0.37	0.19	4.09	0.18	0.01	0.92	0.00	0.98	7.82
04-Nov-98	0.36	0.17	3.66	0.18	0.01	0.92	0.00	0.94	7.50
05-Nov-98	0.36	0.17	3.66	0.17	0.01	0.72	0.00	0.92	7.38
06-Nov-98	0.36	0.17	3.66	0.16	0.01	0.67	0.00	0.88	7.03
07-Nov-98	0.36	0.17	3.66	0.16	0.01	0.67	0.00	0.83	6.62
08-Nov-98	0.36	0.16	3.45	0.16	0.01	0.67	0.00	0.79	6.29
09-Nov-98	0.35	0.18	3.79	0.16	0.01	0.67	0.00	0.71	5.66

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Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
10-Nov-98	ND	ND	ND	0.16	0.01	0.52	0.00	0.57	4.52
11-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.55	4.36
12-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.52	4.19
13-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.50	4.02
14-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.48	3.86
15-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.46	3.71
16-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.44	3.55
17-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.43	3.42
18-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.41	3.29
19-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.46	3.70
20-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.52	4.18
21-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.48	3.81
22-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.43	3.46
23-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.42	3.32
24-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.41	3.24
25-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.40	3.17
26-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.39	3.10
27-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.37	2.96
28-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.35	2.80
29-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.33	2.66
30-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.32	2.52
01-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.31	2.50
02-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.31	2.47
03-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.31	2.45
04-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.42
05-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
06-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.38
07-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.29	2.34
08-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.29	2.30
09-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.28	2.27
10-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.42
11-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.32	2.58
12-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.34	2.75
13-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.32	2.58
14-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.42
15-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.27	2.18
16-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.26	2.06
17-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.43
18-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.29	2.34
19-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.27	2.12

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
20-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.24	1.92
21-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.23	1.84
22-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.22	1.77
23-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
24-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
25-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
26-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
27-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.54
28-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.51
29-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
30-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44
31-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.41

APPENDIX 4.3-C: FOUR CREEK WATERSHED: GROUNDWATER SURFACE WATER INTERACTION INVESTIGATION AND WATER BALANCE MODEL DEVELOPMENT, SLR CONSULTING

Four Creek Watershed

Groundwater Surface Water Interaction Investigation and Water Balance Model Development

Telkwa Coal Limited

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SLR Project No.: 201.V24219.00000

September 5, 2025

Revision: 0

Revision Record

Revision	Date	Prepared By	Checked By	Authorized By
0	September 5, 2025	Glenn Hall / Joanna Borzecki	Tomaso Marangoni / Stefan Gronsdahl	Rick Palmer

Statement of Limitations

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Executive Summary

The Four Creek Watershed Study conducted by SLR Consulting (Canada) Ltd. (SLR), for Telkwa Coal Limited (Telkwa Coal) provides a comprehensive analysis of the Four Creek Watershed, focusing on the impacts of mining activities by Telkwa Coal. The study aims to quantify the expected loss of flow in Four Creek due to mine activities. The Tenas Project is a proposed surface coal mine owned by Telkwa Mining Ltd., located in northwestern British Columbia. The project includes an open pit mine, coal processing plant, water management infrastructure, and ancillary facilities. The study aims to develop an accurate representation of groundwater and surface water processes in Four Creek and assess the impact of mine development on these processes.

Four Creek is a tributary to Goathorn Creek, flowing along the perimeter of the proposed open pit. It supports a resident Dolly Varden fish population and is identified as fish habitat in the Project's Environmental Assessment (EA) application[1].

According to the findings of the EA, the construction and operation of the mine are expected to reduce groundwater contributions to Four Creek by 30-35%, potentially affecting fish habitat due to streamflow reduction.

This study addresses information gaps in hydrogeology and hydrology, specifically for the Four Creek watershed, and aims to refine modelled streamflow losses and habitat loss estimates.

The study comprised of stream discharge measurements, conductivity surveys, groundwater level monitoring, and groundwater and surface water chemistry analyses at selected locations within the Four Creek watershed. These field measurements were then used to calibrate a hydrological model to interpret how proposed mine infrastructure might impact Four Creek's streamflow.

The findings of the field study confirm that Four Creek is a perched system and the watershed model developed by SLR suggests that monthly streamflow is expected to increase anywhere from 4% to 11% from baseline conditions under the operations phase. The increase in streamflow, despite the loss in the overall watershed area due to proposed mine infrastructure, is primarily due to the influence of diversion Channel C02, which capture water from adjacent hillslopes and increase the contributing area of Four Creek. During the closure and post-closure phases, the predicted change in streamflow ranges from a 0% to -7% difference relative to baseline conditions.

[1] In February 2022, Telkwa Mining applied for an EA certificate, which was accepted for review by the Environmental Assessment Office (EAO) in April 2022 (Telkwa Coal Ltd. 2022). The EA application is currently in the development and review stage. Telkwa Mining and their consultants are working on addressing comments from the EAO Technical Advisory Committee and First Nations involved in the Project.

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Appendix A **Mini Piezometers MP5S/D**

Appendix B **Summary of 2024 Water Quality Results**

Appendix C **Certificate of Analysis**

Appendix D **Summary of 2024 Field Conductivity Measurements**

Appendix E **Piper Diagrams**

Acronyms and Abbreviations

AV	Area-Velocity
BC	British Columbia
BEC	Biogeoclimatic Ecosystem Classification
Ca	calcium
$CaHCO_3$	calcium bicarbonate
CPP	Coal Processing Plant
cm	centimetre
EA	Environmental Assessment
EAO	Environmental Assessment Office
EFN	environmental flow needs
EOM	End of Mine
ESSF	Engelmann Spruce-Subalpine Fir
FHCP	Fish Habitat Compensation Plan
HCO_3	bicarbonate
HRU	Hydrologic Response Unit
km	kilometre
m	metre
mm	millimetre
masl	metres above sea level
mbgs	metres below ground surface
mbtoc	metres below top of casing
MP	mini piezometer
MW	monitoring well
NRMSE	Normalized Root Mean Square Error
NSE	Nash-Sutcliffe Efficiency
PAG	potential acid generating
PBIAS	Percent Bias
PET	potential evapotranspiration
SBS	Sub-Boreal Spruce
SRK	SRK Consulting
SW	surface water
Telkwa Mining	Telkwa Mining Ltd.
VGH	vertical hydraulic gradient

1.0 Introduction

1.1 Background

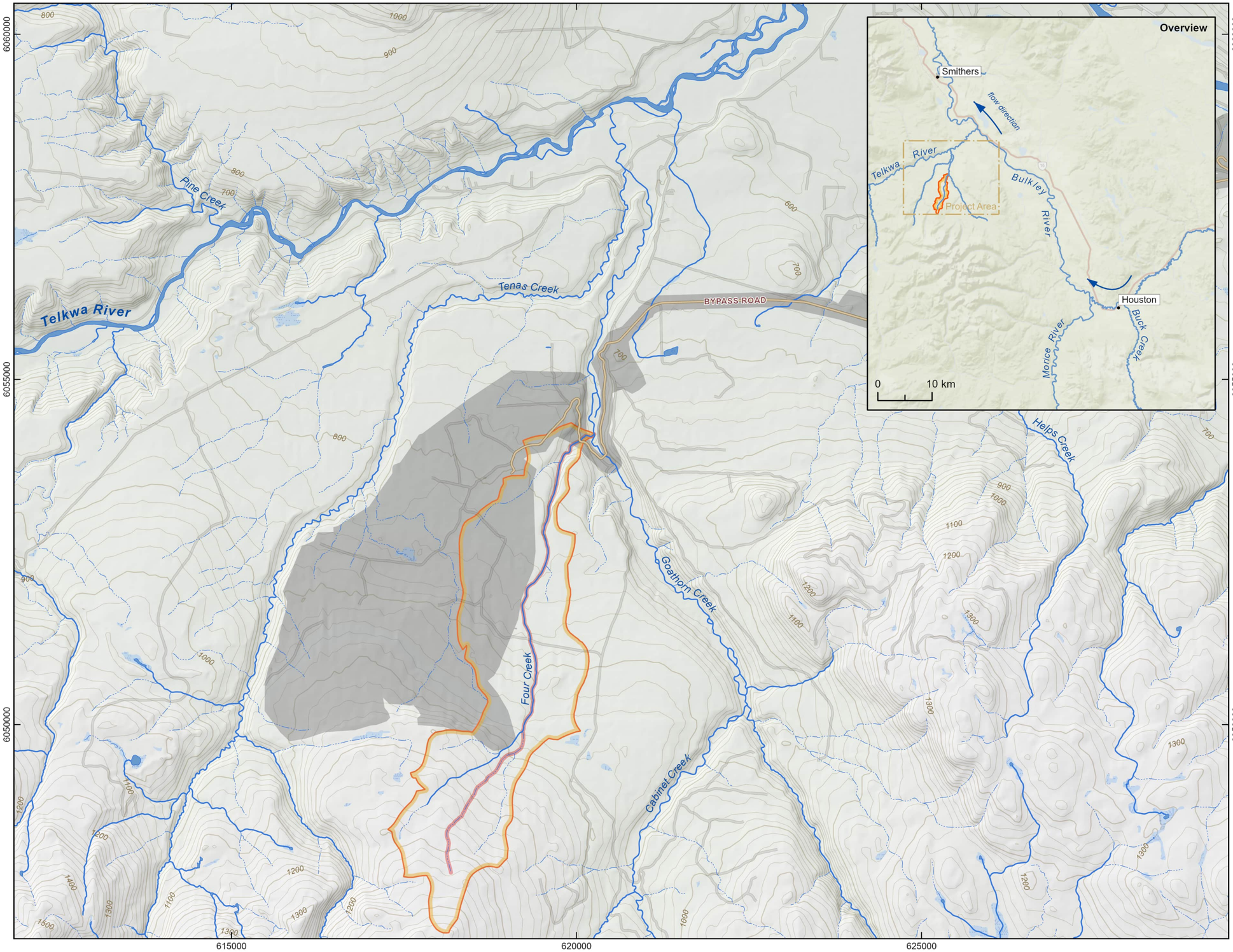
The Tenas Project (the Project) is a proposed surface coal mine owned and operated by Telkwa Mining Ltd. (Telkwa Mining) located 25 kilometres (km) south of Smithers and 7 km southwest of Telkwa in northwestern British Columbia (BC; Figure 1). The Project includes an open pit mine with a coal processing plant, water management infrastructure, ancillary facilities, train infrastructure, and a series of management ponds which will contain submerged, potentially acid-generating materials. The expected life-of-mine is approximately 26.5 years, which includes construction, operation, decommission, and reclamation phases.

The Project entered the BC Environmental Assessment (EA) process in November 2018, with the submission of the Project Description (Telkwa Coal 2022). The Project Description submission included baseline reporting for the period from 2017 to 2019 which characterized the baseline conditions for climate, noise, fish habitat, and groundwater, surface water, and sediment conditions (ERM 2020). In February 2022, Telkwa Mining applied for an EA certificate. The EA application was accepted for review by the Environmental Assessment Office (EAO) in April 2022 and is currently in the development and review stage (Telkwa Coal 2022). As a part of the review process, Telkwa Mining and their consultants are working on addressing comments from the EAO Technical Advisory Committee and First Nations involved in the Project.

1.2 Study Area

The Project lies between Tenas Creek, Goathorn Creek, and Four Creek, each of which are within the Telkwa River watershed (Figure 1). The Telkwa River is a tributary to the Bulkley River, which feeds into the Skeena River, and ultimately drains into the Pacific Ocean approximately 180 km west of the project.

Four Creek is a tributary to Goathorn Creek and flows along the perimeter of the Project's proposed open pit. The creek is approximately 7 km long and flows into Goathorn Creek approximately 4 km upstream of the confluence of Goathorn Creek and Tenas Creek. The upper reaches of Four Creek provide fish habitat that supports a resident Dolly Varden (*Salvelinus malma*) population (Figure 2). For this reason, Four Creek was identified as fish habitat in the Project's EA application (Telkwa Coal 2022).



KEY MAP

LEGEND

- Watercourse[1]
- Intermittent or Indeterminate Watercourse[1]
- Four Creek[1]
- Resource Road[2]
- Proposed Bypass Road
- Wetland[1]
- Proposed Project Footprint
- Four Creek Watershed[1]

1 - BC Freshwater Atlas
2 - BC Digital Road Atlas (for clarity, not all roads displayed)

0 1 2 3

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

Scale: 1:55,000
Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
Checked: GH
Date: September 3, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Contour interval is 20 metres (minor) and 100 metres (major). All elevations in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Project Location and Site Overview

SLR

REF. NO. 2404901-MR-003

Figure 1

REV. 1

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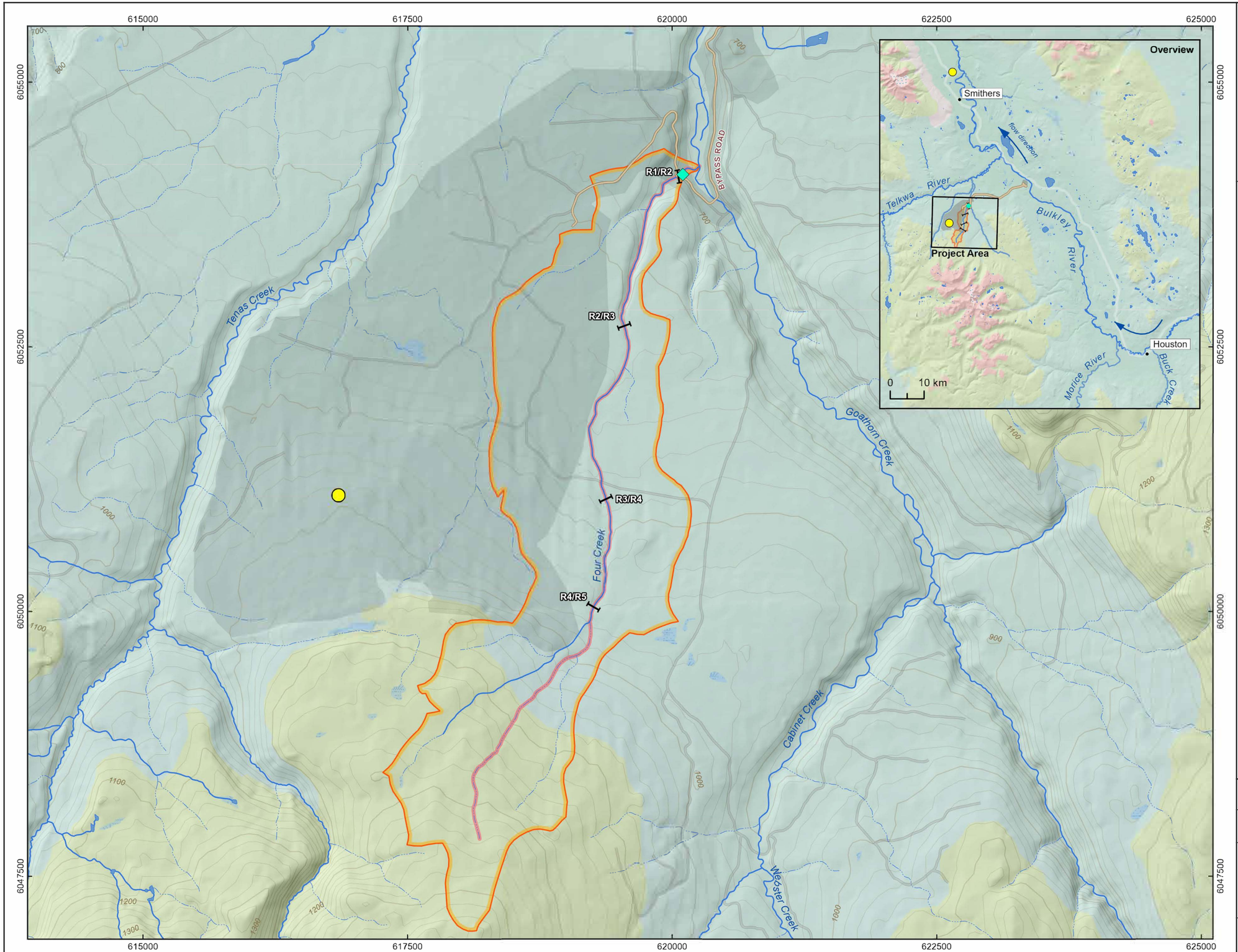

KEY MAP

LEGEND

- Hydrometric Station[1]
- Weather Station[1-2]
- Reach Break
- Watercourse[3]
- Intermittent or Indeterminate Watercourse[3]
- Four Creek[3]
- Resource Road[4]
- Proposed Bypass Road
- Wetland[3]
- Proposed Project Footprint
- Four Creek Watershed[3]

Biogeoclimatic Zone[5]

- Boreal Altai Fescue Alpine
- Engelmann Spruce -- Subalpine Fir
- Interior Cedar -- Hemlock
- Sub-Boreal Spruce

1 - Environmental Resources Management (ERM)
2 - Environment Canada
3 - BC Freshwater Atlas
4 - BC Digital Road Atlas (for clarity, not all roads displayed)
5 - BC Government Forest Analysis and Inventory

0 1 2

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

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Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
Checked: GH
Date: September 3, 2025

NORTH

Source Notes:
Base map data from Natural Resources Canada (CanVec, CDEM) and the Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Hydrometric and weather station data provided by ERM, except for the Smithers weather station, which is sourced from Environment Canada. Biogeoclimatic Zones provided by the BC Government's Forest Analysis and Inventory Branch. Contour interval: 20 metres (minor), 100 metres (major). All elevations are in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Four Creek Reach Breaks, Biogeoclimatic Zones, and Weather Station Locations

SLR

REF. NO. 2404901-MR-016-01

Figure 2

REV. 1

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1.3 Natural Function of Four Creek

Four Creek is a small, headwater watercourse that provides habitat to a resident Dolly Varden trout population (Figure 3). The hydrology of Four Creek is shaped by seasonal variability. In winter, most precipitation falls as snow, some of which is intercepted by the forest canopy, reducing the amount that reaches the ground directly. Annual low flows occur during winter months.

Figure 3: Examples of Four Creek channel conditions along various reaches taken on June 4 and 5 2024. Looking upstream at station R-03 (left) and looking downstream at station R-07

In spring, rising temperatures cause the snow to melt, leading to increased runoff. Peak flows, which are important for maintaining channel morphology and flushing fine sediment and debris, typically occur as a result of this snowmelt freshet. Periods of higher flows during freshet provide sufficient wetted habitat to allow for adult salmonid migration and passage throughout the channel network.

Shallow interflow plays a key role in the watershed's hydrology. This subsurface flow, which is above the water table occurs when water infiltrates the thin surficial layer of till and moves laterally through the shallow groundwater system before entering the channel network. Interflow is the key driver of lowflows/baseflow in Four Creek, which is the portion of streamflow that remains during dry periods. These flows are especially important during summer low flow periods that occur between rain events.

The bedrock groundwater system and the deep overburden groundwater flow circulation discharge into the Telkwa River, Tenas Creek and Goathorn Creek.
Four Creek watershed has valleys moderately incised which are not expected to be a discharge location for bedrock groundwater system and the deep overburden groundwater flow circulation.

Annual low flows occur during winter months. Despite lower surface runoff, shallow groundwater helps maintain isolated pools within Four Creek.

1.4 Previous Assessments of Four Creek

The Groundwater Numerical Model presented in the Project's EA application indicated that groundwater was the dominant source of baseflow to Four Creek during the winter months (SRK 2022a), and that the construction and operation of the Project's open pit could draw down the groundwater table in the Four Creek watershed (SRK 2022b). SRK developed a conceptual groundwater model to determine the impact of the proposed mine on baseflows into Four Creek (2022a). SRK Consulting (SRK) modeled two scenarios, a base case that corresponded to the model that achieved the best fit to field data, and a high case that resulted in a 'worst case' reduction in streamflow by maximizing hydraulic conductivities within a minimum generally accepted calibration range (SRK 2022a).

As defined by SRK (2022a), the end of year 7 phase represents the mine during operations. The End of Mine (EOM) scenario represents the mine when it is fully excavated, approximately 22 years into the operation. Their results for the location at the mouth of Four Creek (Four Creek U/S Goathorn Creek) are presented in Table 1.

Table 1: Modeled changes to Four Creek baseflows at "Four Creek U/S Goathorn Creek" station, as presented by SRK (2022a). Changes to net baseflow compared to baseline conditions are presented as percentages.

Model scenario	End of year 7	End of mine
Base case	-14.3%	-10.7%
High case	-50.4%	-25.2%
Note: Modeling results for the post-closure phase were not included in the SRK report (2022a).		

The numerical model was constructed using a finite element mesh comprised of 30 layers, each of them characterized by a constant thickness and saturated conditions. As a consequence, the model's conclusions were based on an assumption that Four Creek surface flow was connected to the deep groundwater aquifer throughout its entire length, and that there was a hydraulic connection through a single hydrostratigraphic unit beneath the creek, down to zones of pit dewatering. This is generally a reasonable assumption, particularly in the absence of specific stream instrumentation and data, which is used in groundwater models at the project scale. The results of the Groundwater Model remain valid at the larger site scales. However, the groundwater model was not intended to represent complex surface water and groundwater interactions over small stream sections, particularly in a more complex perched system.

As a result, the Groundwater Numerical Model overestimates pit dewatering impacts on Four Creek. Given the regional focus of the Groundwater Model, a more detailed, finer-resolution surface water/groundwater interaction study was necessary to better understand the potential impact the project would have on streamflow.

The baseflow estimates produced by the Groundwater Model are used as inputs to the Project's Water and Load Balance Model, which simulates surface water flows during different phases of the mine life and considers the impacts of the following water management (SRK 2022c):

- Construction of East Management Spill Dam;
- Channel C-02: A collection channel that will collect undisturbed runoff upstream of East Management Pond and divert it around the Project and into Four Creek;
- C-05: A collection channel that will divert undisturbed runoff around southern extents of open pit to Four Creek;
- Coal Processing Plant (CPP) and Sedimentation Pond and Spillway; and
- Potential acid generating (PAG) rocks from the pits will be placed into the East Management Pond, which is also partially located within the Four Creek watershed.

Ultimately, the outputs of the Water and Load Balance Model provide a prediction of the expected changes to surface water that will be caused by mine development.

1.5 Study Objectives

The overall purpose of this study is to develop a more detailed representation of the groundwater and surface water processes that generate streamflow in Four Creek, and to better quantify how the proposed mine development will affect those processes and ultimately change streamflow in Four Creek. This study addresses two key objectives:

- Investigate key groundwater processes in the Four Creek watershed, assess groundwater circulation in the till dominated overburden located in the Four Creek Watershed and understand the role of shallow groundwater flow (interflow) pathways within till-dominated overburden; and
- Develop a water balance model that represents key groundwater and surface water processes in Four Creek and can be used to quantify how the proposed mine infrastructure within the Four Creek watershed will affect the Four Creek streamflow.

2.0 Physical Setting

The following sections provide an overview of the physical characteristics of the Four Creek watershed.

2.1 Terrain

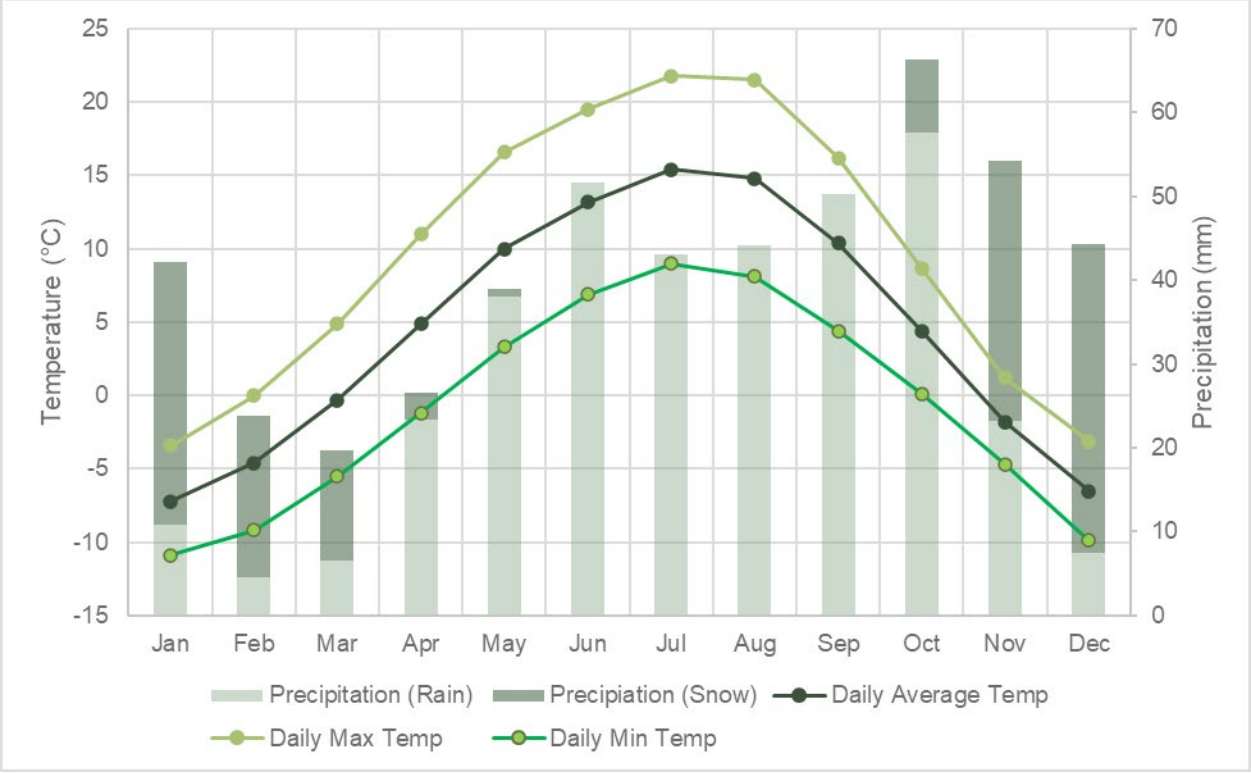
Four Creek lies between Tenas Creek and Goathorn Creek and drains roughly in a north–south direction (Figure 1). Elevations within the Four Creek watershed range from approximately 1,370 metres above sea level (masl) near the headwaters in the south, to about 675 masl at its confluence with Goathorn Creek at the northern end of the watershed.

The proposed open pit is located in southern portion of the watershed, while the proposed East Management Pond is situated in the central/northern part of the watershed. The terrain in the Four Creek watershed predominantly consists of gentle mountain slopes and gentle colluvial aprons at the base of slopes. Bedrock outcrops within the Four Creek watershed are limited and primarily comprise residual knobs (tors) on the hilltops.

2.2 Climate

The nearest long-term climate station is located at Smithers, approximately 20 km north of Goathorn Creek at an elevation of 520 masl. Climatic normals are available at this station for the period between 1991 and 2020 (Environment Canada 2024, Figure 4). The mean annual precipitation recorded was 405 mm, with extreme daily rainfall of 68 mm observed in October 2017.

Figure 4: Climate normals for Smithers BC for the years 1991-2020

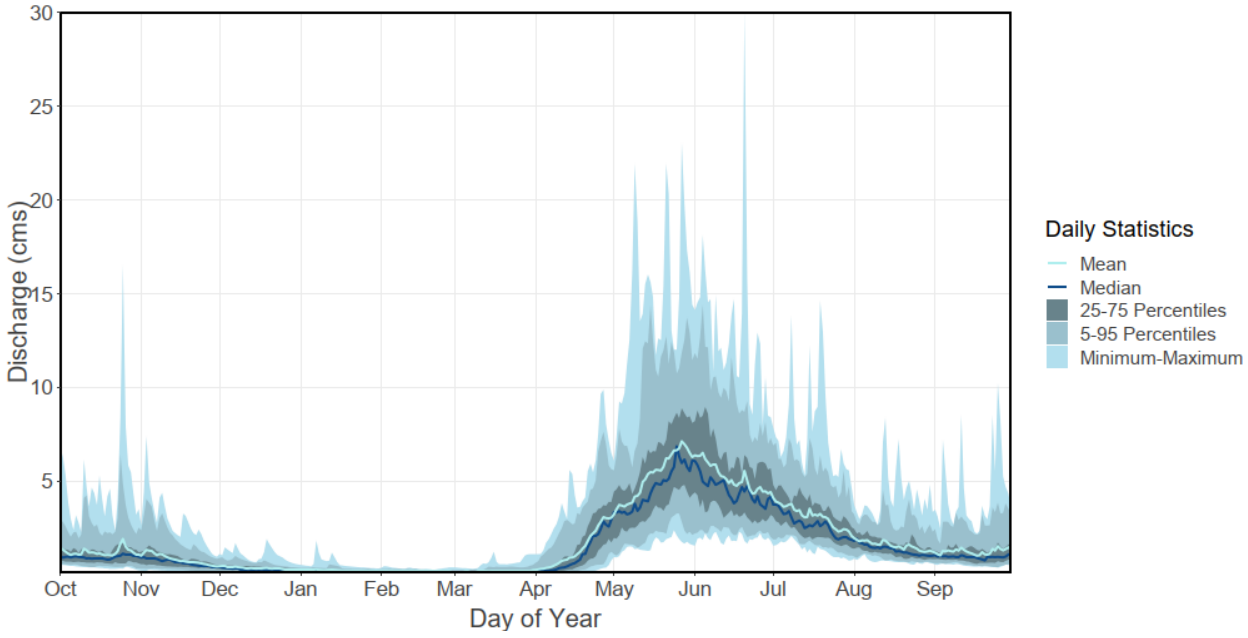


Source: Environment Canada 2024.

2.3 Hydrology

A Water Survey of Canada hydrometric gauge is located on Goathorn Creek, approximately 3.4 km downstream of the confluence with Four Creek (Station 08EE008 named 'Goathorn Creek Near Telkwa') (WaterOffice 2025). The hydrometric gauge has maintained a predominantly continuous discharge record since 1960. Runoff in the Goathorn Creek watershed is primarily influenced by snowmelt, with peak flow periods occurring in spring and early summer (Figure 5). Following the spring freshet, streamflow gradually recedes to low flow conditions that persist during summer months. Portions of Four Creel are regularly disconnected during summertime low flow periods. These summer low flows are regularly interrupted by rainfall events that can also produce secondary peak flows. The most extreme low flow periods typically occur between December and March, when precipitation primarily falls as snow.

Figure 5: Daily discharge statistics for Goathorn Creek at the Water Survey of Canada Gauge (08EE008)



2.4 Groundwater – Surface Water Interactions

Within the Four Creek watershed, the presence of fine till (refer to Section 2.6 for additional information) prevents or reduces water from flowing down to the deeper groundwater system. Consequently, flow in Four Creek is not supported or fed by the groundwater table in the overburden and bedrock.

During low flow periods, the primary source for streamflow in the creek is from the movement through the upper soil layer, above the groundwater table. This process is known as interflow and can result from rainfall or surface water that percolates downward into the shallow subsurface and later reemerges at the surface as it enters the creek. For the purposes of this reporting, baseflow is the water stored within a catchment that sustains streamflow between high rainfall periods and snowmelt periods when surface runoff is limited.

2.5 Forest Characteristics

The Biogeoclimatic Ecosystem Classification (BEC) system classifies ecosystems and forest cover characteristics across BC based on climate, soil, and vegetation characteristics (Pojar et al. 1987). The watershed encompasses two distinct BEC zones: the Sub-Boreal Spruce (SBS) zone and the Engelmann Spruce-Subalpine Fir (ESSF) zone (Figure 2). The SBS zone, characterized by cold winters and warm summers, covers the downslope two-thirds of the watershed. This zone features dense forests with dominant tree species such as hybrid white spruce, subalpine fir, and lodgepole pine. The ESSF zone, located near the upper portion of the watershed, is adapted to colder temperatures and longer winters relative to SBS zones. Precipitation patterns in ESSF zones are dominated by snowpacks ranging from 1 to over 3 metres (m), which can persist into late spring or early summer. This zone supports old-growth forests dominated by Engelmann spruce and subalpine fir.

2.6 Surficial Geology

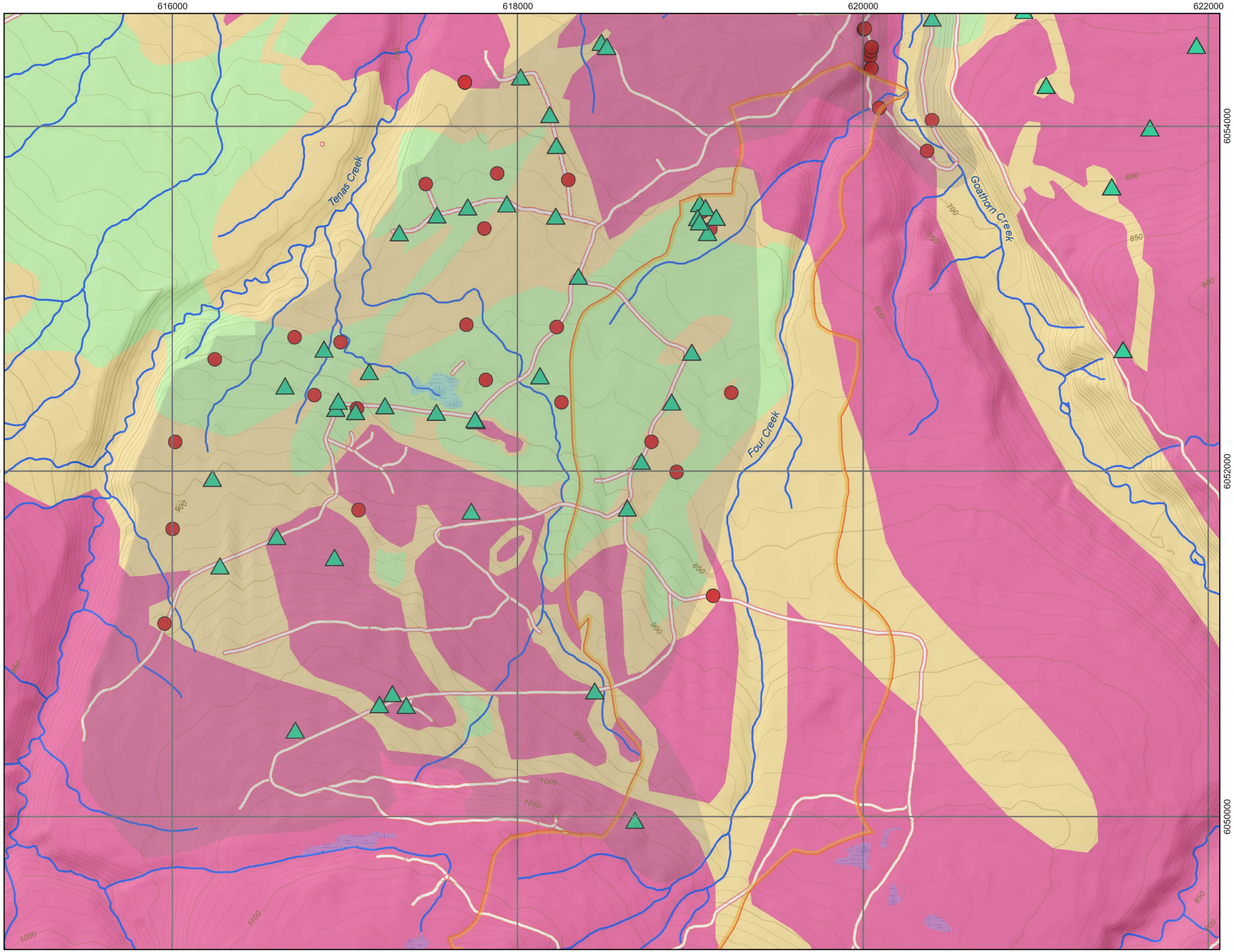
Within the Four Creek watershed, surficial geology primarily consists of glacial clay-silt-rich till and glaciofluvial sand-gravel-rich till.

The surficial geology map (Figure 6) was prepared by SRK and it is included in the EA supporting documents (2022a). The report indicates that the central portion of the watershed and the surficial material underneath the creek channel are generally composed of sand-gravel-rich till, while the upper and lower portions of the watershed predominantly consist of clay-silt-rich till.

The clay-silt-rich till typically contains silt, clay, and fine sand with some gravel. It is commonly very stiff to hard in consistency with low to medium plasticity. Areas with this type of surficial soil are typically more prone to water retention, resulting in lower infiltration rates. Water tends to accumulate or move more slowly through these soils, leading to predominant surface runoff and interflow (due to the fine till acting as a restrictive layer).

The sand-gravel-rich till was assessed as dense to very dense through standard penetration testing during sonic drilling (SRK 2022a). This material is less fine, allowing water to move through it more easily compared to fine-grained soils. These areas can have a more pronounced impact on hydrology because water infiltrates faster and may flow vertically toward the deep groundwater system not connected to Four creek, which results in a reduction of the baseflow.

In addition, the surficial geology map indicates that the stream incises down into a glacial till deposit which has the potential to restrict the movement of water between the creek and the surrounding subsurface.



KEY MAP

LEGEND

- Test Pit[1]
- Sonic[1]
- Watercourse[2]
- Wetland[2]
- Proposed Project Footprint
- Four Creek Watershed[2]

Surficial Geology[1]

- Upper Till
- Lower Till
- Sand and Gravel

1 - SRK Consulting/Telkwa Coal, January 2021 - Disclaimer: all mapped features are approximate and should be used for discussion purposes only.
2 - BC Freshwater Atlas

0 0.25 0.5 0.75 1

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

Scale: 1:22,000
Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
Checked: GH
Date: September 3, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Surficial Geology (georeferenced) from Allegiance Coal and SRK Consulting, January 2021. Contour interval is 10 metres (minor) and 50 metres (major). All elevations in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Surficial Geology

SLR

REF. NO. 2404901-MR-006

Figure 6

REV. 1

Document Path: G:_Projects\Tenas\1_Workspace\Task 02 - Figures\2025\(2025-04) Four Creek Environmental and Hydrology Figures\(2025-04) Environmental Figures.aprx

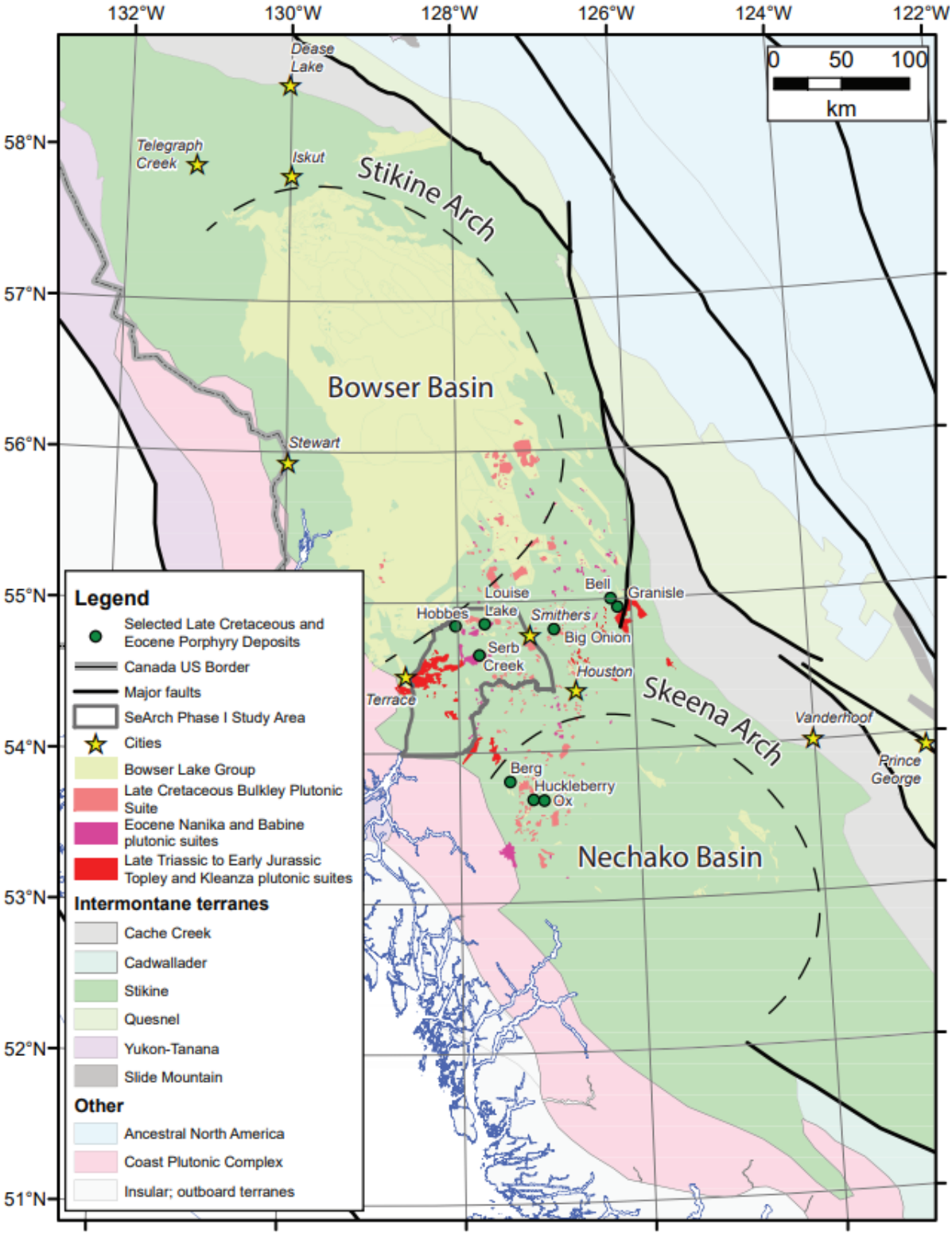
2.7 Bedrock Geology

The study area is in the northeast/southwest trending Skeena Arch, which separates older (Jurassic) sedimentary rocks of the Bowser Basin in the north from the younger (Cretaceous) sedimentary rocks of the Nechako Basin to the south. The Skeena Arch represents a magmatic arc that has produced a diverse range of mineral deposits in West Central BC. The regional geology map is included in Figure 7.

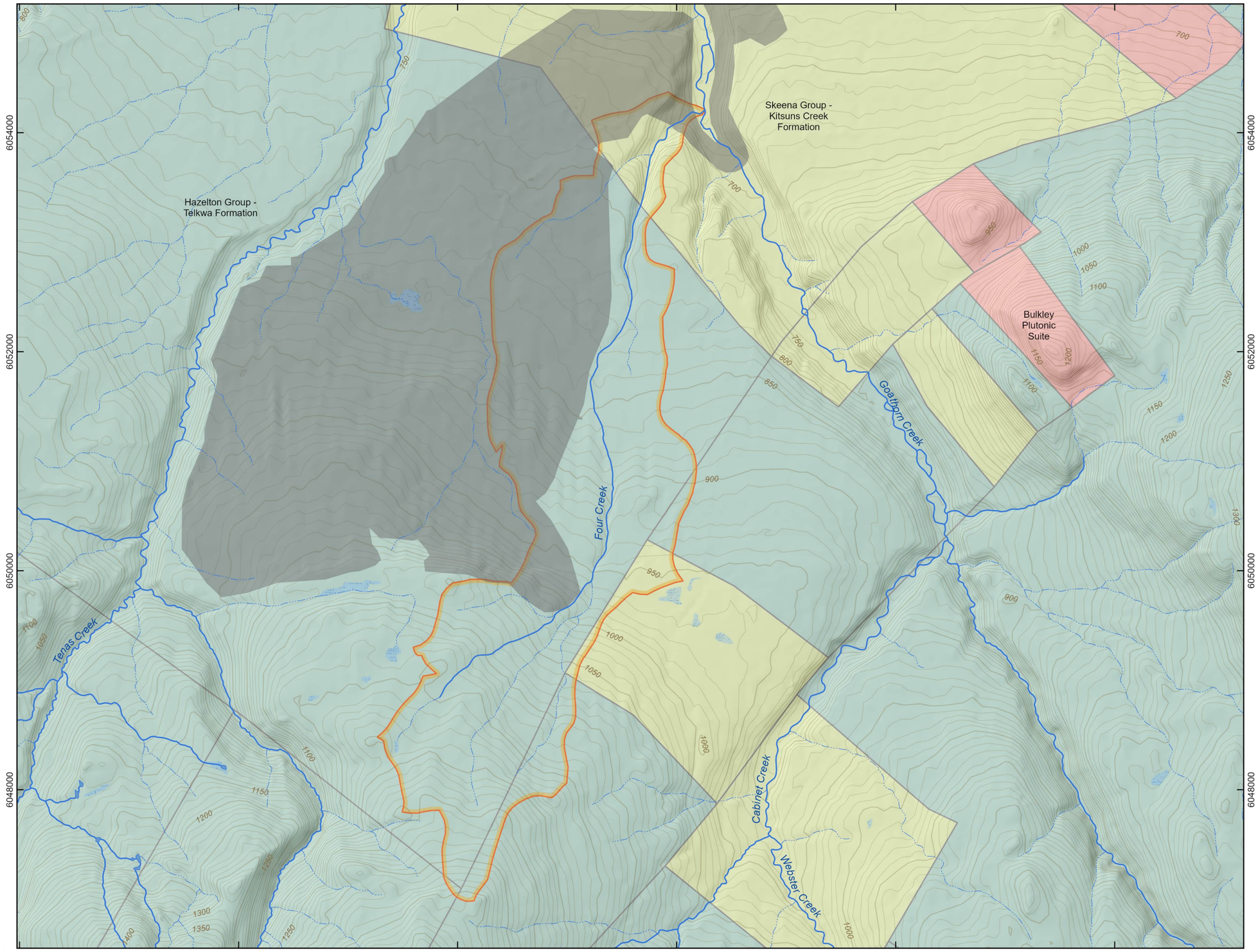
The Four Creek watershed is mostly comprised of the Telkwa formation, which is a volcanic rocks geologic formation part of the Hazelton Group and is made up of subaerial and marine volcanic, sedimentary, and pyroclastic rocks. The upper portion of the watershed, where the open pit will be developed, comprises of sandstone, conglomerate and coal (defined as Unit 1 in Figure 8). Similarly, the lower portion of the watershed, at the confluence between Four Creek and Goathorn Creek, the bedrock comprised of Unit 1 and marine mudstone and siltstones (defined as Unit 2 in Figure 8).

As part of the EA study, SRK identified that the bulk of recharge to the bedrock system occurs from the infiltration of precipitation and runoff in the upland area of the Tenas Creek and Goathorn Creek watersheds, where the silt-clay-rich till coverage is limited. SRK also noted that locally the groundwater can be disconnected (i.e., perched) above the bedrock groundwater system.

Figure 7: Geology Map



Source: Geoscience BC Report 2022-09 – BCGS Open File 2019-09 – MDRU Publication 458.



KEY MAP

LEGEND

- Watercourse[1]
- Intermittent or Indeterminate Watercourse[1]
- Wetland[1]
- Proposed Project Footprint
- Four Creek Watershed[1]

Geological Unit - Mesozoic Era[2]

Cretaceous Period

- Intrusive Rocks; undivided
- Sedimentary Rocks; coarse clastic

Jurassic Period

- Volcanic Rocks; calc-alkaline

1- BC Freshwater Atlas
2- BC Geological Survey

0 0.5 1 1.5 2

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

Scale: 1:35,000
Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
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Date: September 3, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Bedrock Geology provided by British Columbia Geological Survey (BC Digital Geology which includes compiled field mapping from 50K to 250K scale). Contour interval is 10 metres (minor) and 50 metres (major). All elevations in metres above sea level.

CLIENT: Telkwa Coal

PROJECT: Tenas Project

TITLE: **Bedrock Geology**

SLR

REF. NO. 2404901-MR-020

Figure 8

REV. 1

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3.0 Groundwater and Surface Water Investigation

Groundwater and surface water are often studied and managed separately; however, they are connected through the hydrologic cycle. The direction and rate at which water is exchanged between surface water and groundwater can vary both in space and time as result of several factors such as topographic position, seasonality, and sediment type. The gradient between surface water and groundwater in the overburden strongly influences surface and subsurface groundwater exchange.

This study relies on empirical data collection and analysis to assess the nature of groundwater processes that contribute to discharge in Four Creek. Specifically, surface water levels, shallow groundwater levels, discharge measurements, and water quality data are used to investigate and compare the streamflow contributions from interflow and deeper groundwater flow systems in overburden and bedrock.

3.1 Methods

Historical information, collected by SRK and ERM as part of the Environmental Assessment process, was reviewed and analyzed to complete this study (SRK 2022, 2022b, 2022c; ERM 2020, 2025).

A field program was conducted to support the modeling and historical literature review efforts. The objectives of the field program were to characterize and monitor shallow groundwater/surface water interactions in Four Creek, and provide additional groundwater, and surface water quantity and quality data beyond the information collected during the original baseline program.

A summary of the tasks completed for each trip in included in Table 2.

Table 2: Summary of field work completed at Four Creek

Field Dates	Tasks
2024/07/03 – 2024/07/10	• Assessed the status of the Monitoring Wells (MW) and Mini Piezometers (MPs). • Measured Water Levels (WLs). • Installed shallow and deep MPs in proximity to Water Quality Station WQS-20. • Collected groundwater samples and physical parameters from select MWs, MPs, and Surface Water (SW) Stations.
2024/09/04 – 2024/09/11	• Measured Water Levels in MWs and MPs. • Collected groundwater samples and physical parameters from select MWs, MPs, and SW Stations. • Performed a temperature, conductivity, and flow survey along Four Creek and identified potential overwintering locations for vulnerable species.
2024/10/16 – 2024/10/17	• Collected groundwater samples and physical parameters from select MPs and SW stations. • Performed a temperature, conductivity, and flow survey along Four Creek.

3.1.1 Discharge Measurements

The Area-Velocity (AV) method was used to estimate discharge at Four Creek during the June, September, and October 2024 field trips, adhering to BC Hydrometric Standards (RISC 2018).

Area-velocity measurements were collected along suitable cross sections (e.g., transects that perpendicularly intersect the stream) with relatively uniform bed characteristics and low turbulence conditions. The identification of suitable cross-sections was conducted by experienced field personnel for each visit. Depth and velocity measurements were collected using an acoustic Doppler velocimeter (Sontek FlowTracker2). Manual area-velocity streamflow measurement procedures were consistent with the Standards (RISC 2018) and included:

- A tag-line measuring tape across the cross-section perpendicular to the direction of flow.
- A minimum of 20 vertical depth and velocity measurements were collected, unless restricted by the channel width and the resolution of the field equipment. Vertical measurement points were spaced so that no more than 10% of total streamflow was accounted for by any single measurement point. This typically resulted in scenarios where velocity measurements were more closely spaced in deeper, faster moving water.
- If depths were <1.0 m, velocity was measured at a 0.6 m depth from the water surface. If the depth was >=1.0 m, velocities were measured at 0.2 m and 0.8 m depths from the water surface. Velocity measurements were averaged for a minimum of 40 seconds.

The volumetric flow rate of each panel was then calculated as the product of the cross-sectional area of the panel and the average velocity measured within that panel. The flow rate for a river transect was determined by summing the flow rates of all the panels in that transect.

$$Q = \Sigma A_i V_i$$

Where $\boldsymbol{Q}$ denotes the volumetric flow rate for the whole transect, $\boldsymbol{A_i}$ denotes the cross-sectional area of the ith panel, and $\boldsymbol{V_i}$ denotes the average velocity of the ith panel. Each panel was 10 centimetres (cm) in width, with depths from zero to 36 cm (October 2024 survey).

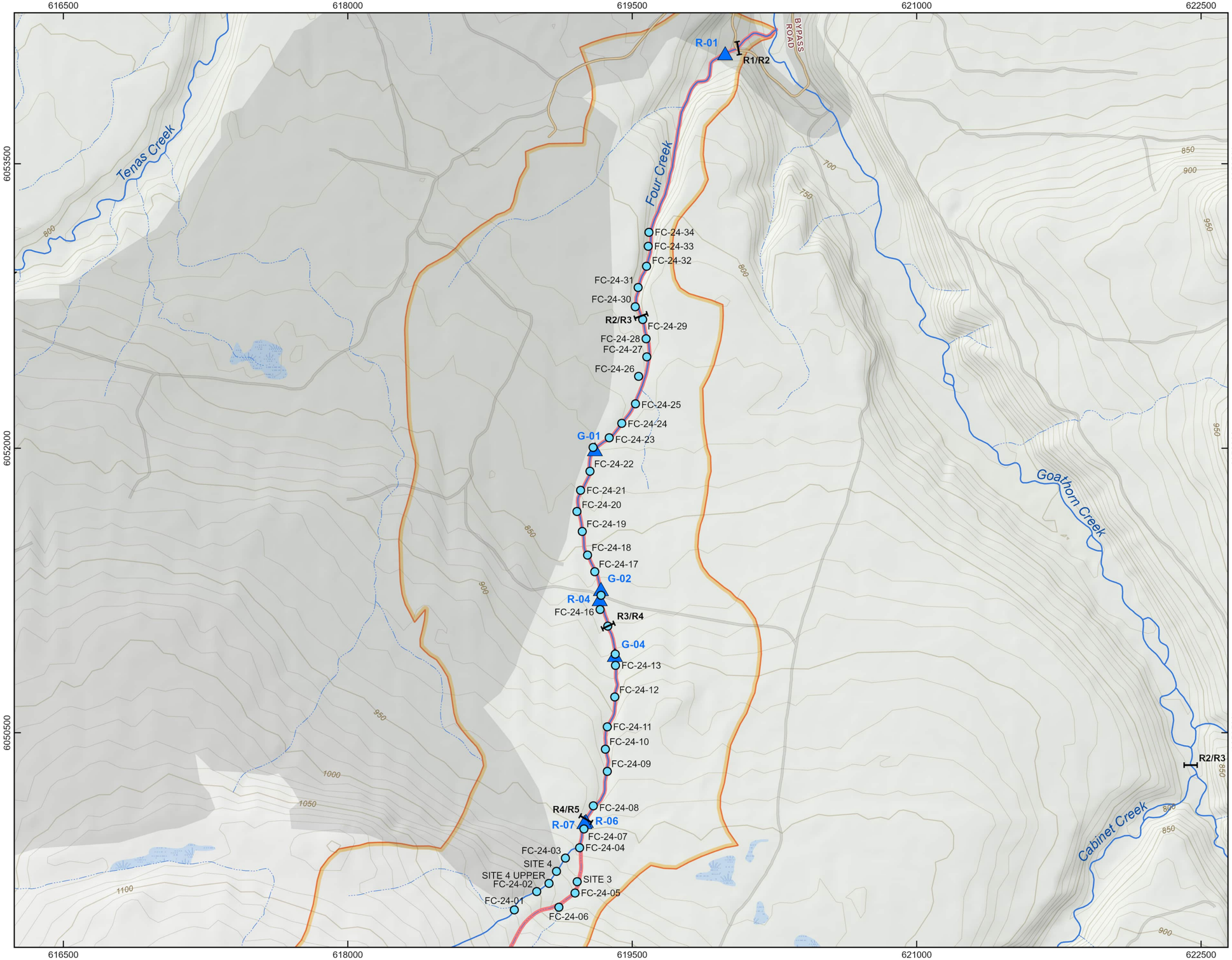
Discharge measurements were taken at select transects along the length of Four Creek from the headwaters down to the Goathorn Creek confluence. Changes in discharge rates between these measurement stations can indicate whether the stream lost water out to the aquifer (downstream discharge is less than upstream discharge) or if the stream gained water ream discharge is greater than upstream discharge).

3.1.2 Conductivity Survey

The analysis of electrical conductivity in various components of a watershed (i.e., creeks, rivers, ponds and reservoirs, bedrock groundwater, overburden groundwater, and intermittent flow) is an efficient and rapid preliminary investigation technique that can provide insight into both the flow path the water has taken through the watershed and its provenance. As water moves through soil and/or rock in the subsurface, it dissolves minerals and salts it encounters along its flow path. The longer the water remains in contact with the rock, the greater the degree of dissolution and the higher the concentration of free ions in the water. These free ions enable the water to conduct electricity, so the higher the concentration of free ions, the higher the electrical conductivity.

Changes in conductivity along a stream reach can help identify mixing zones of groundwater and surface water. Creek water tends to have lower conductivity than groundwater (circulating both in bedrock and overburden).

In September 2024, SLR Consulting (Canada) Ltd. (SLR) completed a survey of a four-kilometer stretch of the Four Creek channel, including two 500 m segments along the contributing headwater reaches in the southern, higher elevation portion of the catchment. Conductivity and flow measurements were collected at 100 m intervals using a YSI multiparameter probe. Additional conductivity measurements were collected in June 2024 and October 2024 (Figure 9).



KEY MAP

LEGEND

- Conductivity Measurement Location
- SEFA Flow Measurement
- Reach Break
- Watercourse[1]
- Intermittent or Indeterminate Watercourse[1]
- Four Creek[1]
- Proposed Bypass Road
- Resource Road [2]
- Wetland[1]
- Proposed Project Footprint
- Four Creek Watershed[1]

1 - BC Freshwater Atlas
2 - BC Digital Road Atlas (for clarity, not all roads displayed)

0 0.25 0.5 0.75 1

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North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

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Drawn: BE/RS
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Date: September 4, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Contour interval is 10 metres (minor) and 50 metres (major). All elevations in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Conductivity/Discharge Locations from Manual Creek Surveys

SLR

REF. NO. 2404901-MR-008-01

Figure 9

REV. 1

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3.1.3 Groundwater Monitoring and Hydraulic Gradients

3.1.3.1 Monitoring Wells

SLR selected the monitoring wells (MW) listed in Table 3 to characterize overburden and bedrock groundwater circulation within or in close proximity to the Four Creek watershed. All the monitoring wells were installed by other consultants as part of the baseline hydrogeology characterization of the Tenas Project to support the EA process.

The monitoring well depths were designed to characterize groundwater circulation in both the shallow and deep overburden, as well as in the bedrock. It should be noted that some of the selected monitoring wells are located outside the Four Creek watershed; they were chosen for the study due to their proximity and the limited number of MWs within the Four Creek watershed.

The location of the monitoring wells is depicted in Figure 10.

Table 3: Scope of Work and list of Monitoring Wells for the Four Creek study

Well ID	UTM Coordinates (Zone 9N)		Depth to Bottom (mbtoc)	Lithology	Notes
	Easting (m)	Northing (m)			
T95R-64	618278	6050597	94.0	Bedrock (Coal seam #1)	To characterize groundwater circulation in the deep bedrock in the ore zone-
T19-18S	619237	6050602	47.2	Overburden	To characterize groundwater circulation in the deep overburden, located within Four creek watershed
T19-19S	618775	6052171	47.2	Overburden + Bedrock	To characterize groundwater circulation in the deep overburden and deep bedrock, located within Four creek watershed
18-02S (GEO11)	618921	6051995	19.5	Overburden	To characterize groundwater circulation in the overburden, located within Tenas creek watershed
TOB96-02-06	618466	6051947	33.5	Overburden	To characterize groundwater circulation in the deep overburden, located within Tenas creek watershed
TOB96-01-05	619014	6050602	10.5	Overburden	To characterize groundwater circulation in the overburden, located within Four creek watershed
T18-01D	617840	6050689	59.9	Bedrock	To characterize groundwater circulation in the deep bedrock in the ore zone, located within Tenas creek watershed

Well ID	UTM Coordinates (Zone 9N)		Depth to Bottom (mbtoc)	Lithology	Notes
	Easting (m)	Northing (m)			
T95R-40	618188	6051460	52.2	Bedrock	To characterize groundwater circulation in the deep overburden, located within Tenas creek watershed

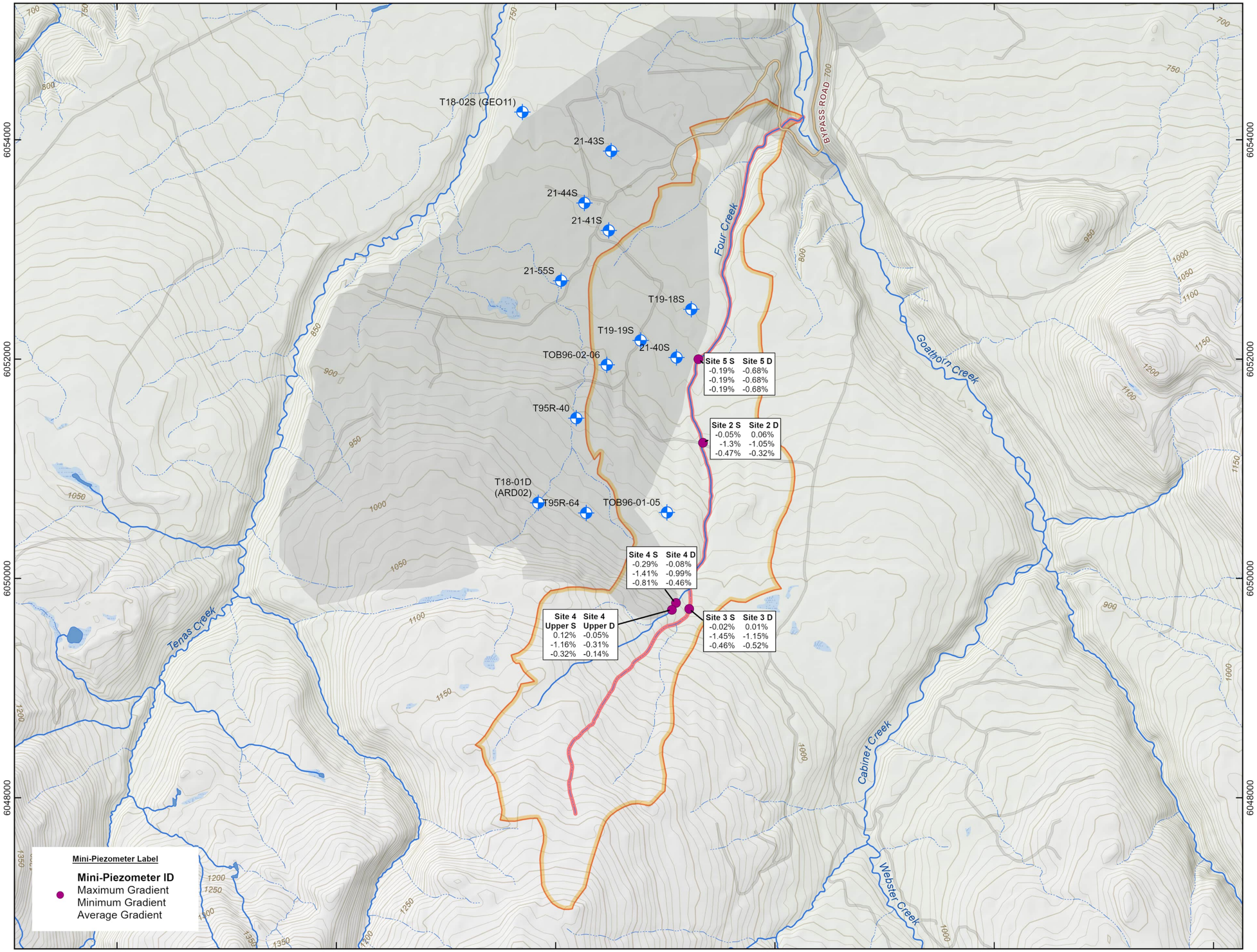
3.1.3.2 Mini-Piezometers

Cassiar Geoscience Consulting Ltd installed four nested Solinst mini piezometers (MPs) within Four Creek as part of a preliminary surface water/groundwater study at specific locations within the Four Creek watershed. The initial focus of the MP installation was to determine whether Four Creek, around the proposed Tenas pit, is supported by groundwater or surface water (i.e., recharge or discharge features). The location and installation details of each MP are provided in Figure 10 and Table 4, respectively.

In 2024, SLR installed one additional nested MP (shallow and deep) to further characterize the surface water/groundwater interaction in proximity to the water management pond. Prior to each MP installation, hand augers were used to extract the upper 1-1.5 m of soil for characterization, providing a broad assessment of surficial geology and soil permeability in the valley. The details of the two MPs installed by SLR are included in Appendix A.

Table 4: Mini-Piezometer Installation Details

ID	Date	UTM Coordinates (Zone 9N)		Elevation (masl)	Stick-Up (m)	Total Depth (mbtoc)	Source
		Easting (m)	Northing (m)				
Site 2 Shallow	05-Nov-21	619343	6051237	864	0.54	1.12	Cassiar 2021
Site 2 Deep	05-Nov-21	619343	6051237	864	1.16	2.16	Cassiar 2021
Site 3 Shallow	19-Nov-21	619218	6049722	973	0.61	1.11	Cassiar 2021
Site 3 Deep	19-Nov-21	619218	6049722	973	0.99	1.84	Cassiar 2021
Site 4 Shallow	18-Nov-21	619097	6049776	980	0.7	1.12	Cassiar 2021
Site 4 Deep	18-Nov-21	619097	6049776	980	1.17	2.1	Cassiar 2021
Site 4 Upper Shallow	18-Nov-21	619060	6049713	980	0.65	1.15	Cassiar 2021
Site 4 Upper Deep	18-Nov-21	619060	6049713	980	1.06	1.86	Cassiar 2021
Site 5 Deep	04-Jul-24	619297	6052003	831	0.62	2.55	SLR 2024
Site 5 Shallow	04-Jul-24	619297	6052003	831	0.75	1.44	SLR 2024



KEY MAP

LEGEND

- Mini-Piezometer
- Monitoring Well
- Watercourse[1]
- Intermittent or Indeterminate Watercourse[1]
- Four Creek[1]
- Proposed Bypass Road
- Resource Road[2]
- Wetland[1]
- Proposed Project Footprint
- Four Creek Watershed[1]

1 - BC Freshwater Atlas
2 - BC Digital Road Atlas (for clarity, not all roads displayed)

0 0.5 1 1.5 2

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

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Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
Checked: GH
Date: September 3, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Contour interval is 10 metres (minor) and 50 metres (major). All elevations in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Monitoring Well Locations and Mini-Piezometer Locations

SLR

REF. NO. 2404901-MR-007

Figure 10

REV. 1

Document Path: G:_Projects\Tenas\1_Workspace\Task 02 - Figures\2025\(2025-04) Four Creek Environmental and Hydrology Figures\(2025-04) GW and SW Modelling Figures.aprx

3.1.3.3 Groundwater Level Monitoring

Monitoring groundwater levels over time enables both temporal (i.e., seasonal or over time) and spatial (i.e., relationships between different areas or geological formations) assessments of groundwater flow and transport. The purpose of groundwater level monitoring is to evaluate the response of groundwater levels to precipitation, stream stage fluctuations, snowmelt, and other external influences.

3.1.3.4 Manual Measurements

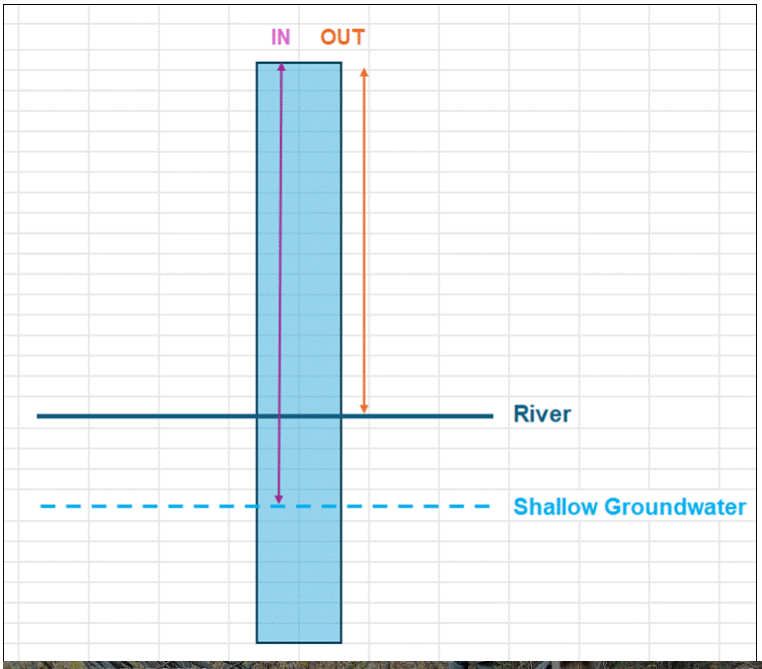
To measure water levels manually, a water level meter is lowered into the MP or MW until the probe detects water. The groundwater level is then recorded as the distance from the top of the casing of the MP or MW down to the water surface. These can be converted to elevation measurements when the top of casing elevation is known.

For MPs, both groundwater levels (referred to as the IN measurement) and creek surface water (referred to as the OUT measurement) were measured using a staff gauge or tape measure (Figure 11). This processed was repeated at each MP location for consistency.

Manual measurements serve two purposes:

- Correcting Sensor Drift: Water levels within each MP and MW were manually measured to account for natural drift in the pressure transducers.
- Vertical Hydraulic Gradient: Water levels in the creek adjacent to each MP were measured to calculate the vertical hydraulic gradient in the streambed.

Figure 11: (Top) Schematic of the MP groundwater level (IN) and surface water (OUT) measurements. (Bottom) Field photo of the deep (image left) and shallow (image right) MPs at Site 2.



3.1.3.5 Vertical Gradients

The vertical hydraulic gradient (VHG) is calculated to quantify the difference in hydraulic head between two or more points in the vertical direction within a watershed system. This was calculated based on the measured difference between the surface water of the creek and groundwater levels measured in the shallow and deep MPs relative to the separation distance between the creek bed and the mid-point of the MP screened interval.

The VHG equation was determined for each MP and uses measured water levels and discrete discharge measurements. The VGH was calculated using the following equation:

$$VHG = \frac{(H_2 - H_1)}{L}$$

Where:

- VHG = vertical hydraulic gradient
- H_1 = hydraulic head at the surface water
- H_2 = hydraulic head at the lower mini-piezometer / upper mini-piezometer
- L = vertical distance between the midpoints of the screened interval

The difference between the water levels in the MP and the surface water indicates direction of flow:

- Positive Vertical Gradient: Water level in the MP is higher than the creek, meaning shallow groundwater is discharging into the creek in the immediate vicinity of the MP.
- Negative Vertical Gradient: Water level in the MP is lower than the creek, meaning water from the creek is seeping into the streambed and recharging shallow groundwater in the vicinity of the MP.
- Neutral Vertical Gradient: Water level in the MP and the water level in the creek are similar (+/- 2 cm) meaning that the creek is neither gaining or losing significant volumes of water to/from the groundwater table.

In case of the MP being dry, the bottom of the MP was assumed to be the water level for the purpose of estimating the vertical gradient.

3.1.3.6 Pressure Transducer Installation

MP Site 2D, Site 3D, Site 4D, Site 4upD, Site 5D and Site 5S were equipped with Solinst pressure transducers to continuously measure groundwater pressure and record groundwater levels at a frequency of one reading every hour for the duration of the study. A separate transducer for barometric pressure was installed for barometric compensation of the collected pressure data. Pressure transducers were also installed at selected monitoring wells. Pressure transducer installation details are summarized in Table 5.

Table 5: Mini-Piezometer Pressure Transducer Installation Information

Transducer Make and Model	Serial Number	Mini Piezometer	Depth of Installation (mbtoc)
Solinst Model 3001 Levelogger 5 M5	214561	Site 2D	1.62
Solinst Model 3001 Levelogger 5 M5	214265	Site 3D	1.58
Solinst Model 3001 Levelogger 5 M5	2145258, replaced by 2110511 in Oct 2023	Site 4D	1.63
Solinst Model 3001 Levelogger 5 M5	2145264	Site 4UD	1.61
Solinst Model 3001 Levelogger 5 M5	2147359	Site 5S	1.25*
Solinst Model 3001 Levelogger 5 M5	2171776	Site 5D	1.50
Note: mbtoc – metres below top of casing * inferred			

Table 6: Monitoring Well Pressure Transducer Installation Information

Transducer Make and Model	Serial Number	Monitoring Well	installation notes
Solinst Model 3001 Levelogger 5 M10	2065044	T95R-64	Transducer installed in 2017
Solinst Model 3001 Levelogger 5 M10	2065063	TOB96-02-06	Transducer installed in 2017
Solinst Model 3001 Levelogger 5 M10	2145258	TOB96-01-05	Installed in July 2024 by Cody Cameron (Cassiar Gesocience Consulting Ltd.)
Solinst Model 3001 Levelogger 5 M5	2195947	T19-18S	Installed in July 2024 by Cody Cameron (Cassiar Gesocience Consulting Ltd.)

3.1.3.7 Groundwater Sampling

The specific pumping method selected at each location was designed to minimize agitation of sediments in the monitoring well, which is common in manual pumping methods, and was adjusted to a pumping rate that allowed for minimal drawdown. These methods provided samples representative of groundwater conditions.

In July 2024, monitoring well T95R-64 was partially pumped using a Monsoon XL submersible pump, but the sampling was completed using a bailer and hand pumping with a Waterra Footvalve as the submersible pump stopped working during the initial purging. Monitoring wells TOB96-02-06 and TOB96-01-05 were sampled using a peristaltic pump, while T95R-40 and T18-01D were sampled by hand pumping with a Waterra Footvalve. A bailer was used to sample T19-18S due to the depth of the water level making hand pumping difficult.
The mini-piezometers were sampled using a combination of Waterra® Foot Valves and 1” bailers. No purging was conducted at all MP locations due to the limited amount of water in the steel pipe (1”).

In September 2024, monitoring wells T95R-64, T94R-40, TOB96-02-06, T19-18S, and T18-01D were sampled using a combination of a Monsoon XL submersible pump and bailers. Physical

parameters were measured throughout the duration of purging. Mini-piezometers at Site 2S, Site 4 Upper S, Site 4 Upper D, and Site 5 were sampled using a peristaltic pump, with groundwater levels and surface water levels monitored. Groundwater physical parameters were taken at each MP except Site 3 Deep and Site 5 Deep due to limited water. Site 2 Shallow, Site 4 Upper Shallow, Site 4 Upper Deep, Site 5 Deep, and Site 5 Shallow were sampled using a peristaltic pump.

Grab samples were collected at surface water sites Site 2, Site 4 Upper, and Site 5.

Throughout the purging process, in situ parameters were regularly monitored using a YSI multiparameter meter and a turbidity meter. The recorded in situ parameters included pH, temperature, dissolved oxygen, redox potential, conductivity, and turbidity. In situ parameters were continually recorded throughout purging until they stabilized over at least three consecutive recordings.

Once the purging conditions were met and the final in situ parameters were recorded, the water sample for laboratory analysis was collected. Samples for dissolved parameters were filtered in the field using a 0.45 µm in-line Waterra™ filter connected to the sampling tubing. Required preservatives were added to the appropriate sample bottles by the laboratory (Caro Analytical Services) in the appropriate concentrations and volumes.

The 2024 sampling events and collected samples from MWs, MPs, and surface water (SW) stations are summarized in Table 7.

Table 7: Groundwater Samples collected during each sampling event

Monitoring Location ID		Sampling Season	
		July 2024	September 2025
T95R-64		✓	✓
T19-18S		✓	✓
T19-19S		[a]	[a]
18-02S (GEOG11)		[b]	[b]
TOB96-02-06		✓	✓
TOB96-01-05		✓	✓
T95R-40		✓	✓
21-41S		[c]	[a]
Site 2	Shallow	✓	✓
	Deep	-	-
	Surface Water	✓	✓
Site 3	Shallow	-	-
	Deep	-	-
Site 4	Shallow	-	-
	Deep	-	-

Monitoring Location ID		Sampling Season	
		July 2024	September 2025
Site 4 Upper	Shallow	✓	✓
	Deep	✓	✓
	Surface Water	-	✓
Site 5	Shallow	✓	✓
	Deep	-	✓
	Surface Water	✓	✓

✓ = Groundwater sample was collected
[a] = Sample not taken as well was dry
[b] = Sample not taken as well was broken
[c] = Location not visited

3.1.3.8 Duplicate Samples

To evaluate the repeatability and reliability of the sample results, duplicate water samples and trip blanks were collected and analyzed for the same parameters as the primary samples (Table 8).

Table 8: Summary of Duplicate Samples

Duplicate	T95R-64	T18-01D	T95R-40
DUP-A	Jul-24	-	Sep-24
DUP-B	Sep-24	Jul-24	-

3.2 Water Quality and Quantity Results

The following sections describe the results of the groundwater, interflow and surface water quantity and quality data collected in 2024 by SLR.

In addition, data collected from previous consultants have been reviewed and analyzed to create a more robust Four Creek watershed Conceptual Site Model.

Groundwater quality is discussed by providing a general overview of major ion chemistry, physical and chemical parameters, nutrients, and dissolved metals. A complete summary of the groundwater results is included in Appendix B, and Certificate of Analysis reports from the laboratory are included in Appendix C.

3.2.1 Discharge Measurements

A summary of the discrete discharge measurements collected in June 2024, September 2024, and October 2024, is shown in Table 9, Table 10 and Table 11. Several sections along Four Creek were dry during the September 2024 field trip. The dry sections are depicted in Figure 12.

Discharge vs Distance graphs were produced for each field trip completed in 2024 (Figure 13 to Figure 15). The results for the June 2024 and September 2024 field trips clearly indicate that Four Creek, during low flow conditions, is overall a losing creek. A losing creek is defined when

water lost through the riverbed exceeds the water gained through interflow / groundwater recharge.

The October 2024 field trip graph indicates that the discharge of Four Creek increases with distance down-reach moving towards the Goathorn confluence. This trip was conducted during wet conditions, with an average discharge of 13.6 L/s.

The analysis of the September 2024 discharge vs distance graph (Figure 14) shows an alternating of gaining and losing sections, even if as previously stated the overall trend indicates that Four Creek is a losing creek. Changes between gaining / losing section are likely associated with measurements uncertainty rather than to different contributions from the interflow or changes in the riverbed grain size distributions, because conductivity measurements have been consistent in all the sections (Refer to Section 3.1.2). The September program had to occur over two days due to time constraints. The most recent precipitation event prior to the survey was 1.8 mm on 2024/09/02, and an additional rainfall event of 7.7 millimetres (mm) occurred in-between the two survey days on 2024/09/07. This precipitation had the potential to bias the results of survey towards higher discharge measurements during the second day of the survey, especially as that second day of the survey was focused on the down-reach sections of Four Creek.

Table 9: June 2024 field trip – Discharge measurements

Location ID	Easting (m)	Northing (m)	Distance Up-Reach [1] (m)	Discharge (m^3/s)
R-01	619990	6054083	321	< 0.001
G-01	619303	6051996	2,661	< 0.001
G-02	619335	6051258	3,445	< 0.001
R-04	619329	6051205	3,498	< 0.001
G-04	619408	6050911	3,805	< 0.001
R-06	619255	6050034	4,729	0.003
R-07	619248	6050030	4,737	0.004
[1] Distance up-reach from the Goathorn Creek confluence.				

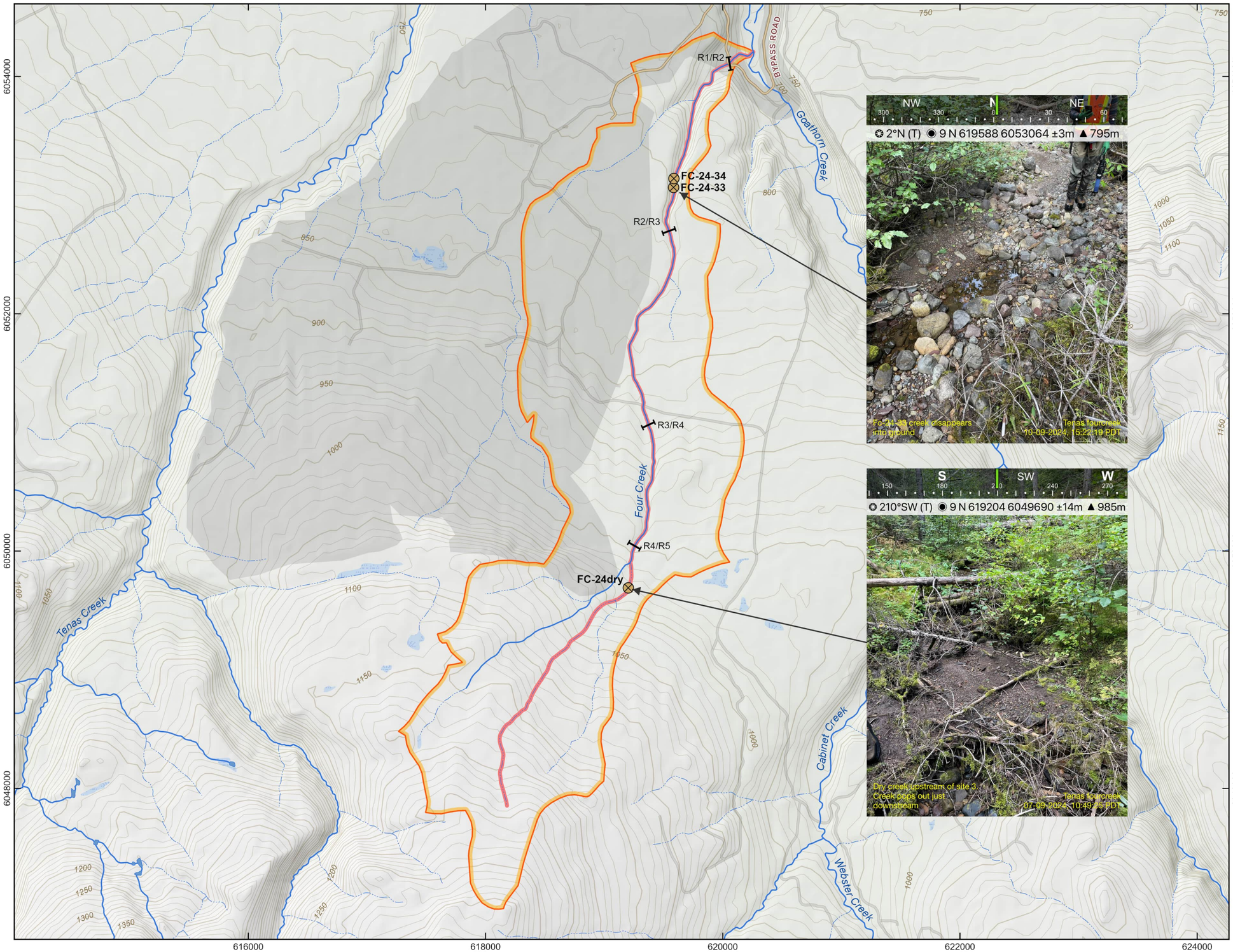
Table 10: September 2024 field trip – Discharge measurements

Location ID	Easting	Northing	Distance Up-Reach [1] (m)	Altitude (masl)	Discharge (m^3/s)
FC-24-01	618878	6049566	4,738	1,021	-
FC-24-02	618997	6049663	4,891	995	-
SITE 4 UPPER	619061	6049705	4,968	993	-
SITE 4	619100	6049769	5,043	984	-
FC-24-03	619147	6049839	5,127	972	0.003
FC-24-04	619222	6049894	5,220	956	0.002
SITE 3	619210	6049714	5,127	980	< 0.001
FC-24-05	619198	6049655	4,946	985	0.001

Location ID	Easting	Northing	Distance Up-Reach [1] (m)	Altitude (masl)	Discharge (m^3/s)
FC-24-06	619113	6049580	4,886	986	0.002
FC-24-07	619245	6049992	4,773	951	0.003
FC-24-08	619295	6050114	4,672	947	0.001
FC-24-09	619368	6050296	4,540	932	0.001
FC-24-10	619358	6050413	4,344	929	0.003
FC-24-11	619368	6050531	4,227	907	0.005
FC-24-12	619408	6050688	4,108	907	0.005
FC-24-13	619412	6050855	3,946	896	< 0.001
FC-24-14	619410	6050915	3,779	889	0.002
FC-24-15	619371	6051062	3,719	873	< 0.001
FC-24-16	619330	6051150	3,567	868	0.005
SITE 2	619336	6051224	3,470	859	0.002
FC-24-17	619302	6051349	3,396	853	0.004
FC-24-18	619264	6051437	3,266	846	0.004
FC-24-19	619237	6051561	3,171	850	0.001
FC-24-20	619208	6051667	3,044	854	0.005
FC-24-21	619228	6051778	2,934	843	0.001
FC-24-22	619277	6051878	2,821	837	< 0.001
SITE 5	619294	6052004	2,662	828	0.003
FC-24-23	619379	6052055	2,582	829	0.002
FC-24-24	619445	6052131	2,483	826	< 0.001
FC-24-25	619517	6052234	2,383	822	0.002
FC-24-26	619534	6052379	2,257	811	0.001
FC-24-27	619577	6052482	2,111	813	< 0.001
FC-24-28	619573	6052577	1,999	-	0.001
FC-24-29	619555	6052679	1,904	811	< 0.001
FC-24-30	619516	6052746	1,701	806	0.001
FC-24-31	619531	6052847	1,723	790	0.002
FC-24-32	619576	6052959	1,621	797	0.002
FC-24-33	619585	6053065	1,500	779	< 0.001
FC-24-34	619588	6053139	1,394	785	< 0.001
[1] Distance up-reach from the Goathorn Creek confluence.					

Table 11: October 2024 field trip – Discharge measurements

Location ID	Easting (m)	Northing (m)	Distance Up-Reach [1] (m)	Discharge (m^3/s)
Site 4U	619061	6049705	5,126	0.033
Site 3	619210	6049714	5,061	0.050
Site 4	619100	6049769	5,052	0.033
Upper Headwater Confluence (UHC)	619222	6049894	4,878	0.009
R-06	619251	6050031	4,729	0.017
G-04	619408	6051094	3,805	0.014
R-04	619331	6051202	3,498	0.012
SITE 2	619336	6051224	3,478	0.012
G-02	619331	6051260	3,445	0.012
G-01	619299	6051994	2,661	0.013
SITE 5	619294	6052004	2,662	0.013
FC-24-27	619577	6052482	2,080	0.012
FC-24-30	619516	6052746	1,701	0.019
R-01	619985	6054080	321	0.016



KEY MAP

LEGEND

- Dry Section
- Reach Break
- Watercourse[1]
- Intermittent or Indeterminate Watercourse[1]
- Four Creek[1]
- Proposed Bypass Road
- Resource Road [2]
- Wetland[1]
- Proposed Project Footprint
- Four Creek Watershed[1]

1 - BC Freshwater Atlas
2 - BC Digital Road Atlas (for clarity, not all roads displayed)

0 0.5 1 1.5 2

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

Scale: 1:32,000
Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
Checked: GH
Date: September 5, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Contour interval is 10 metres (minor) and 50 metres (major). All elevations in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Dry-Section Locations

SLR

REF. NO. 2404901-MR-009

Figure 12

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Figure 13: Discharge vs Distance - 2024/06/05

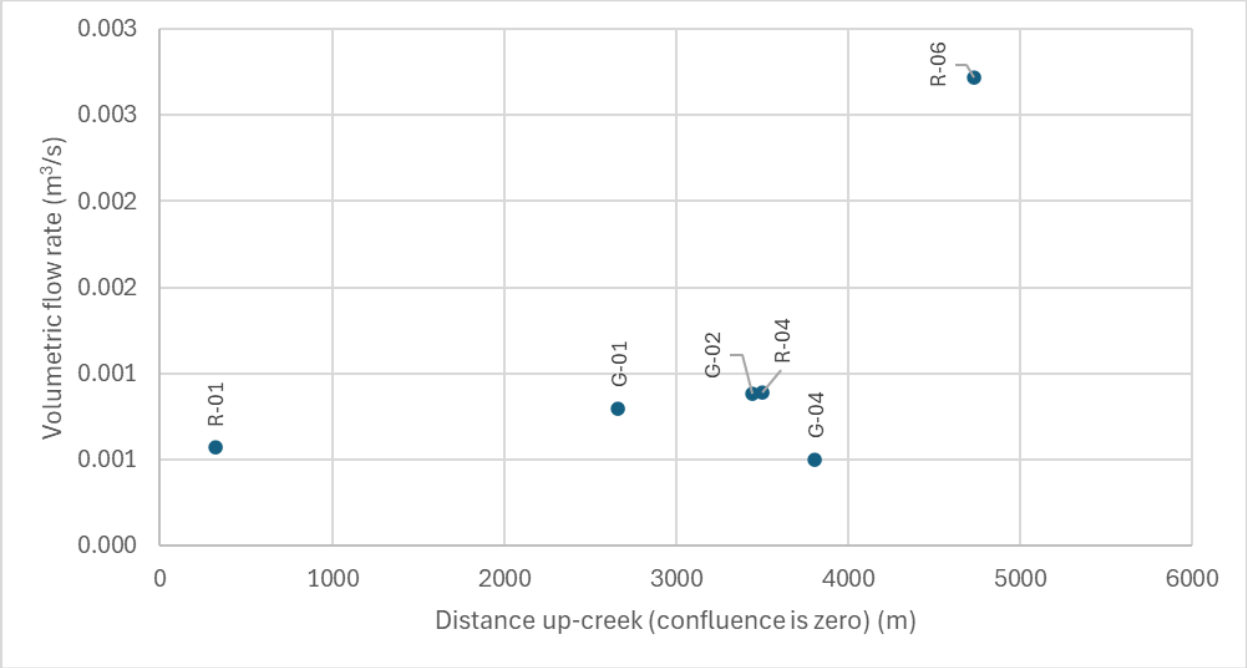


Figure 14: Discharge vs Distance – 2024/09/07 and 2024/09/11

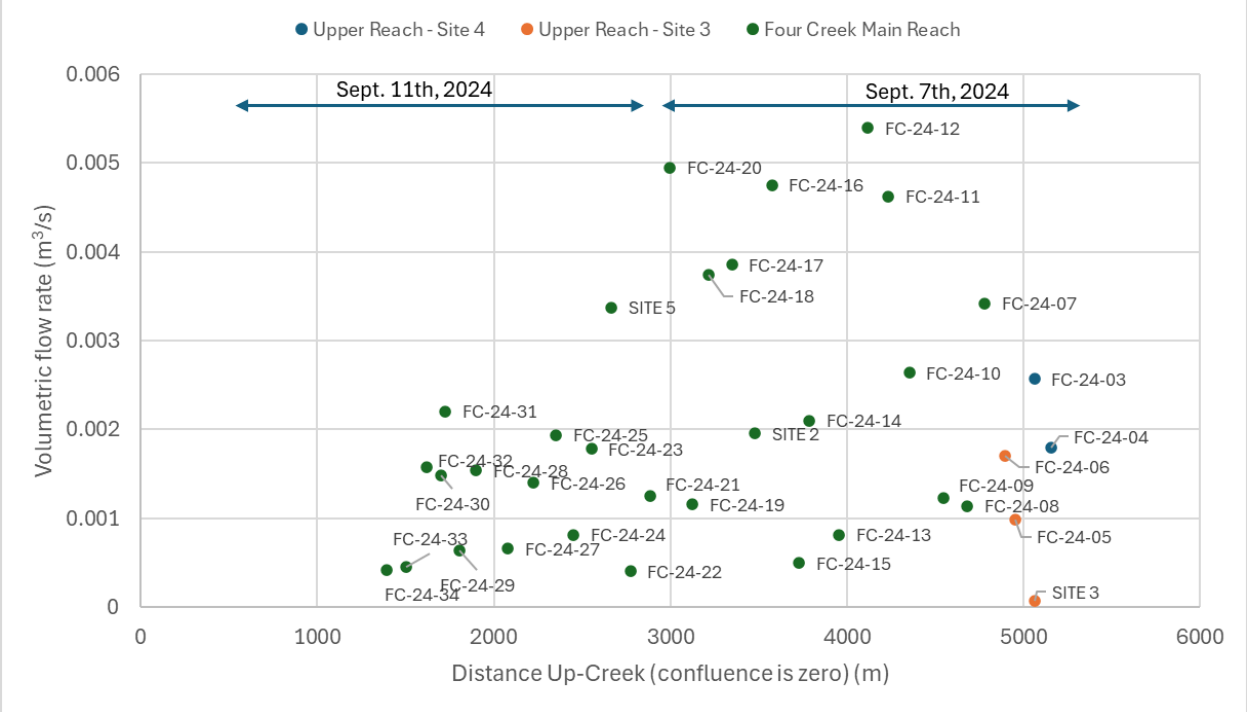
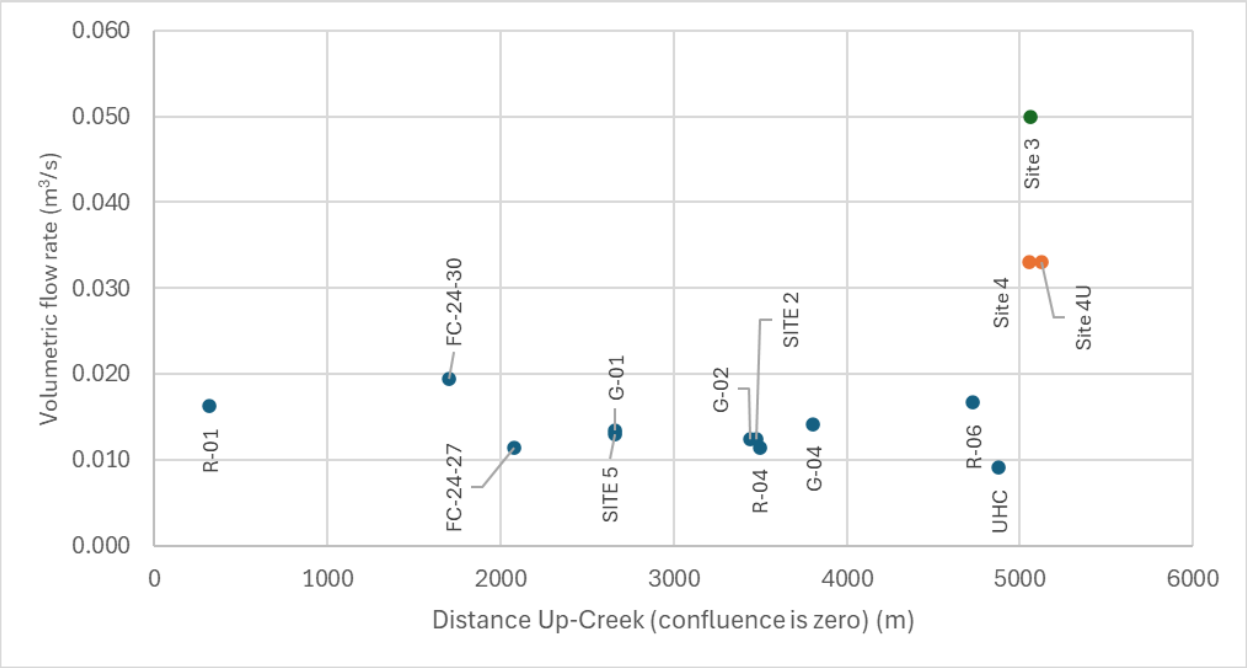


Figure 15: Discharge vs Distance – 2024/10/17



3.2.2 Field Parameter - Conductivity

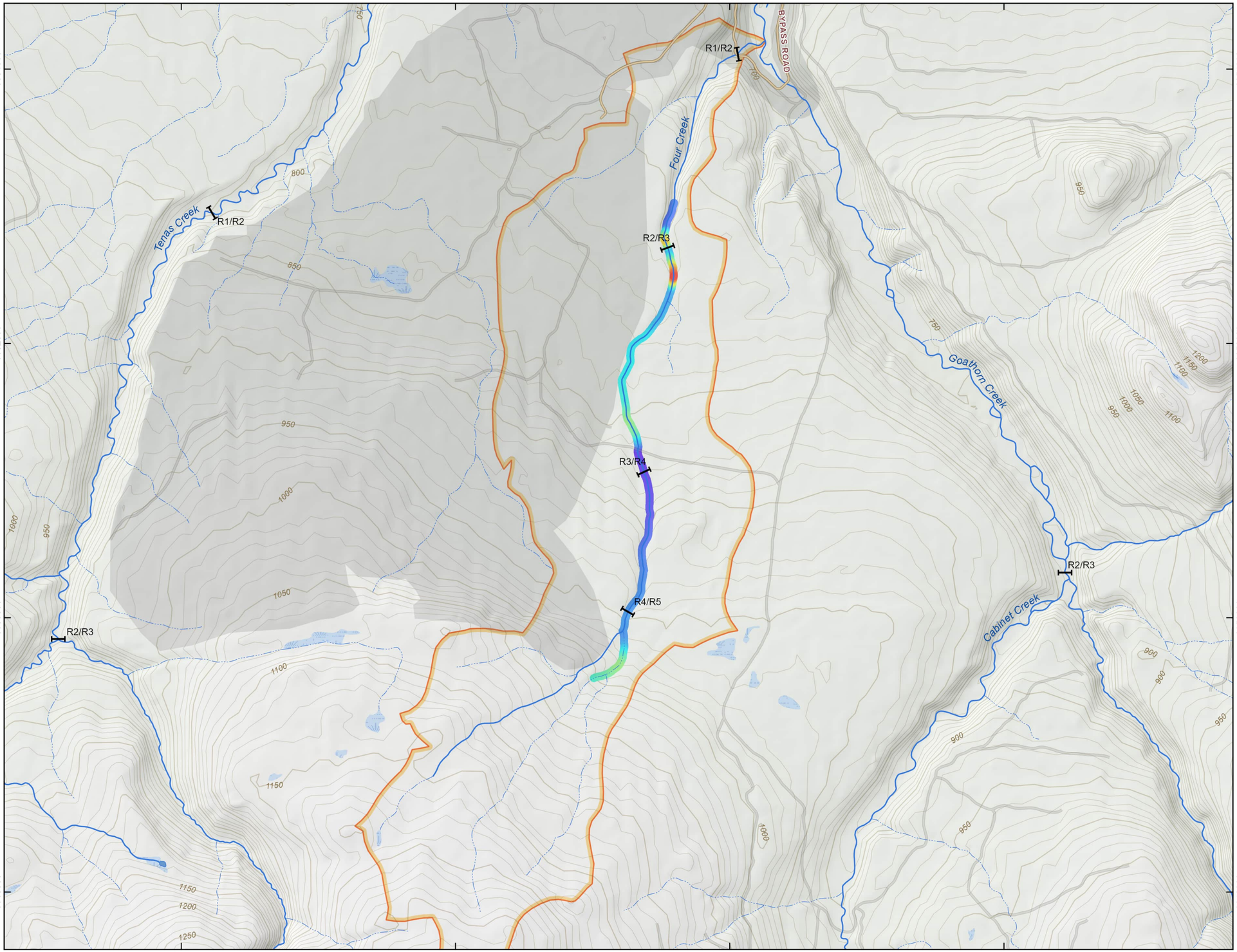
3.2.2.1 September 2024 Survey

The results of the map conductivity survey conducted in September 2024 are included in Table 12 and depicted in Figure 16. The conductivity map was created by interpolating conductivity data points listed in Appendix D, using kriging methodology and Surfer software.

Table 12: Conductivity survey of Four Creek - September 2024

Location ID	Easting (m)	Northing (m)	Date (YYYY/MM/DD)	Specific Conductance (µS/cm)	Conductivity (µS/cm)
FC-24-01	618878	6049566	2024/09/07	373.5	251.8
FC-24-02	618997	6049663	2024/09/07	432.1	285.8
SITE 4 UPPER	619061	6049705	2024/09/07	370.4	253.7
SITE 4	619100	6049769	2024/09/07	374.9	256.7
FC-24-03	619147	6049839	2024/09/07	368.6	253.7
FC-24-04	619222	6049894	2024/09/07	376.0	259.3
SITE 3	619210	6049714	2024/09/07	425.2	290.7
FC-24-05	619198	6049655	2024/09/07	453.3	307.9
FC-24-06	619113	6049580	2024/09/07	432.7	292.3
FC-24-07	619245	6049992	2024/09/07	378.1	263.0
FC-24-08	619295	6050114	2024/09/07	374.6	260.8
FC-24-09	619368	6050296	2024/09/07	370.8	258.9
FC-24-10	619358	6050413	2024/09/07	367.1	257.7
FC-24-11	619368	6050531	2024/09/07	361.6	252.6
FC-24-12	619408	6050688	2024/09/07	352.3	246.2
FC-24-13	619412	6050855	2024/09/07	347.3	244.3
FC-24-14	619410	6050915	2024/09/07	345.4	242.1
FC-24-15	619371	6051062	2024/09/07	340.4	239.9
FC-24-16	619330	6051150	2024/09/07	339.1	245.6
SITE 2	619336	6051224	2024/09/07	336.8	242.9
FC-24-17	619302	6051349	2024/09/11	433.1	272.6
FC-24-18	619264	6051437	2024/09/11	451.9	294.0
FC-24-19	619237	6051561	2024/09/11	417.0	268.7
FC-24-20	619208	6051667	2024/09/11	413.9	268.5
FC-24-21	619228	6051778	2024/09/11	409.0	266.2
FC-24-22	619277	6051878	2024/09/11	407.6	266.0
SITE 5	619294	6052004	2024/09/11	404.0	222.1
FC-24-23	619379	6052055	2024/09/11	405.3	217.0
FC-24-24	619445	6052131	2024/09/11	390.7	261.5
FC-24-25	619517	6052234	2024/09/11	386.0	258.2
FC-24-26	619534	6052379	2024/09/11	378.9	251.8
FC-24-27	619577	6052482	2024/09/11	556.0	374.2

Location ID	Easting (m)	Northing (m)	Date (YYYY/MM/DD)	Specific Conductance (µS/cm)	Conductivity (µS/cm)
FC-24-28	619573	6052577	2024/09/11	372.2	254.4
FC-24-29	619555	6052679	2024/09/11	368.6	244.6
FC-24-30	619516	6052746	2024/09/11	503.0	340.0
FC-24-31	619531	6052847	2024/09/11	360.9	240.2
FC-24-32	619576	6052959	2024/09/11	363.3	242.5
FC-24-33	619585	6053065	2024/09/11	370.1	248.5
FC-24-34	619588	6053139	2024/09/11	382.1	258.7



KEY MAP

LEGEND

- Pond Location along Four Creek
- Reach Break
- Watercourse[1]
- Intermittent or Indeterminate Watercourse[1]
- Resource Road[2]
- Proposed Bypass Road
- Wetland[1]
- Proposed Project Footprint
- Four Creek Watershed[1]

Conductivity

553 µs/cm — 337 µs/cm

1 - BC Freshwater Atlas
2 - BC Digital Road Atlas (for clarity, not all roads displayed)

0 0.5 1 1.5

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

Scale: 1:28,000
Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
Checked: GH
Date: September 3, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). Contour interval is 10 metres (minor) and 50 metres (major). All elevations in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Interpolated Conductivity Map of Four creek

SLR

REF. NO. 2404901-MR-008

Figure 16

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Conductivity can be highly influenced by runoff; therefore, SLR conducted the conductivity survey in September 2024 during dry conditions. The results indicate that the conductivity values are overall stable, as shown in the histogram (Figure 17). Conductivity in creeks is primarily influenced by groundwater discharge and can vary drastically, especially in low flow conditions, as a function of water runoff, interflow, and groundwater discharge. Readings outside the normal range observed within Four Creek might indicate localized groundwater discharge. The average conductivity observed within Four Creek in September 2024 (low flow conditions) was 392.1 µs/cm.

Two outliers were identified using the Goodness-of-fit tests (Figure 18), which help identify outliers in a data set by pinpointing data points far from the least squares line or with large residuals. The two points, FC-24-30 and FC-24-27, have the potential to represent locations influenced by groundwater recharge. The conductivity values measured at these locations were 503 µs/cm and 536 µs/cm, respectively.

Figure 17: Histogram – Conductivity Survey 2024/09/07 and 2024/09/11

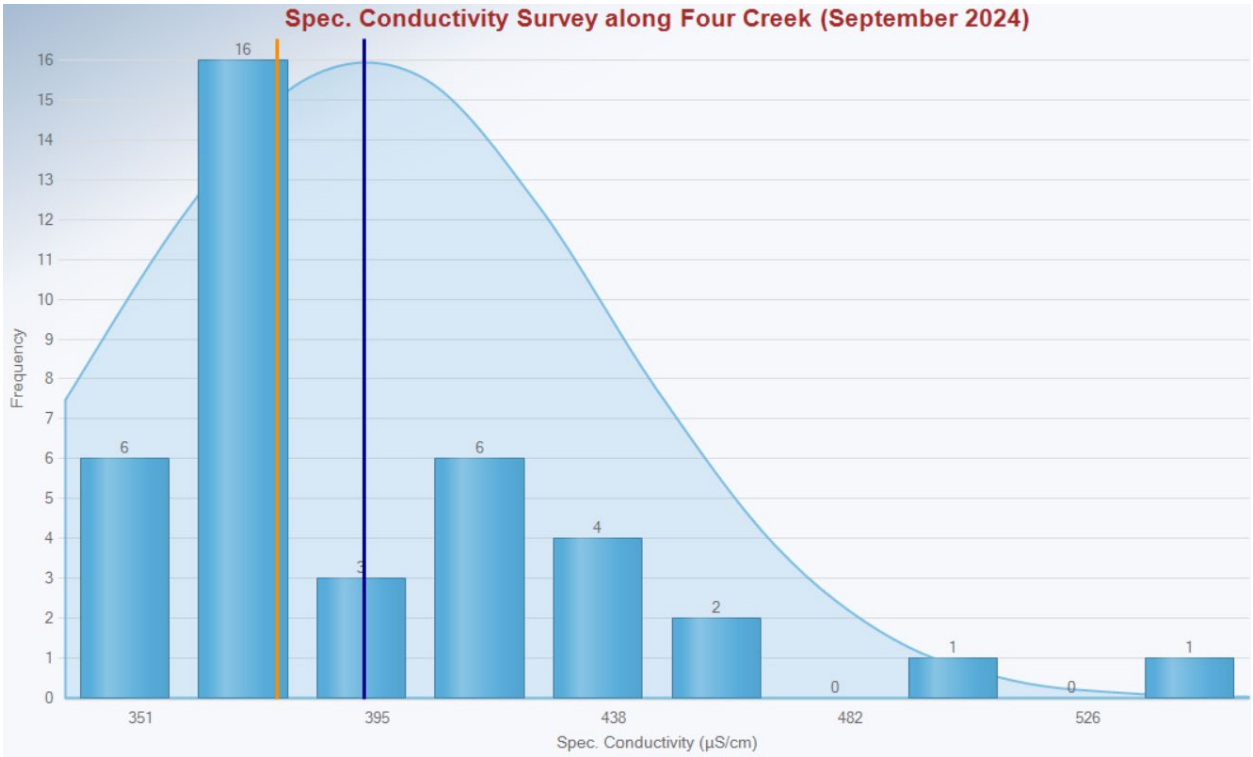
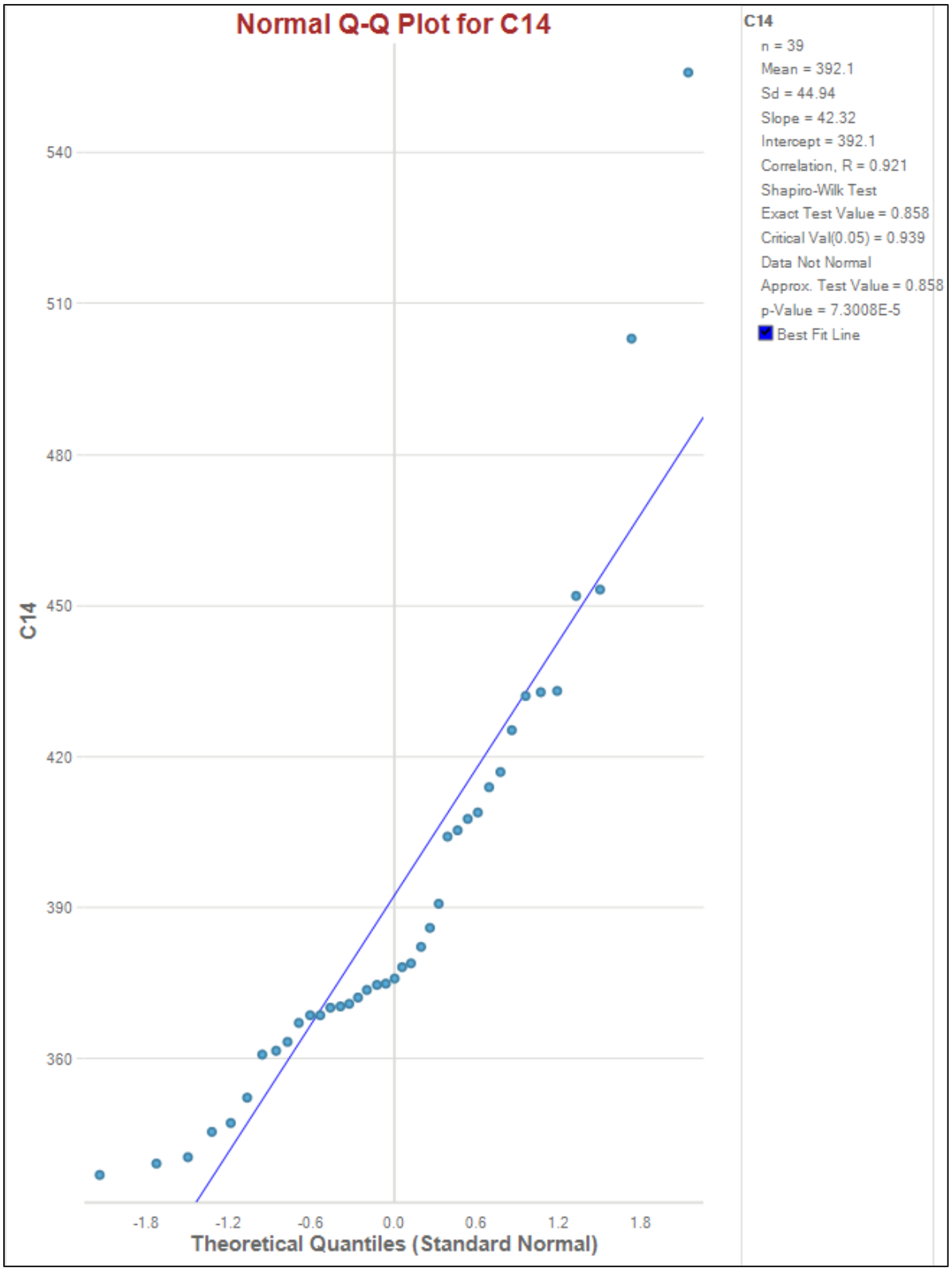


Figure 18: Q-Q plot – Conductivity Survey 2024/09/07 and 2024/09/11



3.2.2.2 Conductivity in Different Water Types

The use of conductivity to differentiate water types has been studied through the analysis of Surface Water, Mini Piezometer, Overburden Monitoring Well, and Bedrock Monitoring Well conductivity data in or near the Four Creek watershed. A summary of the conductivity data collected for each water type is included in Appendix D.

Average values, geometric means, and variance values for each water type are included in Table 13.

Overall, the conductivity measurement values from the MPs and surface water are similar, with an increase in values observed in September 2024 (low flow conditions) when interflow is predominant and there is no runoff due to the absence of precipitation. Conductivity data from the overburden wells present an average specific conductivity value of 633.8 µS/cm, which is approximately 3.3 times the average MP and surface water conductivity values. This is due to the longer residence time in soil, allowing the water to enrich in ionic content.

The conductivity values measured in bedrock monitoring wells are approximately three times higher than the average specific conductivity value measured in overburden monitoring wells and an order of magnitude higher than surface water/interflow. The analysis of electrical conductivity in different water types shows that there are three distinct water types within the Four Creek watershed, each with different electrical conductivity values.

Table 13: Statistical Analysis – Water Types

Water Type	Conductivity (µS/cm)		
	Average	Geomean	Variance
Bedrock monitoring well	2012.4	1884.1	562538.9
Overburden monitoring well	633.8	621.7	18632.9
Mini piezometer	188.1	172.9	5397.3
Surface water	192.4	175.1	6943.2

3.2.3 Groundwater Level Monitoring Data

Manual water levels were measured in July, September and October 2024 at selected MP and MW locations, with surface water level measurements taken concurrently during MP monitoring.

Groundwater levels measured in overburden and bedrock MWs are summarized in Table 14 (July 2024) and Table 15 (September 2024). The MP and surface water manual water measurements are presented in Table 16 (July 2024), Table 17 (September 2024), and Table 18 (October 2024).

The purpose of the 2024 groundwater/surface water interaction field program was to characterize the relationship between shallow groundwater and surface water in Four Creek. This characterization aimed to assess the direction and magnitude of the vertical hydraulic gradient between surface water and groundwater within the stream beds. The vertical hydraulic gradient is a critical parameter for understanding groundwater flow dynamics, such as recharge, discharge, or interactions with surface water bodies. An upwards hydraulic gradient indicates that groundwater is discharging into the creek, supporting baseflow (i.e., the portion of surface water flow sustained by groundwater inputs). Conversely, a negative hydraulic gradient indicates that the creek is losing water to the groundwater table as recharge.

The methods used to complete the 2024 shallow groundwater/surface water interactions are outlined in this section.

Table 14: Monitoring Well - Groundwater Levels July 2024

Monitoring Well	Ground Elevation (masl)	Stick-up (m)	Date Measured	Water Level Measurements		
				mbtoc	mbgs	masl
T95R-64	951.4	1.23	2024/07/04	7.4	6.2	945.2
TOB96-02-06	852.5	0.38	2024/07/08	4.5	4.1	848.4
TOB96-01-05	922.3	0.75	2024/07/07	2.4	1.7	920.6
T19-18S	815.2	0.82	2024/07/09	29.6	28.8	786.4
T95R-40	904.3	0.35	2024/07/09	8.3	7.9	896.4
T18-01D	961.4	0.99	2024/07/08	13.0	12.0	949.4
T19-19S	840.0	2.20	2024/07/07	Dry		

Note:
mbtoc – metres below top of casing
mbgs – metres below ground surface
masl – metres above sea level

Table 15: Monitoring Well - Groundwater Levels September 2024

Monitoring Well	Ground Elevation (masl)	Stick-up (m)	Date Measured	Water Level Measurements		
				mbtoc	mbgs	masl
T95R-64	951.4	1.23	2024/09/06	7.6	6.4	945.1
TOB96-02-06	852.5	0.38	2024/09/06	4.6	4.2	848.3
TOB96-01-05	922.3	0.75	2024/09/07	dry		
21-41S	na	0.71	2024/09/07	dry		
T19-18S	815.2	0.82	2024/09/08	31.7	30.9	784.3
T95R-40	904.3	0.35	2024/09/09	8.3	7.9	896.4
T18-01D	961.4	0.99	2024/09/08	13.1	12.2	949.3

Note:
mbtoc – metres below top of casing
mbgs – metres below ground surface
masl – metres above sea level

Table 16: Mini Piezometer-Surface Water / Groundwater Level Monitoring July 2024

MP Information							GW Levels					
							2024/07/04-2024/07/07					
MP ID	Easting (From Master)	Northing (From Master)	Total Pipe Length (mbtoc)	Depth to bottom of screen (mbgs)	Ground Elevation (masl)	Stick Up (m)	mbtoc		mbgs		masl	
							in	out	in	out	in	out
Site 2 S	619343	6051237	1.12	0.56	864	0.54	0.51	0.48	-0.05	-0.09	864.06	864.09
Site 2 D	619343	6051237	2.16	1.01	864	1.16	1.01	1.06	-0.14	-0.09	864.14	864.09
Site 3 S	619218	6049722	1.11	0.55	973	0.61	0.44	0.42	-0.12	-0.14	973.12	973.14
Site 3 D	619218	6049722	1.84	1.00	973	0.99	0.90	0.91	-0.14	-0.13	973.14	973.13
Site 4 S	619097	6049776	1.12	0.41	980	0.70	0.84	0.69	0.13	-0.02	979.87	980.02
Site 4 D	619097	6049776	2.10	0.89	980	1.17	1.25	1.18	0.03	-0.04	979.97	980.04
Site 4 Upper S	619060	6049713	1.15	0.51	980	0.65	0.65	0.56	0.01	-0.08	979.70	979.78
Site 4 Upper D	619060	6049713	1.86	1.75	980	1.06	0.24	0.07	0.13	-0.04	979.87	980.04
Site 5 S	619301	6051999	1.46	0.85	831	0.62	0.71	0.55	0.09	-0.07	830.91	831.07
Site 5 D	619301	6051999	2.57	1.82	831	0.75	1.89	0.65	1.14	-0.11	829.86	831.11

Table 17: Mini Piezometer-Surface Water / Groundwater Level Monitoring September 2024

MP Information							GW Levels					
							2024/09/06-2024/09/11					
MP ID	Easting (From Master)	Northing (From Master)	Total Pipe Length (mbtoc)	Depth to bottom of screen (mbgs)	Ground Elevation (masl)	Stick Up (m)	mbtoc		mbgs		masl	
							in	out	in	out	in	out
Site 2 S	619343	6051237	1.12	0.56	864	0.54	0.88	0.86	0.32	0.30	863.69	863.71
Site 2 D	619343	6051237	2.16	1.01	864	1.16	1.67	1.10	0.52	-0.05	863.48	864.05
Site 3 S	619218	6049722	1.11	0.55	973	0.61	0.05	0.05	-0.56	-0.56	973.56	973.56
Site 3 D	619218	6049722	1.84	1.00	973	0.99	0.05	0.05	-1.04	-1.04	974.04	974.04
Site 4 S	619097	6049776	1.12	0.41	980	0.70	0.88	0.72	0.17	0.01	979.83	979.99
Site 4 D	619097	6049776	2.10	0.89	980	1.17	1.59	1.20	0.38	-0.02	979.63	980.02
Site 4 Upper S	619060	6049713	1.15	0.51	980	0.65	0.98	0.59	0.34	-0.05	979.36	979.75
Site 4 Upper D	619060	6049713	1.86	1.75	980	1.06	0.26	0.06	0.15	-0.05	979.85	980.05
Site 5 S	619301	6051999	1.46	0.85	831	0.62	0.89	0.54	0.28	-0.08	830.73	831.08
Site 5 D	619301	6051999	2.57	1.82	831	0.75	2.02	0.65	1.27	-0.10	829.73	831.10

Table 18: Mini Piezometer-Surface Water / Groundwater Level Monitoring October 2024

MP Information							GW Levels					
							2024/10/16-2024/10/17					
MP ID	Easting (From Master)	Northing (From Master)	Total Pipe Length (mbtoc)	Depth to bottom of screen (mbgs)	Ground Elevation (masl)	Stick Up (m)	mbtoc		mbgs		masl	
							in	out	in	out	in	out
Site 2 S	619343	6051237	1.12	0.56	864	0.54	0.50	-	-0.04	-	863.69	-
Site 2 D	619343	6051237	2.16	1.01	864	1.16	1.50	-	0.34	-	863.48	-
Site 3 S	619218	6049722	1.11	0.55	973	0.61	0.41	-	-0.20	-	973.56	-
Site 3 D	619218	6049722	1.84	1.00	973	0.99	0.88	-	-0.11	-	974.04	-
Site 4 S	619097	6049776	1.12	0.41	980	0.7	0.84	-	0.14	-	979.83	-
Site 4 D	619097	6049776	2.10	0.89	980	1.17	1.52	-	0.35	-	979.63	-
Site 4 Upper S	619060	6049713	1.15	0.51	980	0.65	0.65	-	-0.01	-	979.36	-
Site 4 Upper D	619060	6049713	1.86	1.75	980	1.06	1.25	-	0.19	-	979.85	-
Site 5 S	619301	6051999	1.46	0.85	831	0.62	0.73	-	0.11	-	830.73	-
Site 5 D	619301	6051999	2.57	1.82	831	0.75	1.87	-	1.12	-	829.73	-

[-] No ‘out’ measurements were taken during the October 2024 trip.

Due to limited data, groundwater flow contours for water circulating in the overburden and bedrock are not presented. The available data shows that some of the overburden monitoring wells are either dry (21-44S, 21-41S, T18-02S, and T19-19S) or present deep water levels (21-40S, 21-43S, T19-18S, and 21-55S). This indicates that a defined water table does not exist in the overburden within the Four Creek watershed, consistent with the hydrogeology conceptual model of Four Creek being a perched surface water feature.

Shallow groundwater levels were measured at shallow overburden monitoring wells TOB96-01-05 and TOB96-02-06. Given that both monitoring wells are less than three meters deep, it is expected that they intercept the same interflow pattern as the mini piezometers.

3.2.4 Vertical Gradients

Calculated gradients were constantly negative in all the measurements at Site 2S, Site 3S, Site 4S, Site 4D, Site4upperD, Site 5S and Site 5D. Site2D shows negative vertical gradients in all the monitoring events, except for April 2022 and July 2024. Similarly, Site 3D and Site 4 Upper S show consistently negative vertical gradients, except for July 2024 and November 2021, respectively.

A summary of the vertical gradients at each MP location is summarized in Table 19, a complete list of all the calculated vertical gradients is shown in Table 20.

Overall, negative vertical gradients are consistent throughout the different seasons and all the monitoring locations, indicating that Four Creek is primarily a losing stream.

Table 19: Statistical Analysis – Vertical Gradients

MP ID	Easting	Northing	Max Gradient	Min Gradient	Average Gradient	Number of measurements
Site 2 S	619343	6051237	-1.30	-0.04	-0.41	7
Site 2 D	619343	6051237	-1.05	0.06	-0.35	7
Site 3 S	619218	6049722	-1.45	-0.02	-0.46	6
Site 3 D	619218	6049722	-1.15	0.01	-0.52	6
Site 4 S	619097	6049776	-1.41	-0.29	-0.75	7
Site 4 D	619097	6049776	-0.96	-0.08	-0.46	7
Site 4 Upper S	619060	6049713	-1.16	0.12	-0.39	7
Site 4 Upper D	619060	6049713	-0.31	-0.05	-0.14	7
Site 5 S	619301	6051999	-0.41	-0.19	-0.30	2
Site 5 D	619301	6051999	-0.75	-0.72	-0.72	2

Table 20: Vertical Gradients – Summary of field data collected during each field trip (2021-2024)

MP ID	Vertical Gradient						
	2021/11/05-2021/11/19	2022/01/10-2022/01/11	2022/04/25-2022/04/26	2022/11/08-2022/11/10	2023/10/11	2024/07/04-2024/07/07	2024/09/06-2024/09/11
Site 2 S	-1.15	-1.30	-0.18	-0.09	-0.07	-0.05	-0.04
Site 2 D	-1.05	-0.67	0.06	-0.25	-0.03	0.05	-0.56
Site 3 S	-0.02	-1.45	-0.04	-1.22	-0.02	-0.04	-
Site 3 D	-0.88	-1.15	-0.08	-1.02	-0.02	0.01	-
Site 4 S	-1.15	-1.41	-0.29	-1.17	-0.46	-0.37	-0.39
Site 4 D	-0.54	-0.99	-0.37	-0.68	-0.11	-0.08	-0.44
Site 4 Upper S	0.12	-0.47	-0.04	-1.16	-0.22	-0.17	-0.76
Site 4 Upper D	-0.25	-0.31	-0.06	-0.09	-0.05	-0.10	-0.11
Site 5 S	-	-	-	-	-	-0.19	-0.41
Site 5 D	-	-	-	-	-	-0.68	-0.75

Notes:
Orange denotes negative vertical gradients, red indicates vertical gradients estimated using the bottom of the MP (dry), blue indicates positive gradients.

3.2.5 Groundwater Facies

To characterize the different groundwater facies at Four Creek, Piper plots were produced for the water chemistry of samples collected at the surface water, MP, overburden MW, and bedrock MW locations (Appendix E). The Piper plot utilizes major anion (bicarbonate, chloride, and sulfate) and cation (calcium, magnesium, sodium, and potassium) concentrations to identify differences in groundwater chemistry and provide insights into the origin of the water and its geochemical history.

Groundwater facies for the Four Creek watershed are discussed based on each water type identified in the previous paragraph.

3.2.5.1 Surface Water and Interflow

The interpretation of Piper's trilinear diagram for surface water and MP water samples revealed that calcium (Ca) and bicarbonate (HCO_3) are the predominant cations and anions. Therefore, all water samples are classified as calcium bicarbonate ($CaHCO_3$) hydrochemical facies. Evaluation of the water types using the Piper plot suggests a clear correlation between the water circulating in the interflow (screened from the MPs) and surface water. The water samples refer to both low flow conditions (September 2024) and medium flow conditions (October 2024).

3.2.5.2 Overburden Monitoring Wells

Groundwater chemistry data are available for monitoring wells T19-18S, TOB96-01-05, and TOB-02-06. Monitoring wells TOB96-01-05 and TOB-02-06 have total depths of 4.6 and 6.4 mbgs, respectively, and are expected to be more representative of interflow conditions rather than overburden (Till) groundwater flow circulation. Monitoring Well T19-18S, which has a total depth of approximately 36 mbgs, is expected to represent groundwater chemistry in the overburden. The water samples collected at this location show a mixed/sodium-bicarbonate type facies.

3.2.5.3 Bedrock Monitoring Wells

Monitoring wells T18-01D, T95R-40, and T95R-64 are installed within the bedrock. They all show a strong sodium-bicarbonate water type, with alkaline earth and weak acids predominating.

3.3 Evaluation of Perched Conditions

The focus of the additional Hydrology and Hydrogeology programs conducted by SLR was to investigate the assertion, based on field observations, that Four Creek is a perched system and is not groundwater supported. That is Four Creek does not receive substantial flow from the saturated zone (below the water table) of an aquifer.

The results clearly show that interflow and surface water have a $CaHCO_3$ waters typical of shallow and fresh waters, groundwater in the overburden materials have a mixed water type with no predominant cations or anions, and bedrock groundwater show a $NaHCO_3$ water which is typical of deeper groundwater influenced by ion exchange.

Based on the findings of the SLR hydrogeological and hydrological study, the Four Creek flow comes not only from direct precipitation and overland flow but also from interflow. The collected hydrogeological data indicate that both the overburden aquifer system and the bedrock aquifer do not discharge directly into the creek and that groundwater is not supporting the baseflow.

The contribution of interflow to the creek baseflow is not expected to vary greatly within the watershed considering that the conductivity survey conducted in September 2024 show minimal variation throughout the entire length of the creek, except for locations FC-24-27 and FC-24-30 where higher conductivity values were observed. These two locations will be further investigated in 2025, to assess for vertical gradients between surface water and interflow.

A permanent deep-water table exist in the till and the bedrock, in addition several of the monitoring wells installed in the overburden are dry indicating that a “real” and continuous water table in the overburden does not exist. Groundwater discharge from the bedrock groundwater and the deep overburden groundwater systems is directed toward Telkwa River, Tenas Creek and Goathorn Creek.

A downward vertical gradient exists between the upper surficial deposits (interflow) and the deep overburden and bedrock units.

Given this conceptual model, the majority of Four Creek is considered to be a losing stream disconnected from the groundwater circulation in overburden and bedrock. This is the reason that Four Creek is intermittent, with many dry reaches and isolated pools during dry periods. Any bedrock dewatering for the proposed open pit to be advanced within or in close proximity of the Four Creek is not expected to negatively impact groundwater discharge to Four Creek considering that the groundwater flow from these geological units does not contribute to the flow

in Four Creek. Impacts to Four Creek flows are expected to be associated with the reduction in Four Creek watershed due to the footprint of the proposed mine infrastructures that will divert the natural runoff and interflow away from Four Creek.

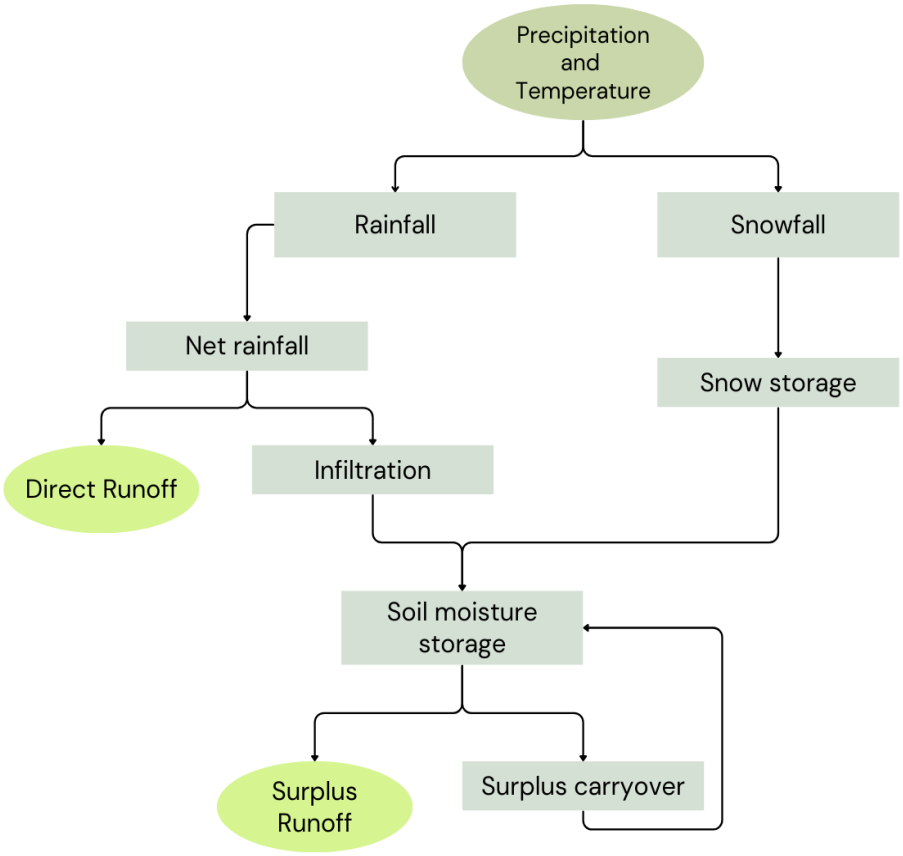
4.0 Water Balance Model

Based on the findings of Section 3.0, interflow is believed to predominantly drive baseflow contributions to Four Creek. This section outlines a water balance model, that was developed to better understand how discharge in Four Creek is expected to be affected by mine construction. A water balance model that was developed to predict average monthly streamflow under natural conditions in BC that is presented by Moore et al. (2012) was modified for this application. The water balance model estimates changes in discharge by simulating key hydrological processes, including snow accumulation and melt, evapotranspiration losses, soil moisture storage, and runoff generation. This modelling platform was selected due to its relative simplicity, its ability to be modified to represent key characteristics that are understood to govern discharge in Four Creek, including snowmelt and interflow processes. The model was first constructed and calibrated using available baseline data from the Project. Once the model calibration was deemed sufficient, it was then modified to predict stream discharge under future phases of mine development.

4.1 Model Overview

The model operates on a monthly timestep following the structure presented in Figure 19. Its function is described in the below sections.

Figure 19: Model Overview



Source: as adapted from Moore et al 2012.

4.1.1 Precipitation

The model is forced monthly with average monthly precipitation and temperature data. Precipitation is partitioned into rainfall and snowfall based on temperature thresholds. A rainfall threshold (T_{rain}) and a snowfall threshold (T_{snow}) define the temperature limits above which all precipitation is treated as rain and below which it is treated as snow. When the average monthly air temperature is between these thresholds, precipitation is distributed as a combination of rain and snow based on the following formula (Moore et al. 2012).

$$SF = \frac{P(T_{rain} - T)}{(T_{rain} - T_{snow})}$$

$$RF = P - SF$$

Where *SF* is the portion of precipitation that falls as snowfall, *T* is the average monthly air temperature, and *RF* is the portion of precipitation that falls as rainfall.

The model structure presented by Moore et al. (2012) was modified by introducing a precipitation adjustment factor that is adjusted through the calibration process and is intended to compensate for possible bias in monthly precipitation inputs. In addition, the model incorporates canopy interception loss by applying land cover–specific interception fractions to rainfall and snowfall prior to partitioning into surface or subsurface pathways. These interception loss fractions are defined by the BEC zone of the watershed.

A portion of rainfall that does not infiltrate is classified as direct runoff, contributing immediately to stream discharge

Snowfall that reaches the surface is stored in a snowpack, which remains until temperatures exceed the melt threshold. Snowmelt is governed by a degree-day melt factor (K_m) that defines the rate of that snowmelt is released to contribute to soil moisture storage and runoff.

For months where mean air temperature exceeds 0°C, potential melt (M_{pot}) is calculated through the following equation:

$$Mpot = K_m \cdot T \cdot n_d$$

Where n_d is the number of days in a given month. Actual melt (M) is then calculated as the lesser of potential melt and the available snowpack:

$$M = \min\left(M_{pot}, SWE_{i-1} + SF_{net}\right)$$

where SWE_{i-1} is the snowpack storage at the end of the previous month. The snowpack storage at the end of the current month is then updated.

4.1.2 Evapotranspiration

Evapotranspiration is represented in the model using the Hamon equation, which estimates potential evapotranspiration (PET) as a function of mean monthly air temperature and day length (Moore et al 2012). PET is then adjusted by subtracting the interception loss (PET_{adj}). This adjusted PET is used to calculate withdrawals from soil moisture storage in snow-free months based on the actual water available for transpiration (i.e., actual evapotranspiration). In months when snow is present, evapotranspiration is assumed to be zero.

4.1.3 Soil Moisture

Rainfall and snowmelt then contribute to soil moisture storage. Initially, soil moisture is defined as the starting volume of water stored in the soil at the beginning of the simulation. To establish a stable starting condition, the model was iteratively spun up by running multiple cycles until moisture storage stabilized. After two iterations, the model consistently converged to the recommended USGS soil moisture capacity value of 150 mm, which was then used as the initial condition.

The model dynamically updates soil moisture each month, and when storage exceeds a specified capacity, the excess is transferred to surplus storage. The soil moisture capacity defines the maximum volume of water the soil can retain.

Surplus storage represents the excess water that is available for delayed release after the soil moisture capacity has been reached. A surplus runoff factor determines the proportion of this storage released as runoff each month, with the remainder carried over to subsequent time steps. When monthly soil moisture inputs exceed the defined soil moisture capacity, a portion is released as direct runoff and another portion is routed to carryover surplus, thereby contributing to delayed runoff. This mechanism indirectly accounts for interflow and other subsurface contributions to streamflow that occur on delayed timescales. This behaviour is controlled by the direct runoff factor, which defines the proportion of rainfall that bypasses soil storage.

4.1.4 Runoff Generation

Total runoff is calculated as the sum of direct runoff and surplus runoff. Total runoff per month is modelled to estimate streamflow conditions in Four Creek under different water management scenarios.

Although the original model was developed for ungauged catchments without sufficient calibration data, continuous baseline discharge records were available for Four Creek. As a result, the model was adapted to incorporate observed discharge data, allowing for parameter calibration and improved representation of watershed conditions. The parameters interception loss, degree-day factor, soil moisture capacity, and surplus runoff factor were modified from their standard values to better reflect site-specific conditions, as summarized in Table 22.

Shallow subsurface flow (interflow) and surface runoff are represented through the soil moisture component of the model, while deeper groundwater contributions such as baseflow are not included.

4.1.5 Land Cover Classification

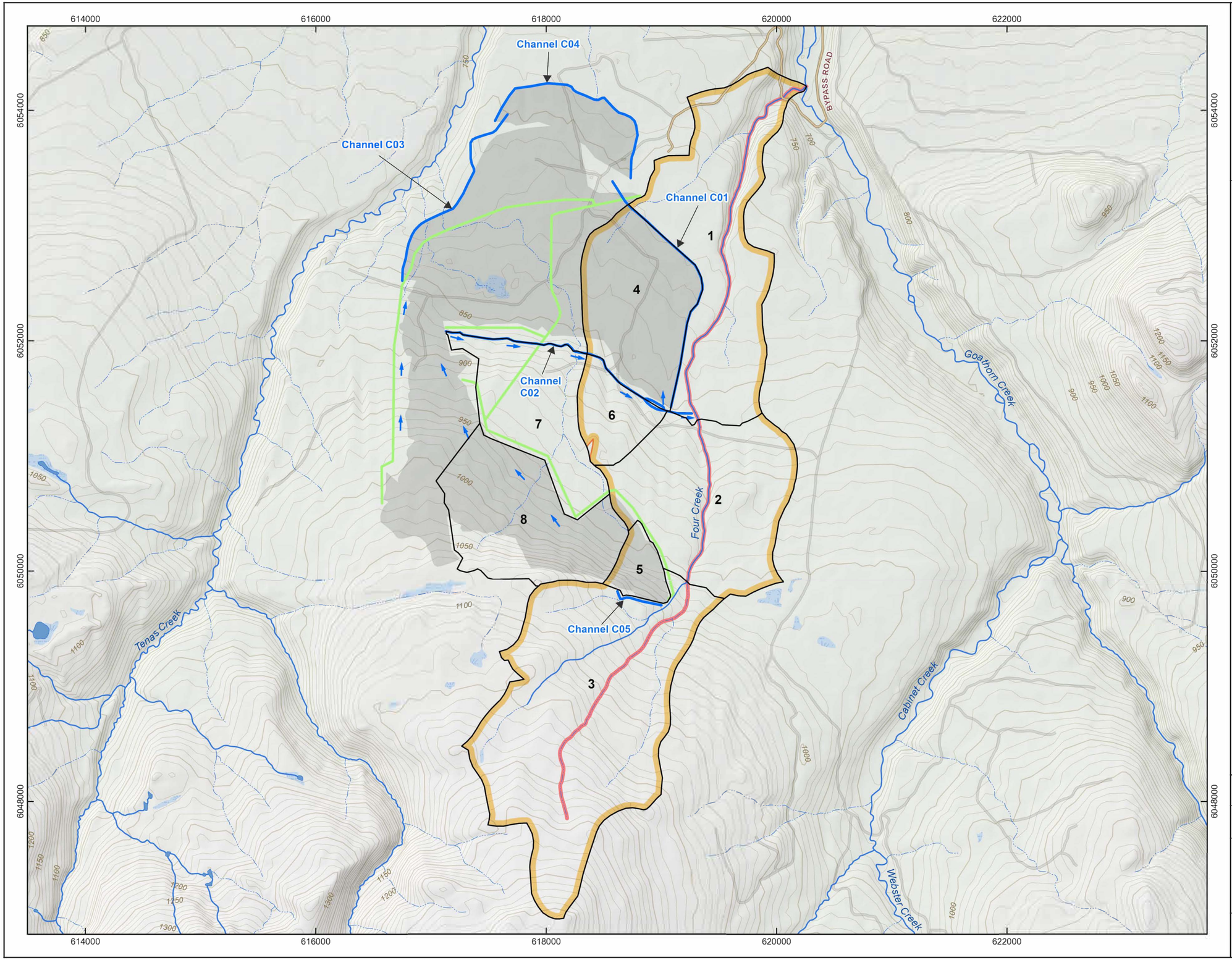
Land cover classification is a required model input to account for spatial differences in hydrological response. The model includes predefined land cover types such as forests, open land, glaciers, and surface water bodies, each affecting how water is partitioned between infiltration, storage, and runoff. For the Four Creek watershed, land cover was determined using BEC zones, which indicated that the area is predominantly forested. Consequently, the model was configured assuming full forest coverage, with an interception loss parameter representing the fraction of precipitation retained by the forest canopy before reaching the ground (Moore et al. 2012). This interception reduces the effective precipitation available for infiltration and runoff.

4.2 Methods

4.2.1 Watershed Discretization

Land cover classifications used in the model were based on BEC zones identified in the Four Creek watershed. Though the watershed consisted of two BEC zones, SBS and ESSF, given the limited variability between these zones, a single land classification of full forest was applied in the model for the entire watershed area.

The model was developed to simulate streamflow at the Four-Hydro hydrometric station, located near the mouth of Four Creek (Figure 2). Hydrologic Response Units (HRUs), which are specific areas within a watershed delineated based on similar hydrological characteristics, such as land use, soil type, vegetation, and topography, were used to discretize the Four Creek watershed. For Four Creek, HRUs were delineated to account for variations in the anticipated hydrological responses across different areas, particularly in relation to land-use changes associated with the project. This process involved identifying areas where surface water would be redirected from Four Creek to management ponds, as well as areas outside the watershed where surface water would be redirected into Four Creek via Channel C02, as described in the Water Management Plan outlined by SRK (2022c). Additional considerations included aligning HRU outlets with hydrometric data collection sites where feasible and maintaining contour bands when possible. Elevation and watershed boundary data were collected from Freshwater Atlas (2024). There is inherent uncertainty with the provincial watershed and elevation data set. Seven HRUs were identified in the Four Creek Watershed (Figure 20) and are detailed in Table 21.



KEY MAP

LEGEND

- Water Flow Direction[1]
- Proposed Road[1]
- Water Management Feature[1]
- Watercourse[2]
- Intermittent or Indeterminate Watercourse[2]
- Four Creek[2]
- Resource Road [3]
- Hydrologic Response Unit (HRU)
- Wetland[1]
- Proposed Project Footprint[1]
- Four Creek Watershed[2]

1 - SRK Consulting/Telkwa Coal, 2022 - Disclaimer: all features are approximate and should be used for discussion purposes only.
2 - BC Freshwater Atlas
3 - BC Digital Road Atlas (for clarity, not all roads displayed)

0 0.5 1 1.5 2

KILOMETRE SCALE

North American Datum 1983
Universal Transverse Mercator Projection Zone 9 North

Scale: 1:32,000
Page Size: Tabloid (11 x 17 inches)

Drawn: BE/RS
Checked: JB
Date: September 3, 2025

NORTH

Source Notes:
Base map data provided by Natural Resources Canada (CanVec, CDEM) and The Government of British Columbia (BC Freshwater Atlas, Digital Road Atlas). The Water Flow Direction and Management Feature, as well as the Proposed Road and Project Footprint, were digitized from the SRK Consulting and Telkwa Coal Water Management Design Technical Report (2022). Contour interval is 10 metres (minor) and 50 metres (major). All elevations in metres above sea level.

CLIENT
Telkwa Coal

PROJECT
Tenas Project

TITLE
Model Discretization

SLR

REF. NO. 2404901-MR-018

Figure 20

REV. 1

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Table 21: HRU Characteristics delineated for the Four Creek water balance model

HRU	Area (km^2)	Mean elevation (m)	Median elevation (m)	Potential change
1	2.3	804	807	No proposed changes.
2	1.9	912	916	No proposed changes.
3	3.5	1140	1142	No proposed changes.
4	1.3	834	836	Proposed to be converted to management pond. No runoff expected from this HRU into Four Creek in operation, closure, or post-closure phases.
5	0.2	975	970	Proposed to be backfilled. No runoff expected from this HRU into Four Creek in operation, closure, or post-closure phases.
6	0.4	892	893	No proposed changes.
7	1.1	914	921	Runoff from this HRU expected to be diverted into Four Creek by end of year 10 operation phase through collection channel CO2.
8	1.4	1,000	994	Runoff from this HRU expected to be diverted into Four Creek by operation (end of year 10) phase. By closure phase, HRU 8 proposed to be converted to pit and runoff will be diverted out of the watershed during closure / post-post closure phase.

Based on the provincial watershed boundary GIS data, the total Four Creek watershed area is approximately 9.5 km^2. The total area of all HRUs, which includes areas outside of the watershed is approximately 11.7 km^2.

4.2.2 Climate Forcing Data

The precipitation and temperature forcing data utilized in the model were collected at an on-site meteorological station situated at an elevation of 993 masl, covering the period from 2020 to 2024 (Figure 2). This period was selected to align with the available hydrological data for Four Creek that was used for model calibration.

To account for differences in elevation amongst HRUs, temperature and precipitation lapse rates were calculated using concurrent data from the 2017-2024 period that were collected by the ERM weather station at 993 masl (ERM 2025) and the Environment Canada weather station in Smithers, located at 518 masl, for the same period (Environment Canada 2025). Lapse rates were calculated monthly by dividing the difference in monthly temperature or precipitation between the two meteorological stations by the difference in elevation. A histogram of the resulting lapse rates was generated, and the mean lapse rate was selected for use in the model.

Scatterplots between temperature and precipitation data from the Smithers station and the project site station is presented in Figure 21 and Figure 22, respectively, to visualize the trends between the two sites.

Figure 21: Monthly correlation in temperature between the Smithers meteorological station (520 masl) and the project site station (993 masl) for the 2017–2024 period

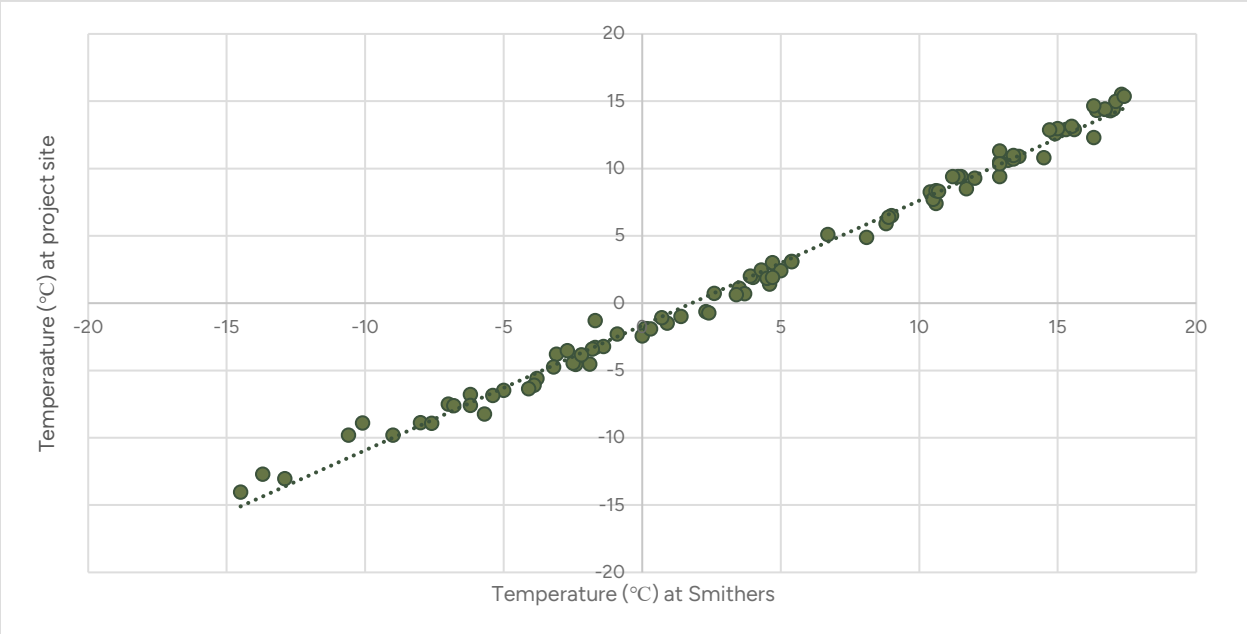
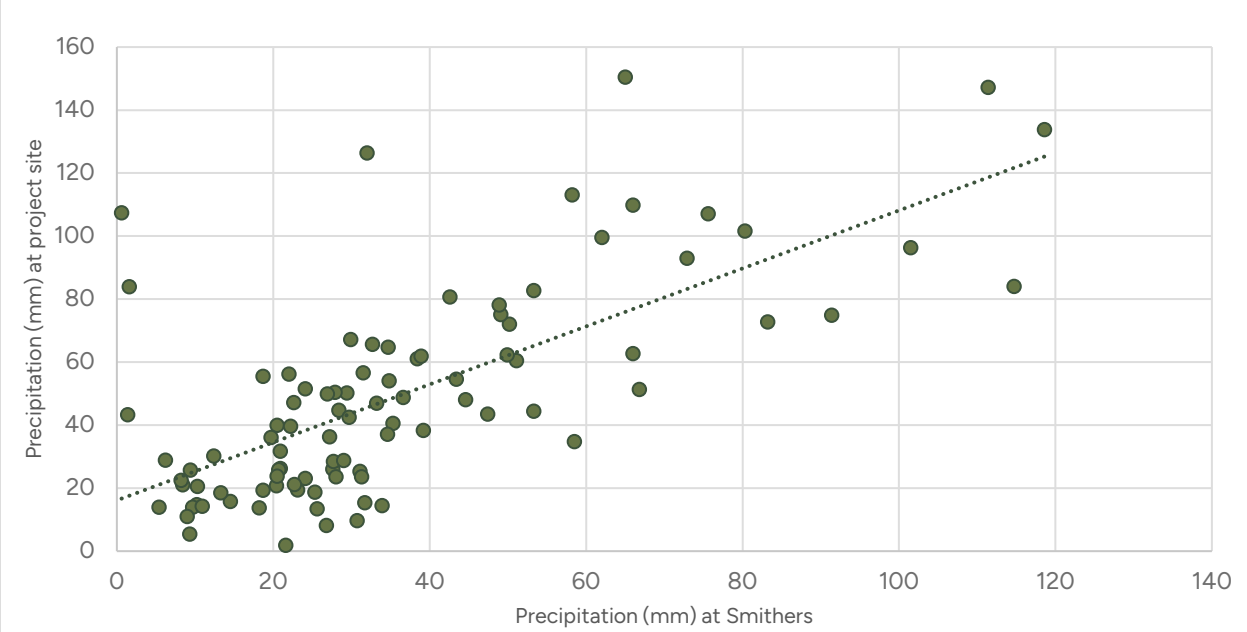


Figure 22: Monthly correlation in precipitation between the Smithers meteorological station (520 masl) and the project site station (993 masl) for the 2017–2024 period.



The calculated lapse rate for temperature was -0.45°C per 100 m of increasing elevation and 0.05 mm per 100 meters of increasing elevation for precipitation. These lapse rates were applied to adjust the precipitation and temperature data from the 993 masl station to the median elevation of each HRU. The calculated lapse rates were used to adjust the climate forcing data separately or each HRU, based on their median elevations.

4.2.3 Model Calibration and Validation

Although the original model was developed for ungauged catchments without sufficient calibration data, continuous baseline discharge records were available for Four Creek. As a result, the model was adapted to incorporate observed discharge data, allowing for parameter calibration and improved representation of watershed conditions. The parameters interception loss, degree-day factor, soil moisture capacity, and surplus runoff factor were modified from their standard values to better reflect site-specific conditions, as summarized in Table 22.

Table 22: Parameters used in the Four Creek water balance model.

Parameter	Recommended Value from Moore et al. 2012.	Calibrated Value for Four Creek
initial Soil Moisture (mm)	From spin up	150
Direct Runoff factor (%)	5	5
$T_{(rain)}$ threshold (℃)	3	3
$T_{(snow)}$ threshold (℃)	-5	-5
Interception Loss (%)	25	20
Degree day factor (mm/℃/day)	2	0.75
Soil Moisture Capacity (mm)	150	150
Surplus Runoff factor (%)	50	32
Precipitation factor (%)	n/a	80

The timeseries of continuous discharge data that was collected at the Hydro-Four hydrometric station near the mouth of Four Creek was used to calibrate the simulated streamflow generated by the model. These hydrometric data have been made available by ERM (2025), who are responsible for the hydrometric monitoring program. SLR takes no responsibility for the accuracy of these data and understands these data have been appropriately reviewed and quality checked in accordance with relevant standards.

Data from this location includes observed hydrometric records, which are primarily collected during winter months, as well as estimated data produced by a statistical analysis during winter months, when field data collection is not possible due to field conditions. Details regarding the data availability for model calibration are summarised in Table 23.

Table 23: Availability of streamflow data used for mode calibration from the Hydro-Four station (ERM 2025).

	2020	2021	2022	2023	2024
January	Estimated[1]	No data	Estimated[1]	No data	Estimated[1]
February	Estimated[1]	No data	Estimated[1]	No data	Estimated[1]
March	Estimated[1]	No data	Estimated[1]	No data	Estimated[1]
April	Estimated[1]	No data	Estimated[1] /Observations	No data	Estimated[1] /Observations
May	Observations	No data	Observations	No data	Estimated[1] /Observations
June	Observations	No data	Observations	No data	Estimated[1] /Observations
July	Observations	No data	Observations	No data	Estimated[1]
August	Observations	No data	Observations	No data	Estimated[1] /Observations
September	Observations	No data	Observations	No data	Estimated[1] /Observations
October	Observations	No data	Observations/Estimated	No data	Estimated[1] /Observations
November	Estimated[1]	No data	Estimated	No data	Observations
December	Estimated[1]	No data	Estimated	No data	Observations

[1] The estimated discharge provided by ERM were reportedly modeled using either linear regression between measurements or by estimating linear or logarithmic growth or decay between measurements.

The water balance model used in this study produces monthly average streamflow conditions (Moore et al. 2012). Due to the limited available observed from Four Creek, the calibration record relies on monthly values that were only developed using anywhere from one to three years of data. To assess how representative the available streamflow data are of longer-term trends, the short-term record at Four Creek was compared to the longer-term hydrometric record from Goathorn Creek, which is collected by the WSC. This comparison helped evaluate whether the calibration period is broadly representative of long-term averages. Since Four Creek is located within the Goathorn Creek watershed, it is assumed that climatic variability patterns observed in Goathorn Creek would also be broadly reflected in Four Creek. Figure 23 and Table 24 present Goathorn Creek's average monthly discharge per month for the years 2020 to 2024 against a climate normal period of 1994 to 2024.

The average discharge for the 2020 to 2024 period from Goathorn Creek is generally lower compared to the long-term average in all months except November and December, where the 2020-2024 observations exceed the long-term average. The most significant variation in discharge between the 2020-2024 average and the long-term average occurs in December, where the mean daily discharge for the 2020-2024 period is approximately 48% higher than the long-term average. In contrast, June shows a substantial difference, with the 2020-2024 average daily discharge being approximately 45% lower than the long-term average. Overall, the average daily discharge for the 2020-2024 period is lower than the long-term average for every month except November and December.

Figure 23: Goathorn Creek average monthly discharge (m^3/s) for each year from 2020 to 2024, the average daily discharge for the period 2020 to 2024, and the average daily discharge from 1994 to 2024

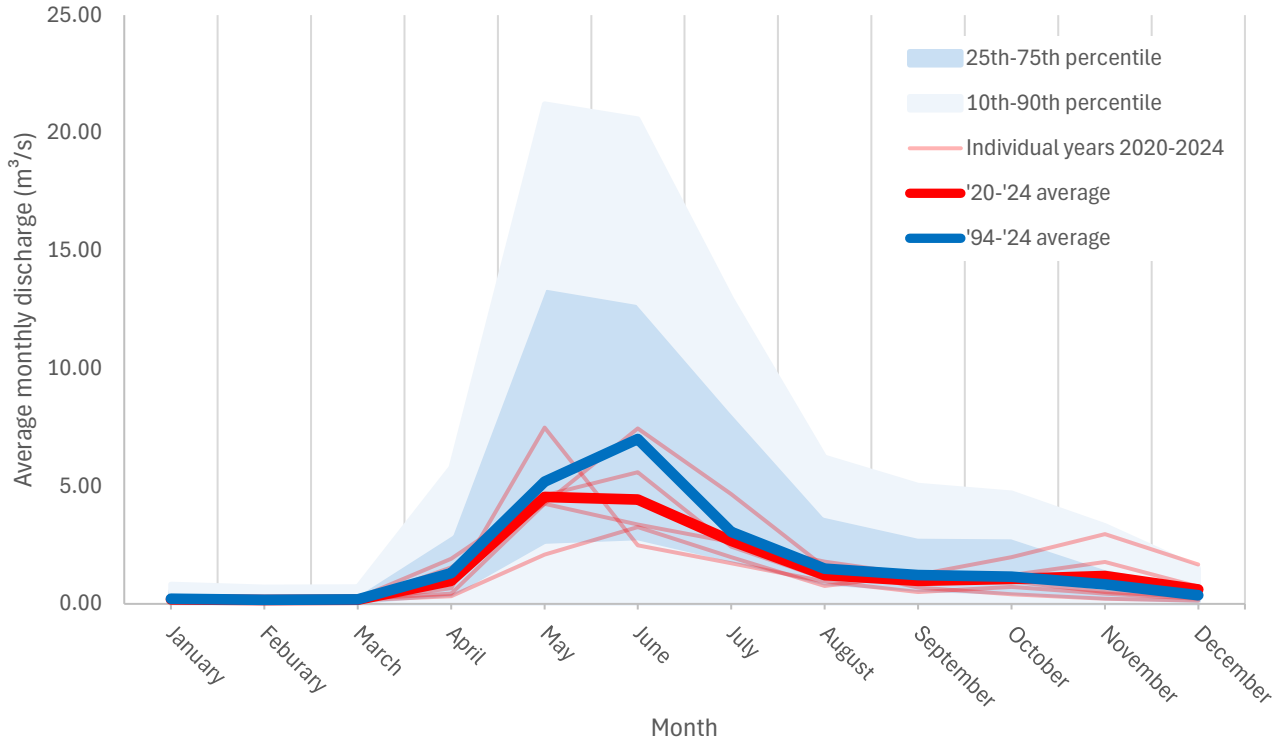


Table 24: Mean monthly discharge (m^3/s) of Goathorn Creek

	Goathorn Creek mean monthly discharge (m^3/s)							% variation of '20-'24 mean from '94-'24 mean
	2020	2021	2022	2023	2024	2020-2024 Average	1994-2024 Average	
January	0.25	0.26	0.19	0.12	0.14	0.19	0.22	-12.2
February	0.16	0.18	0.24	0.11	0.12	0.16	0.17	-5.2
March	0.14	0.25	0.20	0.13	0.15	0.17	0.18	-5.2
April	1.55	1.91	0.44	0.67	0.33	0.98	1.30	-28.5
May	4.25	4.61	4.26	7.49	2.10	4.54	5.20	-13.5
June	3.37	5.59	7.45	2.49	3.26	4.43	7.00	-44.9
July	2.62	2.43	4.66	1.73	1.98	2.68	3.05	-12.9
August	1.79	1.07	1.56	0.95	0.76	1.23	1.50	-20.2
September	1.22	1.22	0.70	0.50	1.23	0.97	1.23	-23.0
October	1.23	0.95	0.41	0.72	1.99	1.06	1.16	-9.3
November	1.78	0.51	0.22	0.44	2.96	1.18	0.82	35.6
December	0.73	0.27	0.14	0.22	1.67	0.61	0.37	47.5

A visual comparison of hydrographs (Figure 24) and three goodness of fit metrics were used to test the calibration and performance of the model:

- Nash-Sutcliffe Efficiency (NSE) is widely used for calibration and evaluation of hydrological models with observed data (Moriasi et al. 2007, Hoshin et al. 2009). NSE values range from -∞ to 1, with 1 indicating a perfect match between observed and predicted data. Generally, an NSE value above 0.8 indicates that the model is very well calibrated (Moriasi et al. 2007).
- Percent Bias (PBIAS) measures the average tendency of the simulated values to be larger or smaller than their observed counterparts. It is calculated as the percentage difference between observed and predicted values. A PBIAS value of 0 indicates an unbiased model, while positive or negative values reveal overestimation or underestimation, respectively. For hydrological models, PBIAS values within ±25% are typically considered acceptable (Moriasi et al. 2007)
- Normalized Root Mean Square Error (NRMSE) assesses the model's accuracy by calculating the square root of the average squared differences between observed and predicted values, normalized by the range or mean of the observed data. Lower NRMSE values indicate better model performance. An NRMSE value within 10-20% is generally considered acceptable for model calibration (BC MOE 2012.; Singh et al. 2004).

4.2.4 Predictive Scenarios

Following calibration, the model was then modified to estimate the anticipated streamflow under different phases of mine life by changing the HRUs that contribute runoff to Four Creek. These results were then compared to streamflow generated under baseline conditions to evaluate the expected magnitude of change that will occur due to mine processes. The water management plan developed by SRK Consulting (2022c) provides an overview of the different phases that were assessed and outlines areas within the Four Creek watershed that are associated with each phase of the project, which were used to inform the hydrological modelling scenarios.

- **Operations:** During the operational phase, projected to be in place by the end of year 10, SRK (2022c) identifies several areas within and near the Four Creek watershed where surface water will be actively managed. Water management infrastructure associated with the East Management Pond and the southern pit excavation area in the will divert water away from Four Creek. These were simulated by removing HRU 4 and HRU 5. During this phase, there is also a non-developed area located upslope of the East Management Pond that will divert water into Four Creek via Channel 02. This was simulated by adding HRU 7 and HRU 8 to the watershed. This scenario also assumes that no water will be intercepted by the road or pipeline accessing the southern pit, and that no flow will be diverted out of the watershed via ditches.
- **Closure and Post-Closure:** For the closure and post-closure phase, SRK (2022c) outlines that drainage infrastructure will remain in place with some modifications as the site transitions from active operations to closure. Additional pit areas have been constructed between the end of Operation End of Year 10 phase and the post-closure phase which will redirect additional flow outside of the Four Creek watershed. This was simulated by removing HRU 8. HRU 4 and HRU 5 are still removed from the watershed, and HRU 7 remains included in the watershed. Flow mitigation features designed to limit excess contributions to Four Creek during peak events are expected to remain functional post-closure.

- **Low Flows:** The impacts under low flow scenarios are particularly important as these are periods when limited access to physical fish habitat can negatively affect fish populations. The model was also modified to evaluate the impacts during low flow years. To do this, the ratio of 10th percentile annual precipitation to mean annual precipitation was applied to the average monthly precipitation values to generate a new set of low flow precipitation inputs. These new input parameters were used to evaluate the relative change in streamflow that would be caused under the operations and closure/post-closure phases during low flow years.

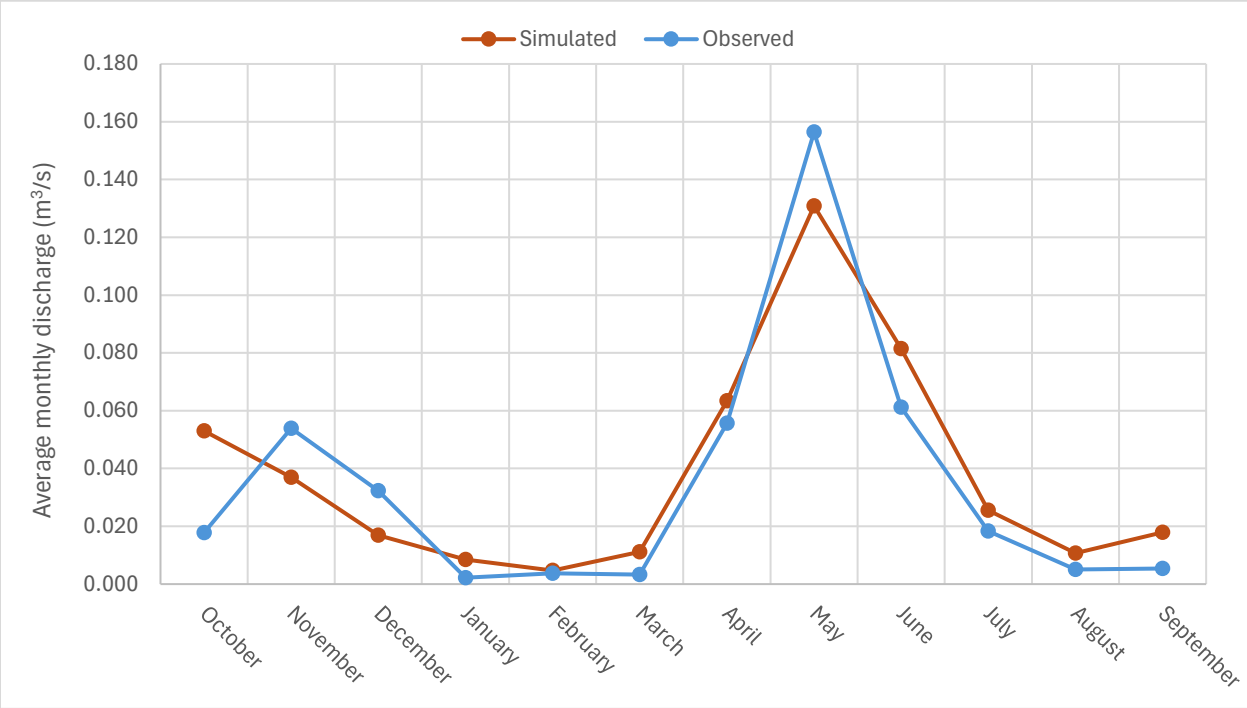
The modeled scenarios assume that Channel C02 is fully functional, captures all runoff and interflow generated from its upslope catchment, and is constructed in the location delineated by SRK (2022c). These scenarios also assume that the channel alignment will not be altered. The design performance of this channel is not considered by SLR in this analysis.

4.3 Results

4.3.1 Model Calibration

The calibrated Four Creek model achieved an NSE value of 0.851, a PBIAS value of -11.0%, and an NRMSE value of 10.6%. These metrics indicate that the model fits well but moderately overestimates discharge compared to the observed ERM data. Specifically, the model underpredicts streamflow in November and December and overpredicts streamflow from June through September compared to the observed values. These discrepancies reflect the bias observed in the 2020-2024 subset of data from Goathorn Creek that was used for calibration (Table 24), which suggests that the model likely better predicts long-term averages than the goodness of fit metrics suggest.

Figure 24: Comparison of the Four Creek watershed balance model (simulated) with observed and modelled data provided by ERM (2025) for the period 2020-2024



4.3.2 Predictive Scenarios

4.3.2.1 Operations Phase

As shown in Figure 25 and Table 25, the planned water management measures during the operation and post-closure phases of the mine would result in an increase to average daily discharge in Four Creek across all months. Increased streamflow under this scenario is due to the increase in contributing area (represented by HRU 7 and HRU 8) to the Four Creek watershed.

Figure 25: Average daily discharge in Four Creek accounting for all diversions out of and into the watershed during the operations phase at the end of year 10, compared to baseline conditions

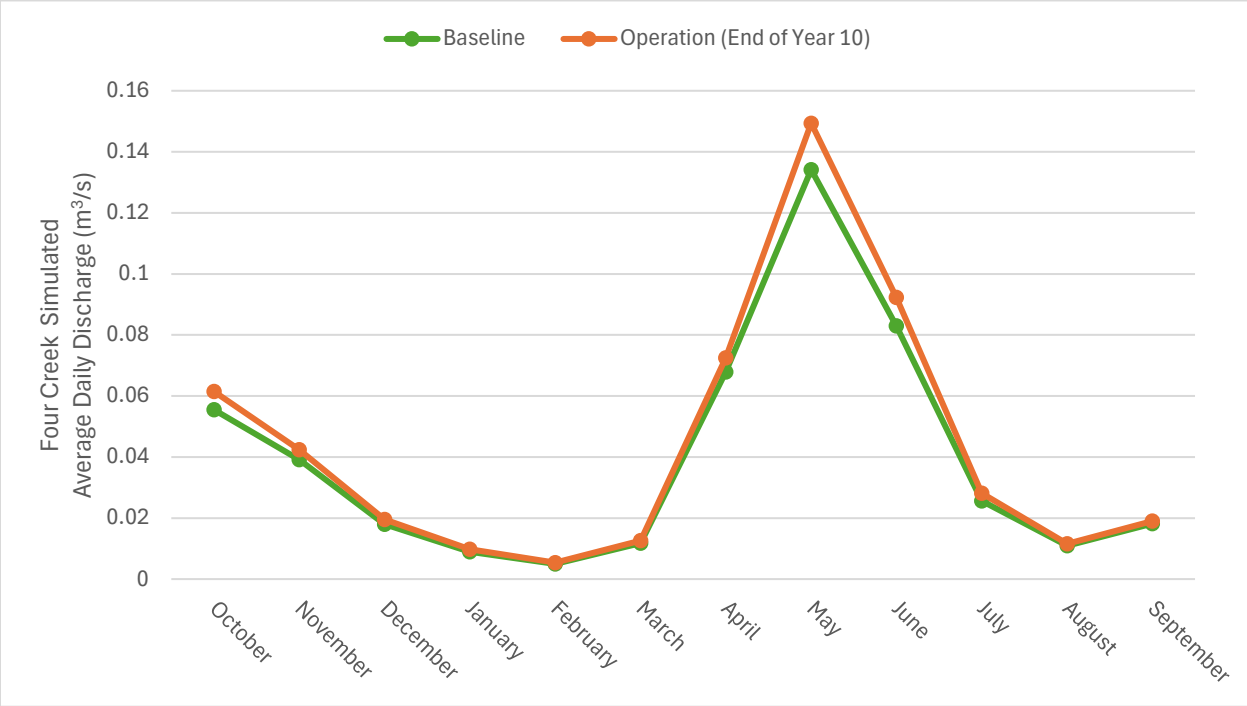


Table 25: Modelled average daily discharge (m^3/s) in Four Creek during baseline conditions and during operation and post-closure mine phases.

	Average Daily Discharge (m^3/s)		
	Baseline	**Operation**	**% Difference from Baseline**
October	0.055	0.061	10%
November	0.039	0.042	8%
December	0.018	0.020	8%
January	0.009	0.010	8%
February	0.005	0.005	8%
March	0.012	0.013	7%
April	0.068	0.073	7%
May	0.134	0.149	11%
June	0.083	0.092	11%
July	0.026	0.028	9%
August	0.011	0.012	5%
September	0.018	0.019	4%
Mean Annual Discharge	0.040	0.044	9%

4.3.2.2 Closure/Post-Closure Phase

Figure 26 illustrates the combined effect of all diversions into and out of the watershed at the closure and post-closure phase. The exclusions of HRU 4 and HRU 5 remain unchanged from the end-of year 10 operation phase. Once the pit in HRU 8 is constructed, sometime after year 10 operation and closure, water will be diverted away from Four Creek as per the SRK (2022c) water management strategy. Table 26 the average monthly discharge of the closure / post-closure phase within Four Creek and the percentage difference between the overall changes to the water balance compared to the baseline.

Figure 26: Average daily discharge in Four Creek accounting for all diversions out of and into the watershed during the closure and post-closure phases compared to baseline conditions

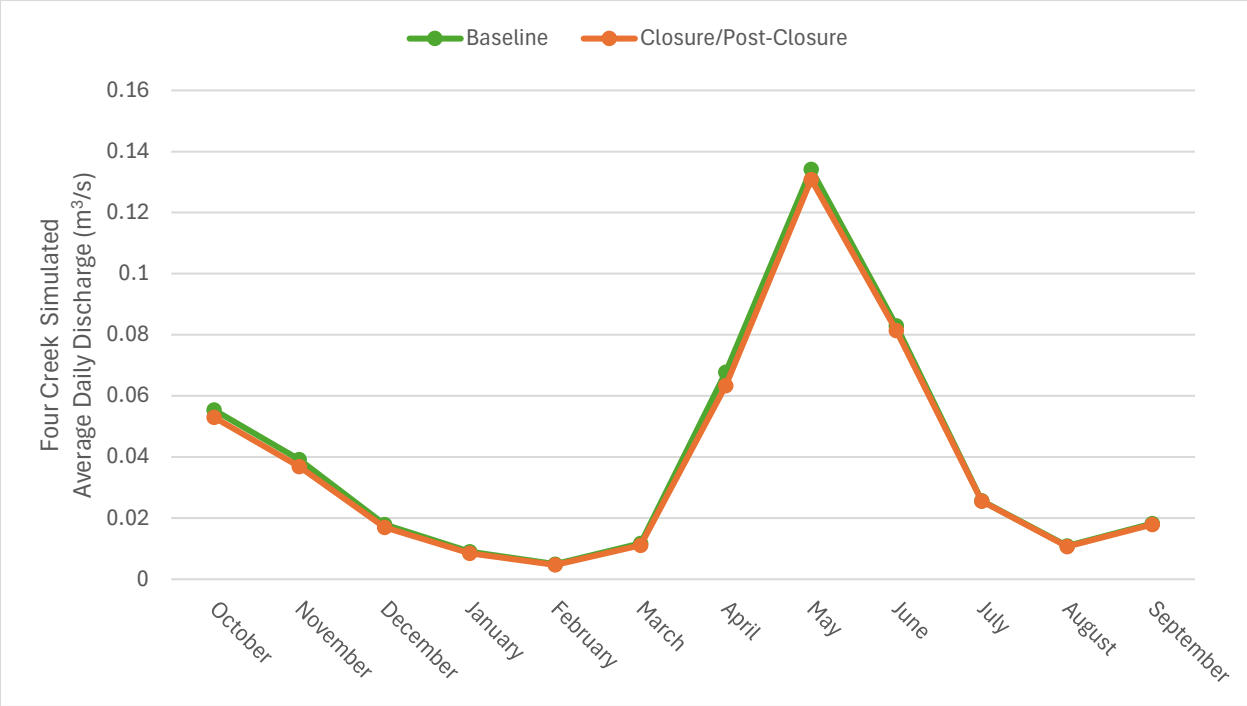


Table 26: Modelled average daily discharge (m^3/s) in Four Creek during baseline conditions and closure and post-closure mine phases

	Average Daily Discharge (m^3/s)		
	Baseline	**Closure / Post-closure**	**% Difference from Baseline**
October	0.055	0.053	-5%
November	0.039	0.037	-6%
December	0.018	0.017	-6%
January	0.009	0.008	-6%
February	0.005	0.005	-6%
March	0.012	0.011	-6%
April	0.068	0.063	-7%
May	0.134	0.131	-2%
June	0.083	0.081	-2%
July	0.026	0.026	0%
August	0.011	0.011	-2%
September	0.018	0.018	-2%
Mean Annual Discharge	0.040	0.039	-4%

Once the surface water diversion mechanisms are in place for the southern excavation pit, this will result in an overall decrease to discharge in Four Creek for all months except July and September.

4.3.2.3 Low Flow Conditions

The relative change in streamflow under low flow and the average flow conditions for both Operations and Closure/Post-Closure phases are provided in Table 27. The results show no significant difference in the projected relative change in streamflow between October and May. However, from June to September, streamflow is expected to be slightly higher during the Operations phase and slightly lower during the Closure and Post-Closure phases. These variations are minor: up to a 6% increase during Operations and up to a 4% decrease during Closure/Post-Closure.

Table 27: Percent difference in average daily discharge between baseline and mine development phases under varying flow conditions

	Operations Phase		Closure/Post-Closure Phase	
	Average flows	**Low flows**	**Average flows**	**Low flows**
October	10%	10%	-5%	-5%
November	8%	8%	-6%	-6%
December	8%	8%	-6%	-6%
January	8%	8%	-6%	-6%
February	8%	8%	-6%	-6%
March	7%	8%	-6%	-6%
April	7%	7%	-7%	-7%
May	11%	11%	-2%	-2%
June	11%	12%	-2%	0%
July	9%	10%	0%	-4%
August	5%	10%	-2%	-4%
September	4%	10%	-2%	-4%
Mean Annual Discharge	9%	10%	-4%	-4%

5.0 Discussion

The surficial geology of Four Creek watershed suggests that perched groundwater conditions are likely, due to the presence of fine till in the shallow overburden which acts as a low permeability layer inhibiting water from percolating down to the main deep groundwater table. The results of the groundwater-surface water interaction detailed herein support this conclusion for several reasons:

- Vertical hydraulic gradients consistently show negative values, indicating that Four Creek is a losing stream, where water from the creek seeps outwards into the shallow subsurface.
- Conductivity measurements along Four Creek show minimal variation except for a few locations. These conductivity measurements suggest contributions to streamflow along Four Creek come from direct precipitation and recently fallen precipitation that arrives at the creek as interflow along the creek's length.
- Discharge measurements taken at multiple points along Four Creek show no measurable increase in streamflow under baseflow conditions that would suggest the presence of groundwater contributions. Additionally, water level measurements obtained from mini-piezometers installed adjacent to the stream channel indicate that the vertical hydraulic gradient is predominantly negative at all monitoring locations. A negative vertical gradient suggests a downward movement of water from the stream toward the underlying shallow groundwater. These consistent patterns across Four Creek suggest that the stream is functioning as a losing stream along its entire reach, and that the findings of the model can be extended to the entire length of Four Creek, with the exception of the impacts of proposed water conveyance infrastructure, such as ditches.

The Groundwater Numerical Model (SRK 2022a) was developed to understand regional groundwater patterns. Its predictions for Four Creek assume that Four Creek surface flow was connected to the deep groundwater aquifer throughout its entire length, and that there was a hydraulic connection through a single hydrostratigraphic unit connected to the proposed pit. This model was not intended to try and represent complex surface water and groundwater interactions over small stream sections in a perched system, such as Four Creek.

Given the habitat that Four Creek provides to resident Dolly Varden, a more detailed water balance model was developed for Four Creek, specifically, to estimate streamflow changes under different mine-life scenarios. The model calibration and validation demonstrate good alignment with observed data, although there are several limitations to consider.

- Although the model structure is primarily designed to simulate average hydrological conditions (Moore et al. 2012), it was also modified to estimate low flows during a 10th percentile dry year. These results indicate no difference in the predicted relative change in streamflow from October to May. From June to September, proportionally higher streamflow is expected under the Operations phase, and proportionally lower streamflow is expected under the Closer and Post-Closure phases. The magnitude of these changes are small (increases of up to 6% under Operations, and decreases of up to 4% during Closure/Post-Closure) and are expected to be caused by changes in the amount of water stored within subsurface soils.
- The model is only as reliable as the input data. Four Creek streamflow data, used for calibration, limited in duration and includes estimated values during winter months when direct observations were unavailable.

- To produce realistic simulations of future scenarios, it is important that parameter values represent physical reality. Where possible, calibration was constrained based on site characteristics. Although there are some discrepancies, the selected values generally align with those reported by Moore et al. (2012) support their suitability for application in the predictive scenarios.
- The model predicts changes over a relatively short timeframe, corresponding with the short duration of the projected mine life, and therefore does not incorporate the influence of long-term climate change.
- The model assumes that water management infrastructure captures all runoff and interflow but does not account for potential changes in the timing or intensity of runoff that may result from land disturbance or future modifications to site infrastructure.

The predictive analysis suggests that monthly streamflow is project to increase anywhere from 4% to 11% from baseline conditions under the operations phase. These changes are primarily due to the influence of diversion Channel C02, which capture water from adjacent hillslopes and increase the contributing area of Four Creek. This differs from the Groundwater Numerical Model, which predicts a decrease of -14.3% compared to baseline conditions (SRK 2022a). During the closure and post-closure phases, the predicted change in streamflow ranges from a 0% to -7% difference relative to baseline conditions. This also differs from the Groundwater Numerical Model, which predicts a decrease of –10.7% compared to baseline conditions (SRK 2022a).

6.0 Closure

We trust that this report on the Four Creek Watershed meets your needs in support of the Environmental Assessment process and addressing comments from involved stakeholders. If you have any further questions, please contact the undersigned.

Regards,

SLR Consulting (Canada) Ltd.

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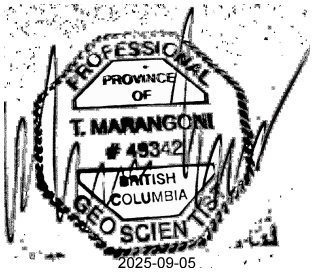

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Appendix A Mini Piezometers MP5S/D

Four Creek Watershed

Groundwater Surface Water Interaction Investigation
and Water Balance Model Development

Telkwa Coal Limited

SLR Project No.: 201.V24219.00000

September 5, 2025

Appendix A Mini Piezometers MP5S/D

A.1 July Field Program Installation

The field program to install two piezometers as nested pair (shallow/deep) at the location of water quality station WQS20 was undertaken in July of 2024. This new monitoring location was named Site 5, with the denominations Site 5S and Site 5D referring to the shallow and deep piezometers respectively (Table A.1).

The deep MP (Site 5D) was constructed out of 1.52 m (2 x 2.5 ft) of galvanized steel riser, followed by 0.76 m (2 ft) piece of stainless-steel riser then the 0.3 m (1 ft) stainless steel MP tip. It was installed 1.88 m below ground surface. The shallow MP (Site 5S) was constructed out of 0.76 m galvanized steel riser, followed by 0.76 m stainless steel riser and then the 0.3 m (1 ft) stainless steel MP tip. It was installed 0.90 m below ground surface.

The purpose of this installation is to collect information on the shallow groundwater levels and the surface water levels in the creek. Manual surface and shallow groundwater levels were measured after the MPs were installed and had time to equilibrate. The MPs were equipped with an M10 Solinst Levelogger® 5 pressure transducer to record continuous groundwater levels every hour.

Table A.1: Mini-Piezometer Installation Details

Nearest Water Quality Station	Mini Piezometer ID	Northing (m)	Easting (m)	Elevation (masl)	Total Length (m)	Stick Up (m)	Screen Length (m)
WQS20	Site 5 S	6051999	0619301	831	1.52	0.615	0.3
WQS20	Site 5 D				2.63	0.75	0.3

A.1.1 Site 5 Mini Piezometer Installation Photographic Log

Photo 1: Site 5 D Installation Field staff pictured: Pryanka Rai (July 4, 2024)	**Photo 2:** Site 5 S Installation Field staff pictured: Pryanka Rai (July 4, 2024)

Photo 3: Site 5 S/D installation completed (July 4, 2024)

Appendix B Summary of 2024 Water Quality Results

Four Creek Watershed

Groundwater Surface Water Interaction Investigation
and Water Balance Model Development

Telkwa Coal Limited

SLR Project No.: 201.V24219.00000

September 5, 2025

		Physical Tests										Anions and Nutrients							Anions and Nutrients												Cyanides	Phenols	Organic / Inorganic Carbon (Water)					
Client Sample ID		Colour, True	Conductivity	Hardness Total (as CaCO3)	Hardness Dissolved (as CaCO3)	pH Field	pH Lab	Total Suspended Solids	TDS (Calculated)	Turbidity	Orthophosphate (P)	Phosphorus (as P)-Total	Phosphorus (as P)-Dissolved	Acidity (as CaCO3) pH 4.5	Acidity (as CaCO3) pH 8	Alkalinity, Total (as CaCO3)	Alkalinity, Phenolphthalein (as CaCO3)	Alkalinity, Bicarbonate (as CaCO3)	Alkalinity, Carbonate (as CaCO3)	Alkalinity, Hydroxide (as CaCO3)	Ammonia, Total (as N)	Bromide (Br)	Chloride (Cl)	Fluoride (F)	Nitrate (as N)	Nitrite (as N)	Total Kjeldahl Nitrogen	Total Nitrogen	Sulfate (SO4)	Cyanide, Total	Phenols, Total	Total Organic Carbon	Dissolved Organic Carbon	Aluminum (Al)-Total	Antimony (Sb)-Total	Arsenic (As)-Total	Barium (Ba)-Total
	Units	CU	uS/cm	mg/L	mg/L	pH	pH	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LDL	5.0	2.0	0.125	0.125	0.1	0.1	2.0	10.0	0.1		0.005	0.005	2.0	2.0	1.0	1.0	1.0	1.0	1.0	0.0500	0.1000	0.10	0.100	0.0050	0.0050	0.050	0.050	1.00	0.0005	0.0015	0.50	0.50	0.0030	0.00005	0.00010	0.00100
	BC CSR (Aquatic Life (AW))																				pH Dependent (1.31 @pH>8.5, 3.7 @pH8-<8.5, 11.3 @pH7.5-<8, 18.5 @pH 7-7.5, 18.4 @pH <7)		1500	Hardness Dependent (2 @ H<50, 3 @ H>50)	400	CI Dependent (0.2 @ CI<2, 0.4 @CI2-<4), 0.6 @CI4-<6, 0.8 @CI 6-<8, 1 @CI 8-10, 2 @CI > 10)			Hardness Dependent (1280@H<30, 2180 @H 31-75, 3090@H76-180, 4290@H>180)		2.0000						
T95R-64	Summer - July 2024	<2.0	1300	48.9	52.3	7.28	8.06	1.6	790.0	0.69	<0.0030	0.012	-	<1.0	<1.0	720	<1.0	880	<1.0	<1.0	0.3600	-	1.1	1.4	<0.020	<0.0050	0.446	0.446	<1.0	<0.00050	<0.0015	<0.50	0.68	0.0046	<0.0005	<0.0001	0.397
	Fall - September 20224	2.1	1300	51.2	55.3	7.21	8.26	2	780	2.4	<0.0030	0.0076	-	<1.0	<1.0	740	<1	910	<1.0	<1.0	0.37	-	1.2	1.6	<0.020	<0.005	0.47	0.472	<1.0	<0.00050	<0.0015	<0.50	<0.50	0.0249	0.0016	<0.0002	0.368
T19-18S	Summer - July 2024	15.8	-	216	219	8.13	8.2	9.2	600.0	9.80	0.0630	1.3	-	<1.0	<1.0	240	<1.0	290	<1.0	<1.0	-	-	13	0.18	<0.020	<0.0050	3.59	3.59	220	-	0.0043	41	14	0.158	<0.0025	0.00355	0.0787
	Fall - September 20224	4.5	940	552	228	7.44	8.05	5100	610.0	3700.00	<0.0030	1.6	-	<1.0	<1.0	230	<1.0	280	<1.0	<1.0	0.4400	-	5.2	0.17	<0.020	<0.0050	1.5	1.49	240	<0.00050	<0.0015	<50	12	71.9	<0.005	0.0332	1.25
T0B96-02-06	Summer - July 2024	<2.0	610	274	309	7.28	8.03	25	340.0	380.00	0.0042	0.0056	0.0056	<1.0	3.3	320	<1.0	390	<1.0	<1.0	<0.015	-	<1.0	0.086	<0.020	<0.0050	0.063	0.063	13	<0.00050	<0.0015	0.82	1	0.326	<0.0005	0.00021	0.119
	Fall - September 20224	<2.0	610	349	287		8.01	96	340.0	35.00	<0.0030	0.0058	-	<1.0	1.8	330	<1.0	400	<1.0	<1.0	<0.015	-	<1.0	0.096	<0.020	<0.0050	0.091	0.091	18	0.00096	<0.0015	0.79	1.9	5.29	0.00085	0.00261	0.411
T0B96-01-05	Summer - July 2024	16.9	690	312	357	6.81	7.91	57	420.0	31.00	0.0077	0.065	-	<1.0	<1.0	340	<1.0	410	<1.0	<1.0	-	-	<1.0	0.07	<0.020	<0.0050	0.481	0.481	41	-	<0.0015	90	-	0.744	0.00053	0.00096	0.174
T95R-40	Summer - July 2024	<2.0	2900	101	112	7.22	7.96	17	1800.0	0.63	0.0074	0.087	-	<1.0	2.1	1700	-	1700	<1.0	<1.0	0.6000	-	12	0.49	<0.020	<0.0050	-	0.926	10	<0.00050	<0.0015	0.95	0.8	0.075	<0.005	<0.001	4.82
	Fall - September 20224	<2.0	2800	96.4	98.2	-	7.92	150	1700.0	32.00	<0.0030	0.072	-	<1.0	4.5	1600	<1.0	2000	<1.0	<1.0	0.6400	-	10	0.62	<0.020	<0.0050	0.96	0.959	26	<0.00050	<0.0015	0.96	<0.50	1.2	<0.0025	0.00083	3.23
T18-01D	Summer - July 2024	3.4	1200	11.4	9.34	8.42	8.44	42	790.0	4.90	0.0043	0.08	-	<1.0	<1.0	610	21	690	25	<1.0	0.3700	-	15	2.1	<0.020	0.0062	1.49	1.49	25	<0.00050	<0.0015	2.6	2.3	1.24	0.00093	0.00849	0.12
	Fall - September 20224	18.5	1200	11.1	11.4	-	8.51	8.8	780.0	-	0.0050	0.046	-	<1.0	<1.0	640	34	700	41	<1.0	0.3900	-	15	2.4	<0.020	<0.0050	0.58	0.577	25	<0.00050	<0.0015	3.5	3.1	0.747	<0.001	0.00822	0.117
Site 2S	Summer - July 2024	42.9	160	70.2	72.6	7.34	7.7	2.8	110.0	5.20	<0.0030	0.0059	-	<1.0	<1.0	79	<1.0	97	<1.0	<1.0	<0.015	-	<1.0	<0.050	0.028	<0.0050	0.294	0.322	<1.0	0.00053	<0.0015	11	11	0.0622	<0.0005	0.00049	0.0617
	Fall - September 20224	13.8	310	137	145	-	8.15	67	170.0	5.70	<0.0030	0.012	-	<1.0	<1.0	170	<1.0	200	<1.0	<1.0	<0.015	-	<1.0	<0.050	0.047	<0.0050	0.18	0.227	<1.0	0.00052	<0.0015	3.9	3.9	0.0707	<0.0005	0.00054	0.112
Site 2SW	Summer - July 2024	43.1	160	69.9	74.1	7.77	7.81	110.0	110.0	0.34	0.0079	0.0046	-	<1.0	<1.0	80	<1.0	97	<1.0	<1.0	<0.015	-	<1.0	<0.050	0.049	<0.0050	0.257	0.306	<1.0	0.00051	<0.0015	11	11	0.0382	<0.0005	0.00048	0.0614
	Fall - September 20224	13.7	310	138	151	-	8.22	1.2	170.0	0.26	<0.0030	<0.0030	-	<1.0	<1.0	170	<1.0	200	<1.0	<1.0	<0.015	-	<1.0	<0.050	0.036	<0.0050	0.21	0.241	<1.0	<0.00050	<0.0015	3.8	3.7	0.0169	<0.0005	0.0005	0.109
Site 2D	Fall - September 20224	-	230	90	-	-	7.55	-	-	35.00	-	0.15	-	-	-	120	<1.0	140	<1.0	<1.0	0.3200	-	2.3	0.066	0.023	0.01	-	-	<1.0	-	-	-	-	0.562	0.00216	0.0025	0.155
Site 4 Upper S	Summer - July 2024	31.4	190	90.6	93.5	7.65	7.94	120.0	120.0	6.20	0.0066	0.0069	-	<1.0	<1.0	100	<1.0	120	<1.0	<1.0	0.0230	-	<1.0	<0.050	<0.020	<0.0050	0.257	0.257	<1.0	<0.00050	<0.0015	7.6	7.5	0.118	<0.0005	0.00066	0.0896
	Fall - September 20224	8.2	340	160	167	-	8.18	5.6	180.0	0.98	<0.0030	0.0034	-	<1.0	<1.0	180	<1.0	220	<1.0	<1.0	<0.015	-	<1.0	<0.050	<0.020	<0.0050	0.14	0.143	<1.0	<0.00050	<0.0015	2.2	2.3	0.0286	<0.0005	0.0007	0.13
Site 4 Upper SW	Summer - July 2024	32.4	190	85.5	89.1	7.94	7.92	120.0	120.0	1.60	0.0056	0.0048	-	<1.0	<1.0	99	<1.0	120	<1.0	<1.0	<0.015	-	<1.0	<0.050	<0.020	<0.0050	0.262	0.262	<1.0	<0.00050	<0.0015	7.9	8	0.0419	<0.0005	0.00061	0.0832
	Fall - September 20224	9.2	330	153	168	-	8.23	<1.0	170.0	0.39	<0.0030	<0.0030	-	<1.0	<1.0	180	<1.0	220	<1.0	<1.0	<0.015	-	<1.0	<0.050	<0.020	<0.0050	0.14	0.141	<1.0	<0.00050	<0.0015	2.4	2.2	0.0191	<0.0005	0.00064	0.125
Site 4 Upper D	Summer - July 2024	16.8	-	84.2	89.3	-	7.9	160.0	160.0	11.00	<0.0030	0.1	-	<1.0	<1.0	100	<1.0	130	<1.0	<1.0	0.1900	-	<1.0	<0.050	<0.020	<0.0050	1.16	1.16	<1.0	-	-	35	-	0.575	0.00142	0.00055	0.0917
	Fall - September 20224	-	270	-	122	-	8	-	-	3900.00	-	0.0035	-	-	-	150	<1.0	180	<1.0	<1.0	<0.015	-	<1.0	<0.050	<0.20	<0.050	-	-	<1.0	-	-	-	-	-	-	-	-
Site 5S	Summer - July 2024	45.2	160	74.9	80.3	7.21	7.55	130.0	130.0	5.70	0.0044	0.016	-	<1.0	<1.0	84	<1.0	100	<1.0	<1.0	0.0270	-	<1.0	<0.050	<0.020	<0.0050	0.43	0.43	<1.0	0.00065	<0.0015	12	12	0.15	<0.0005	0.00118	0.0801
	Fall - September 20224	32.5	280	127	138	-	7.9	10.0	150.0	4.00	0.0045	0.0086	-	<1.0	<1.0	150	<1.0	180	<1.0	<1.0	0.0650	-	<1.0	<0.050	<0.020	<0.0050	0.33	0.327	<1.0	<0.00050	<0.0015	5.7	5.9	0.0574	<0.0005	0.00218	0.113
Site 5D	Fall - September 20224	-	160	239	-	-	10.1	-	-	>4000	-	0.052	-	-	-	88	41	7.9	49	<1.0	0.2300	-	<1.0	0.14	<0.020	<0.0050	-	-	<1.0	-	-	-	-	28.1	<0.001	0.0185	0.754
Site 5 SW	Summer - July 2024	38.8	160	71.6	75.9	7.37	7.83	110.0	110.0	0.32	<0.0030	0.0037	-	<1.0	<1.0	82	<1.0	100	<1.0	<1.0	<0.015	-	<1.0	<0.050	<0.020	<0.0050	0.311	0.311	<1.0	0.00052	<0.0015	10	11	0.0323	<0.0005	0.00045	0.0645
	Fall - September 20224	14.8	290	131	138	-	8.16	<1.0	160.0	0.31	<0.0030	<0.0030	-	<1.0	<1.0	150	<1.0	190	<1.0	<1.0	<0.015	-	<1.0	<0.050	0.079	<0.0050	0.18	0.255	<1.0	<0.00050	<0.0015	4.2	4.2	0.0172	<0.001	0.00046	0.103

		Total Metals						Total Metals															Total Metals										Dissolved Metals				
Client Sample ID		Beryllium (Be)-Total	Bismuth (Bi)-Total	Boron (B)-Total	Cadmium (Cd)-Total	Calcium (Ca)-Total	Chromium (Cr)-Total	Cobalt (Co)-Total	Copper (Cu)-Total	Iron (Fe)-Total	Lead (Pb)-Total	Lithium (Li)-Total	Magnesium (Mg)-Total	Manganese (Mn)-Total	Mercury (Hg)-Total	Molybdenum (Mo)-Total	Nickel (Ni)-Total	Phosphorus-Total	Potassium (K)-Total	Selenium (Se)-Total	Silicon (Si)-Total	Silver (Ag)-Total	Sodium (Na)-Total	Strontium (Sr)-Total	Sulfur (S)-Total	Thallium (Tl)-Total	Tin (Sn)-Total	Titanium (Ti)-Total	Tungsten (W)-Total	Uranium (U)-Total	Vanadium (V)-Total	Zinc (Zn)-Total	Zirconium (Zr)-Total	Aluminum (Al)-Dissolved	Antimony (Sb)-Dissolved	Arsenic (As)-Dissolved	Barium (Ba)-Dissolved	Beryllium (Be)-Dissolved
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LDL	0.00010	0.001000	0.050	0.0000100	0.050	0.00100	0.00020	0.00050	0.010	0.000200	0.0020	0.0050	0.00000	0.0000050	0.001000	0.00100	0.0100	0.050	0.000100	0.10	0.000020	0.050	0.00100	3.00	0.000010	0.00500	0.00100	0.00100	0.100000	0.00500	0.0050	0.000100	0.0030	0.00050	0.00010	0.00100	0.00010
	BC CSR (Aquatic Life (AW))																																		0.0900	0.0500	10.0000	0.0015
T95R-64	Summer - July 2024	<0.0001	<0.001	0.124	<0.00001	16.7	<0.001	<0.0002	<0.0005	0.401	<0.0002	0.053	**1.74**	0.0155	<0.0000019	<0.001	<0.001	0.013	**1.22**	<0.0001	3.48	<0.00002	**279**	0.28	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	<0.0001	<0.003	<0.0005	<0.0001	0.4360	<0.0001
	Fall - September 20224	<0.0002	<0.002	0.136	0.000061	17.7	<0.002	<0.0004	0.0014	0.349	<0.0004	0.0539	1.71	0.0153	<0.000019	<0.002	0.0033	<0.02	1.27	<0.0002	-	<0.00004	275	0.249	<6.0	0.000046	<0.01	<0.01	-	<0.0002	<0.01	<0.01	-	<0.003	<0.0005	-	0.447	<0.0001
T19-18S	Summer - July 2024	<0.0005	<0.005	<0.25	0.0000530	52.7	<0.005	<0.001	0.0037	<0.05	<0.001	<0.01	**20.50**	0.3850	<0.0000095	0.00760	<0.005	0.563	**3.34**	<0.0005	4.95	<0.0001	**127**	0.49	73	<0.00005	<0.025	<0.025	<0.005	0.000930	<0.025	<0.025	<0.0005	<0.003	0.00075	0.00279	0.0824	<0.0001
	Fall - September 20224	0.0051	<0.01	<0.5	0.0019600	129.0	0.103	0.0647	0.362	125.000	0.075800	0.058	**55.90**	4.4900	0.000413	<0.01	0.14	-	**8.29**	<0.001	-	0.001070	**92**	1.04	68	0.00095	<0.05	0.373	-	0.011000	0.146	0.549	-	0.0040	0.00051	0.00249	0.1050	<0.0001
T0B96-02-06	Summer - July 2024	<0.0001	<0.001	<0.05	0.0000240	72.2	<0.001	<0.0002	<0.0005	0.174	0.000380	0.004	**22.80**	0.0911	<0.0000019	<0.001	<0.001	<0.01	**0.83**	<0.0001	6.24	<0.00002	**10**	0.42	4	<0.00001	<0.005	0.0065	<0.001	0.001250	<0.005	<0.005	0.000340	<0.003	<0.0005	0.00014	0.1280	<0.0001
	Fall - September 20224	0.00092	<0.001	<0.05	0.0005720	95.7	0.0028	0.00607	0.0106	5.330	0.018400	0.007	**26.70**	2.0600	<0.0000019	<0.001	0.0114	-	**1.90**	0.00057	-	0.000118	**11**	0.50	6	0.000089	<0.005	0.0675	-	0.003830	0.0063	0.0388	-	<0.003	<0.0005	0.00017	0.1180	<0.0001
T0B96-01-05	Summer - July 2024	<0.0001	<0.001	<0.05	0.0000990	78.7	<0.001	0.0006	0.00377	0.550	0.000950	0.003	**28.10**	0.2990	<0.0000019	0.00140	0.0026	0.037	**1.11**	0.00015	5.66	0.000026	**18**	0.55	12	0.000017	<0.005	0.0147	<0.001	0.002880	<0.005	0.0066	0.000800	0.0059	0.00051	0.00111	0.1750	<0.0001
T95R-40	Summer - July 2024	<0.001	<0.01	<0.5	<0.0001	30.1	<0.01	<0.002	<0.005	0.631	0.039300	0.114	**6.35**	0.0300	<0.0000019	<0.01	<0.01	<0.1	**2.95**	<0.001	3.30	<0.0002	**645**	0.66	<30	<0.0001	<0.05	<0.05	<0.01	<0.001	<0.05	<0.05	<0.001	<0.003	<0.005	<0.001	4.9200	<0.001
	Fall - September 20224	<0.0005	<0.005	0.309	<0.00005	28.9	<0.005	<0.001	<0.0025	1.220	0.003800	0.081	**5.91**	0.0354	<0.00000019	<0.005	<0.005	-	**2.73**	<0.0005	-	<0.0001	**623**	0.53	<15	<0.00005	<0.025	<0.025	-	0.000950	<0.025	<0.025	-	<0.015	<0.0025	<0.0005	3.3800	<0.0005
T18-01D	Summer - July 2024	0.0001	<0.001	0.112	<0.00001	3.0	<0.001	0.00022	0.00109	0.872	0.003360	0.041	**0.93**	0.0140	<0.0000019	0.01220	<0.001	0.049	**2.32**	<0.0001	12.30	<0.00002	**276**	0.12	6	0.000016	<0.005	0.0113	0.00150	0.005240	<0.005	0.0059	0.001250	0.0059	<0.0005	0.00825	0.0973	<0.0001
	Fall - September 20224	<0.0002	<0.002	0.120	<0.00002	3.1	<0.002	<0.00004	0.0016	0.592	0.001860	0.042	**0.81**	0.0096	<0.0000019	0.01170	<0.002	0.039	**2.20**	<0.0002	-	<0.00004	**270**	0.11	6	<0.000020	<0.01	<0.01	-	0.005420	<0.01	<0.01	-	0.9460	<0.0005	-	0.1150	<0.0001
Site 2S	Summer - July 2024	<0.0001	<0.001	<0.05	<0.00001	15.6	<0.001	<0.0002	0.00151	0.054	<0.0002	<0.002	**7.57**	0.0016	0.000002	<0.001	<0.001	<0.01	**0.28**	<0.0001	3.31	<0.00002	**4**	0.11	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000200	0.0285	<0.0005	0.00050	0.0642	<0.0001
	Fall - September 20224	<0.0001	<0.001	<0.05	<0.00001	28.5	<0.001	<0.0002	0.00069	0.090	<0.0002	<0.002	**16.00**	0.0039	0.000002	<0.001	<0.001	-	**0.46**	<0.0001	-	<0.00002	**10**	0.21	<3.0	<0.00001	<0.005	<0.005	-	0.000150	<0.005	<0.005	-	0.0180	<0.0005	0.00053	0.1180	<0.0001
Site 2SW	Summer - July 2024	<0.0001	<0.001	<0.05	<0.00001	15.3	<0.001	<0.0002	0.00139	0.021	<0.0002	<0.002	**7.66**	0.0012	<0.0000019	<0.001	<0.001	<0.01	**0.26**	<0.0001	3.20	<0.00002	**4**	0.10	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000190	0.0353	<0.0005	0.00051	0.0665	<0.0001
	Fall - September 20224	<0.0001	<0.001	<0.05	<0.00001	29.0	<0.001	<0.0002	0.0006	0.010	<0.0002	<0.002	**15.80**	0.0016	<0.0000019	<0.001	<0.001	-	**0.44**	<0.0001		<0.00002	**10**	0.21	<3.0	<0.00001	<0.005	<0.005	-	0.000140	<0.005	<0.005	-	0.0122	<0.0005	0.00053	0.1180	<0.0001
Site 2D	Fall - September 20224	<0.0001	0.0025	0.076	0.0002580	20.2	0.0398	0.00379	0.117	4.870	0.058800	0.002	**9.59**	0.8680	-	0.00220	0.0932	-	**2.16**	<0.0001		0.000049	**10**	0.15	<3.0	0.000011	<0.005	0.0117	-	0.000170	<0.005	0.129	-	-	-	-	-	-
Site 4 Upper S	Summer - July 2024	<0.0001	<0.001	<0.05	<0.00001	20.9	<0.001	<0.0002	0.00125	0.114	<0.0002	<0.002	**9.35**	0.0032	<0.0000019	<0.001	<0.001	<0.01	**0.29**	<0.0001	3.27	<0.00002	**4**	0.17	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000250	0.0288	<0.0005	0.00061	0.0901	<0.0001
	Fall - September 20224	<0.0001	<0.001	<0.05	<0.00001	35.4	<0.001	<0.0002	<0.0005	0.019	<0.0002	<0.002	**17.30**	<0.001	<0.0000019	<0.001	<0.001	-	**0.35**	<0.0001		<0.00002	**8**	0.26	<3.0	<0.00001	<0.005	<0.005	-	0.000130	<0.005	<0.005	-	0.0137	<0.0005	0.00072	0.1390	<0.0001
Site 4 Upper SW	Summer - July 2024	<0.0001	<0.001	<0.05	<0.00001	20.2	<0.001	<0.0002	0.00112	0.023	<0.0002	<0.002	**8.50**	<0.001	<0.0000019	<0.001	<0.001	<0.01	**0.25**	<0.0001	3.16	<0.00002	**4**	0.16	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000170	0.0269	<0.0005	0.00063	0.0884	<0.0001
	Fall - September 20224	<0.0001	<0.001	<0.05	<0.00001	34.2	<0.001	<0.0002	<0.0005	<0.01	<0.0002	<0.002	**16.50**	<0.001	<0.0000019	<0.001	<0.001	-	**0.33**	<0.0001		<0.00002	**8**	0.25	<3.0	<0.00001	<0.005	<0.005	-	0.000110	<0.005	<0.005	-	0.0160	<0.0005	0.00071	0.1420	<0.0001
Site 4 Upper D	Summer - July 2024	<0.0001	<0.001	<0.05	0.0000960	19.9	0.003	0.00032	0.103	0.555	0.008840	<0.002	**8.42**	0.0590	<0.0000019	<0.001	0.0035	0.037	**1.09**	<0.0001	3.48	0.000033	**5**	0.15	<3.0	<0.00001	<0.005	0.0098	<0.001	<0.0001	<0.005	0.0398	0.000270	0.0257	0.00089	0.00042	0.0884	<0.0001
	Fall - September 20224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0292	<0.0005	0.00063	0.1440	<0.0001
Site 5S	Summer - July 2024	<0.0001	<0.001	<0.05	0.0000270	17.3	<0.001	0.00054	0.00133	0.251	<0.0002	<0.002	**7.73**	0.1620	<0.0000019	<0.001	<0.001	0.012	**0.38**	<0.0001	3.60	<0.00002	**4**	0.11	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	0.0142	0.000210	0.0477	<0.0005	0.00114	0.0823	<0.0001
	Fall - September 20224	<0.0001	<0.001	<0.05	<0.00001	27.6	<0.001	0.00068	<0.0005	0.621	<0.0002	<0.002	**14.20**	0.4590	<0.0000019	<0.001	<0.001	-	**0.51**	<0.0001	-	<0.00002	**9**	0.19	<3.0	<0.00001	<0.005	<0.005	-	<0.0001	<0.005	0.0125	-	0.0231	<0.0005	0.00225	0.1210	<0.0001
Site 5D	Fall - September 20224	0.001	<0.002	<0.1	0.0008990	60.8	0.0402	0.0263	0.0429	35.600	0.030700	0.024	**21.00**	2.6500	-	<0.002	0.0513	-	**2.51**	<0.0002	-	0.000227	**8**	0.45	<6.0	0.000117	<0.01	0.155	-	0.000930	0.073	2.09	-	-	-	-	-	-
Site 5 SW	Summer - July 2024	<0.0001	<0.001	<0.05	<0.00001	15.9	<0.001	<0.0002	0.00138	0.015	<0.0002	<0.002	**7.74**	<0.001	<0.0000019	<0.001	<0.001	<0.01	**0.31**	<0.0001	3.28	<0.00002	**4**	0.11	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000180	0.0287	<0.0005	0.00048	0.0674	<0.0001
	Fall - September 20224	<0.0002	<0.002	<0.1	<0.00002	27.9	<0.002	<0.0004	<0.001	<0.02	<0.0004	<0.004	**14.80**	<0.002	<0.0000019	<0.002	<0.002	-	**0.47**	<0.0002	-	<0.00004	**9**	0.20	<6.0	<0.00002	<0.01	<0.01	-	<0.0002	<0.01	<0.01	-	0.0139	<0.0005	0.00048	0.1100	<0.0001

		Dissolved Metals											Dissolved Metals																		
Client Sample ID		Bismuth (Bi)-Dissolved	Boron (B)-Dissolved	Cadmium (Cd)-Dissolved	Calcium (Ca)-Dissolved	Chromium (Cr)-Dissolved	Cobalt (Co)-Dissolved	Copper (Cu)-Dissolved	Iron (Fe)-Dissolved	Lead (Pb)-Dissolved	Lithium (Li)-Dissolved	Magnesium (Mg)-Dissolved	Manganese (Mn)-Dissolved	Mercury (Hg)-Dissolved	Molybdenum (Mo)-Dissolved	Nickel (Ni)-Dissolved	Phosphorus-Dissolved	Potassium (K)-Dissolved	Selenium (Se)-Dissolved	Silicon (Si)-Dissolved	Silver (Ag)-Dissolved	Sodium (Na)-Dissolved	Strontium (Sr)-Dissolved	Sulfur (S)-Dissolved	Thallium (Tl)-Dissolved	Tin (Sn)-Dissolved	Titanium (Ti)-Dissolved	Tungsten (W)-Dissolved	Uranium (U)-Dissolved	Vanadium (V)-Dissolved	Zinc (Zn)-Dissolved	Zirconium (Zr)-Dissolved
	Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LDL	0.001000	0.050	0.0000100	0.000	0.00100	0.00020	0.00020	0.005	0.000200	0.0020	0.0001	0.00100	0.0000019	0.001000	0.00100	0.01000	0.000	0.000010	0.100	0.000020	0.000	0.00100	0.00	0.000010	0.00500	0.00500	0.00100	0.000100	0.00500	0.0050	0.000100
	BC CSR (Aquatic Life (AW))		12.0000	Hardness Dependent (0.0005 @H<30, 0.0015 @H30-<90, 0.0025 @H90-<150, 0.0035 @H150-<210, 0.004 @H>210)		0.0100	0.0400	Hardness Dependent (0.02 @H<50, 0.03 @H50-<75, 0.04 @H75-<100, 0.05 @H100-<125, 0.06 AH125-<150, 0.07 @H150-<200, 0.08 @H175-<200, 0.09@H>200)		Hardness Dependent (0.04 AH<50, 0.05 @H 50-<100, 0.06 @h 100-<200, 0.11 @H 200-<300, 0.16 @H>300)				0.0003	10.0000	Hardness Dependent (0.25 @h<60, 0.65 @H 60-<120, 1.1 @H 120-<180, 1.5 @H>180)			0.0200		Hardness Dependent (0.5 @H>100, 15 @ H>100)				0.0030		1.0000		0.0850		Hardness Dependent (0.075 @h<90, 0.15 @H90-<100, 0.9 @H100-<200, 1.65 @H200-<300, 2.4 @H300-<400)	
T95R-64	Summer - July 2024	<0.001	0.139	<0.00001	17.7	<0.001	<0.0002	<0.0002	0.344	<0.0002	0.058	1.9800	0.0170	<0.0000019	<0.001	<0.001	0.01	1.41	<0.0001	3.76	<0.00002	327	0.29	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	<0.0001
	Fall - September 20224	<0.001	0.148	<0.00001	19	<0.001	<0.0002	<0.0002	0.363	<0.0002	0.0552	1.91	0.0149	<0.000019	<0.001	<0.001	0.013	1.36	<0.0001	-	<0.00002	323	0.285	-	<0.00001	<0.005	<0.005	-	<0.0001	<0.005	<0.005	-
T19-18S	Summer - July 2024	<0.001	0.069	<0.00001	53.9	<0.001	<0.0002	0.00044	0.177	<0.0002	0.004	20.50	0.5850	<0.0000019	0.01510	<0.001	0.012	1.88	<0.0001	4.43	<0.00002	114	0.58	78	<0.00001	<0.005	<0.005	<0.001	0.001020	<0.005	<0.005	<0.0001
	Fall - September 20224	<0.001	0.064	0.000041	59.6	<0.001	0.00026	0.00047	0.281	<0.0002	0.003	19.20	0.6780	<0.00000019	0.01290	0.0016	-	1.87	<0.0001	-	<0.00002	101	0.58	80	<0.00001	<0.005	<0.005	-	0.002260	<0.005	<0.005	-
T0B96-02-06	Summer - July 2024	<0.001	<0.05	0.000021	80.0	<0.001	<0.0002	0.00054	<0.005	<0.0002	0.004	26.50	0.0339	<0.0000019	<0.001	<0.001	<0.01	0.90	<0.0001	5.82	<0.00002	11	0.45	4	<0.00001	<0.005	<0.005	<0.001	0.001140	<0.005	<0.005	<0.0001
	Fall - September 20224	<0.001	<0.05	<0.00001	77.3	<0.001	<0.0002	0.00063	<0.005	<0.0002	0.004	22.80	<0.001	<0.0000019	0.00110	<0.001		0.99	0.00037	-	<0.00002	14	0.43	8	<0.00001	<0.005	<0.005	-	0.001640	<0.005	<0.005	-
T0B96-01-05	Summer - July 2024	<0.001	<0.05	0.000015	90.9	<0.001	0.0009	0.00103	0.021	<0.0002	0.003	31.60	0.3500	<0.0000019	0.00130	0.0024	0.016	1.19	0.00011	4.69	<0.00002	21	0.60	18	<0.00001	<0.005	<0.005	<0.001	0.002360	<0.005	<0.005	0.000300
T95R-40	Summer - July 2024	<0.01	<0.5	<0.0001	33.0	<0.01	<0.002	<0.002	0.090	<0.002	0.127	7.14	0.0280	<0.0000019	<0.01	<0.01	<0.1	3.14	<0.001	3.33	<0.0002	738	0.66	<30	<0.0001	<0.05	<0.05	-	<0.001	<0.05	<0.05	<0.001
	Fall - September 20224	<0.005	0.382	<0.00005	28.6	<0.005	<0.001	<0.001	0.464	<0.001	0.100	6.50	0.0295	<0.00000019	<0.005	<0.005		3.06	<0.0005	-	<0.0001	694	0.56	<15	<0.00005	<0.025	<0.025	-	<0.0005	<0.025	<0.025	-
T18-01D	Summer - July 2024	<0.001	0.128	<0.00001	2.6	<0.001	<0.0002	0.00025	0.037	<0.0002	0.047	0.67	0.0033	<0.0000019	0.01350	<0.001	0.016	2.44	<0.0001	9.70	<0.00002	321	0.10	7	<0.00001	<0.005	<0.005	0.00110	0.004290	<0.005	<0.005	0.000760
	Fall - September 20224	<0.001	0.123	<0.00001	3.1	<0.001	<0.0002	0.00068	0.435	0.00072	0.041	0.00091	0.0062	<0.0000019	0.01410	<0.001	0.033	2.39	<0.0001	-	<0.00001	316	0.13	7	<0.00001	<0.005	<0.005	-	0.005500	<0.005	<0.005	-
Site 2S	Summer - July 2024	<0.001	<0.05	0.000112	15.3	<0.001	<0.0002	0.00209	0.024	<0.0002	<0.002	8.35	<0.001	0.0000034	<0.001	<0.001	<0.01	0.30	<0.0001	3.35	<0.00002	4	0.11	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000210
	Fall - September 20224	<0.001	<0.05	<0.00001	31.1	0.0012	<0.0002	0.00068	0.038	<0.0002	<0.002	16.30	0.0022	<0.0000019	<0.001	<0.001		0.48	<0.0001	-	<0.00002	10	0.22	<3.0	<0.00001	<0.005	<0.005	-	0.000160	<0.005	<0.005	-
Site 2SW	Summer - July 2024	<0.001	<0.05	<0.00001	15.8	<0.001	<0.0002	0.00149	0.019	<0.0002	<0.002	8.43	<0.001	0.000003	<0.001	<0.001	<0.01	0.29	<0.0001	3.41	<0.00002	4	0.12	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000210
	Fall - September 20224	<0.001	<0.05	<0.00001	31.9	<0.001	<0.0002	0.00056	0.007	<0.0002	<0.002	17.20	0.0010	<0.0000019	<0.001	<0.001		0.48	<0.0001	-	<0.00002	10	0.22	<3.0	<0.00001	<0.005	<0.005		0.000160	<0.005	<0.005	-
Site 2D	Fall - September 20224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site 4 Upper S	Summer - July 2024	<0.001	<0.05	<0.00001	20.8	<0.001	<0.0002	0.00127	0.020	<0.0002	<0.002	10.10	<0.001	0.0000023	<0.001	<0.001	<0.01	0.29	<0.0001	3.24	<0.00002	5	0.17	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000140
	Fall - September 20224	<0.001	<0.05	<0.00001	37.1	<0.001	<0.0002	0.00045	<0.005	<0.0002	<0.002	18.00	<0.001	<0.0000019	<0.001	<0.001	-	0.37	<0.0001	-	<0.00002	8	0.27	<3.0	<0.00001	<0.005	<0.005	-	0.000130	<0.005	<0.005	-
Site 4 Upper SW	Summer - July 2024	<0.001	<0.05	<0.00001	19.9	<0.001	<0.0002	0.00126	0.011	<0.0002	<0.002	9.54	<0.001	0.0000026	<0.001	<0.001	<0.01	0.27	<0.0001	3.20	<0.00002	5	0.17	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000140
	Fall - September 20224	<0.001	<0.05	<0.00001	36.8	<0.001	<0.0002	0.00043	<0.005	<0.0002	<0.002	18.50	<0.001	<0.0000019	<0.001	<0.001	-	0.37	<0.0001	-	<0.00002	8	0.27	<3.0	<0.00001	<0.005	<0.005	-	0.000130	<0.005	<0.005	-
Site 4 Upper D	Summer - July 2024	<0.001	<0.05	0.000094	20.6	<0.001	<0.0002	0.07740	0.034	0.00165	<0.002	9.23	0.0592	0.0000022	<0.001	0.0031	<0.01	1.24	<0.0001	2.96	<0.00002	6	0.16	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	0.0355	0.000180
	Fall - September 20224	<0.001	<0.05	0.000691	28.2	<0.001	0.00052	0.00512	0.123	0.00069	<0.002	12.50	0.9410	-	<0.001	0.0022	-	0.77	<0.0001	-	<0.00002	7	0.21	<3.0	<0.00001	<0.005	<0.005	-	<0.0001	<0.005	0.0159	-
Site 5S	Summer - July 2024	<0.001	<0.05	0.000018	18.1	<0.001	0.00049	0.00116	0.146	<0.0002	<0.002	8.53	0.1770	<0.0000019	<0.001	<0.001	<0.01	0.41	<0.0001	3.82	<0.00002	5	0.12	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	0.0126	0.000240
	Fall - September 20224	<0.001	<0.05	<0.00001	30.0	<0.001	0.00072	<0.0002	0.637	<0.0002	<0.002	15.30	0.5000	<0.0000019	<0.001	<0.001	-	0.54	<0.0001	-	<0.00002	10	0.19	<3.0	<0.00001	<0.005	<0.005	-	<0.0001	<0.005	0.0093	
Site 5D	Fall - September 20224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Site 5 SW	Summer - July 2024	<0.001	<0.05	<0.00001	16.0	<0.001	<0.0002	0.00159	0.014	<0.0002	<0.002	8.74	<0.001	0.000003	<0.001	<0.001	<0.01	0.34	<0.0001	3.44	<0.00002	5	0.12	<3.0	<0.00001	<0.005	<0.005	<0.001	<0.0001	<0.005	<0.005	0.000190
	Fall - September 20224	<0.001	<0.05	<0.00001	30.0	<0.001	<0.0002	0.00065	<0.005	<0.0002	<0.002	15.20	<0.001	<0.0000019	<0.001	<0.001	-	0.49	<0.0001	-	<0.00002	10	0.20	<3.0	<0.00001	<0.005	<0.005	-	0.000140	<0.005	<0.005	-

Appendix C Certificate of Analysis

Four Creek Watershed

Groundwater Surface Water Interaction Investigation
and Water Balance Model Development

Telkwa Coal Limited

SLR Project No.: 201.V24219.00000

September 5, 2025

Your Project #: 201.V24219.00000
Site Location: TENAS
Your C.O.C. #: C#733646-01-01

Attention: Nathalie Brandebourger

SLR CONSULTING (CANADA) LTD
#200 - 887 Great Northern Way
VANCOUVER, BC
Canada V5T 4T5

Report Date: 2024/09/18
Report #: R3558249
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C471255
Received: 2024/09/11, 10:55

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Acidity pH 4.5 & pH 8.3 (as CaCO3)	7	N/A	2024/09/16	BBY6SOP-00037	SM 24 2310 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	7	N/A	2024/09/12	BBY6SOP-00026	SM 24 2320 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	3	N/A	2024/09/13	BBY6SOP-00026	SM 24 2320 B m
Chloride/Sulphate by Auto Colourimetry	10	N/A	2024/09/13	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Cyanide (total) (1)	7	N/A	2024/09/18	CAL SOP-00270	SM 24 4500-CN m
Color (True) by Automated Analyzer	7	N/A	2024/09/12	BBY6SOP-00057	SM 24 2120 C m
Carbon (DOC) (2)	1	N/A	2024/09/13	BBY6SOP-00053	SM 24 5310 B m
Carbon (DOC) (2)	6	N/A	2024/09/16	BBY6SOP-00053	SM 24 5310 B m
Conductivity @25C	7	N/A	2024/09/12	BBY6SOP-00026	SM 24 2510 B m
Conductivity @25C	3	N/A	2024/09/13	BBY6SOP-00026	SM 24 2510 B m
Fluoride	10	N/A	2024/09/13	BBY6SOP-00037	SM 24 4500-F C m
Hardness Total (calculated as CaCO3) (3)	8	N/A	2024/09/16	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (3)	1	N/A	2024/09/17	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	7	N/A	2024/09/16	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2024/09/18	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV (4)	7	2024/09/13	2024/09/13	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Mercury (Total) by CV	7	2024/09/13	2024/09/13	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	7	N/A	2024/09/16	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2024/09/18	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved) (4)	8	N/A	2024/09/13	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	8	2024/09/12	2024/09/16	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	2024/09/12	2024/09/17	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	9	2024/09/12	2024/09/14	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrogen (Total)	7	N/A	2024/09/17	BBY6SOP-00016	SM 24 4500-N C m
Ammonia-N (Total)	10	N/A	2024/09/16	AB SOP-00007	SM 24 4500 NH3 A G m
Nitrate + Nitrite (N)	10	N/A	2024/09/12	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrite (N) Regular Level Water	10	N/A	2024/09/12	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrogen - Nitrate (as N)	10	N/A	2024/09/13	BBY WI-00033	Auto Calc
pH @25°C (5)	7	N/A	2024/09/12	BBY6SOP-00026	SM 24 4500-H+ B m
pH @25°C (5)	3	N/A	2024/09/13	BBY6SOP-00026	SM 24 4500-H+ B m

Your Project #: 201.V24219.00000
Site Location: TENAS
Your C.O.C. #: C#733646-01-01

Attention: Nathalie Brandebourger

SLR CONSULTING (CANADA) LTD
#200 - 887 Great Northern Way
VANCOUVER, BC
Canada V5T 4T5

Report Date: 2024/09/18
Report #: R3558249
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C471255
Received: 2024/09/11, 10:55

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Phenols (4-AAP) (1)	7	N/A	2024/09/17	AB SOP-00088	EPA 9066 R0 m
Orthophosphate by Automated Analyzer (6)	7	N/A	2024/09/12	BBY6SOP-00013	SM 24 4500-P E m
Total Dissolved Solids (Filt. Residue)	7	2024/09/12	2024/09/13	BBY6SOP-00033	SM 24 2540 C m
Total Kjeldahl Nitrogen (Total)	7	N/A	2024/09/17	BBY WI-00033	Auto Calc
Carbon (Total Organic) (7)	7	N/A	2024/09/14	BBY6SOP-00053	SM 24 5310 B m
Total Phosphorus	10	2024/09/13	2024/09/13	BBY6SOP-00013	SM 24 4500-P E m
Total Suspended Solids (NFR)	2	2024/09/12	2024/09/13	BBY6SOP-00034	SM 24 2540 D m
Total Suspended Solids (NFR)	5	2024/09/13	2024/09/16	BBY6SOP-00034	SM 24 2540 D m
Turbidity	10	N/A	2024/09/12	BBY6SOP-00027	SM 24 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) DOC present in the sample should be considered as non-purgeable DOC. Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 201.V24219.00000
Site Location: TENAS
Your C.O.C. #: C#733646-01-01

Attention: Nathalie Brandebourger

SLR CONSULTING (CANADA) LTD
#200 - 887 Great Northern Way
VANCOUVER, BC
Canada V5T 4T5

Report Date: 2024/09/18
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CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C471255

Received: 2024/09/11, 10:55

(3) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(4) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(6) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(7) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

AUTHORIZED REPORT
RAPPORT AUTORISÉ

Bureau Veritas
18 Sep 2024 18:07:33

Please direct all questions regarding this Certificate of Analysis to:
Nahed Amer, Key Account Specialist
Email: Nahed.AMER@bureauveritas.com
Phone# (604) 734 7276

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This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, General Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD646		CVD647			CVD648		
Sampling Date		2024/09/05 14:30		2024/09/05 15:03			2024/09/05 15:40		
COC Number		C#733646-01-01		C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 4 U S**	**QC Batch**	**SITE 4 U SW**	**RDL**	**QC Batch**	**SITE 4 U D**	**RDL**	**QC Batch**
ANIONS									
Nitrite (N)	mg/L	<0.0050	B514406	<0.0050	0.0050	B514406	<0.050 (1)	0.050	B514406
Calculated Parameters									
Dissolved Hardness (CaCO3)	mg/L	167	B513791	168	0.50	B513791	122	0.50	B513791
Total Hardness (CaCO3)	mg/L	160	B513790	153	0.50	B513790			
Total Kjeldahl Nitrogen (Calc)	mg/L	0.14	B514058	0.14	0.020	B514058			
Nitrate (N)	mg/L	<0.020	B511987	<0.020	0.020	B511987	<0.20	0.20	B513798
Misc. Inorganics									
Conductivity	uS/cm	340	B514396	330	2.0	B514396	270	2.0	B514557
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	B525529	<0.00050	0.00050	B525529			
Dissolved Organic Carbon (C)	mg/L	2.3	B516346	2.2	0.50	B519408			
pH	pH	8.18	B514401	8.23	N/A	B514401	8.00	N/A	B514544
Acidity (pH 4.5)	mg/L	<1.0	B518800	<1.0	1.0	B518800			
Total Organic Carbon (C)	mg/L	2.2	B516565	2.4	0.50	B516565			
Acidity (pH 8.3)	mg/L	<1.0	B518800	<1.0	1.0	B518800			
Total Dissolved Solids	mg/L	180	B514538	170	10	B514538			
Total Suspended Solids	mg/L	5.6	B514806	<1.0	1.0	B514806			
Anions									
Alkalinity (PP as CaCO3)	mg/L	<1.0	B514390	<1.0	1.0	B514390	<1.0	1.0	B514550
Alkalinity (Total as CaCO3)	mg/L	180	B514390	180	1.0	B514390	150	1.0	B514550
Bicarbonate (HCO3)	mg/L	220	B514390	220	1.0	B514390	180	1.0	B514550
Carbonate (CO3)	mg/L	<1.0	B514390	<1.0	1.0	B514390	<1.0	1.0	B514550
Dissolved Fluoride (F)	mg/L	<0.050	B515656	<0.050	0.050	B515656	<0.050	0.050	B515656
Hydroxide (OH)	mg/L	<1.0	B514390	<1.0	1.0	B514390	<1.0	1.0	B514550
Chloride (Cl)	mg/L	<1.0	B515814	<1.0	1.0	B515814	<1.0	1.0	B516001
Sulphate (SO4)	mg/L	<1.0	B515814	<1.0	1.0	B515814	<1.0	1.0	B516001
MISCELLANEOUS									
True Colour	Col. Unit	8.2	B514731	9.2	2.0	B514731			
Nutrients									
Total Ammonia (N)	mg/L	<0.015	B519177	<0.015	0.015	B519177	<0.015	0.015	B519177
Orthophosphate (P)	mg/L	<0.0030	B514752	<0.0030	0.0030	B514752			

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Detection limit raised due to interferent.

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD646		CVD647			CVD648		
Sampling Date		2024/09/05 14:30		2024/09/05 15:03			2024/09/05 15:40		
COC Number		C#733646-01-01		C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 4 U S**	**QC Batch**	**SITE 4 U SW**	**RDL**	**QC Batch**	**SITE 4 U D**	**RDL**	**QC Batch**
Total Phosphorus (P)	mg/L	0.0034	B515761	<0.0030	0.0030	B515761	0.0035	0.0030	B515761
Nitrate plus Nitrite (N)	mg/L	<0.020	B514405	<0.020	0.020	B514405	<0.20 (1)	0.20	B514405
Total Nitrogen (N)	mg/L	0.143	B518512	0.141	0.020	B518512			
Misc. Organics									
Phenols	mg/L	<0.0015	B522355	<0.0015	0.0015	B522355			
Physical Properties									
Turbidity	NTU	0.98	B514522	0.39	0.10	B514522	3900	0.10	B514522

RDL = Reportable Detection Limit
(1) Detection limit raised due to interferent.

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Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD649			CVD650		
Sampling Date		2024/09/06 12:59			2024/09/06 12:32		
COC Number		C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 5 S**	**RDL**	**QC Batch**	**SITE 5 D**	**RDL**	**QC Batch**
ANIONS							
Nitrite (N)	mg/L	<0.0050	0.0050	B514406	<0.0050	0.0050	B514406
Calculated Parameters							
Dissolved Hardness (CaCO3)	mg/L	138	0.50	B513791			
Total Hardness (CaCO3)	mg/L	127	0.50	B513790	239	0.50	B513790
Total Kjeldahl Nitrogen (Calc)	mg/L	0.33	0.020	B514058			
Nitrate (N)	mg/L	<0.020	0.020	B511987	<0.020	0.020	B513798
Misc. Inorganics							
Conductivity	uS/cm	280	2.0	B514431	160	2.0	B514557
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	0.00050	B525529			
Dissolved Organic Carbon (C)	mg/L	5.9	0.50	B519408			
pH	pH	7.90	N/A	B514427	10.1	N/A	B514544
Acidity (pH 4.5)	mg/L	<1.0	1.0	B518800			
Total Organic Carbon (C)	mg/L	5.7	0.50	B516565			
Acidity (pH 8.3)	mg/L	<1.0	1.0	B518800			
Total Dissolved Solids	mg/L	150	10	B514538			
Total Suspended Solids	mg/L	10	1.0	B516146			
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B514414	41	1.0	B514550
Alkalinity (Total as CaCO3)	mg/L	150	1.0	B514414	88	1.0	B514550
Bicarbonate (HCO3)	mg/L	180	1.0	B514414	7.9	1.0	B514550
Carbonate (CO3)	mg/L	<1.0	1.0	B514414	49	1.0	B514550
Dissolved Fluoride (F)	mg/L	<0.050	0.050	B515656	0.14	0.050	B515656
Hydroxide (OH)	mg/L	<1.0	1.0	B514414	<1.0	1.0	B514550
Chloride (Cl)	mg/L	<1.0	1.0	B516001	<1.0	1.0	B516001
Sulphate (SO4)	mg/L	<1.0	1.0	B516001	<1.0	1.0	B516001
MISCELLANEOUS							
True Colour	Col. Unit	32.5	2.0	B514731			
Nutrients							
Total Ammonia (N)	mg/L	0.065	0.015	B519177	0.23	0.015	B519177
Orthophosphate (P)	mg/L	0.0045	0.0030	B514752			
Total Phosphorus (P)	mg/L	0.0086	0.0030	B515761	0.052	0.0030	B515765

RDL = Reportable Detection Limit
N/A = Not Applicable

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Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD649			CVD650		
Sampling Date		2024/09/06 12:59			2024/09/06 12:32		
COC Number		C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 5 S**	**RDL**	**QC Batch**	**SITE 5 D**	**RDL**	**QC Batch**
Nitrate plus Nitrite (N)	mg/L	<0.020	0.020	B514405	<0.020	0.020	B514405
Total Nitrogen (N)	mg/L	0.327	0.020	B518512			
Misc. Organics							
Phenols	mg/L	<0.0015	0.0015	B522355			
Physical Properties							
Turbidity	NTU	4.0	0.10	B514522	>4000	0.10	B514522
RDL = Reportable Detection Limit							

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Bureau Veritas Job #: C471255
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SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD651	CVD652			CVD653		
Sampling Date		2024/09/06 13:50	2024/09/06 15:16			2024/09/06 15:46		
COC Number		C#733646-01-01	C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 5 SW**	**SITE 2 S**	**RDL**	**QC Batch**	**SITE 2 D**	**RDL**	**QC Batch**
ANIONS								
Nitrite (N)	mg/L	<0.0050	<0.0050	0.0050	B514406	0.0086	0.0050	B514406
Calculated Parameters								
Dissolved Hardness (CaCO3)	mg/L	138	145	0.50	B513791			
Total Hardness (CaCO3)	mg/L	131	137	0.50	B513790	90.0	0.50	B513790
Total Kjeldahl Nitrogen (Calc)	mg/L	0.18	0.18	0.020	B514058			
Nitrate (N)	mg/L	0.079	0.047	0.020	B511987	0.023	0.020	B513798
Misc. Inorganics								
Conductivity	uS/cm	290	310	2.0	B514431	230	2.0	B514557
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	0.00052	0.00050	B525529			
Dissolved Organic Carbon (C)	mg/L	4.2	3.9	0.50	B519408			
pH	pH	8.16	8.15	N/A	B514427	7.55	N/A	B514544
Acidity (pH 4.5)	mg/L	<1.0	<1.0	1.0	B518800			
Total Organic Carbon (C)	mg/L	4.2	3.9	0.50	B516565			
Acidity (pH 8.3)	mg/L	<1.0	<1.0	1.0	B518800			
Total Dissolved Solids	mg/L	160	170	10	B514538			
Total Suspended Solids	mg/L	<1.0	67	1.0	B516146			
Anions								
Alkalinity (PP as CaCO3)	mg/L	<1.0	<1.0	1.0	B514414	<1.0	1.0	B514550
Alkalinity (Total as CaCO3)	mg/L	150	170	1.0	B514414	120	1.0	B514550
Bicarbonate (HCO3)	mg/L	190	200	1.0	B514414	140	1.0	B514550
Carbonate (CO3)	mg/L	<1.0	<1.0	1.0	B514414	<1.0	1.0	B514550
Dissolved Fluoride (F)	mg/L	<0.050	<0.050	0.050	B515656	0.066	0.050	B515656
Hydroxide (OH)	mg/L	<1.0	<1.0	1.0	B514414	<1.0	1.0	B514550
Chloride (Cl)	mg/L	<1.0	<1.0	1.0	B516001	2.3	1.0	B516001
Sulphate (SO4)	mg/L	<1.0	<1.0	1.0	B516001	<1.0	1.0	B516001
MISCELLANEOUS								
True Colour	Col. Unit	14.8	13.8	2.0	B514731			
Nutrients								
Total Ammonia (N)	mg/L	<0.015	<0.015	0.015	B519177	0.32	0.015	B519177
Orthophosphate (P)	mg/L	<0.0030	<0.0030	0.0030	B514752			
Total Phosphorus (P)	mg/L	<0.0030	0.012	0.0030	B515765	0.15	0.0030	B515765

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD651	CVD652			CVD653		
Sampling Date		2024/09/06 13:50	2024/09/06 15:16			2024/09/06 15:46		
COC Number		C#733646-01-01	C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 5 SW**	**SITE 2 S**	**RDL**	**QC Batch**	**SITE 2 D**	**RDL**	**QC Batch**
Nitrate plus Nitrite (N)	mg/L	0.079	0.047	0.020	B514405	0.032	0.020	B514405
Total Nitrogen (N)	mg/L	0.255	0.227	0.020	B518512			
Misc. Organics								
Phenols	mg/L	<0.0015	<0.0015	0.0015	B522355			
Physical Properties								
Turbidity	NTU	0.31	5.7	0.10	B514522	35	0.10	B514522
RDL = Reportable Detection Limit								

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD654		CVD655		
Sampling Date		2024/09/06 15:55		2024/09/06 10:08		
COC Number		C#733646-01-01		C#733646-01-01		
	UNITS	**SITE 2 SW**	**QC Batch**	**TOB96-02-06**	**RDL**	**QC Batch**
ANIONS						
Nitrite (N)	mg/L	<0.0050	B514406	<0.0050	0.0050	B514406
Calculated Parameters						
Dissolved Hardness (CaCO3)	mg/L	151	B513791	287	0.50	B525942
Total Hardness (CaCO3)	mg/L	138	B513790	349	0.50	B513790
Total Kjeldahl Nitrogen (Calc)	mg/L	0.21	B514058	0.091	0.020	B514058
Nitrate (N)	mg/L	0.036	B511987	<0.020	0.020	B511987
Misc. Inorganics						
Conductivity	uS/cm	310	B514431	610	2.0	B514431
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	B525529	0.00096	0.00050	B525529
Dissolved Organic Carbon (C)	mg/L	3.7	B519408	1.9	0.50	B519408
pH	pH	8.22	B514427	8.01	N/A	B514427
Acidity (pH 4.5)	mg/L	<1.0	B518800	<1.0	1.0	B518800
Total Organic Carbon (C)	mg/L	3.8	B516565	0.79	0.50	B516565
Acidity (pH 8.3)	mg/L	<1.0	B518800	1.8	1.0	B518800
Total Dissolved Solids	mg/L	170	B514538	340	10	B514538
Total Suspended Solids	mg/L	1.2	B516146	96	1.0	B516146
Anions						
Alkalinity (PP as CaCO3)	mg/L	<1.0	B514414	<1.0	1.0	B514414
Alkalinity (Total as CaCO3)	mg/L	170	B514414	330	1.0	B514414
Bicarbonate (HCO3)	mg/L	200	B514414	400	1.0	B514414
Carbonate (CO3)	mg/L	<1.0	B514414	<1.0	1.0	B514414
Dissolved Fluoride (F)	mg/L	<0.050	B515656	0.096	0.050	B515656
Hydroxide (OH)	mg/L	<1.0	B514414	<1.0	1.0	B514414
Chloride (Cl)	mg/L	<1.0	B516001	<1.0	1.0	B516001
Sulphate (SO4)	mg/L	<1.0	B516001	18	1.0	B516001
MISCELLANEOUS						
True Colour	Col. Unit	13.7	B514731	<2.0	2.0	B514731
Nutrients						
Total Ammonia (N)	mg/L	<0.015	B519177	<0.015	0.015	B519177
Orthophosphate (P)	mg/L	<0.0030	B514752	<0.0030	0.0030	B514752
Total Phosphorus (P)	mg/L	<0.0030	B515765	0.0058	0.0030	B515765

RDL = Reportable Detection Limit
N/A = Not Applicable

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Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVD654		CVD655		
Sampling Date		2024/09/06 15:55		2024/09/06 10:08		
COC Number		C#733646-01-01		C#733646-01-01		
	UNITS	**SITE 2 SW**	**QC Batch**	**TOB96-02-06**	**RDL**	**QC Batch**
Nitrate plus Nitrite (N)	mg/L	0.036	B514405	<0.020	0.020	B514405
Total Nitrogen (N)	mg/L	0.241	B518512	0.091	0.020	B518512
Misc. Organics						
Phenols	mg/L	<0.0015	B522355	<0.0015	0.0015	B522355
Physical Properties						
Turbidity	NTU	0.26	B514522	35	0.10	B514522
RDL = Reportable Detection Limit						

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Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		CVD646	CVD647	CVD649	CVD651	CVD652		
Sampling Date		2024/09/05 14:30	2024/09/05 15:03	2024/09/06 12:59	2024/09/06 13:50	2024/09/06 15:16		
COC Number		C#733646-01-01	C#733646-01-01	C#733646-01-01	C#733646-01-01	C#733646-01-01		
	UNITS	**SITE 4 U S**	**SITE 4 U SW**	**SITE 5 S**	**SITE 5 SW**	**SITE 2 S**	**RDL**	**QC Batch**
Elements								
Dissolved Mercury (Hg)	ug/L	<0.0019	<0.0019	<0.0019	<0.0019	0.0020	0.0019	B515658
Total Mercury (Hg)	ug/L	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	0.0019	B515813
RDL = Reportable Detection Limit								

Bureau Veritas ID		CVD654	CVD655		
Sampling Date		2024/09/06 15:55	2024/09/06 10:08		
COC Number		C#733646-01-01	C#733646-01-01		
	UNITS	**SITE 2 SW**	**TOB96-02-06**	**RDL**	**QC Batch**
Elements					
Dissolved Mercury (Hg)	ug/L	<0.0019	<0.0019	0.0019	B515658
Total Mercury (Hg)	ug/L	<0.0019	<0.0019	0.0019	B515813
RDL = Reportable Detection Limit					

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD646		CVD647			CVD648		
Sampling Date		2024/09/05 14:30		2024/09/05 15:03			2024/09/05 15:40		
COC Number		C#733646-01-01		C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 4 U S**	**QC Batch**	**SITE 4 U SW**	**RDL**	**QC Batch**	**SITE 4 U D**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS									
Dissolved Aluminum (Al)	ug/L	13.7	B514639	16.0	3.0	B514639	29.2	3.0	B514639
Dissolved Antimony (Sb)	ug/L	<0.50	B514639	<0.50	0.50	B514639	<0.50	0.50	B514639
Dissolved Arsenic (As)	ug/L	0.72	B514639	0.71	0.10	B514639	0.63	0.10	B514639
Dissolved Barium (Ba)	ug/L	139	B514639	142	1.0	B514639	144	1.0	B514639
Dissolved Beryllium (Be)	ug/L	<0.10	B514639	<0.10	0.10	B514639	<0.10	0.10	B514639
Dissolved Bismuth (Bi)	ug/L	<1.0	B514639	<1.0	1.0	B514639	<1.0	1.0	B514639
Dissolved Boron (B)	ug/L	<50	B514639	<50	50	B514639	<50	50	B514639
Dissolved Cadmium (Cd)	ug/L	<0.010	B514639	<0.010	0.010	B514639	0.691	0.010	B514639
Dissolved Chromium (Cr)	ug/L	<1.0	B514639	<1.0	1.0	B514639	<1.0	1.0	B514639
Dissolved Cobalt (Co)	ug/L	<0.20	B514639	<0.20	0.20	B514639	0.52	0.20	B514639
Dissolved Copper (Cu)	ug/L	0.45	B514639	0.43	0.20	B514639	5.12	0.20	B514639
Dissolved Iron (Fe)	ug/L	<5.0	B514639	<5.0	5.0	B514639	123	5.0	B514639
Dissolved Lead (Pb)	ug/L	<0.20	B514639	<0.20	0.20	B514639	0.69	0.20	B514639
Dissolved Lithium (Li)	ug/L	<2.0	B514639	<2.0	2.0	B514639	<2.0	2.0	B514639
Dissolved Manganese (Mn)	ug/L	<1.0	B514639	<1.0	1.0	B514639	941	1.0	B514639
Dissolved Molybdenum (Mo)	ug/L	<1.0	B514639	<1.0	1.0	B514639	<1.0	1.0	B514639
Dissolved Nickel (Ni)	ug/L	<1.0	B514639	<1.0	1.0	B514639	2.2	1.0	B514639
Dissolved Selenium (Se)	ug/L	<0.10	B514639	<0.10	0.10	B514639	<0.10	0.10	B514639
Dissolved Silver (Ag)	ug/L	<0.020	B514639	<0.020	0.020	B514639	<0.020	0.020	B514639
Dissolved Strontium (Sr)	ug/L	272	B514639	270	1.0	B514639	206	1.0	B514639
Dissolved Thallium (Tl)	ug/L	<0.010	B514639	<0.010	0.010	B514639	<0.010	0.010	B514639
Dissolved Tin (Sn)	ug/L	<5.0	B514639	<5.0	5.0	B514639	<5.0	5.0	B514639
Dissolved Titanium (Ti)	ug/L	<5.0	B514639	<5.0	5.0	B514639	<5.0	5.0	B514639
Dissolved Uranium (U)	ug/L	0.13	B514639	0.13	0.10	B514639	<0.10	0.10	B514639
Dissolved Vanadium (V)	ug/L	<5.0	B514639	<5.0	5.0	B514639	<5.0	5.0	B514639
Dissolved Zinc (Zn)	ug/L	<5.0	B514639	<5.0	5.0	B514639	15.9	5.0	B514639
Dissolved Calcium (Ca)	mg/L	37.1	B513793	36.8	0.050	B513793	28.2	0.050	B513793
Dissolved Magnesium (Mg)	mg/L	18.0	B513793	18.5	0.050	B513793	12.5	0.050	B513793
Dissolved Potassium (K)	mg/L	0.369	B513793	0.367	0.050	B513793	0.765	0.050	B513793
Dissolved Sodium (Na)	mg/L	8.43	B513793	8.36	0.050	B513793	6.90	0.050	B513793
Dissolved Sulphur (S)	mg/L	<3.0	B513793	<3.0	3.0	B513793	<3.0	3.0	B513793
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD646		CVD647			CVD648		
Sampling Date		2024/09/05 14:30		2024/09/05 15:03			2024/09/05 15:40		
COC Number		C#733646-01-01		C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 4 U S**	**QC Batch**	**SITE 4 U SW**	**RDL**	**QC Batch**	**SITE 4 U D**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	ug/L	28.6	B514762	19.1	3.0	B514778			
Total Antimony (Sb)	ug/L	<0.50	B514762	<0.50	0.50	B514778			
Total Arsenic (As)	ug/L	0.70	B514762	0.64	0.10	B514778			
Total Barium (Ba)	ug/L	130	B514762	125	1.0	B514778			
Total Beryllium (Be)	ug/L	<0.10	B514762	<0.10	0.10	B514778			
Total Bismuth (Bi)	ug/L	<1.0	B514762	<1.0	1.0	B514778			
Total Boron (B)	ug/L	<50	B514762	<50	50	B514778			
Total Cadmium (Cd)	ug/L	<0.010	B514762	<0.010	0.010	B514778			
Total Chromium (Cr)	ug/L	<1.0	B514762	<1.0	1.0	B514778			
Total Cobalt (Co)	ug/L	<0.20	B514762	<0.20	0.20	B514778			
Total Copper (Cu)	ug/L	<0.50	B514762	<0.50	0.50	B514778			
Total Iron (Fe)	ug/L	19	B514762	<10	10	B514778			
Total Lead (Pb)	ug/L	<0.20	B514762	<0.20	0.20	B514778			
Total Lithium (Li)	ug/L	<2.0	B514762	<2.0	2.0	B514778			
Total Manganese (Mn)	ug/L	<1.0	B514762	<1.0	1.0	B514778			
Total Molybdenum (Mo)	ug/L	<1.0	B514762	<1.0	1.0	B514778			
Total Nickel (Ni)	ug/L	<1.0	B514762	<1.0	1.0	B514778			
Total Selenium (Se)	ug/L	<0.10	B514762	<0.10	0.10	B514778			
Total Silver (Ag)	ug/L	<0.020	B514762	<0.020	0.020	B514778			
Total Strontium (Sr)	ug/L	264	B514762	251	1.0	B514778			
Total Thallium (Tl)	ug/L	<0.010	B514762	<0.010	0.010	B514778			
Total Tin (Sn)	ug/L	<5.0	B514762	<5.0	5.0	B514778			
Total Titanium (Ti)	ug/L	<5.0	B514762	<5.0	5.0	B514778			
Total Uranium (U)	ug/L	0.13	B514762	0.11	0.10	B514778			
Total Vanadium (V)	ug/L	<5.0	B514762	<5.0	5.0	B514778			
Total Zinc (Zn)	ug/L	<5.0	B514762	<5.0	5.0	B514778			
Total Calcium (Ca)	mg/L	35.4	B513795	34.2	0.050	B513795			
Total Magnesium (Mg)	mg/L	17.3	B513795	16.5	0.050	B513795			
Total Potassium (K)	mg/L	0.350	B513795	0.329	0.050	B513795			
Total Sodium (Na)	mg/L	7.99	B513795	7.54	0.050	B513795			
Total Sulphur (S)	mg/L	<3.0	B513795	<3.0	3.0	B513795			
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD649			CVD650			CVD651		
Sampling Date		2024/09/06 12:59			2024/09/06 12:32			2024/09/06 13:50		
COC Number		C#733646-01-01			C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 5 S**	**RDL**	**QC Batch**	**SITE 5 D**	**RDL**	**QC Batch**	**SITE 5 SW**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	23.1	3.0	B514639				13.9	3.0	B514639
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	B514639				<0.50	0.50	B514639
Dissolved Arsenic (As)	ug/L	2.25	0.10	B514639				0.48	0.10	B514639
Dissolved Barium (Ba)	ug/L	121	1.0	B514639				110	1.0	B514639
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	B514639				<0.10	0.10	B514639
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	B514639				<1.0	1.0	B514639
Dissolved Boron (B)	ug/L	<50	50	B514639				<50	50	B514639
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	B514639				<0.010	0.010	B514639
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	B514639				<1.0	1.0	B514639
Dissolved Cobalt (Co)	ug/L	0.72	0.20	B514639				<0.20	0.20	B514639
Dissolved Copper (Cu)	ug/L	<0.20	0.20	B514639				0.65	0.20	B514639
Dissolved Iron (Fe)	ug/L	637	5.0	B514639				<5.0	5.0	B514639
Dissolved Lead (Pb)	ug/L	<0.20	0.20	B514639				<0.20	0.20	B514639
Dissolved Lithium (Li)	ug/L	<2.0	2.0	B514639				<2.0	2.0	B514639
Dissolved Manganese (Mn)	ug/L	500	1.0	B514639				<1.0	1.0	B514639
Dissolved Molybdenum (Mo)	ug/L	<1.0	1.0	B514639				<1.0	1.0	B514639
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	B514639				<1.0	1.0	B514639
Dissolved Selenium (Se)	ug/L	<0.10	0.10	B514639				<0.10	0.10	B514639
Dissolved Silver (Ag)	ug/L	<0.020	0.020	B514639				<0.020	0.020	B514639
Dissolved Strontium (Sr)	ug/L	192	1.0	B514639				202	1.0	B514639
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	B514639				<0.010	0.010	B514639
Dissolved Tin (Sn)	ug/L	<5.0	5.0	B514639				<5.0	5.0	B514639
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	B514639				<5.0	5.0	B514639
Dissolved Uranium (U)	ug/L	<0.10	0.10	B514639				0.14	0.10	B514639
Dissolved Vanadium (V)	ug/L	<5.0	5.0	B514639				<5.0	5.0	B514639
Dissolved Zinc (Zn)	ug/L	9.3	5.0	B514639				<5.0	5.0	B514639
Dissolved Calcium (Ca)	mg/L	30.0	0.050	B513793				30.0	0.050	B513793
Dissolved Magnesium (Mg)	mg/L	15.3	0.050	B513793				15.2	0.050	B513793
Dissolved Potassium (K)	mg/L	0.541	0.050	B513793				0.492	0.050	B513793
Dissolved Sodium (Na)	mg/L	9.66	0.050	B513793				9.52	0.050	B513793
Dissolved Sulphur (S)	mg/L	<3.0	3.0	B513793				<3.0	3.0	B513793

RDL = Reportable Detection Limit

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD649			CVD650			CVD651		
Sampling Date		2024/09/06 12:59			2024/09/06 12:32			2024/09/06 13:50		
COC Number		C#733646-01-01			C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 5 S**	**RDL**	**QC Batch**	**SITE 5 D**	**RDL**	**QC Batch**	**SITE 5 SW**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	ug/L	57.4	3.0	B514778	28100	6.0	B514778	17.2	6.0	B514778
Total Antimony (Sb)	ug/L	<0.50	0.50	B514778	<1.0	1.0	B514778	<1.0	1.0	B514778
Total Arsenic (As)	ug/L	2.18	0.10	B514778	18.5	0.20	B514778	0.46	0.20	B514778
Total Barium (Ba)	ug/L	113	1.0	B514778	754	2.0	B514778	103	2.0	B514778
Total Beryllium (Be)	ug/L	<0.10	0.10	B514778	1.00	0.20	B514778	<0.20	0.20	B514778
Total Bismuth (Bi)	ug/L	<1.0	1.0	B514778	<2.0	2.0	B514778	<2.0	2.0	B514778
Total Boron (B)	ug/L	<50	50	B514778	<100	100	B514778	<100	100	B514778
Total Cadmium (Cd)	ug/L	<0.010	0.010	B514778	0.899	0.020	B514778	<0.020	0.020	B514778
Total Chromium (Cr)	ug/L	<1.0	1.0	B514778	40.2	2.0	B514778	<2.0	2.0	B514778
Total Cobalt (Co)	ug/L	0.68	0.20	B514778	26.3	0.40	B514778	<0.40	0.40	B514778
Total Copper (Cu)	ug/L	<0.50	0.50	B514778	42.9	1.0	B514778	<1.0	1.0	B514778
Total Iron (Fe)	ug/L	621	10	B514778	35600	20	B514778	<20	20	B514778
Total Lead (Pb)	ug/L	<0.20	0.20	B514778	30.7	0.40	B514778	<0.40	0.40	B514778
Total Lithium (Li)	ug/L	<2.0	2.0	B514778	24.2	4.0	B514778	<4.0	4.0	B514778
Total Manganese (Mn)	ug/L	459	1.0	B514778	2650	2.0	B514778	<2.0	2.0	B514778
Total Molybdenum (Mo)	ug/L	<1.0	1.0	B514778	<2.0	2.0	B514778	<2.0	2.0	B514778
Total Nickel (Ni)	ug/L	<1.0	1.0	B514778	51.3	2.0	B514778	<2.0	2.0	B514778
Total Selenium (Se)	ug/L	<0.10	0.10	B514778	<0.20	0.20	B514778	<0.20	0.20	B514778
Total Silver (Ag)	ug/L	<0.020	0.020	B514778	0.227	0.040	B514778	<0.040	0.040	B514778
Total Strontium (Sr)	ug/L	190	1.0	B514778	446	2.0	B514778	200	2.0	B514778
Total Thallium (Tl)	ug/L	<0.010	0.010	B514778	0.117	0.020	B514778	<0.020	0.020	B514778
Total Tin (Sn)	ug/L	<5.0	5.0	B514778	<10	10	B514778	<10	10	B514778
Total Titanium (Ti)	ug/L	<5.0	5.0	B514778	155	10	B514778	<10	10	B514778
Total Uranium (U)	ug/L	<0.10	0.10	B514778	0.93	0.20	B514778	<0.20	0.20	B514778
Total Vanadium (V)	ug/L	<5.0	5.0	B514778	73	10	B514778	<10	10	B514778
Total Zinc (Zn)	ug/L	12.5	5.0	B514778	2090	10	B514778	<10	10	B514778
Total Calcium (Ca)	mg/L	27.6	0.050	B513795	60.8	0.10	B513795	27.9	0.10	B513795
Total Magnesium (Mg)	mg/L	14.2	0.050	B513795	21.0	0.10	B513795	14.8	0.10	B513795
Total Potassium (K)	mg/L	0.506	0.050	B513795	2.51	0.10	B513795	0.47	0.10	B513795
Total Sodium (Na)	mg/L	8.86	0.050	B513795	8.38	0.10	B513795	9.05	0.10	B513795
Total Sulphur (S)	mg/L	<3.0	3.0	B513795	<6.0	6.0	B513795	<6.0	6.0	B513795
RDL = Reportable Detection Limit										

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD652			CVD653			CVD654		
Sampling Date		2024/09/06 15:16			2024/09/06 15:46			2024/09/06 15:55		
COC Number		C#733646-01-01			C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 2 S**	**RDL**	**QC Batch**	**SITE 2 D**	**RDL**	**QC Batch**	**SITE 2 SW**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS										
Dissolved Aluminum (Al)	ug/L	18.0	3.0	B514639				12.2	3.0	B515379
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	B514639				<0.50	0.50	B515379
Dissolved Arsenic (As)	ug/L	0.53	0.10	B514639				0.53	0.10	B515379
Dissolved Barium (Ba)	ug/L	118	1.0	B514639				118	1.0	B515379
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	B514639				<0.10	0.10	B515379
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	B514639				<1.0	1.0	B515379
Dissolved Boron (B)	ug/L	<50	50	B514639				<50	50	B515379
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	B514639				<0.010	0.010	B515379
Dissolved Chromium (Cr)	ug/L	1.2	1.0	B514639				<1.0	1.0	B515379
Dissolved Cobalt (Co)	ug/L	<0.20	0.20	B514639				<0.20	0.20	B515379
Dissolved Copper (Cu)	ug/L	0.68	0.20	B514639				0.56	0.20	B515379
Dissolved Iron (Fe)	ug/L	38.0	5.0	B514639				7.2	5.0	B515379
Dissolved Lead (Pb)	ug/L	<0.20	0.20	B514639				<0.20	0.20	B515379
Dissolved Lithium (Li)	ug/L	<2.0	2.0	B514639				<2.0	2.0	B515379
Dissolved Manganese (Mn)	ug/L	2.2	1.0	B514639				1.0	1.0	B515379
Dissolved Molybdenum (Mo)	ug/L	<1.0	1.0	B514639				<1.0	1.0	B515379
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	B514639				<1.0	1.0	B515379
Dissolved Selenium (Se)	ug/L	<0.10	0.10	B514639				<0.10	0.10	B515379
Dissolved Silver (Ag)	ug/L	<0.020	0.020	B514639				<0.020	0.020	B515379
Dissolved Strontium (Sr)	ug/L	215	1.0	B514639				220	1.0	B515379
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	B514639				<0.010	0.010	B515379
Dissolved Tin (Sn)	ug/L	<5.0	5.0	B514639				<5.0	5.0	B515379
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	B514639				<5.0	5.0	B515379
Dissolved Uranium (U)	ug/L	0.16	0.10	B514639				0.16	0.10	B515379
Dissolved Vanadium (V)	ug/L	<5.0	5.0	B514639				<5.0	5.0	B515379
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	B514639				<5.0	5.0	B515379
Dissolved Calcium (Ca)	mg/L	31.1	0.050	B513793				31.9	0.050	B513793
Dissolved Magnesium (Mg)	mg/L	16.3	0.050	B513793				17.2	0.050	B513793
Dissolved Potassium (K)	mg/L	0.475	0.050	B513793				0.478	0.050	B513793
Dissolved Sodium (Na)	mg/L	9.72	0.050	B513793				10.2	0.050	B513793
Dissolved Sulphur (S)	mg/L	<3.0	3.0	B513793				<3.0	3.0	B513793

RDL = Reportable Detection Limit

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Bureau Veritas Job #: C471255
Report Date: 2024/09/18

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Sampler Initials: G

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD652			CVD653			CVD654		
Sampling Date		2024/09/06 15:16			2024/09/06 15:46			2024/09/06 15:55		
COC Number		C#733646-01-01			C#733646-01-01			C#733646-01-01		
	UNITS	**SITE 2 S**	**RDL**	**QC Batch**	**SITE 2 D**	**RDL**	**QC Batch**	**SITE 2 SW**	**RDL**	**QC Batch**
Total Metals by ICPMS										
Total Aluminum (Al)	ug/L	70.7	3.0	B514778	562	3.0	B514778	16.9	3.0	B514778
Total Antimony (Sb)	ug/L	<0.50	0.50	B514778	2.16	0.50	B514778	<0.50	0.50	B514778
Total Arsenic (As)	ug/L	0.54	0.10	B514778	2.50	0.10	B514778	0.50	0.10	B514778
Total Barium (Ba)	ug/L	112	1.0	B514778	155	1.0	B514778	109	1.0	B514778
Total Beryllium (Be)	ug/L	<0.10	0.10	B514778	<0.10	0.10	B514778	<0.10	0.10	B514778
Total Bismuth (Bi)	ug/L	<1.0	1.0	B514778	2.5	1.0	B514778	<1.0	1.0	B514778
Total Boron (B)	ug/L	<50	50	B514778	76	50	B514778	<50	50	B514778
Total Cadmium (Cd)	ug/L	<0.010	0.010	B514778	0.258	0.010	B514778	<0.010	0.010	B514778
Total Chromium (Cr)	ug/L	<1.0	1.0	B514778	39.8	1.0	B514778	<1.0	1.0	B514778
Total Cobalt (Co)	ug/L	<0.20	0.20	B514778	3.79	0.20	B514778	<0.20	0.20	B514778
Total Copper (Cu)	ug/L	0.69	0.50	B514778	117	0.50	B514778	0.60	0.50	B514778
Total Iron (Fe)	ug/L	90	10	B514778	4870	10	B514778	10	10	B514778
Total Lead (Pb)	ug/L	<0.20	0.20	B514778	58.8	0.20	B514778	<0.20	0.20	B514778
Total Lithium (Li)	ug/L	<2.0	2.0	B514778	2.2	2.0	B514778	<2.0	2.0	B514778
Total Manganese (Mn)	ug/L	3.9	1.0	B514778	868	1.0	B514778	1.6	1.0	B514778
Total Molybdenum (Mo)	ug/L	<1.0	1.0	B514778	2.2	1.0	B514778	<1.0	1.0	B514778
Total Nickel (Ni)	ug/L	<1.0	1.0	B514778	93.2	1.0	B514778	<1.0	1.0	B514778
Total Selenium (Se)	ug/L	<0.10	0.10	B514778	<0.10	0.10	B514778	<0.10	0.10	B514778
Total Silver (Ag)	ug/L	<0.020	0.020	B514778	0.049	0.020	B514778	<0.020	0.020	B514778
Total Strontium (Sr)	ug/L	213	1.0	B514778	152	1.0	B514778	207	1.0	B514778
Total Thallium (Tl)	ug/L	<0.010	0.010	B514778	0.011	0.010	B514778	<0.010	0.010	B514778
Total Tin (Sn)	ug/L	<5.0	5.0	B514778	<5.0	5.0	B514778	<5.0	5.0	B514778
Total Titanium (Ti)	ug/L	<5.0	5.0	B514778	11.7	5.0	B514778	<5.0	5.0	B514778
Total Uranium (U)	ug/L	0.15	0.10	B514778	0.17	0.10	B514778	0.14	0.10	B514778
Total Vanadium (V)	ug/L	<5.0	5.0	B514778	<5.0	5.0	B514778	<5.0	5.0	B514778
Total Zinc (Zn)	ug/L	<5.0	5.0	B514778	129	5.0	B514778	<5.0	5.0	B514778
Total Calcium (Ca)	mg/L	28.5	0.050	B513795	20.2	0.050	B513795	29.0	0.050	B513795
Total Magnesium (Mg)	mg/L	16.0	0.050	B513795	9.59	0.050	B513795	15.8	0.050	B513795
Total Potassium (K)	mg/L	0.456	0.050	B513795	2.16	0.050	B513795	0.444	0.050	B513795
Total Sodium (Na)	mg/L	9.85	0.050	B513795	10.2	0.050	B513795	9.51	0.050	B513795
Total Sulphur (S)	mg/L	<3.0	3.0	B513795	<3.0	3.0	B513795	<3.0	3.0	B513795
RDL = Reportable Detection Limit										

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD655		
Sampling Date		2024/09/06 10:08		
COC Number		C#733646-01-01		
	UNITS	**TOB96-02-06**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS				
Dissolved Aluminum (Al)	ug/L	<3.0	3.0	B515379
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	B515379
Dissolved Arsenic (As)	ug/L	0.17	0.10	B515379
Dissolved Barium (Ba)	ug/L	118	1.0	B515379
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	B515379
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	B515379
Dissolved Boron (B)	ug/L	<50	50	B515379
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	B515379
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	B515379
Dissolved Cobalt (Co)	ug/L	<0.20	0.20	B515379
Dissolved Copper (Cu)	ug/L	0.63	0.20	B515379
Dissolved Iron (Fe)	ug/L	<5.0	5.0	B515379
Dissolved Lead (Pb)	ug/L	<0.20	0.20	B515379
Dissolved Lithium (Li)	ug/L	3.5	2.0	B515379
Dissolved Manganese (Mn)	ug/L	<1.0	1.0	B515379
Dissolved Molybdenum (Mo)	ug/L	1.1	1.0	B515379
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	B515379
Dissolved Selenium (Se)	ug/L	0.37	0.10	B515379
Dissolved Silver (Ag)	ug/L	<0.020	0.020	B515379
Dissolved Strontium (Sr)	ug/L	429	1.0	B515379
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	B515379
Dissolved Tin (Sn)	ug/L	<5.0	5.0	B515379
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	B515379
Dissolved Uranium (U)	ug/L	1.64	0.10	B515379
Dissolved Vanadium (V)	ug/L	<5.0	5.0	B515379
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	B515379
Dissolved Calcium (Ca)	mg/L	77.3	0.050	B525949
Dissolved Magnesium (Mg)	mg/L	22.8	0.050	B525949
Dissolved Potassium (K)	mg/L	0.989	0.050	B525949
Dissolved Sodium (Na)	mg/L	13.5	0.050	B525949
Dissolved Sulphur (S)	mg/L	8.4	3.0	B525949
RDL = Reportable Detection Limit				

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVD655		
Sampling Date		2024/09/06 10:08		
COC Number		C#733646-01-01		
	UNITS	**TOB96-02-06**	**RDL**	**QC Batch**
Total Metals by ICPMS				
Total Aluminum (Al)	ug/L	5290	3.0	B514778
Total Antimony (Sb)	ug/L	0.85	0.50	B514778
Total Arsenic (As)	ug/L	2.61	0.10	B514778
Total Barium (Ba)	ug/L	411	1.0	B514778
Total Beryllium (Be)	ug/L	0.92	0.10	B514778
Total Bismuth (Bi)	ug/L	<1.0	1.0	B514778
Total Boron (B)	ug/L	<50	50	B514778
Total Cadmium (Cd)	ug/L	0.572	0.010	B514778
Total Chromium (Cr)	ug/L	2.8	1.0	B514778
Total Cobalt (Co)	ug/L	6.07	0.20	B514778
Total Copper (Cu)	ug/L	10.6	0.50	B514778
Total Iron (Fe)	ug/L	5330	10	B514778
Total Lead (Pb)	ug/L	18.4	0.20	B514778
Total Lithium (Li)	ug/L	6.7	2.0	B514778
Total Manganese (Mn)	ug/L	2060	1.0	B514778
Total Molybdenum (Mo)	ug/L	<1.0	1.0	B514778
Total Nickel (Ni)	ug/L	11.4	1.0	B514778
Total Selenium (Se)	ug/L	0.57	0.10	B514778
Total Silver (Ag)	ug/L	0.118	0.020	B514778
Total Strontium (Sr)	ug/L	502	1.0	B514778
Total Thallium (Tl)	ug/L	0.089	0.010	B514778
Total Tin (Sn)	ug/L	<5.0	5.0	B514778
Total Titanium (Ti)	ug/L	67.5	5.0	B514778
Total Uranium (U)	ug/L	3.83	0.10	B514778
Total Vanadium (V)	ug/L	6.3	5.0	B514778
Total Zinc (Zn)	ug/L	38.8	5.0	B514778
Total Calcium (Ca)	mg/L	95.7	0.050	B513795
Total Magnesium (Mg)	mg/L	26.7	0.050	B513795
Total Potassium (K)	mg/L	1.90	0.050	B513795
Total Sodium (Na)	mg/L	11.0	0.050	B513795
Total Sulphur (S)	mg/L	5.8	3.0	B513795
RDL = Reportable Detection Limit				

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.0°C
Package 2	13.0°C
Package 3	9.3°C

Sample CVD646 [SITE 4 U S] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD647 [SITE 4 U SW] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD648 [SITE 4 U D] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD649 [SITE 5 S] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD650 [SITE 5 D] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD651 [SITE 5 SW] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD652 [SITE 2 S] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD653 [SITE 2 D] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for

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Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD654 [SITE 2 SW] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVD655 [TOB96-02-06] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B514390	Alkalinity (PP as CaCO3)	2024/09/12					<1.0	mg/L	NC	20
B514390	Alkalinity (Total as CaCO3)	2024/09/12			98	80 - 120	<1.0	mg/L	0.44	20
B514390	Bicarbonate (HCO3)	2024/09/12					<1.0	mg/L	0.44	20
B514390	Carbonate (CO3)	2024/09/12					<1.0	mg/L	NC	20
B514390	Hydroxide (OH)	2024/09/12					<1.0	mg/L	NC	20
B514396	Conductivity	2024/09/12			100	90 - 110	<2.0	uS/cm	0.11	10
B514401	pH	2024/09/12			100	97 - 103			0.43	N/A
B514405	Nitrate plus Nitrite (N)	2024/09/12	120	80 - 120	110	80 - 120	<0.020	mg/L	NC	25
B514406	Nitrite (N)	2024/09/12	113	80 - 120	104	80 - 120	<0.0050	mg/L	NC	20
B514414	Alkalinity (PP as CaCO3)	2024/09/12					<1.0	mg/L	NC	20
B514414	Alkalinity (Total as CaCO3)	2024/09/12			99	80 - 120	<1.0	mg/L	0.063	20
B514414	Bicarbonate (HCO3)	2024/09/12					<1.0	mg/L	0.063	20
B514414	Carbonate (CO3)	2024/09/12					<1.0	mg/L	NC	20
B514414	Hydroxide (OH)	2024/09/12					<1.0	mg/L	NC	20
B514427	pH	2024/09/12			100	97 - 103			0.24	N/A
B514431	Conductivity	2024/09/12			100	90 - 110	<2.0	uS/cm	0.16	10
B514522	Turbidity	2024/09/12			102	80 - 120	<0.10	NTU	5.7	20
B514538	Total Dissolved Solids	2024/09/13	101	80 - 120	102	80 - 120	<10	mg/L	4.3	20
B514544	pH	2024/09/13			100	97 - 103			0.24	N/A
B514550	Alkalinity (PP as CaCO3)	2024/09/13					<1.0	mg/L	NC	20
B514550	Alkalinity (Total as CaCO3)	2024/09/13			94	80 - 120	<1.0	mg/L	0.30	20
B514550	Bicarbonate (HCO3)	2024/09/13					<1.0	mg/L	0.30	20
B514550	Carbonate (CO3)	2024/09/13					<1.0	mg/L	NC	20
B514550	Hydroxide (OH)	2024/09/13					<1.0	mg/L	NC	20
B514557	Conductivity	2024/09/13			100	90 - 110	<2.0	uS/cm	0	10
B514639	Dissolved Aluminum (Al)	2024/09/13	98	80 - 120	103	80 - 120	<3.0	ug/L	14	20
B514639	Dissolved Antimony (Sb)	2024/09/13	99	80 - 120	101	80 - 120	<0.50	ug/L	NC	20
B514639	Dissolved Arsenic (As)	2024/09/13	103	80 - 120	102	80 - 120	<0.10	ug/L	2.4	20
B514639	Dissolved Barium (Ba)	2024/09/13	NC	80 - 120	100	80 - 120	<1.0	ug/L	1.1	20
B514639	Dissolved Beryllium (Be)	2024/09/13	97	80 - 120	98	80 - 120	<0.10	ug/L	NC	20
B514639	Dissolved Bismuth (Bi)	2024/09/13	95	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B514639	Dissolved Boron (B)	2024/09/13	102	80 - 120	102	80 - 120	<50	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B514639	Dissolved Cadmium (Cd)	2024/09/13	101	80 - 120	102	80 - 120	<0.010	ug/L	NC	20
B514639	Dissolved Chromium (Cr)	2024/09/13	90	80 - 120	95	80 - 120	<1.0	ug/L	17	20
B514639	Dissolved Cobalt (Co)	2024/09/13	93	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
B514639	Dissolved Copper (Cu)	2024/09/13	90	80 - 120	95	80 - 120	<0.20	ug/L	4.7	20
B514639	Dissolved Iron (Fe)	2024/09/13	98	80 - 120	101	80 - 120	<5.0	ug/L	8.3	20
B514639	Dissolved Lead (Pb)	2024/09/13	95	80 - 120	99	80 - 120	<0.20	ug/L	NC	20
B514639	Dissolved Lithium (Li)	2024/09/13	95	80 - 120	97	80 - 120	<2.0	ug/L	NC	20
B514639	Dissolved Manganese (Mn)	2024/09/13	96	80 - 120	100	80 - 120	<1.0	ug/L	6.3	20
B514639	Dissolved Molybdenum (Mo)	2024/09/13	107	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B514639	Dissolved Nickel (Ni)	2024/09/13	93	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B514639	Dissolved Selenium (Se)	2024/09/13	104	80 - 120	99	80 - 120	<0.10	ug/L	NC	20
B514639	Dissolved Silver (Ag)	2024/09/13	101	80 - 120	99	80 - 120	<0.020	ug/L	NC	20
B514639	Dissolved Strontium (Sr)	2024/09/13	NC	80 - 120	94	80 - 120	<1.0	ug/L	3.5	20
B514639	Dissolved Thallium (Tl)	2024/09/13	98	80 - 120	99	80 - 120	<0.010	ug/L	NC	20
B514639	Dissolved Tin (Sn)	2024/09/13	103	80 - 120	102	80 - 120	<5.0	ug/L	NC	20
B514639	Dissolved Titanium (Ti)	2024/09/13	101	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
B514639	Dissolved Uranium (U)	2024/09/13	99	80 - 120	100	80 - 120	<0.10	ug/L	2.4	20
B514639	Dissolved Vanadium (V)	2024/09/13	96	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
B514639	Dissolved Zinc (Zn)	2024/09/13	100	80 - 120	107	80 - 120	<5.0	ug/L	NC	20
B514731	True Colour	2024/09/12			97	80 - 120	<2.0	Col. Unit	7.4	20
B514752	Orthophosphate (P)	2024/09/12	81	80 - 120	92	80 - 120	<0.0030	mg/L	NC	20
B514762	Total Aluminum (Al)	2024/09/14	108	80 - 120	103	80 - 120	<3.0	ug/L		
B514762	Total Antimony (Sb)	2024/09/14	107	80 - 120	103	80 - 120	<0.50	ug/L		
B514762	Total Arsenic (As)	2024/09/14	NC	80 - 120	106	80 - 120	<0.10	ug/L	0.74	20
B514762	Total Barium (Ba)	2024/09/14	NC	80 - 120	103	80 - 120	<1.0	ug/L		
B514762	Total Beryllium (Be)	2024/09/14	105	80 - 120	107	80 - 120	<0.10	ug/L		
B514762	Total Bismuth (Bi)	2024/09/14	32 (1)	80 - 120	102	80 - 120	<1.0	ug/L		
B514762	Total Boron (B)	2024/09/14	104	80 - 120	114	80 - 120	<50	ug/L		
B514762	Total Cadmium (Cd)	2024/09/14	104	80 - 120	105	80 - 120	<0.010	ug/L		
B514762	Total Chromium (Cr)	2024/09/14	97	80 - 120	101	80 - 120	<1.0	ug/L		
B514762	Total Cobalt (Co)	2024/09/14	91	80 - 120	101	80 - 120	<0.20	ug/L		
B514762	Total Copper (Cu)	2024/09/14	68 (1)	80 - 120	99	80 - 120	<0.50	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B514762	Total Iron (Fe)	2024/09/14	115	80 - 120	104	80 - 120	<10	ug/L		
B514762	Total Lead (Pb)	2024/09/14	94	80 - 120	101	80 - 120	<0.20	ug/L	6.7	20
B514762	Total Lithium (Li)	2024/09/14	102	80 - 120	107	80 - 120	<2.0	ug/L		
B514762	Total Manganese (Mn)	2024/09/14	NC	80 - 120	105	80 - 120	<1.0	ug/L		
B514762	Total Molybdenum (Mo)	2024/09/14	NC	80 - 120	108	80 - 120	<1.0	ug/L		
B514762	Total Nickel (Ni)	2024/09/14	91	80 - 120	103	80 - 120	<1.0	ug/L	3.5	20
B514762	Total Selenium (Se)	2024/09/14	6.0 (1)	80 - 120	108	80 - 120	<0.10	ug/L		
B514762	Total Silver (Ag)	2024/09/14	40 (1)	80 - 120	104	80 - 120	<0.020	ug/L		
B514762	Total Strontium (Sr)	2024/09/14	NC	80 - 120	98	80 - 120	<1.0	ug/L		
B514762	Total Thallium (Tl)	2024/09/14	103	80 - 120	104	80 - 120	<0.010	ug/L		
B514762	Total Tin (Sn)	2024/09/14	104	80 - 120	104	80 - 120	<5.0	ug/L		
B514762	Total Titanium (Ti)	2024/09/14	109	80 - 120	107	80 - 120	<5.0	ug/L		
B514762	Total Uranium (U)	2024/09/14	106	80 - 120	108	80 - 120	<0.10	ug/L		
B514762	Total Vanadium (V)	2024/09/14	99	80 - 120	101	80 - 120	<5.0	ug/L		
B514762	Total Zinc (Zn)	2024/09/14	NC	80 - 120	106	80 - 120	<5.0	ug/L	1.3	20
B514778	Total Aluminum (Al)	2024/09/14	106	80 - 120	110	80 - 120	<3.0	ug/L	1.6	20
B514778	Total Antimony (Sb)	2024/09/14	105	80 - 120	105	80 - 120	<0.50	ug/L	NC	20
B514778	Total Arsenic (As)	2024/09/14	107	80 - 120	107	80 - 120	<0.10	ug/L	2.0	20
B514778	Total Barium (Ba)	2024/09/14	NC	80 - 120	103	80 - 120	<1.0	ug/L	3.1	20
B514778	Total Beryllium (Be)	2024/09/14	111	80 - 120	111	80 - 120	<0.10	ug/L	NC	20
B514778	Total Bismuth (Bi)	2024/09/14	100	80 - 120	105	80 - 120	<1.0	ug/L	NC	20
B514778	Total Boron (B)	2024/09/14	112	80 - 120	118	80 - 120	<50	ug/L	NC	20
B514778	Total Cadmium (Cd)	2024/09/14	103	80 - 120	105	80 - 120	<0.010	ug/L	NC	20
B514778	Total Chromium (Cr)	2024/09/14	97	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
B514778	Total Cobalt (Co)	2024/09/14	95	80 - 120	102	80 - 120	<0.20	ug/L	NC	20
B514778	Total Copper (Cu)	2024/09/14	91	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
B514778	Total Iron (Fe)	2024/09/14	104	80 - 120	105	80 - 120	<10	ug/L	NC	20
B514778	Total Lead (Pb)	2024/09/14	97	80 - 120	101	80 - 120	<0.20	ug/L	NC	20
B514778	Total Lithium (Li)	2024/09/14	107	80 - 120	109	80 - 120	<2.0	ug/L	NC	20
B514778	Total Manganese (Mn)	2024/09/14	100	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B514778	Total Molybdenum (Mo)	2024/09/14	106	80 - 120	108	80 - 120	<1.0	ug/L	NC	20
B514778	Total Nickel (Ni)	2024/09/14	95	80 - 120	103	80 - 120	<1.0	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B514778	Total Selenium (Se)	2024/09/14	106	80 - 120	107	80 - 120	<0.10	ug/L	NC	20
B514778	Total Silver (Ag)	2024/09/14	102	80 - 120	104	80 - 120	<0.020	ug/L	NC	20
B514778	Total Strontium (Sr)	2024/09/14	NC	80 - 120	99	80 - 120	<1.0	ug/L	2.3	20
B514778	Total Thallium (Tl)	2024/09/14	103	80 - 120	107	80 - 120	<0.010	ug/L	NC	20
B514778	Total Tin (Sn)	2024/09/14	104	80 - 120	105	80 - 120	<5.0	ug/L	NC	20
B514778	Total Titanium (Ti)	2024/09/14	104	80 - 120	107	80 - 120	<5.0	ug/L	NC	20
B514778	Total Uranium (U)	2024/09/14	107	80 - 120	107	80 - 120	<0.10	ug/L	2.2	20
B514778	Total Vanadium (V)	2024/09/14	99	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
B514778	Total Zinc (Zn)	2024/09/14	99	80 - 120	105	80 - 120	<5.0	ug/L	NC	20
B514806	Total Suspended Solids	2024/09/13	111	80 - 120	98	80 - 120	<1.0	mg/L	NC	20
B515379	Dissolved Aluminum (Al)	2024/09/13	97	80 - 120	112	80 - 120	<3.0	ug/L	4.3	20
B515379	Dissolved Antimony (Sb)	2024/09/13	99	80 - 120	100	80 - 120	<0.50	ug/L	NC	20
B515379	Dissolved Arsenic (As)	2024/09/13	105	80 - 120	103	80 - 120	<0.10	ug/L	1.8	20
B515379	Dissolved Barium (Ba)	2024/09/13	NC	80 - 120	100	80 - 120	<1.0	ug/L	0.38	20
B515379	Dissolved Beryllium (Be)	2024/09/13	95	80 - 120	108	80 - 120	<0.10	ug/L	NC	20
B515379	Dissolved Bismuth (Bi)	2024/09/13	94	80 - 120	101	80 - 120	<1.0	ug/L	NC	20
B515379	Dissolved Boron (B)	2024/09/13	101	80 - 120	112	80 - 120	<50	ug/L	NC	20
B515379	Dissolved Cadmium (Cd)	2024/09/13	100	80 - 120	101	80 - 120	<0.010	ug/L	NC	20
B515379	Dissolved Chromium (Cr)	2024/09/13	92	80 - 120	95	80 - 120	<1.0	ug/L	NC	20
B515379	Dissolved Cobalt (Co)	2024/09/13	95	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
B515379	Dissolved Copper (Cu)	2024/09/13	89	80 - 120	95	80 - 120	<0.20	ug/L	2.6	20
B515379	Dissolved Iron (Fe)	2024/09/13	98	80 - 120	105	80 - 120	<5.0	ug/L	2.3	20
B515379	Dissolved Lead (Pb)	2024/09/13	95	80 - 120	100	80 - 120	<0.20	ug/L	NC	20
B515379	Dissolved Lithium (Li)	2024/09/13	93	80 - 120	101	80 - 120	<2.0	ug/L	NC	20
B515379	Dissolved Manganese (Mn)	2024/09/13	91	80 - 120	101	80 - 120	<1.0	ug/L	1.0	20
B515379	Dissolved Molybdenum (Mo)	2024/09/13	102	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B515379	Dissolved Nickel (Ni)	2024/09/13	92	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B515379	Dissolved Selenium (Se)	2024/09/13	99	80 - 120	103	80 - 120	<0.10	ug/L	NC	20
B515379	Dissolved Silver (Ag)	2024/09/13	98	80 - 120	99	80 - 120	<0.020	ug/L	NC	20
B515379	Dissolved Strontium (Sr)	2024/09/13	NC	80 - 120	96	80 - 120	<1.0	ug/L	0.36	20
B515379	Dissolved Thallium (Tl)	2024/09/13	97	80 - 120	102	80 - 120	<0.010	ug/L	NC	20
B515379	Dissolved Tin (Sn)	2024/09/13	100	80 - 120	102	80 - 120	<5.0	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B515379	Dissolved Titanium (Ti)	2024/09/13	100	80 - 120	102	80 - 120	<5.0	ug/L	NC	20
B515379	Dissolved Uranium (U)	2024/09/13	105	80 - 120	106	80 - 120	<0.10	ug/L	0.062	20
B515379	Dissolved Vanadium (V)	2024/09/13	95	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
B515379	Dissolved Zinc (Zn)	2024/09/13	98	80 - 120	108	80 - 120	<5.0	ug/L	NC	20
B515656	Dissolved Fluoride (F)	2024/09/13	276 (1)	80 - 120	101	80 - 120	<0.050	mg/L	NC	20
B515658	Dissolved Mercury (Hg)	2024/09/13	99	80 - 120	95	80 - 120	<0.0019	ug/L	1.9	20
B515761	Total Phosphorus (P)	2024/09/13	NC	N/A	106	80 - 120	<0.0030	mg/L	0.29	20
B515765	Total Phosphorus (P)	2024/09/13	91	N/A	108	80 - 120	<0.0030	mg/L	NC	20
B515813	Total Mercury (Hg)	2024/09/13	98	80 - 120	92	80 - 120	<0.0019	ug/L	NC	20
B515814	Chloride (Cl)	2024/09/13	101	80 - 120	102	80 - 120	<1.0	mg/L	NC	20
B515814	Sulphate (SO4)	2024/09/13	NC	80 - 120	102	80 - 120	<1.0	mg/L	1.2	20
B516001	Chloride (Cl)	2024/09/13	102	80 - 120	96	80 - 120	<1.0	mg/L	4.0	20
B516001	Sulphate (SO4)	2024/09/13	97	80 - 120	101	80 - 120	<1.0	mg/L	4.1	20
B516146	Total Suspended Solids	2024/09/16	105	80 - 120	100	80 - 120	<1.0	mg/L	NC	20
B516346	Dissolved Organic Carbon (C)	2024/09/13	103	80 - 120	99	80 - 120	<0.50	mg/L	6.9	20
B516565	Total Organic Carbon (C)	2024/09/14	103	80 - 120	100	80 - 120	<0.50	mg/L	8.1	20
B518512	Total Nitrogen (N)	2024/09/17	82	80 - 120	108	80 - 120	<0.020	mg/L	1.6	20
B518800	Acidity (pH 4.5)	2024/09/16					<1.0	mg/L	NC	20
B518800	Acidity (pH 8.3)	2024/09/16			99	80 - 120	<1.0	mg/L	NC	20
B519177	Total Ammonia (N)	2024/09/16	97	80 - 120	109	80 - 120	<0.015	mg/L		
B519408	Dissolved Organic Carbon (C)	2024/09/17			100	80 - 120	<0.50	mg/L	0.21 (2)	20
B522355	Phenols	2024/09/17	95	80 - 120	95	80 - 120	<0.0015	mg/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B525529	Strong Acid Dissoc. Cyanide (CN)	2024/09/18	103	80 - 120	105	80 - 120	<0.00050	mg/L	NC	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

(2) DOC higher than TOC, sample rerun to confirm data

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Mauro Oselin, P.Chem., QP, Scientific Specialist

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Automated Statchk

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, General Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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2024/09/11 10:55

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#1776 SLR CONSULTING (CANADA) LTD	Company Name	SLR CONSULTING	Quotation #	C40429	Bureau Veritas Job #	Bottle Order #: 733646
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			
Address	#200 - 887 Great Northern Way	Address	887 GREAT NOTHERN WAY	Project #	201.V24219.00000		
	VANCOUVER BC V5T 4T5		SUITE 200, VANCOUVER,	Project Name	TENAS	Chain Of Custody Record	Project Manager
Phone	(604) 738-2500 Fax: (604) 738-2542	Phone	BC Fax:	Site #		C#733646-01-01	Nahed Amer
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Sampled By	GLENN + BECKS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other _____

Special Instructions

MVAN-2024-09-595

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (If applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Color (True) by Automated Analyzer	Conductivity @25C	pH @25°C	Total Suspended Solids (NFR)	Total Dissolved Solids (Filt. Residue)	Turbidity	Acidity pH 4.5 & pH 8.3 (as CaCO3)	Alkalinity @25C (pp, total), CO3,HCO3,OH	Ammonia-N (Total)	Total Kjeldahl Nitrogen (Total), Nitrate, Nitrite	# of Bottles	Comments
1	TENAS FOUR CREEK	SITE 4 U S	2024-09-05	14:30	GW	Y	X	X	X	X	X	X	X	X	X	X	12	GROUNDWATER
2	TENAS FOUR CREEK	SITE 4 U SW	2024-09-05	15:03	SW	Y	X	X	X	X	X	X	X	X	X	X	12	SURFACE WATER
3	TENAS FOUR CREEK	SITE 4 U D	2024-09-05	15:40	GW	Y	X	X	X	X	X	X	X	X	X	X	2	GROUNDWATER ~100 ml METALS ~100ml GEN CHEM
4	TENAS FOUR CREEK	SITE 5 S	2024-09-06	12:59	GW	Y	X	X	X	X	X	X	X	X	X	X	12	GROUNDWATER
5	TENAS FOUR CREEK	SITE 5 D	2024-09-06	12:32	GW	Y	X	X	X	X	X	X	X	X	X	X	2	GROUNDWATER ~200ml GEN CHEM + ~500ml TOTAL METALS
6	TENAS FOUR CREEK	SITE 5 SW	2024-09-06	13:50	SW	Y	X	X	X	X	X	X	X	X	X	X	12	SURFACE WATER
7	TENAS FOUR CREEK	SITE 2 S	2024-09-06	15:16	GW	Y	X	X	X	X	X	X	X	X	X	X	12	GROUNDWATER
8	TENAS FOUR CREEK	SITE 2 D	2024-09-06	15:46	GW	Y	X	X	X	X	X	X	X	X	X	X	2	GROUNDWATER ~100ml TOTAL METAL ~200ml + GEN CHEM
9	TENAS FOUR CREEK	SITE 2 SW	2024-09-06	15:55	SW	Y	X	X	X	X	X	X	X	X	X	X	12	SURFACE WATER
10	TENAS FOUR CREEK	TOB96-02-06	2024-09-06	10:08	GW	Y	X	X	X	X	X	X	X	X	X	X	10	GROUNDWATER

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
REBECCA BRADFORD	24/09/09	08:30	Maria Zamora	2024/09/11	10:55		☐	9/9/9	☐ Yes ☒ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

13/13/13
10/9/19
LAB FRIDGE FROZEN

C471255
2024/09/11 10:55

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#1776 SLR CONSULTING (CANADA) LTD	Company Name	SLR CONSULTING	Quotation #	C40429	Bureau Veritas Job #	Bottle Order #: 733646
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			
Address	#200 - 887 Great Northern Way VANCOUVER BC V5T 4T5	Address	887 GREAT NORTHERN WAY SUITE 200, VANCOUVER, BC	Project #	201.V24219.00000	Chain Of Custody Record	Project Manager
Phone	(604) 738-2500 Fax: (604) 738-2542	Phone	Fax:	Project Name	TENAS	C#733646-01-02	Nahed Amer
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Site #			
				Sampled By	GLENN + BECKS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other _____

Special Instructions

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: (will be applied if Rush TAT is not specified): ☑
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered? (Y/N)	Nitrogen (Total)	Orthophosphate by Automated Analyzer	Total Phosphorus	Fluoride	Chloride/Sulphate by Auto Colourimetry	Carbon (DOC)	Carbon (Total Organic)	Dissolved Al,Sb,As,Ba,Be,Bi,B,Cd,Cr,Co,Cu,Pb, Hardness	Dissolved Fe,Li,Mn,Hg,Mo,Ni,Se,Ag,Sr,Tl,Sn,Ti, U,V,Zn	Total Al,Sb,As,Ba,Be,Bi,B,Cd,Cr,Co,Cu,Pb, Hardness	# of Bottles	Comments
1	TENAS FOUR CREEK	SITE 4 U S	2024-09-05	14:30	GW	4	X	X	X	X	X	X	X	X	X	X	12	GROUNDWATER
2	TENAS FOUR CREEK	SITE 4 U SW	2024-09-05	15:03	SW	4	X	X	X	X	X	X	X	X	X	X	12	SURFACE WATER
3	TENAS FOUR CREEK	SITE 4 U D	2024-09-05	15:40	GW	4	X	X	X	X	X	X	X	X	X		2	GROUNDWATER ~100ml Metals ~100ml GEN CHEM
4	TENAS FOUR CREEK	SITE 5 S	2024-09-06	12:59	GW	4	X	X	X	X	X	X	X	X	X	X	12	GROUNDWATER
5	TENAS FOUR CREEK	SITE 5 D	2024-09-06	12:32	GW	4	X	X	X	X	X	X	X	X	X	X	2	GROUNDWATER ~200ml GEN CHEM ~50ML TOTAL METALS
6	TENAS FOUR CREEK	SITE 5 SW	2024-09-06	13:50	SW	4	X	X	X	X	X	X	X	X	X	X	12	SURFACE WATER
7	TENAS FOUR CREEK	SITE 2 S	2024-09-06	15:16	GW	4	X	X	X	X	X	X	X	X	X	X	12	GROUNDWATER
8	TENAS FOUR CREEK	SITE 2 D	2024-09-06	15:46	GW	4	X	X	X	X	X	X	X	X	X	X	2	GROUNDWATER ~100ml TOTAL METAL ~200ml GEN CHEM
9	TENAS FOUR CREEK	SITE 2 SW	2024-09-06	15:55	SW	4	X	X	X	X	X	X	X	X	X	X	12	SURFACE WATER
10	TENAS FOUR CREEK	TOB96-02-06	2024-09-06	10:08	GW	4	X	X	X	X	X	X	X	X	X	X	10	GROUNDWATER

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
REBECCA BRADFORD	24/09/09	09:30	Maria Zamora	2024/09/11	10:55		☐	9/9/9	☐ Yes ☒ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

13/13/13

Bureau Veritas Canada (2019) Inc.

WE FROZEN 10/9/9

C471255
2024/09/11 10:55

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#1776 SLR CONSULTING (CANADA) LTD	Company Name	SLR CONSULTING	Quotation #	C40429	Bureau Veritas Job #	Bottle Order #: 733646
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			
Address	#200 - 887 Great Northern Way	Address	887 GREAT NORTHERN WAY SUITE 200, VANCOUVER, BC	Project #	201.V24219.00000		
	VANCOUVER BC V5T 4T5			Project Name	TENAS	Chain Of Custody Record	Project Manager
Phone	(604) 738-2500 Fax: (604) 738-2542	Phone	Fax:	Site #		C#733646-01-03	Nahed Amer
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Sampled By	GLENN + BECKS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other _____

Special Instructions

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (If applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Total Fe,Li,Mn,Hg,Mo,Ni,Se,Ag,Sr,Tl,Sn,Ti,U,V,Zn	Cyanide (total)	Phenols (4-AAP)	# of Bottles	Comments
1	TENAS FOUR CREEK	SITE 4 U S	2024-09-05	14:30	GW	Y	X	X	X	12	GROUNDWATER
2	TENAS FOUR CREEK	SITE 4 U SW	2024-09-05	15:03	SW	Y	X	X	X	12	SURFACE WATER
3	TENAS FOUR CREEK	SITE 4 U D	2024-09-05	15:40	GW	Y	X	X	X	2	GROUNDWATER 100 ml Metals + 100 ml GENCHEM
4	TENAS FOUR CREEK	SITE 5 S	2024-09-06	12:59	GW	Y	X	X	X	12	GROUNDWATER
5	TENAS FOUR CREEK	SITE 5 D	2024-09-06	12:32	GW	Y	X	X	X	2	GROUNDWATER ~200ml GENCHEM + ~50ml TOTAL METAL
6	TENAS FOUR CREEK	SITE 5 SW	2024-09-06	13:50	SW	Y	X	X	X	12	SURFACE WATER
7	TENAS FOUR CREEK	SITE 2 S	2024-09-06	15:16	GW	Y	X	X	X	12	GROUNDWATER
8	TENAS FOUR CREEK	SITE 2 D	2024-09-06	15:46	GW	Y	X	X	X	2	GROUNDWATER ~ 100 ML TOTAL METAL + 200ML GENCHEM
9	TENAS FOUR CREEK	SITE 2 SW	2024-09-06	15:55	SW	Y	X	X	X	12	SURFACE WATER.
10	TENAS FOUR CREEK	TUB96-02-06	2024-09-06	10:08	GW	Y	X	X	X	10	GROUNDWATER

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
REBECCA BRADBERD	24/09/09	08:30	Blanca Zamora	2024/09/11	10:55		☐	9/9/9	☐ Yes ☒ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

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13/13/13

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

ICE FROZEN 10/9/9

Your P.O. #: VAN16079
Your Project #: 201.V24219.00000
Site Location: TENAS
Your C.O.C. #: C#733646-03-01

Attention: Nathalie Brandebourger

SLR CONSULTING (CANADA) LTD
#200 - 887 Great Northern Way
VANCOUVER, BC
Canada V5T 4T5

Report Date: 2024/10/01
Report #: R3564484
Version: 5 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C472226
Received: 2024/09/13, 10:40

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Acidity pH 4.5 & pH 8.3 (as CaCO3)	5	N/A	2024/09/16	BBY6SOP-00037	SM 24 2310 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	5	N/A	2024/09/14	BBY6SOP-00026	SM 24 2320 B m
Chloride/Sulphate by Auto Colourimetry	5	N/A	2024/09/16	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Cyanide (total) (1)	5	N/A	2024/09/20	CAL SOP-00270	SM 24 4500-CN m
Color (True) by Automated Analyzer	5	N/A	2024/09/13	BBY6SOP-00057	SM 24 2120 C m
Carbon (DOC) (2)	5	N/A	2024/09/18	BBY6SOP-00053	SM 24 5310 B m
Conductivity @25C	5	N/A	2024/09/14	BBY6SOP-00026	SM 24 2510 B m
Fluoride	5	N/A	2024/09/18	BBY6SOP-00037	SM 24 4500-F C m
Hardness Total (calculated as CaCO3) (3)	2	N/A	2024/09/16	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (3)	1	N/A	2024/09/17	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (3)	2	N/A	2024/09/27	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	3	N/A	2024/09/16	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	2	N/A	2024/09/20	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV (4)	5	2024/09/14	2024/09/17	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Mercury (Total) by CV	5	2024/09/17	2024/09/17	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	3	N/A	2024/09/16	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	2	N/A	2024/09/20	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved) (4)	5	N/A	2024/09/16	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	2	2024/09/13	2024/09/16	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	2024/09/13	2024/09/17	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	2	2024/09/27	2024/09/27	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	3	2024/09/14	2024/09/16	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	2	2024/09/27	2024/09/27	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrogen (Total)	5	N/A	2024/09/19	BBY6SOP-00016	SM 24 4500-N C m
Ammonia-N (Total)	5	N/A	2024/09/19	AB SOP-00007	SM 24 4500 NH3 A G m
Nitrate + Nitrite (N)	5	N/A	2024/09/14	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrite (N) Regular Level Water	5	N/A	2024/09/14	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrogen - Nitrate (as N)	2	N/A	2024/09/14	BBY WI-00033	Auto Calc
Nitrogen - Nitrate (as N)	3	N/A	2024/09/17	BBY WI-00033	Auto Calc

Your P.O. #: VAN16079
Your Project #: 201.V24219.00000
Site Location: TENAS
Your C.O.C. #: C#733646-03-01

Attention: Nathalie Brandebourger

SLR CONSULTING (CANADA) LTD
#200 - 887 Great Northern Way
VANCOUVER, BC
Canada V5T 4T5

Report Date: 2024/10/01
Report #: R3564484
Version: 5 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C472226
Received: 2024/09/13, 10:40

Sample Matrix: Water
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
pH @25°C (5)	5	N/A	2024/09/14	BBY6SOP-00026	SM 24 4500-H+ B m
Phenols (4-AAP) (1)	5	N/A	2024/09/18	AB SOP-00088	EPA 9066 R0 m
Orthophosphate by Automated Analyzer (6)	5	N/A	2024/09/13	BBY6SOP-00013	SM 24 4500-P E m
Total Dissolved Solids (Filt. Residue)	5	2024/09/16	2024/09/17	BBY6SOP-00033	SM 24 2540 C m
Total Kjeldahl Nitrogen (Total)	5	N/A	2024/09/20	BBY WI-00033	Auto Calc
Carbon (Total Organic) (7)	5	N/A	2024/09/19	BBY6SOP-00053	SM 24 5310 B m
Total Phosphorus	5	2024/09/17	2024/09/18	BBY6SOP-00013	SM 24 4500-P E m
Total Suspended Solids (NFR)	5	2024/09/16	2024/09/17	BBY6SOP-00034	SM 24 2540 D m
Turbidity	5	N/A	2024/09/13	BBY6SOP-00027	SM 24 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) DOC present in the sample should be considered as non-purgeable DOC. Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.

Your P.O. #: VAN16079
Your Project #: 201.V24219.00000
Site Location: TENAS
Your C.O.C. #: C#733646-03-01

Attention: Nathalie Brandebourger

SLR CONSULTING (CANADA) LTD
#200 - 887 Great Northern Way
VANCOUVER, BC
Canada V5T 4T5

Report Date: 2024/10/01
Report #: R3564484
Version: 5 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C472226

Received: 2024/09/13, 10:40

(3) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(4) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(6) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(7) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

Nahed Amer
Key Account Specialist
01 Oct 2024 11:22:03

Please direct all questions regarding this Certificate of Analysis to:
Nahed Amer, Key Account Specialist
Email: Nahed.AMER@bureauveritas.com
Phone# (604) 734 7276

==========

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, General Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVJ636		CVJ637		CVJ638		
Sampling Date		2024/09/09		2024/09/09 16:42		2024/09/09 13:40		
COC Number		C#733646-03-01		C#733646-03-01		C#733646-03-01		
	UNITS	**TRIP BLANK**	**QC Batch**	**T18-01D**	**QC Batch**	**T95R-64**	**RDL**	**QC Batch**
ANIONS								
Nitrite (N)	mg/L	<0.0050	B517403	<0.0050	B517403	<0.0050	0.0050	B516808
Calculated Parameters								
Dissolved Hardness (CaCO3)	mg/L	<0.50	B516639	11.4	B516639	55.3	0.50	B529822
Total Hardness (CaCO3)	mg/L	<0.50	B515419	11.1	B515419	51.2	0.50	B540087
Total Kjeldahl Nitrogen (Calc)	mg/L	<0.020	B515626	0.58	B515626	0.47	0.020	B515626
Nitrate (N)	mg/L	<0.020	B516645	<0.020	B516645	<0.020	0.020	B516645
Misc. Inorganics								
Conductivity	uS/cm	<2.0	B516820	1200	B516820	1300	2.0	B516820
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	B529965	<0.00050	B529965	<0.00050	0.00050	B529965
Dissolved Organic Carbon (C)	mg/L	<0.50	B525368	3.1	B525368	<0.50	0.50	B525368
pH	pH	6.12	B516821	8.51	B516821	8.26	N/A	B516821
Acidity (pH 4.5)	mg/L	<1.0	B518800	<1.0	B519219	<1.0	1.0	B519219
Total Organic Carbon (C)	mg/L	<0.50	B525353	3.5	B525353	<0.50	0.50	B525353
Acidity (pH 8.3)	mg/L	<1.0	B518800	<1.0	B519219	<1.0	1.0	B519219
Total Dissolved Solids	mg/L	<10	B518446	780	B518446	780	10	B518446
Total Suspended Solids	mg/L	<1.0	B518343	8.8	B518343	2.0	1.0	B518343
Anions								
Alkalinity (PP as CaCO3)	mg/L	<1.0	B516818	34	B516818	<1.0	1.0	B516818
Alkalinity (Total as CaCO3)	mg/L	<1.0	B516818	640	B516818	740	1.0	B516818
Bicarbonate (HCO3)	mg/L	<1.0	B516818	700	B516818	910	1.0	B516818
Carbonate (CO3)	mg/L	<1.0	B516818	41	B516818	<1.0	1.0	B516818
Dissolved Fluoride (F)	mg/L	<0.050	B525229	2.4	B525229	1.6	0.050	B525229
Hydroxide (OH)	mg/L	<1.0	B516818	<1.0	B516818	<1.0	1.0	B516818
Chloride (Cl)	mg/L	<1.0	B518954	15	B518954	1.2	1.0	B518954
Sulphate (SO4)	mg/L	<1.0	B518954	25	B518954	<1.0	1.0	B518954
MISCELLANEOUS								
True Colour	Col. Unit	<2.0	B515810	18.5	B515810	2.1	2.0	B515810
Nutrients								
Total Ammonia (N)	mg/L	<0.015	B528323	0.39	B528323	0.37	0.015	B528323
Orthophosphate (P)	mg/L	<0.0030	B516618	0.0050	B516618	<0.0030	0.0030	B516618

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVJ636		CVJ637		CVJ638		
Sampling Date		2024/09/09		2024/09/09 16:42		2024/09/09 13:40		
COC Number		C#733646-03-01		C#733646-03-01		C#733646-03-01		
	UNITS	**TRIP BLANK**	**QC Batch**	**T18-01D**	**QC Batch**	**T95R-64**	**RDL**	**QC Batch**
Total Phosphorus (P)	mg/L	<0.0030	B521730	0.046	B521730	0.0076	0.0030	B521730
Nitrate plus Nitrite (N)	mg/L	<0.020	B517402	<0.020	B517402	<0.020	0.020	B516806
Total Nitrogen (N)	mg/L	<0.020	B526045	0.577	B526045	0.472	0.020	B526045
Misc. Organics								
Phenols	mg/L	<0.0015	B526551	<0.0015	B526551	<0.0015	0.0015	B526551
Physical Properties								
Turbidity	NTU	<0.10	B516839	5.4	B516839	2.4	0.10	B516839
RDL = Reportable Detection Limit								

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVJ639		CVJ640		
Sampling Date		2024/09/09 13:40		2024/09/09 19:30		
COC Number		C#733646-03-01		C#733646-03-01		
	UNITS	**T95R-64FD**	**QC Batch**	**FIELD BLANK**	**RDL**	**QC Batch**
ANIONS						
Nitrite (N)	mg/L	<0.0050	B517403	<0.0050	0.0050	B516781
Calculated Parameters						
Dissolved Hardness (CaCO3)	mg/L	56.1	B529822	<0.50	0.50	B516639
Total Hardness (CaCO3)	mg/L	52.2	B540087	<0.50	0.50	B515419
Total Kjeldahl Nitrogen (Calc)	mg/L	0.44	B515626	0.030	0.020	B515626
Nitrate (N)	mg/L	<0.020	B516645	<0.020	0.020	B516645
Misc. Inorganics						
Conductivity	uS/cm	1300	B516820	2.8	2.0	B516820
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	B529965	<0.00050	0.00050	B529965
Dissolved Organic Carbon (C)	mg/L	<0.50	B525368	<0.50	0.50	B525368
pH	pH	8.35	B516821	7.05	N/A	B516821
Acidity (pH 4.5)	mg/L	<1.0	B519219	<1.0	1.0	B519219
Total Organic Carbon (C)	mg/L	<0.50	B525353	<0.50	0.50	B525353
Acidity (pH 8.3)	mg/L	<1.0	B519219	<1.0	1.0	B519219
Total Dissolved Solids	mg/L	780	B518446	<10	10	B518446
Total Suspended Solids	mg/L	<1.0	B518343	<1.0	1.0	B518343
Anions						
Alkalinity (PP as CaCO3)	mg/L	32	B516818	<1.0	1.0	B516818
Alkalinity (Total as CaCO3)	mg/L	750	B516818	2.0	1.0	B516818
Bicarbonate (HCO3)	mg/L	830	B516818	2.4	1.0	B516818
Carbonate (CO3)	mg/L	38	B516818	<1.0	1.0	B516818
Dissolved Fluoride (F)	mg/L	1.6	B525229	<0.050	0.050	B525229
Hydroxide (OH)	mg/L	<1.0	B516818	<1.0	1.0	B516818
Chloride (Cl)	mg/L	1.4	B518954	<1.0	1.0	B518954
Sulphate (SO4)	mg/L	<1.0	B518954	<1.0	1.0	B518954
MISCELLANEOUS						
True Colour	Col. Unit	<2.0	B515810	<2.0	2.0	B515810
Nutrients						
Total Ammonia (N)	mg/L	0.39	B528323	<0.015	0.015	B528323
Orthophosphate (P)	mg/L	0.0054	B516618	<0.0030	0.0030	B516618

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CVJ639		CVJ640		
Sampling Date		2024/09/09 13:40		2024/09/09 19:30		
COC Number		C#733646-03-01		C#733646-03-01		
	UNITS	**T95R-64FD**	**QC Batch**	**FIELD BLANK**	**RDL**	**QC Batch**
Total Phosphorus (P)	mg/L	0.0086	B521730	<0.0030	0.0030	B521730
Nitrate plus Nitrite (N)	mg/L	<0.020	B517402	<0.020	0.020	B516769
Total Nitrogen (N)	mg/L	0.443	B526045	0.030	0.020	B526045
Misc. Organics						
Phenols	mg/L	<0.0015	B526551	<0.0015	0.0015	B526551
Physical Properties						
Turbidity	NTU	2.4	B516839	0.12	0.10	B516839
RDL = Reportable Detection Limit						

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Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		CVJ636	CVJ637	CVJ638	CVJ639	CVJ640		
Sampling Date		2024/09/09	2024/09/09 16:42	2024/09/09 13:40	2024/09/09 13:40	2024/09/09 19:30		
COC Number		C#733646-03-01	C#733646-03-01	C#733646-03-01	C#733646-03-01	C#733646-03-01		
	UNITS	**TRIP BLANK**	**T18-01D**	**T95R-64**	**T95R-64FD**	**FIELD BLANK**	**RDL**	**QC Batch**
Elements								
Dissolved Mercury (Hg)	ug/L	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	0.0019	B517310
Total Mercury (Hg)	ug/L	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	0.0019	B519977
RDL = Reportable Detection Limit								

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Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVJ636			CVJ637		CVJ638		
Sampling Date		2024/09/09			2024/09/09 16:42		2024/09/09 13:40		
COC Number		C#733646-03-01			C#733646-03-01		C#733646-03-01		
	UNITS	**TRIP BLANK**	**RDL**	**QC Batch**	**T18-01D**	**QC Batch**	**T95R-64**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS									
Dissolved Aluminum (Al)	ug/L	<3.0	3.0	B517188	946	B517188	<3.0	3.0	B517188
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	B517188	<0.50	B517188	<0.50	0.50	B517188
Dissolved Barium (Ba)	ug/L	<1.0	1.0	B517188	115	B517188	447	1.0	B530060
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	B517188	<0.10	B517188	<0.10	0.10	B517188
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	B517188	<1.0	B517188	<1.0	1.0	B517188
Dissolved Boron (B)	ug/L	<50	50	B517188	123	B517188	148	50	B517188
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	B517188	<0.010	B517188	<0.010	0.010	B517188
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	B517188	<1.0	B517188	<1.0	1.0	B517188
Dissolved Cobalt (Co)	ug/L	<0.20	0.20	B517188	<0.20	B517188	<0.20	0.20	B517188
Dissolved Copper (Cu)	ug/L	<0.20	0.20	B517188	0.68	B517188	<0.20	0.20	B517188
Dissolved Iron (Fe)	ug/L	<5.0	5.0	B517188	435	B517188	363	5.0	B530060
Dissolved Lead (Pb)	ug/L	<0.20	0.20	B517188	0.72	B517188	<0.20	0.20	B517188
Dissolved Lithium (Li)	ug/L	<2.0	2.0	B517188	41.0	B517188	55.2	2.0	B530060
Dissolved Manganese (Mn)	ug/L	<1.0	1.0	B517188	6.2	B517188	14.9	1.0	B530060
Dissolved Molybdenum (Mo)	ug/L	<1.0	1.0	B517188	14.1	B517188	<1.0	1.0	B517188
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	B517188	<1.0	B517188	<1.0	1.0	B517188
Dissolved Phosphorus (P)	ug/L	<10	10	B517188	33	B517188	13	10	B517188
Dissolved Selenium (Se)	ug/L	<0.10	0.10	B517188	<0.10	B517188	<0.10	0.10	B517188
Dissolved Silver (Ag)	ug/L	<0.020	0.020	B517188	<0.020	B517188	<0.020	0.020	B517188
Dissolved Strontium (Sr)	ug/L	<1.0	1.0	B517188	127	B517188	285	1.0	B530060
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	B517188	<0.010	B517188	<0.010	0.010	B517188
Dissolved Tin (Sn)	ug/L	<5.0	5.0	B517188	<5.0	B517188	<5.0	5.0	B517188
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	B517188	8.2	B517188	<5.0	5.0	B517188
Dissolved Uranium (U)	ug/L	<0.10	0.10	B517188	5.50	B517188	<0.10	0.10	B517188
Dissolved Vanadium (V)	ug/L	<5.0	5.0	B517188	<5.0	B517188	<5.0	5.0	B517188
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	B517188	<5.0	B517188	<5.0	5.0	B517188
Dissolved Calcium (Ca)	mg/L	<0.050	0.050	B515424	3.05	B515424	19.0	0.050	B529824
Dissolved Magnesium (Mg)	mg/L	<0.050	0.050	B515424	0.910	B515424	1.91	0.050	B529824
Dissolved Potassium (K)	mg/L	<0.050	0.050	B515424	2.39	B515424	1.36	0.050	B529824
Dissolved Sodium (Na)	mg/L	<0.050	0.050	B515424	316	B515424	323	0.050	B529824
Dissolved Sulphur (S)	mg/L	<3.0	3.0	B515424	6.6	B515424	<3.0	3.0	B529824
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVJ636			CVJ637		CVJ638		
Sampling Date		2024/09/09			2024/09/09 16:42		2024/09/09 13:40		
COC Number		C#733646-03-01			C#733646-03-01		C#733646-03-01		
	UNITS	**TRIP BLANK**	**RDL**	**QC Batch**	**T18-01D**	**QC Batch**	**T95R-64**	**RDL**	**QC Batch**
Total Metals by ICPMS									
Total Aluminum (Al)	ug/L	<3.0	3.0	B517306	747	B517004	24.9	6.0	B540384
Total Antimony (Sb)	ug/L	<0.50	0.50	B517306	<1.0	B517004	1.6	1.0	B540384
Total Arsenic (As)	ug/L	<0.10	0.10	B517306	8.22	B517004	<0.20	0.20	B540384
Total Barium (Ba)	ug/L	<1.0	1.0	B517306	117	B517004	368	2.0	B540384
Total Beryllium (Be)	ug/L	<0.10	0.10	B517306	<0.20	B517004	<0.20	0.20	B540384
Total Bismuth (Bi)	ug/L	<1.0	1.0	B517306	<2.0	B517004	<2.0	2.0	B540384
Total Boron (B)	ug/L	<50	50	B517306	120	B517004	136	100	B540384
Total Cadmium (Cd)	ug/L	<0.010	0.010	B517306	<0.020	B517004	0.061	0.020	B540384
Total Chromium (Cr)	ug/L	<1.0	1.0	B517306	<2.0	B517004	<2.0	2.0	B540384
Total Cobalt (Co)	ug/L	<0.20	0.20	B517306	<0.40	B517004	<0.40	0.40	B540384
Total Copper (Cu)	ug/L	<0.50	0.50	B517306	1.6	B517004	1.4	1.0	B540384
Total Iron (Fe)	ug/L	<10	10	B517306	592	B517004	349	20	B540384
Total Lead (Pb)	ug/L	<0.20	0.20	B517306	1.86	B517004	<0.40	0.40	B540384
Total Lithium (Li)	ug/L	<2.0	2.0	B517306	41.6	B517004	53.9	4.0	B540384
Total Manganese (Mn)	ug/L	<1.0	1.0	B517306	9.6	B517004	15.3	2.0	B540384
Total Molybdenum (Mo)	ug/L	<1.0	1.0	B517306	11.7	B517004	<2.0	2.0	B540384
Total Nickel (Ni)	ug/L	<1.0	1.0	B517306	<2.0	B517004	3.3	2.0	B540384
Total Phosphorus (P)	ug/L	<10	10	B517306	39	B517004	<20	20	B540384
Total Selenium (Se)	ug/L	<0.10	0.10	B517306	<0.20	B517004	<0.20	0.20	B540384
Total Silver (Ag)	ug/L	<0.020	0.020	B517306	<0.040	B517004	<0.040	0.040	B540384
Total Strontium (Sr)	ug/L	<1.0	1.0	B517306	110	B517004	249	2.0	B540384
Total Thallium (Tl)	ug/L	<0.010	0.010	B517306	<0.020	B517004	0.046	0.020	B540384
Total Tin (Sn)	ug/L	<5.0	5.0	B517306	<10	B517004	<10	10	B540384
Total Titanium (Ti)	ug/L	<5.0	5.0	B517306	<10	B517004	<10	10	B540384
Total Uranium (U)	ug/L	<0.10	0.10	B517306	5.42	B517004	<0.20	0.20	B540384
Total Vanadium (V)	ug/L	<5.0	5.0	B517306	<10	B517004	<10	10	B540384
Total Zinc (Zn)	ug/L	<5.0	5.0	B517306	<10	B517004	<10	10	B540384
Total Calcium (Ca)	mg/L	<0.050	0.050	B515426	3.09	B515426	17.7	0.10	B540094
Total Magnesium (Mg)	mg/L	<0.050	0.050	B515426	0.81	B515426	1.71	0.10	B540094
Total Potassium (K)	mg/L	<0.050	0.050	B515426	2.20	B515426	1.27	0.10	B540094
Total Sodium (Na)	mg/L	<0.050	0.050	B515426	270	B515426	275	0.10	B540094
RDL = Reportable Detection Limit									

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVJ636			CVJ637		CVJ638		
Sampling Date		2024/09/09			2024/09/09 16:42		2024/09/09 13:40		
COC Number		C#733646-03-01			C#733646-03-01		C#733646-03-01		
	UNITS	**TRIP BLANK**	**RDL**	**QC Batch**	**T18-01D**	**QC Batch**	**T95R-64**	**RDL**	**QC Batch**
Total Sulphur (S)	mg/L	<3.0	3.0	B515426	<6.0	B515426	<6.0	6.0	B540094
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVJ639			CVJ640		
Sampling Date		2024/09/09 13:40			2024/09/09 19:30		
COC Number		C#733646-03-01			C#733646-03-01		
	UNITS	**T95R-64FD**	**RDL**	**QC Batch**	**FIELD BLANK**	**RDL**	**QC Batch**
Dissolved Metals by ICPMS							
Dissolved Aluminum (Al)	ug/L	<3.0	3.0	B517188	<3.0	3.0	B517188
Dissolved Antimony (Sb)	ug/L	<0.50	0.50	B517188	<0.50	0.50	B517188
Dissolved Barium (Ba)	ug/L	452	1.0	B530060	<1.0	1.0	B517188
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	B517188	<0.10	0.10	B517188
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	B517188	<1.0	1.0	B517188
Dissolved Boron (B)	ug/L	170	50	B530060	<50	50	B517188
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	B517188	<0.010	0.010	B517188
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	B517188	<1.0	1.0	B517188
Dissolved Cobalt (Co)	ug/L	<0.20	0.20	B517188	<0.20	0.20	B517188
Dissolved Copper (Cu)	ug/L	<0.20	0.20	B517188	0.35	0.20	B517188
Dissolved Iron (Fe)	ug/L	370	5.0	B530060	<5.0	5.0	B517188
Dissolved Lead (Pb)	ug/L	<0.20	0.20	B517188	<0.20	0.20	B517188
Dissolved Lithium (Li)	ug/L	61.3	2.0	B530060	<2.0	2.0	B517188
Dissolved Manganese (Mn)	ug/L	15.2	1.0	B530060	<1.0	1.0	B517188
Dissolved Molybdenum (Mo)	ug/L	<1.0	1.0	B517188	<1.0	1.0	B517188
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	B517188	<1.0	1.0	B517188
Dissolved Phosphorus (P)	ug/L	14	10	B517188	<10	10	B517188
Dissolved Selenium (Se)	ug/L	<0.10	0.10	B517188	<0.10	0.10	B517188
Dissolved Silver (Ag)	ug/L	<0.020	0.020	B517188	<0.020	0.020	B517188
Dissolved Strontium (Sr)	ug/L	300	1.0	B517188	<1.0	1.0	B517188
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	B517188	<0.010	0.010	B517188
Dissolved Tin (Sn)	ug/L	<5.0	5.0	B517188	<5.0	5.0	B517188
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	B517188	<5.0	5.0	B517188
Dissolved Uranium (U)	ug/L	<0.10	0.10	B517188	<0.10	0.10	B517188
Dissolved Vanadium (V)	ug/L	<5.0	5.0	B517188	<5.0	5.0	B517188
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	B517188	<5.0	5.0	B517188
Dissolved Calcium (Ca)	mg/L	19.0	0.050	B529824	<0.050	0.050	B515424
Dissolved Magnesium (Mg)	mg/L	2.09	0.050	B529824	<0.050	0.050	B515424
Dissolved Potassium (K)	mg/L	1.39	0.050	B529824	<0.050	0.050	B515424
Dissolved Sodium (Na)	mg/L	339	0.050	B529824	0.530	0.050	B515424
Dissolved Sulphur (S)	mg/L	<3.0	3.0	B529824	<3.0	3.0	B515424
RDL = Reportable Detection Limit							

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVJ639			CVJ640		
Sampling Date		2024/09/09 13:40			2024/09/09 19:30		
COC Number		C#733646-03-01			C#733646-03-01		
	UNITS	**T95R-64FD**	**RDL**	**QC Batch**	**FIELD BLANK**	**RDL**	**QC Batch**
Total Metals by ICPMS							
Total Aluminum (Al)	ug/L	16.2	6.0	B540384	<3.0	3.0	B517306
Total Antimony (Sb)	ug/L	2.4	1.0	B540384	<0.50	0.50	B517306
Total Arsenic (As)	ug/L	0.23	0.20	B540384	<0.10	0.10	B517306
Total Barium (Ba)	ug/L	372	2.0	B540384	<1.0	1.0	B517306
Total Beryllium (Be)	ug/L	<0.20	0.20	B540384	<0.10	0.10	B517306
Total Bismuth (Bi)	ug/L	<2.0	2.0	B540384	<1.0	1.0	B517306
Total Boron (B)	ug/L	138	100	B540384	<50	50	B517306
Total Cadmium (Cd)	ug/L	0.075	0.020	B540384	<0.010	0.010	B517306
Total Chromium (Cr)	ug/L	<2.0	2.0	B540384	<1.0	1.0	B517306
Total Cobalt (Co)	ug/L	<0.40	0.40	B540384	<0.20	0.20	B517306
Total Copper (Cu)	ug/L	1.9	1.0	B540384	<0.50	0.50	B517306
Total Iron (Fe)	ug/L	353	20	B540384	<10	10	B517306
Total Lead (Pb)	ug/L	<0.40	0.40	B540384	<0.20	0.20	B517306
Total Lithium (Li)	ug/L	53.5	4.0	B540384	<2.0	2.0	B517306
Total Manganese (Mn)	ug/L	15.7	2.0	B540384	<1.0	1.0	B517306
Total Molybdenum (Mo)	ug/L	<2.0	2.0	B540384	<1.0	1.0	B517306
Total Nickel (Ni)	ug/L	4.7	2.0	B540384	<1.0	1.0	B517306
Total Phosphorus (P)	ug/L	<20	20	B540384	<10	10	B517306
Total Selenium (Se)	ug/L	<0.20	0.20	B540384	<0.10	0.10	B517306
Total Silver (Ag)	ug/L	<0.040	0.040	B540384	<0.020	0.020	B517306
Total Strontium (Sr)	ug/L	253	2.0	B540384	<1.0	1.0	B517306
Total Thallium (Tl)	ug/L	0.067	0.020	B540384	<0.010	0.010	B517306
Total Tin (Sn)	ug/L	<10	10	B540384	<5.0	5.0	B517306
Total Titanium (Ti)	ug/L	<10	10	B540384	<5.0	5.0	B517306
Total Uranium (U)	ug/L	<0.20	0.20	B540384	<0.10	0.10	B517306
Total Vanadium (V)	ug/L	<10	10	B540384	<5.0	5.0	B517306
Total Zinc (Zn)	ug/L	<10	10	B540384	<5.0	5.0	B517306
Total Calcium (Ca)	mg/L	18.1	0.10	B540094	<0.050	0.050	B515426
Total Magnesium (Mg)	mg/L	1.72	0.10	B540094	<0.050	0.050	B515426
Total Potassium (K)	mg/L	1.27	0.10	B540094	<0.050	0.050	B515426
Total Sodium (Na)	mg/L	273	0.10	B540094	0.542	0.050	B515426
RDL = Reportable Detection Limit							

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SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CVJ639			CVJ640		
Sampling Date		2024/09/09 13:40			2024/09/09 19:30		
COC Number		C#733646-03-01			C#733646-03-01		
	UNITS	**T95R-64FD**	**RDL**	**QC Batch**	**FIELD BLANK**	**RDL**	**QC Batch**
Total Sulphur (S)	mg/L	<6.0	6.0	B540094	<3.0	3.0	B515426
RDL = Reportable Detection Limit							

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	11.3°C

Version #3: Report reissued to include results for Sulphur and Phosphorus on all samples as per client request received 2024/09/25.
Version #4: Report reissued to include results for Sodium and Potassium on all samples as per client request received 2024/09/25.
Version #5: Report reissued to include reworked total metals results for samples T95R-64 and T95R-64FD (2024/10/01).

Sample CVJ636 [TRIP BLANK] : Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Nitrate + Nitrite (N). Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVJ637 [T18-01D] : Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Nitrate + Nitrite (N). Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVJ638 [T95R-64] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample received past method specified hold time for Color (True) by Automated Analyzer.

Sample CVJ639 [T95R-64FD] : Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample received past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample received past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVJ640 [FIELD BLANK] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water.

Sample CVJ638, Elements by CRC ICPMS (dissolved): Test repeated.
Sample CVJ639, Elements by CRC ICPMS (dissolved): Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B515810	True Colour	2024/09/13			104	80 - 120	<2.0	Col. Unit	5.8	20
B516618	Orthophosphate (P)	2024/09/13			104	80 - 120	<0.0030	mg/L		
B516769	Nitrate plus Nitrite (N)	2024/09/14	113	80 - 120	105	80 - 120	<0.020	mg/L	NC	25
B516781	Nitrite (N)	2024/09/14	105	80 - 120	102	80 - 120	<0.0050	mg/L	NC	20
B516806	Nitrate plus Nitrite (N)	2024/09/14	103	80 - 120	104	80 - 120	<0.020	mg/L	0.99	25
B516808	Nitrite (N)	2024/09/14	111	80 - 120	101	80 - 120	<0.0050	mg/L	NC	20
B516818	Alkalinity (PP as CaCO3)	2024/09/14					<1.0	mg/L	NC	20
B516818	Alkalinity (Total as CaCO3)	2024/09/14			100	80 - 120	<1.0	mg/L	1.5	20
B516818	Bicarbonate (HCO3)	2024/09/14					<1.0	mg/L	NC	20
B516818	Carbonate (CO3)	2024/09/14					<1.0	mg/L	NC	20
B516818	Hydroxide (OH)	2024/09/14					<1.0	mg/L	NC	20
B516820	Conductivity	2024/09/14			100	90 - 110	<2.0	uS/cm	NC	10
B516821	pH	2024/09/14			100	97 - 103			11	N/A
B516839	Turbidity	2024/09/13			103	80 - 120	<0.10	NTU	18	20
B517004	Total Aluminum (Al)	2024/09/17	94	80 - 120	102	80 - 120	<3.0	ug/L	3.9	20
B517004	Total Antimony (Sb)	2024/09/17	99	80 - 120	102	80 - 120	<0.50	ug/L	NC	20
B517004	Total Arsenic (As)	2024/09/17	99	80 - 120	99	80 - 120	<0.10	ug/L	NC	20
B517004	Total Barium (Ba)	2024/09/17	NC	80 - 120	95	80 - 120	<1.0	ug/L	0.21	20
B517004	Total Beryllium (Be)	2024/09/17	95	80 - 120	100	80 - 120	<0.10	ug/L	NC	20
B517004	Total Bismuth (Bi)	2024/09/17	94	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B517004	Total Boron (B)	2024/09/17	102	80 - 120	103	80 - 120	<50	ug/L	5.3	20
B517004	Total Cadmium (Cd)	2024/09/17	96	80 - 120	98	80 - 120	<0.010	ug/L	NC	20
B517004	Total Chromium (Cr)	2024/09/17	94	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
B517004	Total Cobalt (Co)	2024/09/17	92	80 - 120	99	80 - 120	<0.20	ug/L	NC	20
B517004	Total Copper (Cu)	2024/09/17	89	80 - 120	98	80 - 120	<0.50	ug/L	NC	20
B517004	Total Iron (Fe)	2024/09/17	92	80 - 120	100	80 - 120	<10	ug/L	2.5	20
B517004	Total Lead (Pb)	2024/09/17	91	80 - 120	100	80 - 120	<0.20	ug/L	NC	20
B517004	Total Lithium (Li)	2024/09/17	97	80 - 120	99	80 - 120	<2.0	ug/L	1.6	20
B517004	Total Manganese (Mn)	2024/09/17	92	80 - 120	98	80 - 120	<1.0	ug/L	2.1	20
B517004	Total Molybdenum (Mo)	2024/09/17	102	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B517004	Total Nickel (Ni)	2024/09/17	92	80 - 120	99	80 - 120	<1.0	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B517004	Total Phosphorus (P)	2024/09/17	99	80 - 120	99	80 - 120	<10	ug/L	5.5	20
B517004	Total Selenium (Se)	2024/09/17	93	80 - 120	100	80 - 120	<0.10	ug/L	NC	20
B517004	Total Silver (Ag)	2024/09/17	94	80 - 120	97	80 - 120	<0.020	ug/L	NC	20
B517004	Total Strontium (Sr)	2024/09/17	NC	80 - 120	96	80 - 120	<1.0	ug/L	1.3	20
B517004	Total Thallium (Tl)	2024/09/17	96	80 - 120	99	80 - 120	<0.010	ug/L	NC	20
B517004	Total Tin (Sn)	2024/09/17	94	80 - 120	97	80 - 120	<5.0	ug/L	NC	20
B517004	Total Titanium (Ti)	2024/09/17	95	80 - 120	95	80 - 120	<5.0	ug/L	NC	20
B517004	Total Uranium (U)	2024/09/17	102	80 - 120	103	80 - 120	<0.10	ug/L	NC	20
B517004	Total Vanadium (V)	2024/09/17	98	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
B517004	Total Zinc (Zn)	2024/09/17	95	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
B517188	Dissolved Aluminum (Al)	2024/09/16	110	80 - 120	107	80 - 120	<3.0	ug/L	NC	20
B517188	Dissolved Antimony (Sb)	2024/09/16	101	80 - 120	107	80 - 120	<0.50	ug/L	NC	20
B517188	Dissolved Barium (Ba)	2024/09/16	97	80 - 120	105	80 - 120	<1.0	ug/L	NC	20
B517188	Dissolved Beryllium (Be)	2024/09/16	96	80 - 120	105	80 - 120	<0.10	ug/L	NC	20
B517188	Dissolved Bismuth (Bi)	2024/09/16	96	80 - 120	108	80 - 120	<1.0	ug/L	NC	20
B517188	Dissolved Boron (B)	2024/09/16	100	80 - 120	109	80 - 120	<50	ug/L	NC	20
B517188	Dissolved Cadmium (Cd)	2024/09/16	102	80 - 120	107	80 - 120	<0.010	ug/L	NC	20
B517188	Dissolved Chromium (Cr)	2024/09/16	95	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B517188	Dissolved Cobalt (Co)	2024/09/16	102	80 - 120	109	80 - 120	<0.20	ug/L	NC	20
B517188	Dissolved Copper (Cu)	2024/09/16	94	80 - 120	101	80 - 120	<0.20	ug/L	0.11	20
B517188	Dissolved Iron (Fe)	2024/09/16	114	80 - 120	108	80 - 120	<5.0	ug/L	NC	20
B517188	Dissolved Lead (Pb)	2024/09/16	97	80 - 120	106	80 - 120	<0.20	ug/L	NC	20
B517188	Dissolved Lithium (Li)	2024/09/16	93	80 - 120	104	80 - 120	<2.0	ug/L	NC	20
B517188	Dissolved Manganese (Mn)	2024/09/16	95	80 - 120	101	80 - 120	<1.0	ug/L	NC	20
B517188	Dissolved Molybdenum (Mo)	2024/09/16	102	80 - 120	109	80 - 120	<1.0	ug/L	NC	20
B517188	Dissolved Nickel (Ni)	2024/09/16	97	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B517188	Dissolved Phosphorus (P)	2024/09/16	116	80 - 120	112	80 - 120	<10	ug/L	NC	20
B517188	Dissolved Selenium (Se)	2024/09/16	102	80 - 120	106	80 - 120	<0.10	ug/L	NC	20
B517188	Dissolved Silver (Ag)	2024/09/16	101	80 - 120	106	80 - 120	<0.020	ug/L	NC	20
B517188	Dissolved Strontium (Sr)	2024/09/16	NC	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B517188	Dissolved Thallium (Tl)	2024/09/16	100	80 - 120	108	80 - 120	<0.010	ug/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B517188	Dissolved Tin (Sn)	2024/09/16	101	80 - 120	109	80 - 120	<5.0	ug/L	NC	20
B517188	Dissolved Titanium (Ti)	2024/09/16	104	80 - 120	108	80 - 120	<5.0	ug/L	NC	20
B517188	Dissolved Uranium (U)	2024/09/16	104	80 - 120	113	80 - 120	<0.10	ug/L	NC	20
B517188	Dissolved Vanadium (V)	2024/09/16	98	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
B517188	Dissolved Zinc (Zn)	2024/09/16	103	80 - 120	111	80 - 120	<5.0	ug/L	NC	20
B517306	Total Aluminum (Al)	2024/09/16	100	80 - 120	105	80 - 120	<3.0	ug/L	NC	20
B517306	Total Antimony (Sb)	2024/09/16	103	80 - 120	105	80 - 120	<0.50	ug/L	NC	20
B517306	Total Arsenic (As)	2024/09/16	106	80 - 120	110	80 - 120	<0.10	ug/L	NC	20
B517306	Total Barium (Ba)	2024/09/16	99	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B517306	Total Beryllium (Be)	2024/09/16	96	80 - 120	103	80 - 120	<0.10	ug/L	NC	20
B517306	Total Bismuth (Bi)	2024/09/16	100	80 - 120	107	80 - 120	<1.0	ug/L	NC	20
B517306	Total Boron (B)	2024/09/16	101	80 - 120	105	80 - 120	<50	ug/L	NC	20
B517306	Total Cadmium (Cd)	2024/09/16	104	80 - 120	106	80 - 120	<0.010	ug/L	NC	20
B517306	Total Chromium (Cr)	2024/09/16	96	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
B517306	Total Cobalt (Co)	2024/09/16	103	80 - 120	109	80 - 120	<0.20	ug/L	NC	20
B517306	Total Copper (Cu)	2024/09/16	95	80 - 120	100	80 - 120	<0.50	ug/L	NC	20
B517306	Total Iron (Fe)	2024/09/16	102	80 - 120	107	80 - 120	<10	ug/L	NC	20
B517306	Total Lead (Pb)	2024/09/16	100	80 - 120	106	80 - 120	<0.20	ug/L	NC	20
B517306	Total Lithium (Li)	2024/09/16	93	80 - 120	100	80 - 120	<2.0	ug/L	NC	20
B517306	Total Manganese (Mn)	2024/09/16	96	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
B517306	Total Molybdenum (Mo)	2024/09/16	102	80 - 120	106	80 - 120	<1.0	ug/L	NC	20
B517306	Total Nickel (Ni)	2024/09/16	98	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B517306	Total Phosphorus (P)	2024/09/16	118	80 - 120	114	80 - 120	<10	ug/L	NC	20
B517306	Total Selenium (Se)	2024/09/16	101	80 - 120	106	80 - 120	<0.10	ug/L	NC	20
B517306	Total Silver (Ag)	2024/09/16	101	80 - 120	104	80 - 120	<0.020	ug/L	NC	20
B517306	Total Strontium (Sr)	2024/09/16	98	80 - 120	103	80 - 120	<1.0	ug/L	NC	20
B517306	Total Thallium (Tl)	2024/09/16	101	80 - 120	108	80 - 120	<0.010	ug/L	NC	20
B517306	Total Tin (Sn)	2024/09/16	103	80 - 120	107	80 - 120	<5.0	ug/L	NC	20
B517306	Total Titanium (Ti)	2024/09/16	102	80 - 120	107	80 - 120	<5.0	ug/L	NC	20
B517306	Total Uranium (U)	2024/09/16	100	80 - 120	113	80 - 120	<0.10	ug/L	NC	20
B517306	Total Vanadium (V)	2024/09/16	98	80 - 120	101	80 - 120	<5.0	ug/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B517306	Total Zinc (Zn)	2024/09/16	106	80 - 120	111	80 - 120	<5.0	ug/L	NC	20
B517310	Dissolved Mercury (Hg)	2024/09/17	97	80 - 120	97	80 - 120	<0.0019	ug/L	NC	20
B517402	Nitrate plus Nitrite (N)	2024/09/14	NC	80 - 120	106	80 - 120	<0.020	mg/L	0.17 (1)	25
B517403	Nitrite (N)	2024/09/14	126 (2)	80 - 120	101	80 - 120	<0.0050	mg/L	NC	20
B518343	Total Suspended Solids	2024/09/17	103	80 - 120	100	80 - 120	<1.0	mg/L	NC	20
B518446	Total Dissolved Solids	2024/09/17	105	80 - 120	96	80 - 120	<10	mg/L	4.8	20
B518800	Acidity (pH 4.5)	2024/09/16					<1.0	mg/L	NC	20
B518800	Acidity (pH 8.3)	2024/09/16			99	80 - 120	<1.0	mg/L	NC	20
B518954	Chloride (Cl)	2024/09/16	105	80 - 120	99	80 - 120	<1.0	mg/L		
B518954	Sulphate (SO4)	2024/09/16	NC	80 - 120	99	80 - 120	<1.0	mg/L		
B519219	Acidity (pH 4.5)	2024/09/16					<1.0	mg/L	NC	20
B519219	Acidity (pH 8.3)	2024/09/16			99	80 - 120	<1.0	mg/L	NC	20
B519977	Total Mercury (Hg)	2024/09/17	99	80 - 120	99	80 - 120	<0.0019	ug/L	NC	20
B521730	Total Phosphorus (P)	2024/09/18	NC	80 - 120	94	80 - 120	<0.0030	mg/L	0.042	20
B525229	Dissolved Fluoride (F)	2024/09/18	112	80 - 120	101	80 - 120	<0.050	mg/L	3.7	20
B525353	Total Organic Carbon (C)	2024/09/19	111	80 - 120	100	80 - 120	<0.50	mg/L	NC	20
B525368	Dissolved Organic Carbon (C)	2024/09/18	115	80 - 120	99	80 - 120	<0.50	mg/L	NC	20
B526045	Total Nitrogen (N)	2024/09/19	NC	80 - 120	104	80 - 120	<0.020	mg/L	5.2	20
B526551	Phenols	2024/09/18	86	80 - 120	94	80 - 120	<0.0015	mg/L	NC	20
B528323	Total Ammonia (N)	2024/09/19	104	80 - 120	111	80 - 120	<0.015	mg/L	0.37	20
B529965	Strong Acid Dissoc. Cyanide (CN)	2024/09/20	94	80 - 120	99	80 - 120	<0.00050	mg/L	NC	20
B530060	Dissolved Barium (Ba)	2024/09/20			100	80 - 120	<1.0	ug/L		
B530060	Dissolved Boron (B)	2024/09/20			87	80 - 120	<50	ug/L		
B530060	Dissolved Iron (Fe)	2024/09/20			102	80 - 120	<5.0	ug/L		
B530060	Dissolved Lithium (Li)	2024/09/20			87	80 - 120	<2.0	ug/L		
B530060	Dissolved Manganese (Mn)	2024/09/20			94	80 - 120	<1.0	ug/L		
B530060	Dissolved Strontium (Sr)	2024/09/20			95	80 - 120	<1.0	ug/L		
B540384	Total Aluminum (Al)	2024/09/27	NC	80 - 120	102	80 - 120	<3.0	ug/L	2.6	20
B540384	Total Antimony (Sb)	2024/09/27	107	80 - 120	109	80 - 120	<0.50	ug/L	NC	20
B540384	Total Arsenic (As)	2024/09/27	105	80 - 120	106	80 - 120	<0.10	ug/L	1.3	20
B540384	Total Barium (Ba)	2024/09/27	NC	80 - 120	106	80 - 120	<1.0	ug/L	4.0	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B540384	Total Beryllium (Be)	2024/09/27	104	80 - 120	104	80 - 120	<0.10	ug/L	NC	20
B540384	Total Bismuth (Bi)	2024/09/27	105	80 - 120	106	80 - 120	<1.0	ug/L	NC	20
B540384	Total Boron (B)	2024/09/27	103	80 - 120	103	80 - 120	<50	ug/L	NC	20
B540384	Total Cadmium (Cd)	2024/09/27	103	80 - 120	106	80 - 120	<0.010	ug/L	3.9	20
B540384	Total Chromium (Cr)	2024/09/27	105	80 - 120	106	80 - 120	<1.0	ug/L	6.3	20
B540384	Total Cobalt (Co)	2024/09/27	101	80 - 120	103	80 - 120	<0.20	ug/L	1.3	20
B540384	Total Copper (Cu)	2024/09/27	100	80 - 120	103	80 - 120	<0.50	ug/L	3.0	20
B540384	Total Iron (Fe)	2024/09/27	NC	80 - 120	109	80 - 120	<10	ug/L	6.1	20
B540384	Total Lead (Pb)	2024/09/27	109	80 - 120	107	80 - 120	<0.20	ug/L	5.0	20
B540384	Total Lithium (Li)	2024/09/27	102	80 - 120	102	80 - 120	<2.0	ug/L	1.6	20
B540384	Total Manganese (Mn)	2024/09/27	NC	80 - 120	105	80 - 120	<1.0	ug/L	0.93	20
B540384	Total Molybdenum (Mo)	2024/09/27	111	80 - 120	110	80 - 120	<1.0	ug/L	7.1	20
B540384	Total Nickel (Ni)	2024/09/27	103	80 - 120	104	80 - 120	<1.0	ug/L	2.2	20
B540384	Total Phosphorus (P)	2024/09/27	105	80 - 120	104	80 - 120	<10	ug/L	2.0	20
B540384	Total Selenium (Se)	2024/09/27	104	80 - 120	105	80 - 120	<0.10	ug/L	13	20
B540384	Total Silver (Ag)	2024/09/27	102	80 - 120	107	80 - 120	<0.020	ug/L	4.9	20
B540384	Total Strontium (Sr)	2024/09/27	110	80 - 120	105	80 - 120	<1.0	ug/L	1.5	20
B540384	Total Thallium (Tl)	2024/09/27	106	80 - 120	106	80 - 120	<0.010	ug/L	2.7	20
B540384	Total Tin (Sn)	2024/09/27	103	80 - 120	108	80 - 120	<5.0	ug/L	NC	20
B540384	Total Titanium (Ti)	2024/09/27	NC	80 - 120	107	80 - 120	<5.0	ug/L	1.1	20
B540384	Total Uranium (U)	2024/09/27	107	80 - 120	105	80 - 120	<0.10	ug/L	0.96	20
B540384	Total Vanadium (V)	2024/09/27	107	80 - 120	104	80 - 120	<5.0	ug/L	6.4	20

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B540384	Total Zinc (Zn)	2024/09/27	105	80 - 120	105	80 - 120	<5.0	ug/L	3.8	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Detection limit raised due to interferent.

(2) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

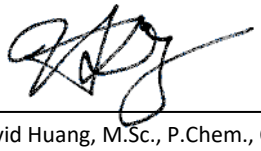
Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Bureau Veritas Job #: C472226
Report Date: 2024/10/01

SLR CONSULTING (CANADA) LTD
Client Project #: 201.V24219.00000
Site Location: TENAS
Your P.O. #: VAN16079
Sampler Initials: GH

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



David Huang, M.Sc., P.Chem., QP, Scientific Services Manager

Ghayasuddin Khan, M.Sc., P.Chem., QP, Scientific Specialist, Inorganics

Mauro Oselin, P.Chem., QP, Scientific Specialist

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Automated Statchk

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, General Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

C472226
2024/09/13 10:40

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#1776 SLR CONSULTING (CANADA) LTD	Company Name	SLR CONSULTING	Quotation #	C40429	Bureau Veritas Job #	Bottle Order #: 733646
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			
Address	#200 - 887 Great Northern Way VANCOUVER BC V5T 4T5	Address	88 F GREAT NOTHERN WAY VANCOUVER	Project #	201-V2421 9.00000	Chain Of Custody Record	Project Manager
Phone	(604) 738-2500 Fax: (604) 738-2542	Phone	Fax:	Project Name	TENAS	C#733646-03-01	Nahed Amer
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Site #			
				Sampled By	GLENN HALL + BECKS BRADFORD		

Regulatory Criteria:
- [ ] CSR
- [ ] CCME
- [ ] BC Water Quality
- [ ] Other

Special Instructions: PLEASE INCLUDE ANALYSIS LISTED IN THE COMMENTS FOR ALL SAMPLES.

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: (will be applied if Rush TAT is not specified): [X]
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY [ ] 2 Day [ ] 3 Day [ ] Date Required: _____ [ ]
Rush Confirmation Number: _____ (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Color (True) by Automated Analyzer	Conductivity @25C	pH @25°C	Total Suspended Solids (NFR)	Total Dissolved Solids (Filt. Residue)	Turbidity	Acidity pH 4.5 & pH 8.3 (as CaCO3)	Alkalinity @25C (pp, total), CO3,HCO3,OH	Ammonia-N (Total)	Total Kjeldahl Nitrogen (Total), Nitrate, Nitrite	# of Bottles	Comments
1	TENAS POUR CREEK T18-OID	TRIP BLANK	2024/09/09			N	X	X	X	X	X	X	X	X	X	X	12	PLEASE INCLUDE THE FOLLOWING IN ALL SAMPLES:
2	TENAS POUR CREEK	T18-OID	2024/09/09	16:42	GW	N	X	X	X	X	X	X	X	X	X	X	12	• CYANIDE (TOTAL)
3	TENAS POUR CREEK	T95R-64	2024/09/09	13:40	GW	N	X	X	X	X	X	X	X	X	X	X	12	• PHENOLS (4-AAP)
4	TENAS POUR CREEK	T95R-64 FD	2024/09/09	13:40	GW	N	X	X	X	X	X	X	X	X	X	X	12	• TOTAL Fe, Li, Mn, Hg, Mo,
5	TENAS POUR CREEK	FIELD BLANK	2024/09/09	19:30	WATER	N	X	X	X	X	X	X	X	X	X	X	12	Ni, Se, Ag, Sr, Tl, Sn, Ti, U, V, Zn
6																		
7																		
8																		
9																		
10																		

MVAN-2024-09-777

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
REBECCA BRADFORD	24/09/11	08:15	Ian Irem Ates	2024/09/13	10:40		[ ]	10/12/12	[ ] Yes [X] No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

ICE MELTED.

C472226
2024/09/13 10:40

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#1776 SLR CONSULTING (CANADA) LTD	Company Name	SLR CONSULTING	Quotation #	C40429	Bureau Veritas Job #	Bottle Order #: 733646
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			
Address	#200 - 887 Great Northern Way VANCOUVER BC V5T 4T5	Address	887 GREAT NOTHERN WAY VANCOUVER, BC	Project #	201.V24219.00000	Chain Of Custody Record	Project Manager
Phone	(604) 738-2500 Fax: (604) 738-2542	Phone	Fax:	Project Name	TENAS	C#733646-03-02	Nahed Amer
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Site #			
				Sampled By	GLENN HALL + ISECKS BRADFORD		

Regulatory Criteria:
- ☐ CSR
- ☐ CCME
- ☐ BC Water Quality
- ☐ Other _____

Special Instructions

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified): ☑
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Nitrogen (Total)	Orthophosphate by Automated Analyzer	Total Phosphorus	Fluoride	Chloride/Sulphate by Auto Colourimetry	Carbon (DOC)	Carbon (Total Organic)	Dissolved Al,Sb,As,Ba,Be,Bi,B,Cd,Cr,Co,Cu,Pb, Hardness	Dissolved Fe,Li,Mn,Hg,Mo,Ni,Se,Ag,Sr,Tl,Sn,Ti, U,V,Zn	Total Al,Sb,As,Ba,Be,Bi,B,Cd,Cr,Co,Cu,Pb, Hardness	# of Bottles	Comments
1	TENAS FOUR CREEK	TRIP BLANK	2024/09/09			Y	X	X	X	X	X	X	X	X	X	X	12	
2	TEN AS FOUR CREEK	T18-01D	2024/09/09	16:42	GW	Y	X	X	X	X	X	X	X	X	X	X	12	
3	TENAS FOUR CREEK	T95R-64	2024/09/09	13:40	GW	Y	X	X	X	X	X	X	X	X	X	X	12	
4	TENAS FOUR CREEK	T95R-64 FD	2024/09/09	13:40	GW	Y	X	X	X	X	X	X	X	X	X	X	12	
5	TENAS FOUR CREEK	FIELD BLANK	2024/09/09	19:30	WATER	Y	X	X	X	X	X	X	X	X	X	X	12	
6																		
7																		
8																		
9																		
10																		

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# Jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
REBECCA BRADFORD	24/09/11	08:15	[illegible]	2024/09/13	10:40		☐	10/12/12	☐ Yes ☒ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

ICE MELTED.

Your Project #: 1905903 TENAS 2024
Your C.O.C. #: C#728282-01-01

Attention: Nathalie Brandebourger

Palmer Environmental Consulting Group (PECG)
#630 – 470 Granville Street
Vancouver, BC
CANADA V6C 1V5

Report Date: 2024/07/24
Report #: R3531668
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453392
Received: 2024/07/16, 09:30

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Acidity pH 4.5 & pH 8.3 (as CaCO3)	6	N/A	2024/07/19	BBY6SOP-00037	SM 24 2310 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	5	N/A	2024/07/17	BBY6SOP-00026	SM 24 2320 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2024/07/19	BBY6SOP-00026	SM 24 2320 B m
Chloride/Sulphate by Auto Colourimetry	6	N/A	2024/07/18	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Cyanide (total) (1)	4	N/A	2024/07/22	CAL SOP-00270	SM 24 4500-CN m
Color (Apparent) by Automated Analyzer	6	N/A	2024/07/19	BBY6SOP-00057	SM 24 2120-C m
Color (True) by Automated Analyzer	5	N/A	2024/07/17	BBY6SOP-00057	SM 24 2120 C m
Color (True) by Automated Analyzer	1	N/A	2024/07/19	BBY6SOP-00057	SM 24 2120 C m
Carbon (DOC) -Lab Filtered (2)	1	N/A	2024/07/19	BBY6SOP-00053	SM 24 5310 B m
Carbon (DOC) (2)	3	N/A	2024/07/20	BBY6SOP-00053	SM 24 5310 B m
Carbon (DOC) (2)	2	N/A	2024/07/22	BBY6SOP-00053	SM 24 5310 B m
Fluoride	5	N/A	2024/07/17	BBY6SOP-00037	SM 24 4500-F C m
Fluoride	1	N/A	2024/07/19	BBY6SOP-00037	SM 24 4500-F C m
Hardness Total (calculated as CaCO3) (3)	4	N/A	2024/07/19	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (3)	1	N/A	2024/07/22	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (3)	1	N/A	2024/07/23	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	5	N/A	2024/07/18	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2024/07/24	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV (4)	6	2024/07/22	2024/07/22	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Mercury (Total) by CV	5	2024/07/22	2024/07/23	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Mercury (Total) by CV	1	2024/07/23	2024/07/23	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Ion Ratio (Cation sum/Anion sum)	1	N/A	2024/07/19	BBY WI-00033	Auto Calc
Ion Ratio (Cation sum/Anion sum)	5	N/A	2024/07/22	BBY WI-00033	Auto Calc
Ion Balance	1	N/A	2024/07/19	BBY WI-00033	Auto Calc
Ion Balance	5	N/A	2024/07/22	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	5	N/A	2024/07/18	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2024/07/24	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved) (4)	6	N/A	2024/07/18	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	4	2024/07/16	2024/07/19	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	2024/07/16	2024/07/22	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	2024/07/16	2024/07/23	BBY WI-00033	Auto Calc

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 1905903 TENAS 2024
Your C.O.C. #: C#728282-01-01

Attention: Nathalie Brandebourger

Palmer Environmental Consulting Group (PECG)
#630 – 470 Granville Street
Vancouver, BC
CANADA V6C 1V5

Report Date: 2024/07/24
Report #: R3531668
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453392
Received: 2024/07/16, 09:30

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by CRC ICPMS (total)	4	2024/07/18	2024/07/18	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2024/07/18	2024/07/20	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Elements by CRC ICPMS (total)	1	2024/07/20	2024/07/23	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrogen (Total)	6	N/A	2024/07/19	BBY6SOP-00016	SM 24 4500-N C m
Ammonia-N (Total)	4	N/A	2024/07/22	AB SOP-00007	SM 24 4500 NH3 A G m
Nitrate + Nitrite (N)	5	N/A	2024/07/17	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrate + Nitrite (N)	1	N/A	2024/07/18	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrite (N) Regular Level Water	5	N/A	2024/07/17	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrite (N) Regular Level Water	1	N/A	2024/07/18	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrogen - Nitrate (as N)	6	N/A	2024/07/19	BBY WI-00033	Auto Calc
pH @25°C (5)	5	N/A	2024/07/17	BBY6SOP-00026	SM 24 4500-H+ B m
pH @25°C (5)	1	N/A	2024/07/19	BBY6SOP-00026	SM 24 4500-H+ B m
Phenols (4-AAP) (1)	6	N/A	2024/07/22	AB SOP-00088	EPA 9066 R0 m
Orthophosphate by Automated Analyzer (6)	6	N/A	2024/07/20	BBY6SOP-00013	SM 24 4500-P E m
Total Dissolved Solids (Filt. Residue)	1	2024/07/18	2024/07/18	BBY6SOP-00033	SM 24 2540 C m
Total Dissolved Solids (Filt. Residue)	5	2024/07/18	2024/07/19	BBY6SOP-00033	SM 24 2540 C m
Total Kjeldahl Nitrogen (Total)	6	N/A	2024/07/19	BBY WI-00033	Auto Calc
Carbon (Total Organic) (7)	6	N/A	2024/07/19	BBY6SOP-00053	SM 24 5310 B m
Total Phosphorus	6	2024/07/17	2024/07/19	BBY6SOP-00013	SM 24 4500-P E m
Total Suspended Solids (NFR)	6	2024/07/17	2024/07/18	BBY6SOP-00034	SM 24 2540 D m
Turbidity	5	N/A	2024/07/17	BBY6SOP-00027	SM 24 2130 B m
Turbidity	1	N/A	2024/07/18	BBY6SOP-00027	SM 24 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are

Your Project #: 1905903 TENAS 2024
Your C.O.C. #: C#728282-01-01

Attention: Nathalie Brandebourger

Palmer Environmental Consulting Group (PECG)
#630 – 470 Granville Street
Vancouver, BC
CANADA V6C 1V5

Report Date: 2024/07/24
Report #: R3531668
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453392
Received: 2024/07/16, 09:30

reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) DOC present in the sample should be considered as non-purgeable DOC. Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(3) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(4) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(6) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(7) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

AUTHORIZED REPORT
RAPPORT AUTORISÉ

Bureau Veritas
24 Jul 2024 14:50:00

Please direct all questions regarding this Certificate of Analysis to:
Nahed Amer, Key Account Specialist
Email: Nahed.AMER@bureauveritas.com
Phone# (604) 734 7276

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI441			CRI442		
Sampling Date		2024/07/09 16:00			2024/07/08 14:30		
COC Number		C#728282-01-01			C#728282-01-01		
	UNITS	T19-18S	RDL	QC Batch	T0B96-02-06	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	<0.0050	0.0050	B443829	<0.0050	0.0050	B442329
Calculated Parameters							
Dissolved Hardness (CaCO3)	mg/L	219	0.50	B440213	309	0.50	B440213
Total Hardness (CaCO3)	mg/L	216	0.50	B440451	274	0.50	B440451
Ion Balance (% Difference)	%	1.2	N/A	B440608	0.21	N/A	B440608
Ion Ratio (cation sum / anion sum)	N/A	0.98	0.010	B440605	1.0	0.010	B440605
Nitrate (N)	mg/L	<0.020	0.020	B440455	<0.020	0.020	B440455
Total Total Kjeldahl Nitrogen (Calc)	mg/L	3.59	0.10	B440550	0.063	0.020	B440550
Misc. Inorganics							
Strong Acid Dissoc. Cyanide (CN)	mg/L				<0.00050	0.00050	B447922
Dissolved Organic Carbon (C)	mg/L	14	0.50	B446050	1.0	0.50	B446050
pH	pH	8.20	N/A	B444332	8.03	N/A	B442505
Acidity (pH 4.5)	mg/L	<1.0	1.0	B444456	<1.0	1.0	B444456
Total Organic Carbon (C)	mg/L	41	5.0	B446160	0.82	0.50	B446160
Acidity (pH 8.3)	mg/L	<1.0	1.0	B444456	3.3	1.0	B444456
Total Dissolved Solids	mg/L	600	10	B444500	340	10	B443397
Total Suspended Solids	mg/L	9.2	1.0	B442803	25	1.0	B442258
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B444278	<1.0	1.0	B442520
Alkalinity (Total as CaCO3)	mg/L	240	1.0	B444278	320	1.0	B442520
Bicarbonate (HCO3)	mg/L	290	1.0	B444278	390	1.0	B442520
Carbonate (CO3)	mg/L	<1.0	1.0	B444278	<1.0	1.0	B442520
Dissolved Fluoride (F)	mg/L	0.18	0.050	B444257	0.086	0.050	B442375
Hydroxide (OH)	mg/L	<1.0	1.0	B444278	<1.0	1.0	B442520
Chloride (Cl)	mg/L	13	1.0	B444245	<1.0	1.0	B442408
Sulphate (SO4)	mg/L	220	5.0	B444245	13	1.0	B442408
MISCELLANEOUS							
True Colour	Col. Unit	15.8	2.0	B446199	<2.0	2.0	B442256
Nutrients							
Total Ammonia (N)	mg/L				<0.015	0.015	B448334
Orthophosphate (P)	mg/L	0.063	0.0030	B446674	0.0042	0.0030	B446674

RDL = Reportable Detection Limit
N/A = Not Applicable

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI441			CRI442		
Sampling Date		2024/07/09 16:00			2024/07/08 14:30		
COC Number		C#728282-01-01			C#728282-01-01		
	UNITS	**T19-18S**	**RDL**	**QC Batch**	**T0B96-02-06**	**RDL**	**QC Batch**
Total Phosphorus (P)	mg/L	1.3	0.015	B442178	0.0056	0.0030	B442178
Nitrate plus Nitrite (N)	mg/L	<0.020	0.020	B443802	<0.020	0.020	B442322
Total Nitrogen (N)	mg/L	3.59	0.10	B443545	0.063	0.020	B443545
Misc. Organics							
Phenols	mg/L	0.0043	0.0015	B447464	<0.0015	0.0015	B447464
Physical Properties							
Turbidity	NTU	9.8	0.10	B443699	380	0.10	B442470
Apparent Colour	PtCo units	32	2.0	B445995	9.8	2.0	B445995
RDL = Reportable Detection Limit							

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI443			CRI444		CRI445		
Sampling Date		2024/07/09 17:30			2024/07/09 12:00		2024/07/08 18:00		
COC Number		C#728282-01-01			C#728282-01-01		C#728282-01-01		
	UNITS	T0B96-01-05	RDL	QC Batch	T95R-40	QC Batch	T18-01D	RDL	QC Batch
ANIONS									
Nitrite (N)	mg/L	<0.0050	0.0050	B442329	<0.0050	B442329	0.0062	0.0050	B442329
Calculated Parameters									
Dissolved Hardness (CaCO3)	mg/L	357	0.50	B449714	112	B440213	9.34	0.50	B440213
Total Hardness (CaCO3)	mg/L	312	0.50	B440451	101	B440451	11.4	0.50	B440451
Ion Balance (% Difference)	%	2.3	N/A	B440608	1.3	B440608	3.5	N/A	B440608
Ion Ratio (cation sum / anion sum)	N/A	1.0	0.010	B440605	1.0	B440605	1.1	0.010	B440605
Nitrate (N)	mg/L	<0.020	0.020	B440455	<0.020	B440455	<0.020	0.020	B440455
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.481	0.020	B440550	0.926	B440550	1.49	0.020	B440550
Misc. Inorganics									
Strong Acid Dissoc. Cyanide (CN)	mg/L				<0.00050	B447922	<0.00050	0.00050	B447922
Dissolved Organic Carbon (C)	mg/L				0.80	B446050	2.3	0.50	B447471
pH	pH	7.91	N/A	B442505	7.96	B442505	8.44	N/A	B442505
Acidity (pH 4.5)	mg/L	<1.0	1.0	B445389	<1.0	B444339	<1.0	1.0	B444339
Total Organic Carbon (C)	mg/L	90	0.50	B446160	0.95	B446160	2.6	0.50	B446160
Acidity (pH 8.3)	mg/L	<1.0	1.0	B445389	2.1	B444339	<1.0	1.0	B444339
Total Dissolved Solids	mg/L	420	10	B443397	1800	B443397	790	10	B443397
Total Suspended Solids	mg/L	57	1.0	B442803	17	B442258	42	1.0	B442258
Lab Filtered Inorganics									
Dissolved Organic Carbon (C)	mg/L	91 (1)	0.50	B445386					
Anions									
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B442520	<1.0	B442520	21	1.0	B442520
Alkalinity (Total as CaCO3)	mg/L	340	1.0	B442520	1700	B442520	610	1.0	B442520
Bicarbonate (HCO3)	mg/L	410	1.0	B442520	2000	B442520	690	1.0	B442520
Carbonate (CO3)	mg/L	<1.0	1.0	B442520	<1.0	B442520	25	1.0	B442520
Dissolved Fluoride (F)	mg/L	0.070	0.050	B442375	0.49	B442375	2.1	0.050	B442375
Hydroxide (OH)	mg/L	<1.0	1.0	B442520	<1.0	B442520	<1.0	1.0	B442520
Chloride (Cl)	mg/L	<1.0	1.0	B442408	12	B442408	15	1.0	B442408
Sulphate (SO4)	mg/L	41	1.0	B442408	10	B442408	25	1.0	B442408
MISCELLANEOUS									
True Colour	Col. Unit	16.9	2.0	B442256	<2.0	B442323	3.4	2.0	B442323

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Sample filtered and preserved past method specified hold time

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI443			CRI444		CRI445		
Sampling Date		2024/07/09 17:30			2024/07/09 12:00		2024/07/08 18:00		
COC Number		C#728282-01-01			C#728282-01-01		C#728282-01-01		
	UNITS	T0B96-01-05	RDL	QC Batch	T95R-40	QC Batch	T18-01D	RDL	QC Batch
Nutrients									
Total Ammonia (N)	mg/L				0.60	B448334	0.37	0.015	B448334
Orthophosphate (P)	mg/L	0.0077 (1)	0.0030	B446674	0.0074	B446674	0.0043	0.0030	B446715
Total Phosphorus (P)	mg/L	0.065	0.0030	B442178	0.087	B442178	0.080	0.0030	B442178
Nitrate plus Nitrite (N)	mg/L	<0.020	0.020	B442322	<0.020	B442322	<0.020	0.020	B442322
Total Nitrogen (N)	mg/L	0.481	0.020	B443545	0.926	B443545	1.49	0.020	B443545
Misc. Organics									
Phenols	mg/L	<0.0015	0.0015	B447464	<0.0015	B447464	<0.0015	0.0015	B447464
Physical Properties									
Turbidity	NTU	31	0.10	B442470	0.63	B442470	4.9	0.10	B442470
Apparent Colour	PtCo units	12	2.0	B445995	2.4	B445995	39	2.0	B445995

RDL = Reportable Detection Limit
(1) Matrix spike exceeds acceptance limits due to matrix interference.

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI446		
Sampling Date		2024/07/08 18:00		
COC Number		C#728282-01-01		
	UNITS	DUP-B	RDL	QC Batch
ANIONS				
Nitrite (N)	mg/L	<0.0050	0.0050	B442329
Calculated Parameters				
Dissolved Hardness (CaCO3)	mg/L	9.34	0.50	B440213
Total Hardness (CaCO3)	mg/L	11.6	0.50	B440451
Ion Balance (% Difference)	%	3.8	N/A	B440608
Ion Ratio (cation sum / anion sum)	N/A	1.1	0.010	B440605
Nitrate (N)	mg/L	<0.020	0.020	B440455
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.730	0.020	B440550
Misc. Inorganics				
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	0.00050	B447922
Dissolved Organic Carbon (C)	mg/L	2.4	0.50	B447471
pH	pH	8.38	N/A	B442505
Acidity (pH 4.5)	mg/L	<1.0	1.0	B444339
Total Organic Carbon (C)	mg/L	2.4	0.50	B446160
Acidity (pH 8.3)	mg/L	<1.0	1.0	B444339
Total Dissolved Solids	mg/L	790	10	B443397
Total Suspended Solids	mg/L	26	1.0	B442258
Anions				
Alkalinity (PP as CaCO3)	mg/L	19	1.0	B442520
Alkalinity (Total as CaCO3)	mg/L	620	1.0	B442520
Bicarbonate (HCO3)	mg/L	710	1.0	B442520
Carbonate (CO3)	mg/L	23	1.0	B442520
Dissolved Fluoride (F)	mg/L	2.2	0.050	B442375
Hydroxide (OH)	mg/L	<1.0	1.0	B442520
Chloride (Cl)	mg/L	15	1.0	B442408
Sulphate (SO4)	mg/L	25	1.0	B442408
MISCELLANEOUS				
True Colour	Col. Unit	3.1	2.0	B442323
Nutrients				
Total Ammonia (N)	mg/L	0.37	0.015	B448334
Orthophosphate (P)	mg/L	0.012	0.0030	B446674

RDL = Reportable Detection Limit
N/A = Not Applicable

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI446		
Sampling Date		2024/07/08 18:00		
COC Number		C#728282-01-01		
	UNITS	**DUP-B**	**RDL**	**QC Batch**
Total Phosphorus (P)	mg/L	0.052	0.0030	B442178
Nitrate plus Nitrite (N)	mg/L	<0.020	0.020	B442322
Total Nitrogen (N)	mg/L	0.730	0.020	B443545
Misc. Organics				
Phenols	mg/L	<0.0015	0.0015	B447464
Physical Properties				
Turbidity	NTU	3.9	0.10	B442470
Apparent Colour	PtCo units	34	2.0	B445995
RDL = Reportable Detection Limit				

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MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		CRI441			CRI442	CRI443	CRI444		
Sampling Date		2024/07/09 16:00			2024/07/08 14:30	2024/07/09 17:30	2024/07/09 12:00		
COC Number		C#728282-01-01			C#728282-01-01	C#728282-01-01	C#728282-01-01		
	UNITS	T19-18S	RDL	QC Batch	T0B96-02-06	T0B96-01-05	T95R-40	RDL	QC Batch
Elements									
Dissolved Mercury (Hg)	ug/L	<0.0019	0.0019	B447719	<0.0019	0.0035 (1)	<0.0019	0.0019	B447719
Total Mercury (Hg)	ug/L	<0.0095 (2)	0.0095	B449571	<0.0019	<0.0019 (1)	<0.0019	0.0019	B448098

RDL = Reportable Detection Limit
(1) Sample received was not in compliance with BC CSR sampling requirements for Mercury in water.
(2) RDL raised due to limited sample volume. Sample received was not in compliance with BC CSR sampling requirements for Mercury in water.

Bureau Veritas ID		CRI445	CRI446		
Sampling Date		2024/07/08 18:00	2024/07/08 18:00		
COC Number		C#728282-01-01	C#728282-01-01		
	UNITS	T18-01D	DUP-B	RDL	QC Batch
Elements					
Dissolved Mercury (Hg)	ug/L	<0.0019	<0.0019	0.0019	B447719
Total Mercury (Hg)	ug/L	<0.0019	<0.0019	0.0019	B448098

RDL = Reportable Detection Limit

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI441			CRI442		CRI443		
Sampling Date		2024/07/09 16:00			2024/07/08 14:30		2024/07/09 17:30		
COC Number		C#728282-01-01			C#728282-01-01		C#728282-01-01		
	UNITS	T19-18S	RDL	QC Batch	T0B96-02-06	QC Batch	T0B96-01-05	RDL	QC Batch
Dissolved Metals by ICPMS									
Dissolved Aluminum (Al)	ug/L	<3.0	3.0	B442119	<3.0	B442119	5.9	3.0	B442119
Dissolved Antimony (Sb)	ug/L	0.75	0.50	B442119	<0.50	B442119	0.51	0.50	B442119
Dissolved Arsenic (As)	ug/L	2.79	0.10	B442119	0.14	B442119	1.11	0.10	B442119
Dissolved Barium (Ba)	ug/L	82.4	1.0	B442119	128	B442119	175	1.0	B442119
Dissolved Beryllium (Be)	ug/L	<0.10	0.10	B442119	<0.10	B442119	<0.10	0.10	B442119
Dissolved Bismuth (Bi)	ug/L	<1.0	1.0	B442119	<1.0	B442119	<1.0	1.0	B442119
Dissolved Boron (B)	ug/L	69	50	B442119	<50	B442119	<50	50	B442119
Dissolved Cadmium (Cd)	ug/L	<0.010	0.010	B442119	0.021	B442119	0.015	0.010	B442119
Dissolved Chromium (Cr)	ug/L	<1.0	1.0	B442119	<1.0	B442119	<1.0	1.0	B442119
Dissolved Cobalt (Co)	ug/L	<0.20	0.20	B442119	<0.20	B442119	0.90	0.20	B442119
Dissolved Copper (Cu)	ug/L	0.44	0.20	B442119	0.54	B442119	1.03	0.20	B442119
Dissolved Iron (Fe)	ug/L	177	5.0	B450485	<5.0	B442119	21.4	5.0	B442119
Dissolved Lead (Pb)	ug/L	<0.20	0.20	B442119	<0.20	B442119	<0.20	0.20	B442119
Dissolved Lithium (Li)	ug/L	3.8	2.0	B442119	4.2	B442119	2.9	2.0	B442119
Dissolved Manganese (Mn)	ug/L	585	1.0	B450485	33.9	B442119	350	1.0	B442119
Dissolved Molybdenum (Mo)	ug/L	15.1	1.0	B442119	<1.0	B442119	1.3	1.0	B442119
Dissolved Nickel (Ni)	ug/L	<1.0	1.0	B442119	<1.0	B442119	2.4	1.0	B442119
Dissolved Phosphorus (P)	ug/L	12	10	B442119	<10	B442119	16	10	B442119
Dissolved Selenium (Se)	ug/L	<0.10	0.10	B442119	<0.10	B442119	0.11	0.10	B442119
Dissolved Silicon (Si)	ug/L	4430	100	B442119	5820	B442119	4690	100	B442119
Dissolved Silver (Ag)	ug/L	<0.020	0.020	B442119	<0.020	B442119	<0.020	0.020	B442119
Dissolved Strontium (Sr)	ug/L	575	1.0	B442119	449	B442119	596	1.0	B442119
Dissolved Thallium (Tl)	ug/L	<0.010	0.010	B442119	<0.010	B442119	<0.010	0.010	B442119
Dissolved Tin (Sn)	ug/L	<5.0	5.0	B442119	<5.0	B442119	<5.0	5.0	B442119
Dissolved Titanium (Ti)	ug/L	<5.0	5.0	B442119	<5.0	B442119	<5.0	5.0	B442119
Dissolved Tungsten (W)	ug/L	<1.0	1.0	B442119	<1.0	B442119	<1.0	1.0	B442119
Dissolved Uranium (U)	ug/L	1.02	0.10	B442119	1.14	B442119	2.36	0.10	B442119
Dissolved Vanadium (V)	ug/L	<5.0	5.0	B442119	<5.0	B442119	<5.0	5.0	B442119
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	B442119	<5.0	B442119	<5.0	5.0	B442119
Dissolved Zirconium (Zr)	ug/L	<0.10	0.10	B442119	<0.10	B442119	0.30	0.10	B442119
Dissolved Calcium (Ca)	mg/L	53.9	0.050	B440542	80.0	B440542	90.9	0.050	B449739
Dissolved Magnesium (Mg)	mg/L	20.5	0.050	B440542	26.5	B440542	31.6	0.050	B449739
Dissolved Potassium (K)	mg/L	1.88	0.050	B440542	0.897	B440542	1.19	0.050	B449739

RDL = Reportable Detection Limit

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI441			CRI442		CRI443		
Sampling Date		2024/07/09 16:00			2024/07/08 14:30		2024/07/09 17:30		
COC Number		C#728282-01-01			C#728282-01-01		C#728282-01-01		
	UNITS	T19-18S	RDL	QC Batch	T0B96-02-06	QC Batch	T0B96-01-05	RDL	QC Batch
Dissolved Sodium (Na)	mg/L	114	0.050	B440542	11.4	B440542	20.7	0.050	B449739
Dissolved Sulphur (S)	mg/L	77.6	3.0	B440542	4.2	B440542	17.5	3.0	B449739
Total Metals by ICPMS									
Total Aluminum (Al)	ug/L	158	15	B446570	326	B443191	744	3.0	B443191
Total Antimony (Sb)	ug/L	<2.5	2.5	B446570	<0.50	B443191	0.53	0.50	B443191
Total Arsenic (As)	ug/L	3.55	0.50	B446570	0.21	B443191	0.96	0.10	B443191
Total Barium (Ba)	ug/L	78.7	5.0	B446570	119	B443191	174	1.0	B443191
Total Beryllium (Be)	ug/L	<0.50	0.50	B446570	<0.10	B443191	<0.10	0.10	B443191
Total Bismuth (Bi)	ug/L	<5.0	5.0	B446570	<1.0	B443191	<1.0	1.0	B443191
Total Boron (B)	ug/L	<250	250	B446570	<50	B443191	<50	50	B443191
Total Cadmium (Cd)	ug/L	0.053	0.050	B446570	0.024	B443191	0.099	0.010	B443191
Total Chromium (Cr)	ug/L	<5.0	5.0	B446570	<1.0	B443191	<1.0	1.0	B443191
Total Cobalt (Co)	ug/L	<1.0	1.0	B446570	<0.20	B443191	0.60	0.20	B443191
Total Copper (Cu)	ug/L	3.7	2.5	B446570	<0.50	B443191	3.77	0.50	B443191
Total Iron (Fe)	ug/L	<50	50	B446570	174	B443191	550	10	B443191
Total Lead (Pb)	ug/L	<1.0	1.0	B446570	0.38	B443191	0.95	0.20	B443191
Total Lithium (Li)	ug/L	<10	10	B446570	3.6	B443191	2.9	2.0	B443191
Total Manganese (Mn)	ug/L	385	5.0	B446570	91.1	B443191	299	1.0	B443191
Total Molybdenum (Mo)	ug/L	7.6	5.0	B446570	<1.0	B443191	1.4	1.0	B443191
Total Nickel (Ni)	ug/L	<5.0	5.0	B446570	<1.0	B443191	2.6	1.0	B443191
Total Phosphorus (P)	ug/L	563	50	B446570	<10	B443191	37	10	B443191
Total Selenium (Se)	ug/L	<0.50	0.50	B446570	<0.10	B443191	0.15	0.10	B443191
Total Silicon (Si)	ug/L	4950	500	B446570	6240	B443191	5660	100	B443191
Total Silver (Ag)	ug/L	<0.10	0.10	B446570	<0.020	B443191	0.026	0.020	B443191
Total Strontium (Sr)	ug/L	489	5.0	B446570	423	B443191	547	1.0	B443191
Total Thallium (Tl)	ug/L	<0.050	0.050	B446570	<0.010	B443191	0.017	0.010	B443191
Total Tin (Sn)	ug/L	<25	25	B446570	<5.0	B443191	<5.0	5.0	B443191
Total Titanium (Ti)	ug/L	<25	25	B446570	6.5	B443191	14.7	5.0	B443191
Total Tungsten (W)	ug/L	<5.0	5.0	B446570	<1.0	B443191	<1.0	1.0	B443191
Total Uranium (U)	ug/L	0.93	0.50	B446570	1.25	B443191	2.88	0.10	B443191
Total Vanadium (V)	ug/L	<25	25	B446570	<5.0	B443191	<5.0	5.0	B443191
Total Zinc (Zn)	ug/L	<25	25	B446570	<5.0	B443191	6.6	5.0	B443191
Total Zirconium (Zr)	ug/L	<0.50	0.50	B446570	0.34	B443191	0.80	0.10	B443191
Total Calcium (Ca)	mg/L	52.7	0.25	B440690	72.2	B440690	78.7	0.050	B440690
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI441			CRI442		CRI443		
Sampling Date		2024/07/09 16:00			2024/07/08 14:30		2024/07/09 17:30		
COC Number		C#728282-01-01			C#728282-01-01		C#728282-01-01		
	UNITS	**T19-18S**	**RDL**	**QC Batch**	**T0B96-02-06**	**QC Batch**	**T0B96-01-05**	**RDL**	**QC Batch**
Total Magnesium (Mg)	mg/L	20.5	0.25	B440690	22.8	B440690	28.1	0.050	B440690
Total Potassium (K)	mg/L	3.34	0.25	B440690	0.828	B440690	1.11	0.050	B440690
Total Sodium (Na)	mg/L	127	0.25	B440690	10.1	B440690	18.4	0.050	B440690
Total Sulphur (S)	mg/L	73	15	B440690	3.8	B440690	12.0	3.0	B440690
RDL = Reportable Detection Limit									

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI444		CRI445		CRI446		
Sampling Date		2024/07/09 12:00		2024/07/08 18:00		2024/07/08 18:00		
COC Number		C#728282-01-01		C#728282-01-01		C#728282-01-01		
	UNITS	T95R-40	RDL	T18-01D	QC Batch	DUP-B	RDL	QC Batch
Dissolved Metals by ICPMS								
Dissolved Aluminum (Al)	ug/L	<30	30	5.9	B442119	6.4	3.0	B442119
Dissolved Antimony (Sb)	ug/L	<5.0	5.0	<0.50	B442119	<0.50	0.50	B442119
Dissolved Arsenic (As)	ug/L	<1.0	1.0	8.25	B442119	8.47	0.10	B442119
Dissolved Barium (Ba)	ug/L	4920	10	97.3	B442119	98.3	1.0	B442119
Dissolved Beryllium (Be)	ug/L	<1.0	1.0	<0.10	B442119	<0.10	0.10	B442119
Dissolved Bismuth (Bi)	ug/L	<10	10	<1.0	B442119	<1.0	1.0	B442119
Dissolved Boron (B)	ug/L	<500	500	128	B442119	132	50	B442119
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	<0.010	B442119	<0.010	0.010	B442119
Dissolved Chromium (Cr)	ug/L	<10	10	<1.0	B442119	<1.0	1.0	B442119
Dissolved Cobalt (Co)	ug/L	<2.0	2.0	<0.20	B442119	<0.20	0.20	B442119
Dissolved Copper (Cu)	ug/L	<2.0	2.0	0.25	B442119	<0.20	0.20	B442119
Dissolved Iron (Fe)	ug/L	90	50	37.3	B442119	22.4	5.0	B442119
Dissolved Lead (Pb)	ug/L	<2.0	2.0	<0.20	B442119	<0.20	0.20	B442119
Dissolved Lithium (Li)	ug/L	127	20	46.9	B442119	47.3	2.0	B442119
Dissolved Manganese (Mn)	ug/L	28	10	3.3	B442119	3.2	1.0	B442119
Dissolved Molybdenum (Mo)	ug/L	<10	10	13.5	B442119	13.6	1.0	B442119
Dissolved Nickel (Ni)	ug/L	<10	10	<1.0	B442119	<1.0	1.0	B442119
Dissolved Phosphorus (P)	ug/L	<100	100	16	B442119	16	10	B442119
Dissolved Selenium (Se)	ug/L	<1.0	1.0	<0.10	B442119	<0.10	0.10	B442119
Dissolved Silicon (Si)	ug/L	3330	1000	9700	B442119	9760	100	B442119
Dissolved Silver (Ag)	ug/L	<0.20	0.20	<0.020	B442119	<0.020	0.020	B442119
Dissolved Strontium (Sr)	ug/L	664	10	100	B442119	104	1.0	B442119
Dissolved Thallium (Tl)	ug/L	<0.10	0.10	<0.010	B442119	<0.010	0.010	B442119
Dissolved Tin (Sn)	ug/L	<50	50	<5.0	B442119	<5.0	5.0	B442119
Dissolved Titanium (Ti)	ug/L	<50	50	<5.0	B442119	<5.0	5.0	B442119
Dissolved Tungsten (W)	ug/L	<10	10	1.1	B442119	1.1	1.0	B442119
Dissolved Uranium (U)	ug/L	<1.0	1.0	4.29	B442119	4.41	0.10	B442119
Dissolved Vanadium (V)	ug/L	<50	50	<5.0	B442119	<5.0	5.0	B442119
Dissolved Zinc (Zn)	ug/L	<50	50	<5.0	B442119	<5.0	5.0	B442119
Dissolved Zirconium (Zr)	ug/L	<1.0	1.0	0.76	B442119	0.81	0.10	B442119
Dissolved Calcium (Ca)	mg/L	33.0	0.50	2.64	B440542	2.64	0.050	B440542
Dissolved Magnesium (Mg)	mg/L	7.14	0.50	0.670	B440542	0.670	0.050	B440542
Dissolved Potassium (K)	mg/L	3.14	0.50	2.44	B440542	2.48	0.050	B440542
RDL = Reportable Detection Limit								

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI444		CRI445		CRI446		
Sampling Date		2024/07/09 12:00		2024/07/08 18:00		2024/07/08 18:00		
COC Number		C#728282-01-01		C#728282-01-01		C#728282-01-01		
	UNITS	T95R-40	RDL	T18-01D	QC Batch	DUP-B	RDL	QC Batch
Dissolved Sodium (Na)	mg/L	738	0.50	321	B440542	326	0.050	B440542
Dissolved Sulphur (S)	mg/L	<30	30	7.1	B440542	7.2	3.0	B440542
Total Metals by ICPMS								
Total Aluminum (Al)	ug/L	75	30	1240	B443191	838	3.0	B443197
Total Antimony (Sb)	ug/L	<5.0	5.0	0.93	B443191	0.76	0.50	B443197
Total Arsenic (As)	ug/L	<1.0	1.0	8.49	B443191	8.59	0.10	B443197
Total Barium (Ba)	ug/L	4820	10	120	B443191	120	1.0	B443197
Total Beryllium (Be)	ug/L	<1.0	1.0	0.10	B443191	<0.10	0.10	B443197
Total Bismuth (Bi)	ug/L	<10	10	<1.0	B443191	<1.0	1.0	B443197
Total Boron (B)	ug/L	<500	500	112	B443191	127	50	B443197
Total Cadmium (Cd)	ug/L	<0.10	0.10	<0.010	B443191	0.013	0.010	B443197
Total Chromium (Cr)	ug/L	<10	10	<1.0	B443191	<1.0	1.0	B443197
Total Cobalt (Co)	ug/L	<2.0	2.0	0.22	B443191	0.20	0.20	B443197
Total Copper (Cu)	ug/L	<5.0	5.0	1.09	B443191	1.00	0.50	B443197
Total Iron (Fe)	ug/L	631	100	872	B443191	786	10	B443197
Total Lead (Pb)	ug/L	39.3	2.0	3.36	B443191	3.62	0.20	B443197
Total Lithium (Li)	ug/L	114	20	41.1	B443191	42.5	2.0	B443197
Total Manganese (Mn)	ug/L	30	10	14.0	B443191	14.7	1.0	B443197
Total Molybdenum (Mo)	ug/L	<10	10	12.2	B443191	12.4	1.0	B443197
Total Nickel (Ni)	ug/L	<10	10	<1.0	B443191	<1.0	1.0	B443197
Total Phosphorus (P)	ug/L	<100	100	49	B443191	39	10	B443197
Total Selenium (Se)	ug/L	<1.0	1.0	<0.10	B443191	<0.10	0.10	B443197
Total Silicon (Si)	ug/L	3300	1000	12300	B443191	11100	100	B443197
Total Silver (Ag)	ug/L	<0.20	0.20	<0.020	B443191	<0.020	0.020	B443197
Total Strontium (Sr)	ug/L	662	10	116	B443191	116	1.0	B443197
Total Thallium (Tl)	ug/L	<0.10	0.10	0.016	B443191	0.018	0.010	B443197
Total Tin (Sn)	ug/L	<50	50	<5.0	B443191	<5.0	5.0	B443197
Total Titanium (Ti)	ug/L	<50	50	11.3	B443191	8.3	5.0	B443197
Total Tungsten (W)	ug/L	<10	10	1.5	B443191	1.3	1.0	B443197
Total Uranium (U)	ug/L	<1.0	1.0	5.24	B443191	4.96	0.10	B443197
Total Vanadium (V)	ug/L	<50	50	<5.0	B443191	<5.0	5.0	B443197
Total Zinc (Zn)	ug/L	<50	50	5.9	B443191	5.8	5.0	B443197
Total Zirconium (Zr)	ug/L	<1.0	1.0	1.25	B443191	0.97	0.10	B443197
Total Calcium (Ca)	mg/L	30.1	0.50	3.03	B440690	3.11	0.050	B440690

RDL = Reportable Detection Limit

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI444		CRI445		CRI446		
Sampling Date		2024/07/09 12:00		2024/07/08 18:00		2024/07/08 18:00		
COC Number		C#728282-01-01		C#728282-01-01		C#728282-01-01		
	UNITS	**T95R-40**	**RDL**	**T18-01D**	**QC Batch**	**DUP-B**	**RDL**	**QC Batch**
Total Magnesium (Mg)	mg/L	6.35	0.50	0.929	B440690	0.921	0.050	B440690
Total Potassium (K)	mg/L	2.95	0.50	2.32	B440690	2.35	0.050	B440690
Total Sodium (Na)	mg/L	645	0.50	276	B440690	292	0.050	B440690
Total Sulphur (S)	mg/L	<30	30	6.0	B440690	6.6	3.0	B440690
RDL = Reportable Detection Limit								

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GENERAL COMMENTS

Sample CRI441 [T19-18S] : Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrate + Nitrite (N). Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer.

Sample CRI442 [T0B96-02-06] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI443 [T0B96-01-05] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI444 [T95R-40] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI445 [T18-01D] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI446 [DUP-B] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI441, Elements by CRC ICPMS (dissolved): Test repeated.

Results relate only to the items tested.

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			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B442119	Dissolved Aluminum (Al)	2024/07/18	97	80 - 120	101	80 - 120	<3.0	ug/L	1.3	20
B442119	Dissolved Antimony (Sb)	2024/07/18	96	80 - 120	102	80 - 120	<0.50	ug/L	0.96	20
B442119	Dissolved Arsenic (As)	2024/07/18	100	80 - 120	101	80 - 120	<0.10	ug/L	1.4	20
B442119	Dissolved Barium (Ba)	2024/07/18	NC	80 - 120	100	80 - 120	<1.0	ug/L	0.77	20
B442119	Dissolved Beryllium (Be)	2024/07/18	93	80 - 120	97	80 - 120	<0.10	ug/L	NC	20
B442119	Dissolved Bismuth (Bi)	2024/07/18	92	80 - 120	97	80 - 120	<1.0	ug/L	NC	20
B442119	Dissolved Boron (B)	2024/07/18	93	80 - 120	97	80 - 120	<50	ug/L	NC	20
B442119	Dissolved Cadmium (Cd)	2024/07/18	97	80 - 120	101	80 - 120	<0.010	ug/L	2.9	20
B442119	Dissolved Chromium (Cr)	2024/07/18	88	80 - 120	93	80 - 120	<1.0	ug/L	NC	20
B442119	Dissolved Cobalt (Co)	2024/07/18	87	80 - 120	95	80 - 120	<0.20	ug/L	NC	20
B442119	Dissolved Copper (Cu)	2024/07/18	87	80 - 120	94	80 - 120	<0.20	ug/L	1.4	20
B442119	Dissolved Iron (Fe)	2024/07/18	97	80 - 120	100	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Lead (Pb)	2024/07/18	93	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
B442119	Dissolved Lithium (Li)	2024/07/18	96	80 - 120	100	80 - 120	<2.0	ug/L	NC	20
B442119	Dissolved Manganese (Mn)	2024/07/18	91	80 - 120	97	80 - 120	<1.0	ug/L	0.70	20
B442119	Dissolved Molybdenum (Mo)	2024/07/18	106	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B442119	Dissolved Nickel (Ni)	2024/07/18	90	80 - 120	97	80 - 120	<1.0	ug/L	1.4	20
B442119	Dissolved Phosphorus (P)	2024/07/18	103	80 - 120	102	80 - 120	<10	ug/L	NC	20
B442119	Dissolved Selenium (Se)	2024/07/18	96	80 - 120	101	80 - 120	<0.10	ug/L	0.56	20
B442119	Dissolved Silicon (Si)	2024/07/18	99	80 - 120	104	80 - 120	<100	ug/L	2.7	20
B442119	Dissolved Silver (Ag)	2024/07/18	96	80 - 120	99	80 - 120	<0.020	ug/L	NC	20
B442119	Dissolved Strontium (Sr)	2024/07/18	NC	80 - 120	97	80 - 120	<1.0	ug/L	1.5	20
B442119	Dissolved Thallium (Tl)	2024/07/18	95	80 - 120	99	80 - 120	<0.010	ug/L	1.5	20
B442119	Dissolved Tin (Sn)	2024/07/18	98	80 - 120	102	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Titanium (Ti)	2024/07/18	95	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Tungsten (W)	2024/07/18	99	80 - 120	102	80 - 120	<1.0	ug/L		
B442119	Dissolved Uranium (U)	2024/07/18	98	80 - 120	102	80 - 120	<0.10	ug/L	2.6	20
B442119	Dissolved Vanadium (V)	2024/07/18	93	80 - 120	96	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Zinc (Zn)	2024/07/18	NC	80 - 120	99	80 - 120	<5.0	ug/L	0.48	20
B442119	Dissolved Zirconium (Zr)	2024/07/18	102	80 - 120	101	80 - 120	<0.10	ug/L	NC	20
B442178	Total Phosphorus (P)	2024/07/19	111	N/A	102	80 - 120	<0.0030	mg/L	NC	20
B442256	True Colour	2024/07/17			103	80 - 120	<2.0	Col. Unit	NC	20
B442258	Total Suspended Solids	2024/07/18	100	80 - 120	98	80 - 120	<1.0	mg/L	12	20

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			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B442322	Nitrate plus Nitrite (N)	2024/07/17	NC	80 - 120	108	80 - 120	<0.020	mg/L	1.1	25
B442323	True Colour	2024/07/17			111	80 - 120	<2.0	Col. Unit	NC	20
B442329	Nitrite (N)	2024/07/17	NC	80 - 120	105	80 - 120	<0.0050	mg/L	0.31	20
B442375	Dissolved Fluoride (F)	2024/07/17	NC	80 - 120	91	80 - 120	<0.050	mg/L	0.88	20
B442408	Chloride (Cl)	2024/07/18	106	80 - 120	102	80 - 120	<1.0	mg/L	NC	20
B442408	Sulphate (SO4)	2024/07/18	99	80 - 120	100	80 - 120	<1.0	mg/L	1.2	20
B442470	Turbidity	2024/07/17			104	80 - 120	<0.10	NTU	8.8	20
B442505	pH	2024/07/17			100	97 - 103			1.4	N/A
B442520	Alkalinity (PP as CaCO3)	2024/07/17					<1.0	mg/L	NC	20
B442520	Alkalinity (Total as CaCO3)	2024/07/17			96	80 - 120	<1.0	mg/L	0.19	20
B442520	Bicarbonate (HCO3)	2024/07/17					<1.0	mg/L	0.19	20
B442520	Carbonate (CO3)	2024/07/17					<1.0	mg/L	NC	20
B442520	Hydroxide (OH)	2024/07/17					<1.0	mg/L	NC	20
B442803	Total Suspended Solids	2024/07/18	104	80 - 120	100	80 - 120	<1.0	mg/L	NC	20
B443191	Total Aluminum (Al)	2024/07/18	103	80 - 120	99	80 - 120	<3.0	ug/L	0.60	20
B443191	Total Antimony (Sb)	2024/07/18	102	80 - 120	103	80 - 120	<0.50	ug/L	NC	20
B443191	Total Arsenic (As)	2024/07/18	103	80 - 120	104	80 - 120	<0.10	ug/L	4.1	20
B443191	Total Barium (Ba)	2024/07/18	99	80 - 120	101	80 - 120	<1.0	ug/L	2.4	20
B443191	Total Beryllium (Be)	2024/07/18	104	80 - 120	103	80 - 120	<0.10	ug/L	NC	20
B443191	Total Bismuth (Bi)	2024/07/18	97	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B443191	Total Boron (B)	2024/07/18	101	80 - 120	98	80 - 120	<50	ug/L	NC	20
B443191	Total Cadmium (Cd)	2024/07/18	102	80 - 120	103	80 - 120	<0.010	ug/L	NC	20
B443191	Total Chromium (Cr)	2024/07/18	99	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B443191	Total Cobalt (Co)	2024/07/18	94	80 - 120	99	80 - 120	<0.20	ug/L	NC	20
B443191	Total Copper (Cu)	2024/07/18	94	80 - 120	99	80 - 120	<0.50	ug/L	6.0	20
B443191	Total Iron (Fe)	2024/07/18	102	80 - 120	110	80 - 120	<10	ug/L	0.22	20
B443191	Total Lead (Pb)	2024/07/18	99	80 - 120	102	80 - 120	<0.20	ug/L	NC	20
B443191	Total Lithium (Li)	2024/07/18	100	80 - 120	102	80 - 120	<2.0	ug/L	0.79	20
B443191	Total Manganese (Mn)	2024/07/18	95	80 - 120	103	80 - 120	<1.0	ug/L	0.85	20
B443191	Total Molybdenum (Mo)	2024/07/18	105	80 - 120	107	80 - 120	<1.0	ug/L	NC	20
B443191	Total Nickel (Ni)	2024/07/18	96	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B443191	Total Phosphorus (P)	2024/07/18	102	80 - 120	101	80 - 120	<10	ug/L	3.3	20
B443191	Total Selenium (Se)	2024/07/18	101	80 - 120	107	80 - 120	<0.10	ug/L	NC	20

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B443191	Total Silicon (Si)	2024/07/18	108	80 - 120	114	80 - 120	<100	ug/L	5.1	20
B443191	Total Silver (Ag)	2024/07/18	99	80 - 120	102	80 - 120	<0.020	ug/L	NC	20
B443191	Total Strontium (Sr)	2024/07/18	100	80 - 120	104	80 - 120	<1.0	ug/L	0.59	20
B443191	Total Thallium (Tl)	2024/07/18	100	80 - 120	104	80 - 120	<0.010	ug/L	NC	20
B443191	Total Tin (Sn)	2024/07/18	101	80 - 120	105	80 - 120	<5.0	ug/L	NC	20
B443191	Total Titanium (Ti)	2024/07/18	104	80 - 120	104	80 - 120	<5.0	ug/L	4.0	20
B443191	Total Tungsten (W)	2024/07/18	97	80 - 120	102	80 - 120	<1.0	ug/L		
B443191	Total Uranium (U)	2024/07/18	104	80 - 120	110	80 - 120	<0.10	ug/L	NC	20
B443191	Total Vanadium (V)	2024/07/18	100	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
B443191	Total Zinc (Zn)	2024/07/18	102	80 - 120	105	80 - 120	<5.0	ug/L	NC	20
B443191	Total Zirconium (Zr)	2024/07/18	103	80 - 120	106	80 - 120	<0.10	ug/L	NC	20
B443197	Total Aluminum (Al)	2024/07/20	108	80 - 120	104	80 - 120	<3.0	ug/L		
B443197	Total Antimony (Sb)	2024/07/20	106	80 - 120	103	80 - 120	<0.50	ug/L		
B443197	Total Arsenic (As)	2024/07/20	108	80 - 120	103	80 - 120	<0.10	ug/L		
B443197	Total Barium (Ba)	2024/07/20	104	80 - 120	101	80 - 120	<1.0	ug/L		
B443197	Total Beryllium (Be)	2024/07/20	105	80 - 120	103	80 - 120	<0.10	ug/L		
B443197	Total Bismuth (Bi)	2024/07/20	99	80 - 120	104	80 - 120	<1.0	ug/L		
B443197	Total Boron (B)	2024/07/20	109	80 - 120	111	80 - 120	<50	ug/L		
B443197	Total Cadmium (Cd)	2024/07/20	104	80 - 120	103	80 - 120	<0.010	ug/L		
B443197	Total Chromium (Cr)	2024/07/20	101	80 - 120	99	80 - 120	<1.0	ug/L		
B443197	Total Cobalt (Co)	2024/07/20	98	80 - 120	99	80 - 120	<0.20	ug/L		
B443197	Total Copper (Cu)	2024/07/20	96	80 - 120	97	80 - 120	<0.50	ug/L		
B443197	Total Iron (Fe)	2024/07/20	147 (1)	80 - 120	103	80 - 120	<10	ug/L		
B443197	Total Lead (Pb)	2024/07/20	102	80 - 120	103	80 - 120	<0.20	ug/L		
B443197	Total Lithium (Li)	2024/07/20	105	80 - 120	106	80 - 120	<2.0	ug/L		
B443197	Total Manganese (Mn)	2024/07/20	109	80 - 120	103	80 - 120	<1.0	ug/L		
B443197	Total Molybdenum (Mo)	2024/07/20	114	80 - 120	108	80 - 120	<1.0	ug/L		
B443197	Total Nickel (Ni)	2024/07/20	100	80 - 120	101	80 - 120	<1.0	ug/L		
B443197	Total Phosphorus (P)	2024/07/20	113	80 - 120	105	80 - 120	<10	ug/L		
B443197	Total Selenium (Se)	2024/07/20	107	80 - 120	103	80 - 120	<0.10	ug/L		
B443197	Total Silicon (Si)	2024/07/20	109	80 - 120	106	80 - 120	<100	ug/L		
B443197	Total Silver (Ag)	2024/07/20	103	80 - 120	101	80 - 120	<0.020	ug/L		
B443197	Total Strontium (Sr)	2024/07/20	113	80 - 120	103	80 - 120	<1.0	ug/L		

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B443197	Total Thallium (Tl)	2024/07/20	106	80 - 120	104	80 - 120	<0.010	ug/L		
B443197	Total Tin (Sn)	2024/07/20	104	80 - 120	103	80 - 120	<5.0	ug/L		
B443197	Total Titanium (Ti)	2024/07/20	105	80 - 120	102	80 - 120	<5.0	ug/L		
B443197	Total Tungsten (W)	2024/07/20	105	80 - 120	105	80 - 120	<1.0	ug/L		
B443197	Total Uranium (U)	2024/07/20	113	80 - 120	109	80 - 120	<0.10	ug/L		
B443197	Total Vanadium (V)	2024/07/20	104	80 - 120	101	80 - 120	<5.0	ug/L		
B443197	Total Zinc (Zn)	2024/07/20	108	80 - 120	104	80 - 120	<5.0	ug/L		
B443197	Total Zirconium (Zr)	2024/07/20	102	80 - 120	104	80 - 120	<0.10	ug/L		
B443397	Total Dissolved Solids	2024/07/19	100	80 - 120	97	80 - 120	<10	mg/L	0	20
B443545	Total Nitrogen (N)	2024/07/19	92	80 - 120	109	80 - 120	<0.020	mg/L	3.4	20
B443699	Turbidity	2024/07/18			104	80 - 120	<0.10	NTU	2.1	20
B443802	Nitrate plus Nitrite (N)	2024/07/18	113	80 - 120	110	80 - 120	<0.020	mg/L	NC	25
B443829	Nitrite (N)	2024/07/18	108	80 - 120	105	80 - 120	<0.0050	mg/L	NC	20
B444245	Chloride (Cl)	2024/07/18	109	80 - 120	102	80 - 120	<1.0	mg/L		
B444245	Sulphate (SO4)	2024/07/18	103	80 - 120	100	80 - 120	<1.0	mg/L	0.18	20
B444257	Dissolved Fluoride (F)	2024/07/19	105	80 - 120	96	80 - 120	<0.050	mg/L	NC	20
B444278	Alkalinity (PP as CaCO3)	2024/07/19					<1.0	mg/L	2.0	20
B444278	Alkalinity (Total as CaCO3)	2024/07/19			96	80 - 120	<1.0	mg/L	0.21	20
B444278	Bicarbonate (HCO3)	2024/07/19					<1.0	mg/L	0.063	20
B444278	Carbonate (CO3)	2024/07/19					<1.0	mg/L	2.0	20
B444278	Hydroxide (OH)	2024/07/19					<1.0	mg/L	NC	20
B444332	pH	2024/07/19			100	97 - 103			0.43	N/A
B444339	Acidity (pH 4.5)	2024/07/19					<1.0	mg/L	NC	20
B444339	Acidity (pH 8.3)	2024/07/19			99	80 - 120	<1.0	mg/L	NC	20
B444456	Acidity (pH 4.5)	2024/07/19					<1.0	mg/L	NC	20
B444456	Acidity (pH 8.3)	2024/07/19			100	80 - 120	<1.0	mg/L	NC	20
B444500	Total Dissolved Solids	2024/07/18	98	80 - 120	98	80 - 120	<10	mg/L	6.1	20
B445386	Dissolved Organic Carbon (C)	2024/07/19	NC	80 - 120	96	80 - 120	<0.50	mg/L	2.3	20
B445389	Acidity (pH 4.5)	2024/07/19					<1.0	mg/L	NC	20
B445389	Acidity (pH 8.3)	2024/07/19			99	80 - 120	<1.0	mg/L	NC	20
B445995	Apparent Colour	2024/07/19			95	80 - 120	<2.0	PtCo units	7.1	20
B446050	Dissolved Organic Carbon (C)	2024/07/19	103	80 - 120	97	80 - 120	<0.50	mg/L	NC	20
B446160	Total Organic Carbon (C)	2024/07/19	103	80 - 120	97	80 - 120	<0.50	mg/L	5.9	20

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B446199	True Colour	2024/07/19			97	80 - 120	<2.0	Col. Unit	0.83	20
B446570	Total Aluminum (Al)	2024/07/23	100	80 - 120	101	80 - 120	<3.0	ug/L	6.7	20
B446570	Total Antimony (Sb)	2024/07/23	99	80 - 120	99	80 - 120	<0.50	ug/L	NC	20
B446570	Total Arsenic (As)	2024/07/23	102	80 - 120	102	80 - 120	<0.10	ug/L	2.3	20
B446570	Total Barium (Ba)	2024/07/23	98	80 - 120	99	80 - 120	<1.0	ug/L	5.3	20
B446570	Total Beryllium (Be)	2024/07/23	98	80 - 120	100	80 - 120	<0.10	ug/L	NC	20
B446570	Total Bismuth (Bi)	2024/07/23	97	80 - 120	101	80 - 120	<1.0	ug/L	NC	20
B446570	Total Boron (B)	2024/07/23	102	80 - 120	104	80 - 120	<50	ug/L	NC	20
B446570	Total Cadmium (Cd)	2024/07/23	99	80 - 120	99	80 - 120	<0.010	ug/L	NC	20
B446570	Total Chromium (Cr)	2024/07/23	100	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B446570	Total Cobalt (Co)	2024/07/23	98	80 - 120	100	80 - 120	<0.20	ug/L	NC	20
B446570	Total Copper (Cu)	2024/07/23	95	80 - 120	98	80 - 120	<0.50	ug/L	NC	20
B446570	Total Iron (Fe)	2024/07/23	NC	80 - 120	101	80 - 120	<10	ug/L	1.8	20
B446570	Total Lead (Pb)	2024/07/23	100	80 - 120	102	80 - 120	<0.20	ug/L	NC	20
B446570	Total Lithium (Li)	2024/07/23	97	80 - 120	101	80 - 120	<2.0	ug/L	NC	20
B446570	Total Manganese (Mn)	2024/07/23	NC	80 - 120	101	80 - 120	<1.0	ug/L	3.0	20
B446570	Total Molybdenum (Mo)	2024/07/23	104	80 - 120	103	80 - 120	<1.0	ug/L	NC	20
B446570	Total Nickel (Ni)	2024/07/23	97	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
B446570	Total Phosphorus (P)	2024/07/23	96	80 - 120	104	80 - 120	<10	ug/L		
B446570	Total Selenium (Se)	2024/07/23	103	80 - 120	102	80 - 120	<0.10	ug/L	NC	20
B446570	Total Silicon (Si)	2024/07/23	NC	80 - 120	106	80 - 120	<100	ug/L	0.43	20
B446570	Total Silver (Ag)	2024/07/23	99	80 - 120	99	80 - 120	<0.020	ug/L	NC	20
B446570	Total Strontium (Sr)	2024/07/23	101	80 - 120	99	80 - 120	<1.0	ug/L	1.7	20
B446570	Total Thallium (Tl)	2024/07/23	100	80 - 120	101	80 - 120	<0.010	ug/L	8.7	20
B446570	Total Tin (Sn)	2024/07/23	99	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
B446570	Total Titanium (Ti)	2024/07/23	100	80 - 120	102	80 - 120	<5.0	ug/L	NC	20
B446570	Total Tungsten (W)	2024/07/23	98	80 - 120	101	80 - 120	<1.0	ug/L		
B446570	Total Uranium (U)	2024/07/23	100	80 - 120	101	80 - 120	<0.10	ug/L	NC	20
B446570	Total Vanadium (V)	2024/07/23	100	80 - 120	101	80 - 120	<5.0	ug/L	NC	20
B446570	Total Zinc (Zn)	2024/07/23	101	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
B446570	Total Zirconium (Zr)	2024/07/23	104	80 - 120	102	80 - 120	<0.10	ug/L	NC	20
B446674	Orthophosphate (P)	2024/07/20	123 (1)	80 - 120	97	80 - 120	<0.0030	mg/L	NC	20
B446715	Orthophosphate (P)	2024/07/20	111	80 - 120	97	80 - 120	<0.0030	mg/L	2.4	20

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			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B447464	Phenols	2024/07/22	82	80 - 120	99	80 - 120	<0.0015	mg/L	NC	20
B447471	Dissolved Organic Carbon (C)	2024/07/22			101	80 - 120	<0.50	mg/L		
B447719	Dissolved Mercury (Hg)	2024/07/22	108	80 - 120	106	80 - 120	<0.0019	ug/L	NC	20
B447922	Strong Acid Dissoc. Cyanide (CN)	2024/07/22	96	80 - 120	99	80 - 120	<0.00050	mg/L	14	20
B448098	Total Mercury (Hg)	2024/07/23	111	80 - 120	102	80 - 120	<0.0019	ug/L	NC	20
B448334	Total Ammonia (N)	2024/07/22	96	80 - 120	99	80 - 120	<0.015	mg/L	NC	20
B449571	Total Mercury (Hg)	2024/07/23	108	80 - 120	102	80 - 120	<0.0019	ug/L	NC	20
B450485	Dissolved Iron (Fe)	2024/07/24			101	80 - 120	<5.0	ug/L		
B450485	Dissolved Manganese (Mn)	2024/07/24			100	80 - 120	<1.0	ug/L		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

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2024/07/16 09:30

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#9888 Palmer Environmental Consulting Group (PEC	Company Name		Quotation #	C40429	Bureau Veritas Job #	Bottle Order #: 728282
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			
Address	#630 – 470 Granville Street Vancouver BC V6C 1V5	Address		Project #	1905903 Tenas 2024		
Phone	(604) 629-9075 Fax:	Phone	Fax:	Project Name		Chain Of Custody Record	Project Manager
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Site #		C#728282-01-01	Nahed Amer
				Sampled By	NICOLE ANTSIS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other

Special Instructions

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ☐
Rush Confirmation Number: (call lab for #)

	Sample Barcode Label	Sample (Location) Identification	Date Sampled (mm/dd)	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Color (True) by Automated Analyzer	Colour (Apparent)	Hardness (calculated as CaCO3)	pH @25°C	Total Suspended Solids (NFR)	Total Dissolved Solids (Filt. Residue)	Turbidity	Acidity pH 4.5 & pH 8.3 (as CaCO3)	Alkalinity @25C (pp, total), CO3,HCO3,OH	Ammonia-N (Total)	# of Bottles	Comments
1	T19-18S	Tenas Four Creek	07/09	1600	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓		5	500 mL Gen Chem, F. Metals, F Mercury F. DOC, Nutrients
2	TOB96-02-06	Tenas Four Creek	07/08	1430	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	1L Gen. Chem bottle 1/3 Full
3	TOB96-01-05	Tenas Four Creek	07/09	1730	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓		3	1L Gen Chem, F. Metals, 250mL Gen Chem
4	T95R-40	Tenas Four Creek	07/09	1200	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
5	T18-01D	Tenas Four Creek	07/08	1800	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
6	DUP-B	Tenas Four Creek	07/08	1800	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
7																		
8																		
9																		
10																		

MVAN-2024-07-806

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
NICOLE ANTSIS	2024/07/10	7:30	HARIGNA JOSHI	2024/07/16	09:30		☐	SEE ACTR	☐ Yes ☑ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

C453392
2024/07/16 09:30

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#9888 Palmer Environmental Consulting Group (PEC	Company Name		Quotation #	C40429	Bureau Veritas Job #	Bottle Order #:
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			728282
Address	#630 – 470 Granville Street	Address		Project #	1905903 Tenas 2024	Chain Of Custody Record	Project Manager
	Vancouver BC V6C 1V5			Project Name		C#728282-01-02	Nahed Amer
Phone	(604) 629-9075 Fax:	Phone	Fax:	Site #			
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Sampled By	NICOLE ANASIS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other _____

Special Instructions:

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Nitrogen - Nitrate (as N)	Total TKN in Water	Orthophosphate by Automated Analyzer	Total Phosphorus	Chloride/Sulphate by Auto Colourimetry	Fluoride	Carbon (Total Organic)	Carbon (DOC)	CSR Dissolved Metals in Water with CV Hg	CSR Total Metals in Water with CV Hg	# of Bottles	Comments
1	T19-185	Tenas Four Creek	07/09	1600	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	5	500ML Genchem, F. Metals, F. Mercury F. DOC, Nutrients
2	TOB96-02-06	Tenas Four Creek	07/08	1430	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	1L Genchem bottle 1/3 FULL
3	TOB96-01-05	Tenas Fourcreek	07/09	1730	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3	1L Gen chem F. Metals, 250ML Genchem
4	T95K-40	Tenas Four creek	07/09	1200	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
5	T18-01D	Tenas Four Creek	07/08	1800	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
6	DUP-B	Tenas Four Creek	07/08	1800	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
7																		
8																		
9																		
10																		

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
NICOLE ANASIS	2024/07/10	7:30	HARIGNA JOSHI	2024/07/16	09:30		☐	SEE ABOVE	☐ Yes ☑ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

C453392
2024/07/16 09:30

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#9888 Palmer Environmental Consulting Group (PEC	Company Name		Quotation #	C40429	Bureau Veritas Job #	Bottle Order #:
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			728282
Address	#630 – 470 Granville Street	Address		Project #	1905903 Tenas 2024	Chain Of Custody Record	Project Manager
	Vancouver BC V6C 1V5			Project Name		C#728282-01-03	Nahed Amer
Phone	(604) 629-9075 Fax:	Phone	Fax:	Site #			
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Sampled By	NICOLE ANTSIS		

Regulatory Criteria:
- ☐ CSR
- ☐ CCME
- ☐ BC Water Quality
- ☐ Other

Special Instructions

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Cyanide (total)	Phenols (4-AAP)	# of Bottles	Comments
1	T19-185	Tenas Four Creek	07/09	1600	GW	Y	✓	✓	5	500ML Gen chem, F. Metals F. Mercury F. DOC, NUTRIENTS
2	TOB96-02-06	Tenas Four Creek	07/08	1430	GW	Y	✓	✓	12	1L Gen Chem bottle 1/3 Full
3	TOB96-01-05	Tenas Four Creek	07/09	1730	GW	Y	✓	✓	3	1L Gen chem, F. Metals, 100 mL Gen chem
4	T95R-40	Tenas Four Creek	07/08	1200	GW	Y	✓	✓	12	
5	T18-010	Tenas Four Creek	07/08	1200	GW	Y	✓	✓	12	
6	DUP-B	TENAS FOUR CREEK	07/08	1800	GW		✓	✓	12	
7										
8										
9										
10										

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT:
(will be applied if Rush TAT is not specified): ☑
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ☐
Rush Confirmation Number: *(call lab for #)*

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted
NICOLE ANTSIS	2024/07/16	7:30	HARJINA JOSHI	2024/07/16	09:30	

Lab Use Only: Time Sensitive ☐ | Temperature (°C) on Receipt: SEE ACTR | Custody Seal Intact on Cooler? ☐ Yes ☒ No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

Bureau Veritas Canada (2019) Inc.

Your Project #: 1905903 TENAS 2024
Your C.O.C. #: C#728282-02-01

Attention: Nathalie Brandebourger

Palmer Environmental Consulting Group (PECG)
#630 – 470 Granville Street
Vancouver, BC
CANADA V6C 1V5

Report Date: 2024/07/23
Report #: R3531225
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453348
Received: 2024/07/16, 09:00

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Acidity pH 4.5 & pH 8.3 (as CaCO3)	10	N/A	2024/07/19	BBY6SOP-00037	SM 24 2310 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	9	N/A	2024/07/17	BBY6SOP-00026	SM 24 2320 B m
Alkalinity @25C (pp, total), CO3,HCO3,OH	1	N/A	2024/07/22	BBY6SOP-00026	SM 24 2320 B m
Chloride/Sulphate by Auto Colourimetry	9	N/A	2024/07/18	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Chloride/Sulphate by Auto Colourimetry	1	N/A	2024/07/22	BBY6SOP-00011 / BBY6SOP-00017	SM24-4500-Cl/SO4-E m
Cyanide (total) (1)	9	N/A	2024/07/19	CAL SOP-00270	SM 24 4500-CN m
Color (Apparent) by Automated Analyzer	10	N/A	2024/07/19	BBY6SOP-00057	SM 24 2120-C m
Color (True) by Automated Analyzer	7	N/A	2024/07/17	BBY6SOP-00057	SM 24 2120 C m
Color (True) by Automated Analyzer	3	N/A	2024/07/19	BBY6SOP-00057	SM 24 2120 C m
Carbon (DOC) -Lab Filtered (2)	1	N/A	2024/07/19	BBY6SOP-00053	SM 24 5310 B m
Carbon (DOC) (2)	5	N/A	2024/07/19	BBY6SOP-00053	SM 24 5310 B m
Carbon (DOC) (2)	4	N/A	2024/07/20	BBY6SOP-00053	SM 24 5310 B m
Fluoride	8	N/A	2024/07/17	BBY6SOP-00037	SM 24 4500-F C m
Fluoride	1	N/A	2024/07/18	BBY6SOP-00037	SM 24 4500-F C m
Fluoride	1	N/A	2024/07/19	BBY6SOP-00037	SM 24 4500-F C m
Hardness Total (calculated as CaCO3) (3)	9	N/A	2024/07/19	BBY WI-00033	Auto Calc
Hardness Total (calculated as CaCO3) (3)	1	N/A	2024/07/23	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	9	N/A	2024/07/18	BBY WI-00033	Auto Calc
Hardness (calculated as CaCO3)	1	N/A	2024/07/22	BBY WI-00033	Auto Calc
Mercury (Dissolved) by CV (4)	10	2024/07/22	2024/07/22	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Mercury (Total) by CV	10	2024/07/22	2024/07/23	BBY7SOP-00032	BCMOE LM 2023 C1.1.3
Ion Ratio (Cation sum/Anion sum)	10	N/A	2024/07/19	BBY WI-00033	Auto Calc
Ion Balance	10	N/A	2024/07/19	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	9	N/A	2024/07/18	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (diss.)	1	N/A	2024/07/22	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (dissolved) (4)	10	N/A	2024/07/18	BBY7SOP-00002	EPA 6020b R2 m
Na, K, Ca, Mg, S by CRC ICPMS (total)	9	2024/07/16	2024/07/19	BBY WI-00033	Auto Calc
Na, K, Ca, Mg, S by CRC ICPMS (total)	1	2024/07/19	2024/07/23	BBY WI-00033	Auto Calc
Elements by CRC ICPMS (total)	1	2024/07/17	2024/07/19	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Your Project #: 1905903 TENAS 2024
Your C.O.C. #: C#728282-02-01

Attention: Nathalie Brandebourger

Palmer Environmental Consulting Group (PECG)
#630 – 470 Granville Street
Vancouver, BC
CANADA V6C 1V5

Report Date: 2024/07/23
Report #: R3531225
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453348
Received: 2024/07/16, 09:00

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by CRC ICPMS (total)	9	2024/07/18	2024/07/18	BBY7SOP-00003 / BBY7SOP-00002	EPA 6020b R2 m
Nitrogen (Total)	9	N/A	2024/07/19	BBY6SOP-00016	SM 24 4500-N C m
Nitrogen (Total)	1	N/A	2024/07/23	BBY6SOP-00016	SM 24 4500-N C m
Ammonia-N (Total)	10	N/A	2024/07/22	AB SOP-00007	SM 24 4500 NH3 A G m
Nitrate + Nitrite (N)	9	N/A	2024/07/17	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrate + Nitrite (N)	1	N/A	2024/07/18	BBY6SOP-00010	SM 24 4500-NO3- H m
Nitrite (N) Regular Level Water	9	N/A	2024/07/17	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrite (N) Regular Level Water	1	N/A	2024/07/18	BBY6SOP-00010	SM 24 4500-NO2- m
Nitrogen - Nitrate (as N)	10	N/A	2024/07/19	BBY WI-00033	Auto Calc
pH @25°C (5)	9	N/A	2024/07/17	BBY6SOP-00026	SM 24 4500-H+ B m
pH @25°C (5)	1	N/A	2024/07/22	BBY6SOP-00026	SM 24 4500-H+ B m
Phenols (4-AAP) (1)	9	N/A	2024/07/22	AB SOP-00088	EPA 9066 R0 m
Orthophosphate by Automated Analyzer (6)	10	N/A	2024/07/20	BBY6SOP-00013	SM 24 4500-P E m
Total Dissolved Solids (Filt. Residue)	2	2024/07/18	2024/07/18	BBY6SOP-00033	SM 24 2540 C m
Total Dissolved Solids (Filt. Residue)	8	2024/07/18	2024/07/19	BBY6SOP-00033	SM 24 2540 C m
Total Kjeldahl Nitrogen (Total)	9	N/A	2024/07/19	BBY WI-00033	Auto Calc
Total Kjeldahl Nitrogen (Total)	1	N/A	2024/07/23	BBY WI-00033	Auto Calc
Carbon (Total Organic) (7)	10	N/A	2024/07/19	BBY6SOP-00053	SM 24 5310 B m
Total Phosphorus	4	2024/07/17	2024/07/18	BBY6SOP-00013	SM 24 4500-P E m
Total Phosphorus	6	2024/07/17	2024/07/19	BBY6SOP-00013	SM 24 4500-P E m
Total Suspended Solids (NFR)	10	2024/07/17	2024/07/18	BBY6SOP-00034	SM 24 2540 D m
Turbidity	6	N/A	2024/07/17	BBY6SOP-00027	SM 24 2130 B m
Turbidity	4	N/A	2024/07/18	BBY6SOP-00027	SM 24 2130 B m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement

Your Project #: 1905903 TENAS 2024
Your C.O.C. #: C#728282-02-01

Attention: Nathalie Brandebourger

Palmer Environmental Consulting Group (PECG)
#630 – 470 Granville Street
Vancouver, BC
CANADA V6C 1V5

Report Date: 2024/07/23
Report #: R3531225
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C453348
Received: 2024/07/16, 09:00

Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary, 4000 - 19 St. , Calgary, AB, T2E 6P8
(2) DOC present in the sample should be considered as non-purgeable DOC. Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(3) "Total Hardness" was calculated from Total Ca and Mg concentrations and may be biased high (Hardness, or Dissolved Hardness, calculated from Dissolved Ca and Mg, should be used for compliance if available).
(4) Dissolved > Total Imbalance: When applicable, Dissolved and Total results were reviewed and data quality meets acceptable levels unless otherwise noted.
(5) The CCME method requires pH to be analysed within 15 minutes of sampling and therefore field analysis is required for compliance. All Laboratory pH analyses in this report are reported past the CCME holding time. Bureau Veritas endeavours to analyze samples as soon as possible after receipt.
(6) Orthophosphate > Total Phosphorus Imbalance: When applicable, Orthophosphate, Total Phosphorus and dissolved Phosphorus results were reviewed and data quality meets acceptable levels unless otherwise noted.
(7) TOC present in the sample should be considered as non-purgeable TOC.

Encryption Key

AUTHORIZED REPORT
RAPPORT AUTORISÉ

Bureau Veritas
23 Jul 2024 18:25:41

Please direct all questions regarding this Certificate of Analysis to:
Nahed Amer, Key Account Specialist
Email: Nahed.AMER@bureauveritas.com
Phone# (604) 734 7276

==========

This report has been generated and distributed using a secure automated process.
Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Raphael Kwan, Senior Manager, BC and Yukon Regions responsible for British Columbia Environmental laboratory operations.

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI255		CRI256	CRI257		
Sampling Date		2024/07/05 13:00		2024/07/05 13:00	2024/07/07 11:00		
COC Number		C#728282-02-01		C#728282-02-01	C#728282-02-01		
	UNITS	SITE 2S	QC Batch	SITE 2SW	SITE 4 UPPER S	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	<0.0050	B442329	<0.0050	<0.0050	0.0050	B442329
Calculated Parameters							
Dissolved Hardness (CaCO3)	mg/L	72.6	B440213	74.1	93.5	0.50	B440213
Total Hardness (CaCO3)	mg/L	70.2	B440451	69.9	90.6	0.50	B440451
Ion Balance (% Difference)	%	2.0	B440608	2.5	1.4	N/A	B440608
Ion Ratio (cation sum / anion sum)	N/A	1.0	B440605	1.1	1.0	0.010	B440605
Nitrate (N)	mg/L	0.028	B440455	0.049	<0.020	0.020	B440455
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.294	B440550	0.257	0.257	0.020	B440550
Misc. Inorganics							
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.00053	B445151	0.00051	<0.00050	0.00050	B445151
Dissolved Organic Carbon (C)	mg/L	11	B446050	11	7.5	0.50	B446050
pH	pH	7.70	B442275	7.81	7.94	N/A	B442275
Acidity (pH 4.5)	mg/L	<1.0	B444339	<1.0	<1.0	1.0	B444339
Total Organic Carbon (C)	mg/L	11	B444524	11	7.6	0.50	B444524
Acidity (pH 8.3)	mg/L	<1.0	B444339	<1.0	<1.0	1.0	B444339
Total Dissolved Solids	mg/L	110	B443397	110	120	10	B443397
Total Suspended Solids	mg/L	2.8	B442102	<1.0	11	1.0	B442102
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	B442285	<1.0	<1.0	1.0	B442285
Alkalinity (Total as CaCO3)	mg/L	79	B442285	80	100	1.0	B442285
Bicarbonate (HCO3)	mg/L	97	B442285	97	120	1.0	B442285
Carbonate (CO3)	mg/L	<1.0	B442285	<1.0	<1.0	1.0	B442285
Dissolved Fluoride (F)	mg/L	<0.050	B442375	<0.050	<0.050	0.050	B442375
Hydroxide (OH)	mg/L	<1.0	B442285	<1.0	<1.0	1.0	B442285
Chloride (Cl)	mg/L	<1.0	B442465	<1.0	<1.0	1.0	B442465
Sulphate (SO4)	mg/L	<1.0	B442465	<1.0	<1.0	1.0	B442465
MISCELLANEOUS							
True Colour	Col. Unit	42.9	B446199	43.1	31.4	2.0	B442323
Nutrients							
Total Ammonia (N)	mg/L	<0.015	B448317	<0.015	0.023	0.015	B448317

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI255		CRI256	CRI257		
Sampling Date		2024/07/05 13:00		2024/07/05 13:00	2024/07/07 11:00		
COC Number		C#728282-02-01		C#728282-02-01	C#728282-02-01		
	UNITS	SITE 2S	QC Batch	SITE 2SW	SITE 4 UPPER S	RDL	QC Batch
Orthophosphate (P)	mg/L	<0.0030	B446674	0.0079	0.0066	0.0030	B446674
Total Phosphorus (P)	mg/L	0.0059	B442175	0.0046 (1)	0.0069	0.0030	B442175
Nitrate plus Nitrite (N)	mg/L	0.028	B442322	0.049	<0.020	0.020	B442322
Total Nitrogen (N)	mg/L	0.322	B443543	0.306	0.257	0.020	B443543
Misc. Organics							
Phenols	mg/L	<0.0015	B447464	<0.0015	<0.0015	0.0015	B447464
Physical Properties							
Turbidity	NTU	5.2	B442470	0.34	6.2	0.10	B442470
Apparent Colour	PtCo units	48	B445995	43	35	2.0	B445995

RDL = Reportable Detection Limit
(1) Phosphorus < Orthophosphate: Both values fall within the method uncertainty for duplicates and are likely equivalent.

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI258			CRI259		
Sampling Date		2024/07/06 17:30			2024/07/07 11:00		
COC Number		C#728282-02-01			C#728282-02-01		
	UNITS	SITE 4 UPPER SW	RDL	QC Batch	SITE 4 UPPER D	RDL	QC Batch
ANIONS							
Nitrite (N)	mg/L	<0.0050	0.0050	B442329	<0.0050	0.0050	B443829
Calculated Parameters							
Dissolved Hardness (CaCO3)	mg/L	89.1	0.50	B440213	89.3	0.50	B440213
Total Hardness (CaCO3)	mg/L	85.5	0.50	B440451	84.2	0.50	B440451
Ion Balance (% Difference)	%	0.24	N/A	B440608	0.62	N/A	B440608
Ion Ratio (cation sum / anion sum)	N/A	1.0	0.010	B440605	1.0	0.010	B440605
Nitrate (N)	mg/L	<0.020	0.020	B440455	<0.020	0.020	B440455
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.262	0.020	B440550	1.16	0.020	B440550
Misc. Inorganics							
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	0.00050	B445151			
Dissolved Organic Carbon (C)	mg/L	8.0	0.50	B446050			
pH	pH	7.92	N/A	B442275	7.90	N/A	B447682
Acidity (pH 4.5)	mg/L	<1.0	1.0	B444339	<1.0	1.0	B444456
Total Organic Carbon (C)	mg/L	7.9	0.50	B444524	35	0.50	B444524
Acidity (pH 8.3)	mg/L	<1.0	1.0	B444339	<1.0	1.0	B444456
Total Dissolved Solids	mg/L	120	10	B443397	160	10	B444500
Total Suspended Solids	mg/L	<1.0	1.0	B442102	61	1.0	B442803
Lab Filtered Inorganics							
Dissolved Organic Carbon (C)	mg/L				32 (1)	0.50	B445386
Anions							
Alkalinity (PP as CaCO3)	mg/L	<1.0	1.0	B442285	<1.0	1.0	B447677
Alkalinity (Total as CaCO3)	mg/L	99	1.0	B442285	100	1.0	B447677
Bicarbonate (HCO3)	mg/L	120	1.0	B442285	130	1.0	B447677
Carbonate (CO3)	mg/L	<1.0	1.0	B442285	<1.0	1.0	B447677
Dissolved Fluoride (F)	mg/L	<0.050	0.050	B442375	<0.050	0.050	B444257
Hydroxide (OH)	mg/L	<1.0	1.0	B442285	<1.0	1.0	B447677
Chloride (Cl)	mg/L	<1.0	1.0	B442465	<1.0	1.0	B447852
Sulphate (SO4)	mg/L	<1.0	1.0	B442465	<1.0	1.0	B447852
MISCELLANEOUS							
True Colour	Col. Unit	32.4	2.0	B442323	16.8	2.0	B446199

RDL = Reportable Detection Limit
N/A = Not Applicable
(1) Sample filtered and preserved past method specified hold time

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI258			CRI259		
Sampling Date		2024/07/06 17:30			2024/07/07 11:00		
COC Number		C#728282-02-01			C#728282-02-01		
	UNITS	SITE 4 UPPER SW	RDL	QC Batch	SITE 4 UPPER D	RDL	QC Batch
Nutrients							
Total Ammonia (N)	mg/L	<0.015	0.015	B448448	0.19	0.015	B448448
Orthophosphate (P)	mg/L	0.0056	0.0030	B446674	<0.0030	0.0030	B446674
Total Phosphorus (P)	mg/L	0.0048 (1)	0.0030	B442175	0.10	0.0030	B442178
Nitrate plus Nitrite (N)	mg/L	<0.020	0.020	B442322	<0.020	0.020	B443802
Total Nitrogen (N)	mg/L	0.262	0.020	B443543	1.16	0.020	B443543
Misc. Organics							
Phenols	mg/L	<0.0015	0.0015	B447464			
Physical Properties							
Turbidity	NTU	1.6	0.10	B442470	11	0.10	B443699
Apparent Colour	PtCo units	32	2.0	B445995	26	2.0	B445995

RDL = Reportable Detection Limit
(1) Phosphorus < Orthophosphate: Both values fall within the method uncertainty for duplicates and are likely equivalent.

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI260		CRI261		CRI262		
Sampling Date		2024/07/07 18:00		2024/07/07 16:00		2024/07/06 11:00		
COC Number		C#728282-02-01		C#728282-02-01		C#728282-02-01		
	UNITS	SITE 5S	QC Batch	SITE 5SW	QC Batch	T95R-64	RDL	QC Batch
ANIONS								
Nitrite (N)	mg/L	<0.0050	B442570	<0.0050	B442570	<0.0050	0.0050	B442570
Calculated Parameters								
Dissolved Hardness (CaCO3)	mg/L	80.3	B440213	75.9	B440213	52.3	0.50	B440213
Total Hardness (CaCO3)	mg/L	74.9	B440451	71.6	B440451	48.9	0.50	B440451
Ion Balance (% Difference)	%	4.5	B440608	3.0	B440608	2.9	N/A	B440608
Ion Ratio (cation sum / anion sum)	N/A	1.1	B440605	1.1	B440605	1.1	0.010	B440605
Nitrate (N)	mg/L	<0.020	B440455	<0.020	B440455	<0.020	0.020	B440455
Total Total Kjeldahl Nitrogen (Calc)	mg/L	0.430	B440550	0.311	B440550	0.446	0.020	B440550
Misc. Inorganics								
Strong Acid Dissoc. Cyanide (CN)	mg/L	0.00065	B445151	0.00052	B445151	<0.00050	0.00050	B445151
Dissolved Organic Carbon (C)	mg/L	12	B446050	11	B446050	0.68	0.50	B446050
pH	pH	7.55	B442275	7.83	B442275	8.06	N/A	B442275
Acidity (pH 4.5)	mg/L	<1.0	B444339	<1.0	B444339	<1.0	1.0	B444339
Total Organic Carbon (C)	mg/L	12	B444524	10	B444524	<0.50	0.50	B444524
Acidity (pH 8.3)	mg/L	<1.0	B444339	<1.0	B444339	<1.0	1.0	B444339
Total Dissolved Solids	mg/L	130	B443397	110	B443397	790	10	B443397
Total Suspended Solids	mg/L	20	B442102	<1.0	B442102	1.6	1.0	B442102
Anions								
Alkalinity (PP as CaCO3)	mg/L	<1.0	B442285	<1.0	B442285	<1.0	1.0	B442285
Alkalinity (Total as CaCO3)	mg/L	84	B442285	82	B442285	720	1.0	B442285
Bicarbonate (HCO3)	mg/L	100	B442285	100	B442285	880	1.0	B442285
Carbonate (CO3)	mg/L	<1.0	B442285	<1.0	B442285	<1.0	1.0	B442285
Dissolved Fluoride (F)	mg/L	<0.050	B442375	<0.050	B442375	1.4	0.050	B442375
Hydroxide (OH)	mg/L	<1.0	B442285	<1.0	B442285	<1.0	1.0	B442285
Chloride (Cl)	mg/L	<1.0	B442465	<1.0	B442465	1.1	1.0	B442465
Sulphate (SO4)	mg/L	<1.0	B442465	<1.0	B442465	<1.0	1.0	B442465
MISCELLANEOUS								
True Colour	Col. Unit	45.2	B446199	38.8	B442323	<2.0	2.0	B442323
Nutrients								
Total Ammonia (N)	mg/L	0.027	B448334	<0.015	B448334	0.36	0.015	B448334

RDL = Reportable Detection Limit
N/A = Not Applicable

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RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI260		CRI261		CRI262		
Sampling Date		2024/07/07 18:00		2024/07/07 16:00		2024/07/06 11:00		
COC Number		C#728282-02-01		C#728282-02-01		C#728282-02-01		
	UNITS	**SITE 5S**	**QC Batch**	**SITE 5SW**	**QC Batch**	**T95R-64**	**RDL**	**QC Batch**
Orthophosphate (P)	mg/L	0.0044	B446674	<0.0030	B446674	<0.0030	0.0030	B446674
Total Phosphorus (P)	mg/L	0.016	B442178	0.0037	B442178	0.012	0.0030	B442178
Nitrate plus Nitrite (N)	mg/L	<0.020	B442537	<0.020	B442537	<0.020	0.020	B442537
Total Nitrogen (N)	mg/L	0.430	B443545	0.311	B443545	0.446	0.020	B443545
Misc. Organics								
Phenols	mg/L	<0.0015	B447464	<0.0015	B447464	<0.0015	0.0015	B447464
Physical Properties								
Turbidity	NTU	5.7	B442470	0.32	B442470	0.69	0.10	B443699
Apparent Colour	PtCo units	53	B445995	39	B445995	3.5	2.0	B445995
RDL = Reportable Detection Limit								

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI263		CRI264		
Sampling Date		2024/07/09 18:30		2024/07/06 11:00		
COC Number		C#728282-02-01		C#728282-02-01		
	UNITS	TRIP BLANK	QC Batch	DUP-A	RDL	QC Batch
ANIONS						
Nitrite (N)	mg/L	<0.0050	B442570	<0.0050	0.0050	B442570
Calculated Parameters						
Dissolved Hardness (CaCO3)	mg/L	<0.50	B446285	52.4	0.50	B440213
Total Hardness (CaCO3)	mg/L	<0.50	B446256	49.4	0.50	B440451
Ion Balance (% Difference)	%	26	B440608	3.5	N/A	B440608
Ion Ratio (cation sum / anion sum)	N/A	NC	B440605	1.1	0.010	B440605
Nitrate (N)	mg/L	<0.020	B440455	<0.020	0.020	B440455
Total Total Kjeldahl Nitrogen (Calc)	mg/L	<0.020	B445191	0.444	0.020	B440550
Misc. Inorganics						
Strong Acid Dissoc. Cyanide (CN)	mg/L	<0.00050	B445151	<0.00050	0.00050	B445151
Dissolved Organic Carbon (C)	mg/L	<0.50	B446050	<0.50	0.50	B446050
pH	pH	6.80	B442505	8.13	N/A	B442505
Acidity (pH 4.5)	mg/L	<1.0	B444339	<1.0	1.0	B444339
Total Organic Carbon (C)	mg/L	<0.50	B444524	<0.50	0.50	B444524
Acidity (pH 8.3)	mg/L	<1.0	B444339	<1.0	1.0	B444339
Total Dissolved Solids	mg/L	<10	B443397	630	10	B444500
Total Suspended Solids	mg/L	<1.0	B442102	1.2	1.0	B442102
Anions						
Alkalinity (PP as CaCO3)	mg/L	<1.0	B442520	<1.0	1.0	B442520
Alkalinity (Total as CaCO3)	mg/L	1.4	B442520	710	1.0	B442520
Bicarbonate (HCO3)	mg/L	1.7	B442520	870	1.0	B442520
Carbonate (CO3)	mg/L	<1.0	B442520	<1.0	1.0	B442520
Dissolved Fluoride (F)	mg/L	<0.050	B442375	1.5	0.050	B443717
Hydroxide (OH)	mg/L	<1.0	B442520	<1.0	1.0	B442520
Chloride (Cl)	mg/L	<1.0	B442465	2.8	1.0	B442465
Sulphate (SO4)	mg/L	<1.0	B442465	<1.0	1.0	B442465
MISCELLANEOUS						
True Colour	Col. Unit	<2.0	B442323	<2.0	2.0	B442323
Nutrients						
Total Ammonia (N)	mg/L	<0.015	B448334	0.36	0.015	B448334

RDL = Reportable Detection Limit
N/A = Not Applicable

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

RESULTS OF CHEMICAL ANALYSES OF WATER

Bureau Veritas ID		CRI263		CRI264		
Sampling Date		2024/07/09 18:30		2024/07/06 11:00		
COC Number		C#728282-02-01		C#728282-02-01		
	UNITS	**TRIP BLANK**	**QC Batch**	**DUP-A**	**RDL**	**QC Batch**
Orthophosphate (P)	mg/L	<0.0030	B446674	<0.0030	0.0030	B446674
Total Phosphorus (P)	mg/L	<0.0030	B442178	0.010	0.0030	B442178
Nitrate plus Nitrite (N)	mg/L	<0.020	B442537	<0.020	0.020	B442537
Total Nitrogen (N)	mg/L	<0.020	B447766	0.444	0.020	B443545
Misc. Organics						
Phenols	mg/L	<0.0015	B447464	<0.0015	0.0015	B447464
Physical Properties						
Turbidity	NTU	0.15	B443699	0.77	0.10	B443699
Apparent Colour	PtCo units	<2.0	B445995	<2.0	2.0	B445995
RDL = Reportable Detection Limit						

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MERCURY BY COLD VAPOR (WATER)

Bureau Veritas ID		CRI255	CRI256	CRI257	CRI258	CRI259		
Sampling Date		2024/07/05 13:00	2024/07/05 13:00	2024/07/07 11:00	2024/07/06 17:30	2024/07/07 11:00		
COC Number		C#728282-02-01	C#728282-02-01	C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 2S	SITE 2SW	SITE 4 UPPER S	SITE 4 UPPER SW	SITE 4 UPPER D	RDL	QC Batch
Elements								
Dissolved Mercury (Hg)	ug/L	0.0034	0.0030	0.0023	0.0026	0.0022 (1)	0.0019	B447484
Total Mercury (Hg)	ug/L	0.0020	<0.0019	<0.0019	<0.0019	<0.0019 (1)	0.0019	B447728

RDL = Reportable Detection Limit
(1) Sample received was not in compliance with BC CSR sampling requirements for Mercury in water.

Bureau Veritas ID		CRI260	CRI261	CRI262	CRI263	CRI264		
Sampling Date		2024/07/07 18:00	2024/07/07 16:00	2024/07/06 11:00	2024/07/09 18:30	2024/07/06 11:00		
COC Number		C#728282-02-01	C#728282-02-01	C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 5S	SITE 5SW	T95R-64	TRIP BLANK	DUP-A	RDL	QC Batch
Elements								
Dissolved Mercury (Hg)	ug/L	<0.0019	0.0030	<0.0019	<0.0019	<0.0019	0.0019	B447484
Total Mercury (Hg)	ug/L	<0.0019	<0.0019	<0.0019	<0.0019	<0.0019	0.0019	B447728

RDL = Reportable Detection Limit

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI255		CRI256	CRI257	CRI258		
Sampling Date		2024/07/05 13:00		2024/07/05 13:00	2024/07/07 11:00	2024/07/06 17:30		
COC Number		C#728282-02-01		C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 2S	QC Batch	SITE 2SW	SITE 4 UPPER S	SITE 4 UPPER SW	RDL	QC Batch
Dissolved Metals by ICPMS								
Dissolved Aluminum (Al)	ug/L	28.5	B442119	35.3	28.8	26.9	3.0	B442119
Dissolved Antimony (Sb)	ug/L	<0.50	B442119	<0.50	<0.50	<0.50	0.50	B442119
Dissolved Arsenic (As)	ug/L	0.50	B442119	0.51	0.61	0.63	0.10	B442119
Dissolved Barium (Ba)	ug/L	64.2	B442119	66.5	90.1	88.4	1.0	B442119
Dissolved Beryllium (Be)	ug/L	<0.10	B442119	<0.10	<0.10	<0.10	0.10	B442119
Dissolved Bismuth (Bi)	ug/L	<1.0	B442119	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Boron (B)	ug/L	<50	B442119	<50	<50	<50	50	B442119
Dissolved Cadmium (Cd)	ug/L	0.112	B446363	<0.010	<0.010	<0.010	0.010	B442119
Dissolved Chromium (Cr)	ug/L	<1.0	B442119	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Cobalt (Co)	ug/L	<0.20	B442119	<0.20	<0.20	<0.20	0.20	B442119
Dissolved Copper (Cu)	ug/L	2.09	B442119	1.49	1.27	1.26	0.20	B442119
Dissolved Iron (Fe)	ug/L	23.6	B442119	19.1	19.6	10.8	5.0	B442119
Dissolved Lead (Pb)	ug/L	<0.20	B442119	<0.20	<0.20	<0.20	0.20	B442119
Dissolved Lithium (Li)	ug/L	<2.0	B442119	<2.0	<2.0	<2.0	2.0	B442119
Dissolved Manganese (Mn)	ug/L	<1.0	B442119	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Molybdenum (Mo)	ug/L	<1.0	B442119	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Nickel (Ni)	ug/L	<1.0	B442119	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Phosphorus (P)	ug/L	<10	B442119	<10	<10	<10	10	B442119
Dissolved Selenium (Se)	ug/L	<0.10	B442119	<0.10	<0.10	<0.10	0.10	B442119
Dissolved Silicon (Si)	ug/L	3350	B442119	3410	3240	3200	100	B442119
Dissolved Silver (Ag)	ug/L	<0.020	B442119	<0.020	<0.020	<0.020	0.020	B442119
Dissolved Strontium (Sr)	ug/L	114	B442119	118	167	165	1.0	B442119
Dissolved Thallium (Tl)	ug/L	<0.010	B442119	<0.010	<0.010	<0.010	0.010	B442119
Dissolved Tin (Sn)	ug/L	<5.0	B442119	<5.0	<5.0	<5.0	5.0	B442119
Dissolved Titanium (Ti)	ug/L	<5.0	B442119	<5.0	<5.0	<5.0	5.0	B442119
Dissolved Tungsten (W)	ug/L	<1.0	B442119	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Uranium (U)	ug/L	<0.10	B442119	<0.10	<0.10	<0.10	0.10	B442119
Dissolved Vanadium (V)	ug/L	<5.0	B442119	<5.0	<5.0	<5.0	5.0	B442119
Dissolved Zinc (Zn)	ug/L	<5.0	B442119	<5.0	<5.0	<5.0	5.0	B442119
Dissolved Zirconium (Zr)	ug/L	0.21	B442119	0.21	0.14	0.14	0.10	B442119
Dissolved Calcium (Ca)	mg/L	15.3	B440542	15.8	20.8	19.9	0.050	B440542

RDL = Reportable Detection Limit

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI255		CRI256	CRI257	CRI258		
Sampling Date		2024/07/05 13:00		2024/07/05 13:00	2024/07/07 11:00	2024/07/06 17:30		
COC Number		C#728282-02-01		C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 2S	QC Batch	SITE 2SW	SITE 4 UPPER S	SITE 4 UPPER SW	RDL	QC Batch
Dissolved Magnesium (Mg)	mg/L	8.35	B440542	8.43	10.1	9.54	0.050	B440542
Dissolved Potassium (K)	mg/L	0.298	B440542	0.293	0.286	0.272	0.050	B440542
Dissolved Sodium (Na)	mg/L	4.30	B440542	4.32	4.78	4.65	0.050	B440542
Dissolved Sulphur (S)	mg/L	<3.0	B440542	<3.0	<3.0	<3.0	3.0	B440542
Total Metals by ICPMS								
Total Aluminum (Al)	ug/L	62.2	B443191	38.2	118	41.9	3.0	B443191
Total Antimony (Sb)	ug/L	<0.50	B443191	<0.50	<0.50	<0.50	0.50	B443191
Total Arsenic (As)	ug/L	0.49	B443191	0.48	0.66	0.61	0.10	B443191
Total Barium (Ba)	ug/L	61.7	B443191	61.4	89.6	83.2	1.0	B443191
Total Beryllium (Be)	ug/L	<0.10	B443191	<0.10	<0.10	<0.10	0.10	B443191
Total Bismuth (Bi)	ug/L	<1.0	B443191	<1.0	<1.0	<1.0	1.0	B443191
Total Boron (B)	ug/L	<50	B443191	<50	<50	<50	50	B443191
Total Cadmium (Cd)	ug/L	<0.010	B443191	<0.010	<0.010	<0.010	0.010	B443191
Total Chromium (Cr)	ug/L	<1.0	B443191	<1.0	<1.0	<1.0	1.0	B443191
Total Cobalt (Co)	ug/L	<0.20	B443191	<0.20	<0.20	<0.20	0.20	B443191
Total Copper (Cu)	ug/L	1.51	B443191	1.39	1.25	1.12	0.50	B443191
Total Iron (Fe)	ug/L	54	B443191	21	114	23	10	B443191
Total Lead (Pb)	ug/L	<0.20	B443191	<0.20	<0.20	<0.20	0.20	B443191
Total Lithium (Li)	ug/L	<2.0	B443191	<2.0	<2.0	<2.0	2.0	B443191
Total Manganese (Mn)	ug/L	1.6	B443191	1.2	3.2	<1.0	1.0	B443191
Total Molybdenum (Mo)	ug/L	<1.0	B443191	<1.0	<1.0	<1.0	1.0	B443191
Total Nickel (Ni)	ug/L	<1.0	B443191	<1.0	<1.0	<1.0	1.0	B443191
Total Phosphorus (P)	ug/L	<10	B443191	<10	<10	<10	10	B443191
Total Selenium (Se)	ug/L	<0.10	B443191	<0.10	<0.10	<0.10	0.10	B443191
Total Silicon (Si)	ug/L	3310	B443191	3200	3270	3160	100	B443191
Total Silver (Ag)	ug/L	<0.020	B443191	<0.020	<0.020	<0.020	0.020	B443191
Total Strontium (Sr)	ug/L	105	B443191	104	171	156	1.0	B443191
Total Thallium (Tl)	ug/L	<0.010	B443191	<0.010	<0.010	<0.010	0.010	B443191
Total Tin (Sn)	ug/L	<5.0	B443191	<5.0	<5.0	<5.0	5.0	B443191
Total Titanium (Ti)	ug/L	<5.0	B443191	<5.0	<5.0	<5.0	5.0	B443191
Total Tungsten (W)	ug/L	<1.0	B443191	<1.0	<1.0	<1.0	1.0	B443191
Total Uranium (U)	ug/L	<0.10	B443191	<0.10	<0.10	<0.10	0.10	B443191

RDL = Reportable Detection Limit

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI255		CRI256	CRI257	CRI258		
Sampling Date		2024/07/05 13:00		2024/07/05 13:00	2024/07/07 11:00	2024/07/06 17:30		
COC Number		C#728282-02-01		C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 2S	QC Batch	SITE 2SW	SITE 4 UPPER S	SITE 4 UPPER SW	RDL	QC Batch
Total Vanadium (V)	ug/L	<5.0	B443191	<5.0	<5.0	<5.0	5.0	B443191
Total Zinc (Zn)	ug/L	<5.0	B443191	<5.0	<5.0	<5.0	5.0	B443191
Total Zirconium (Zr)	ug/L	0.20	B443191	0.19	0.25	0.17	0.10	B443191
Total Calcium (Ca)	mg/L	15.6	B440690	15.3	20.9	20.2	0.050	B440690
Total Magnesium (Mg)	mg/L	7.57	B440690	7.66	9.35	8.50	0.050	B440690
Total Potassium (K)	mg/L	0.277	B440690	0.264	0.285	0.249	0.050	B440690
Total Sodium (Na)	mg/L	3.85	B440690	3.86	4.46	4.16	0.050	B440690
Total Sulphur (S)	mg/L	<3.0	B440690	<3.0	<3.0	<3.0	3.0	B440690
RDL = Reportable Detection Limit								

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI259	CRI260	CRI261	CRI262		
Sampling Date		2024/07/07 11:00	2024/07/07 18:00	2024/07/07 16:00	2024/07/06 11:00		
COC Number		C#728282-02-01	C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 4 UPPER D	SITE 5S	SITE 5SW	T95R-64	RDL	QC Batch
Dissolved Metals by ICPMS							
Dissolved Aluminum (Al)	ug/L	25.7	47.7	28.7	<3.0	3.0	B442119
Dissolved Antimony (Sb)	ug/L	0.89	<0.50	<0.50	<0.50	0.50	B442119
Dissolved Arsenic (As)	ug/L	0.42	1.14	0.48	<0.10	0.10	B442119
Dissolved Barium (Ba)	ug/L	88.4	82.3	67.4	436	1.0	B442119
Dissolved Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	B442119
Dissolved Bismuth (Bi)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Boron (B)	ug/L	<50	<50	<50	139	50	B442119
Dissolved Cadmium (Cd)	ug/L	0.094	0.018	<0.010	<0.010	0.010	B442119
Dissolved Chromium (Cr)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Cobalt (Co)	ug/L	<0.20	0.49	<0.20	<0.20	0.20	B442119
Dissolved Copper (Cu)	ug/L	77.4	1.16	1.59	<0.20	0.20	B442119
Dissolved Iron (Fe)	ug/L	34.1	146	14.0	344	5.0	B442119
Dissolved Lead (Pb)	ug/L	1.65	<0.20	<0.20	<0.20	0.20	B442119
Dissolved Lithium (Li)	ug/L	<2.0	<2.0	<2.0	58.0	2.0	B442119
Dissolved Manganese (Mn)	ug/L	59.2	177	<1.0	17.0	1.0	B442119
Dissolved Molybdenum (Mo)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Nickel (Ni)	ug/L	3.1	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Phosphorus (P)	ug/L	<10	<10	<10	10	10	B442119
Dissolved Selenium (Se)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	B442119
Dissolved Silicon (Si)	ug/L	2960	3820	3440	3760	100	B442119
Dissolved Silver (Ag)	ug/L	<0.020	<0.020	<0.020	<0.020	0.020	B442119
Dissolved Strontium (Sr)	ug/L	156	123	120	286	1.0	B442119
Dissolved Thallium (Tl)	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	B442119
Dissolved Tin (Sn)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	B442119
Dissolved Titanium (Ti)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	B442119
Dissolved Tungsten (W)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	B442119
Dissolved Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	B442119
Dissolved Vanadium (V)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	B442119
Dissolved Zinc (Zn)	ug/L	35.5	12.6	<5.0	<5.0	5.0	B442119
Dissolved Zirconium (Zr)	ug/L	0.18	0.24	0.19	<0.10	0.10	B442119
Dissolved Calcium (Ca)	mg/L	20.6	18.1	16.0	17.7	0.050	B440542

RDL = Reportable Detection Limit

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI259	CRI260	CRI261	CRI262		
Sampling Date		2024/07/07 11:00	2024/07/07 18:00	2024/07/07 16:00	2024/07/06 11:00		
COC Number		C#728282-02-01	C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 4 UPPER D	SITE 5S	SITE 5SW	T95R-64	RDL	QC Batch
Dissolved Magnesium (Mg)	mg/L	9.23	8.53	8.74	1.98	0.050	B440542
Dissolved Potassium (K)	mg/L	1.24	0.408	0.336	1.41	0.050	B440542
Dissolved Sodium (Na)	mg/L	5.63	4.57	4.80	327	0.050	B440542
Dissolved Sulphur (S)	mg/L	<3.0	<3.0	<3.0	<3.0	3.0	B440542
Total Metals by ICPMS							
Total Aluminum (Al)	ug/L	575	150	32.3	4.6	3.0	B443191
Total Antimony (Sb)	ug/L	1.42	<0.50	<0.50	<0.50	0.50	B443191
Total Arsenic (As)	ug/L	0.55	1.18	0.45	<0.10	0.10	B443191
Total Barium (Ba)	ug/L	91.7	80.1	64.5	397	1.0	B443191
Total Beryllium (Be)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	B443191
Total Bismuth (Bi)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	B443191
Total Boron (B)	ug/L	<50	<50	<50	124	50	B443191
Total Cadmium (Cd)	ug/L	0.096	0.027	<0.010	<0.010	0.010	B443191
Total Chromium (Cr)	ug/L	3.0	<1.0	<1.0	<1.0	1.0	B443191
Total Cobalt (Co)	ug/L	0.32	0.54	<0.20	<0.20	0.20	B443191
Total Copper (Cu)	ug/L	103	1.33	1.38	<0.50	0.50	B443191
Total Iron (Fe)	ug/L	555	251	15	401	10	B443191
Total Lead (Pb)	ug/L	8.84	<0.20	<0.20	<0.20	0.20	B443191
Total Lithium (Li)	ug/L	<2.0	<2.0	<2.0	53.1	2.0	B443191
Total Manganese (Mn)	ug/L	59.0	162	<1.0	15.5	1.0	B443191
Total Molybdenum (Mo)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	B443191
Total Nickel (Ni)	ug/L	3.5	<1.0	<1.0	<1.0	1.0	B443191
Total Phosphorus (P)	ug/L	37	12	<10	13	10	B443191
Total Selenium (Se)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	B443191
Total Silicon (Si)	ug/L	3480	3600	3280	3480	100	B443191
Total Silver (Ag)	ug/L	0.033	<0.020	<0.020	<0.020	0.020	B443191
Total Strontium (Sr)	ug/L	152	111	110	277	1.0	B443191
Total Thallium (Tl)	ug/L	<0.010	<0.010	<0.010	<0.010	0.010	B443191
Total Tin (Sn)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	B443191
Total Titanium (Ti)	ug/L	9.8	<5.0	<5.0	<5.0	5.0	B443191
Total Tungsten (W)	ug/L	<1.0	<1.0	<1.0	<1.0	1.0	B443191
Total Uranium (U)	ug/L	<0.10	<0.10	<0.10	<0.10	0.10	B443191

RDL = Reportable Detection Limit

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI259	CRI260	CRI261	CRI262		
Sampling Date		2024/07/07 11:00	2024/07/07 18:00	2024/07/07 16:00	2024/07/06 11:00		
COC Number		C#728282-02-01	C#728282-02-01	C#728282-02-01	C#728282-02-01		
	UNITS	SITE 4 UPPER D	SITE 5S	SITE 5SW	T95R-64	RDL	QC Batch
Total Vanadium (V)	ug/L	<5.0	<5.0	<5.0	<5.0	5.0	B443191
Total Zinc (Zn)	ug/L	39.8	14.2	<5.0	<5.0	5.0	B443191
Total Zirconium (Zr)	ug/L	0.27	0.21	0.18	<0.10	0.10	B443191
Total Calcium (Ca)	mg/L	19.9	17.3	15.9	16.7	0.050	B440690
Total Magnesium (Mg)	mg/L	8.42	7.73	7.74	1.74	0.050	B440690
Total Potassium (K)	mg/L	1.09	0.382	0.313	1.22	0.050	B440690
Total Sodium (Na)	mg/L	4.81	4.05	4.31	279	0.050	B440690
Total Sulphur (S)	mg/L	<3.0	<3.0	<3.0	<3.0	3.0	B440690
RDL = Reportable Detection Limit							

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ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI263		CRI264		
Sampling Date		2024/07/09 18:30		2024/07/06 11:00		
COC Number		C#728282-02-01		C#728282-02-01		
	UNITS	TRIP BLANK	QC Batch	DUP-A	RDL	QC Batch
Dissolved Metals by ICPMS						
Dissolved Aluminum (Al)	ug/L	<3.0	B442119	<3.0	3.0	B442119
Dissolved Antimony (Sb)	ug/L	<0.50	B442119	<0.50	0.50	B442119
Dissolved Arsenic (As)	ug/L	<0.10	B442119	<0.10	0.10	B442119
Dissolved Barium (Ba)	ug/L	<1.0	B442119	431	1.0	B442119
Dissolved Beryllium (Be)	ug/L	<0.10	B442119	<0.10	0.10	B442119
Dissolved Bismuth (Bi)	ug/L	<1.0	B442119	<1.0	1.0	B442119
Dissolved Boron (B)	ug/L	<50	B442119	147	50	B442119
Dissolved Cadmium (Cd)	ug/L	<0.010	B442119	<0.010	0.010	B442119
Dissolved Chromium (Cr)	ug/L	<1.0	B442119	<1.0	1.0	B442119
Dissolved Cobalt (Co)	ug/L	<0.20	B442119	<0.20	0.20	B442119
Dissolved Copper (Cu)	ug/L	0.54	B446363	<0.20	0.20	B442119
Dissolved Iron (Fe)	ug/L	<5.0	B442119	300	5.0	B442119
Dissolved Lead (Pb)	ug/L	<0.20	B442119	<0.20	0.20	B442119
Dissolved Lithium (Li)	ug/L	<2.0	B442119	62.0	2.0	B442119
Dissolved Manganese (Mn)	ug/L	<1.0	B442119	16.9	1.0	B442119
Dissolved Molybdenum (Mo)	ug/L	<1.0	B442119	<1.0	1.0	B442119
Dissolved Nickel (Ni)	ug/L	<1.0	B442119	<1.0	1.0	B442119
Dissolved Phosphorus (P)	ug/L	<10	B442119	11	10	B442119
Dissolved Selenium (Se)	ug/L	<0.10	B442119	<0.10	0.10	B442119
Dissolved Silicon (Si)	ug/L	<100	B442119	3800	100	B442119
Dissolved Silver (Ag)	ug/L	<0.020	B442119	<0.020	0.020	B442119
Dissolved Strontium (Sr)	ug/L	<1.0	B442119	288	1.0	B442119
Dissolved Thallium (Tl)	ug/L	<0.010	B442119	<0.010	0.010	B442119
Dissolved Tin (Sn)	ug/L	<5.0	B442119	<5.0	5.0	B442119
Dissolved Titanium (Ti)	ug/L	<5.0	B442119	<5.0	5.0	B442119
Dissolved Tungsten (W)	ug/L	<1.0	B442119	<1.0	1.0	B442119
Dissolved Uranium (U)	ug/L	<0.10	B442119	<0.10	0.10	B442119
Dissolved Vanadium (V)	ug/L	<5.0	B442119	<5.0	5.0	B442119
Dissolved Zinc (Zn)	ug/L	<5.0	B442119	<5.0	5.0	B442119
Dissolved Zirconium (Zr)	ug/L	<0.10	B442119	<0.10	0.10	B442119
Dissolved Calcium (Ca)	mg/L	<0.050	B445292	17.7	0.050	B440542
RDL = Reportable Detection Limit						

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI263		CRI264		
Sampling Date		2024/07/09 18:30		2024/07/06 11:00		
COC Number		C#728282-02-01		C#728282-02-01		
	UNITS	**TRIP BLANK**	**QC Batch**	**DUP-A**	**RDL**	**QC Batch**
Dissolved Magnesium (Mg)	mg/L	<0.050	B445292	2.01	0.050	B440542
Dissolved Potassium (K)	mg/L	<0.050	B445292	1.39	0.050	B440542
Dissolved Sodium (Na)	mg/L	0.373	B445292	331	0.050	B440542
Dissolved Sulphur (S)	mg/L	<3.0	B445292	<3.0	3.0	B440542
Total Metals by ICPMS						
Total Aluminum (Al)	ug/L	<3.0	B442630	4.7	3.0	B443191
Total Antimony (Sb)	ug/L	<0.50	B442630	<0.50	0.50	B443191
Total Arsenic (As)	ug/L	<0.10	B442630	<0.10	0.10	B443191
Total Barium (Ba)	ug/L	<1.0	B442630	402	1.0	B443191
Total Beryllium (Be)	ug/L	<0.10	B442630	<0.10	0.10	B443191
Total Bismuth (Bi)	ug/L	<1.0	B442630	<1.0	1.0	B443191
Total Boron (B)	ug/L	<50	B442630	128	50	B443191
Total Cadmium (Cd)	ug/L	<0.010	B442630	<0.010	0.010	B443191
Total Chromium (Cr)	ug/L	<1.0	B442630	<1.0	1.0	B443191
Total Cobalt (Co)	ug/L	<0.20	B442630	<0.20	0.20	B443191
Total Copper (Cu)	ug/L	0.55	B442630	<0.50	0.50	B443191
Total Iron (Fe)	ug/L	<10	B442630	421	10	B443191
Total Lead (Pb)	ug/L	<0.20	B442630	<0.20	0.20	B443191
Total Lithium (Li)	ug/L	<2.0	B442630	56.6	2.0	B443191
Total Manganese (Mn)	ug/L	<1.0	B442630	15.8	1.0	B443191
Total Molybdenum (Mo)	ug/L	<1.0	B442630	<1.0	1.0	B443191
Total Nickel (Ni)	ug/L	<1.0	B442630	<1.0	1.0	B443191
Total Phosphorus (P)	ug/L	<10	B442630	13	10	B443191
Total Selenium (Se)	ug/L	<0.10	B442630	<0.10	0.10	B443191
Total Silicon (Si)	ug/L	<100	B442630	3600	100	B443191
Total Silver (Ag)	ug/L	<0.020	B442630	<0.020	0.020	B443191
Total Strontium (Sr)	ug/L	<1.0	B442630	283	1.0	B443191
Total Thallium (Tl)	ug/L	<0.010	B442630	<0.010	0.010	B443191
Total Tin (Sn)	ug/L	<5.0	B442630	<5.0	5.0	B443191
Total Titanium (Ti)	ug/L	<5.0	B442630	<5.0	5.0	B443191
Total Tungsten (W)	ug/L	<1.0	B442630	<1.0	1.0	B443191
Total Uranium (U)	ug/L	<0.10	B442630	<0.10	0.10	B443191
RDL = Reportable Detection Limit						

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		CRI263		CRI264		
Sampling Date		2024/07/09 18:30		2024/07/06 11:00		
COC Number		C#728282-02-01		C#728282-02-01		
	UNITS	TRIP BLANK	QC Batch	DUP-A	RDL	QC Batch
Total Vanadium (V)	ug/L	<5.0	B442630	<5.0	5.0	B443191
Total Zinc (Zn)	ug/L	<5.0	B442630	<5.0	5.0	B443191
Total Zirconium (Zr)	ug/L	<0.10	B442630	0.10	0.10	B443191
Total Calcium (Ca)	mg/L	<0.050	B445403	16.9	0.050	B440690
Total Magnesium (Mg)	mg/L	<0.050	B445403	1.76	0.050	B440690
Total Potassium (K)	mg/L	<0.050	B445403	1.27	0.050	B440690
Total Sodium (Na)	mg/L	0.363	B445403	283	0.050	B440690
Total Sulphur (S)	mg/L	<3.0	B445403	<3.0	3.0	B440690
RDL = Reportable Detection Limit						

Bureau Veritas Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

GENERAL COMMENTS

Sample CRI255 [SITE 2S] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer.

Sample CRI256 [SITE 2SW] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI257 [SITE 4 UPPER S] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI258 [SITE 4 UPPER SW] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI259 [SITE 4 UPPER D] : Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrate + Nitrite (N). Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Alkalinity @25C (pp, total), CO3,HCO3,OH.

Sample CRI260 [SITE 5S] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer.

Sample CRI261 [SITE 5SW] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold

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time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI262 [T95R-64] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI263 [TRIP BLANK] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI264 [DUP-A] : Sample received past method specified hold time for Nitrate + Nitrite (N). Exceedance of hold time increases the uncertainty of test results but does not necessarily imply that results are compromised. Sample received past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Color (True) by Automated Analyzer. Sample received past method specified hold time for Color (True) by Automated Analyzer. Sample was analyzed past method specified hold time for Total Suspended Solids (NFR). Sample was analyzed past method specified hold time for Nitrate + Nitrite (N). Sample was analyzed past method specified hold time for Nitrite (N) Regular Level Water. Sample was analyzed past method specified hold time for Turbidity. Sample was analyzed past method specified hold time for Total Dissolved Solids (Filt. Residue). Sample was analyzed past method specified hold time for Orthophosphate by Automated Analyzer.

Sample CRI255, Elements by CRC ICPMS (dissolved): Test repeated.
Sample CRI263, Elements by CRC ICPMS (dissolved): Test repeated.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B442102	Total Suspended Solids	2024/07/18	100	80 - 120	98	80 - 120	<1.0	mg/L	NC	20
B442119	Dissolved Aluminum (Al)	2024/07/18	97	80 - 120	101	80 - 120	<3.0	ug/L	1.3	20
B442119	Dissolved Antimony (Sb)	2024/07/18	96	80 - 120	102	80 - 120	<0.50	ug/L	0.96	20
B442119	Dissolved Arsenic (As)	2024/07/18	100	80 - 120	101	80 - 120	<0.10	ug/L	1.4	20
B442119	Dissolved Barium (Ba)	2024/07/18	NC	80 - 120	100	80 - 120	<1.0	ug/L	0.77	20
B442119	Dissolved Beryllium (Be)	2024/07/18	93	80 - 120	97	80 - 120	<0.10	ug/L	NC	20
B442119	Dissolved Bismuth (Bi)	2024/07/18	92	80 - 120	97	80 - 120	<1.0	ug/L	NC	20
B442119	Dissolved Boron (B)	2024/07/18	93	80 - 120	97	80 - 120	<50	ug/L	NC	20
B442119	Dissolved Cadmium (Cd)	2024/07/18	97	80 - 120	101	80 - 120	<0.010	ug/L	2.9	20
B442119	Dissolved Chromium (Cr)	2024/07/18	88	80 - 120	93	80 - 120	<1.0	ug/L	NC	20
B442119	Dissolved Cobalt (Co)	2024/07/18	87	80 - 120	95	80 - 120	<0.20	ug/L	NC	20
B442119	Dissolved Copper (Cu)	2024/07/18	87	80 - 120	94	80 - 120	<0.20	ug/L	1.4	20
B442119	Dissolved Iron (Fe)	2024/07/18	97	80 - 120	100	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Lead (Pb)	2024/07/18	93	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
B442119	Dissolved Lithium (Li)	2024/07/18	96	80 - 120	100	80 - 120	<2.0	ug/L	NC	20
B442119	Dissolved Manganese (Mn)	2024/07/18	91	80 - 120	97	80 - 120	<1.0	ug/L	0.70	20
B442119	Dissolved Molybdenum (Mo)	2024/07/18	106	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B442119	Dissolved Nickel (Ni)	2024/07/18	90	80 - 120	97	80 - 120	<1.0	ug/L	1.4	20
B442119	Dissolved Phosphorus (P)	2024/07/18	103	80 - 120	102	80 - 120	<10	ug/L	NC	20
B442119	Dissolved Selenium (Se)	2024/07/18	96	80 - 120	101	80 - 120	<0.10	ug/L	0.56	20
B442119	Dissolved Silicon (Si)	2024/07/18	99	80 - 120	104	80 - 120	<100	ug/L	2.7	20
B442119	Dissolved Silver (Ag)	2024/07/18	96	80 - 120	99	80 - 120	<0.020	ug/L	NC	20
B442119	Dissolved Strontium (Sr)	2024/07/18	NC	80 - 120	97	80 - 120	<1.0	ug/L	1.5	20
B442119	Dissolved Thallium (Tl)	2024/07/18	95	80 - 120	99	80 - 120	<0.010	ug/L	1.5	20
B442119	Dissolved Tin (Sn)	2024/07/18	98	80 - 120	102	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Titanium (Ti)	2024/07/18	95	80 - 120	98	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Tungsten (W)	2024/07/18	99	80 - 120	102	80 - 120	<1.0	ug/L		
B442119	Dissolved Uranium (U)	2024/07/18	98	80 - 120	102	80 - 120	<0.10	ug/L	2.6	20
B442119	Dissolved Vanadium (V)	2024/07/18	93	80 - 120	96	80 - 120	<5.0	ug/L	NC	20
B442119	Dissolved Zinc (Zn)	2024/07/18	NC	80 - 120	99	80 - 120	<5.0	ug/L	0.48	20
B442119	Dissolved Zirconium (Zr)	2024/07/18	102	80 - 120	101	80 - 120	<0.10	ug/L	NC	20
B442175	Total Phosphorus (P)	2024/07/18	NC	N/A	102	80 - 120	<0.0030	mg/L	0.28	20

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			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B442178	Total Phosphorus (P)	2024/07/19	111	N/A	102	80 - 120	<0.0030	mg/L	NC	20
B442275	pH	2024/07/17			100	97 - 103			0.23	N/A
B442285	Alkalinity (PP as CaCO3)	2024/07/17					<1.0	mg/L	NC	20
B442285	Alkalinity (Total as CaCO3)	2024/07/17			98	80 - 120	<1.0	mg/L	2.2	20
B442285	Bicarbonate (HCO3)	2024/07/17					<1.0	mg/L	2.2	20
B442285	Carbonate (CO3)	2024/07/17					<1.0	mg/L	NC	20
B442285	Hydroxide (OH)	2024/07/17					<1.0	mg/L	NC	20
B442322	Nitrate plus Nitrite (N)	2024/07/17	NC	80 - 120	108	80 - 120	<0.020	mg/L	1.1	25
B442323	True Colour	2024/07/17			111	80 - 120	<2.0	Col. Unit	NC	20
B442329	Nitrite (N)	2024/07/17	NC	80 - 120	105	80 - 120	<0.0050	mg/L	0.31	20
B442375	Dissolved Fluoride (F)	2024/07/17	NC	80 - 120	91	80 - 120	<0.050	mg/L	0.88	20
B442465	Chloride (Cl)	2024/07/18	61 (1)	80 - 120	100	80 - 120	<1.0	mg/L	NC	20
B442465	Sulphate (SO4)	2024/07/18	NC	80 - 120	101	80 - 120	<1.0	mg/L	0.67	20
B442470	Turbidity	2024/07/17			104	80 - 120	<0.10	NTU	8.8	20
B442505	pH	2024/07/17			100	97 - 103			1.4	N/A
B442520	Alkalinity (PP as CaCO3)	2024/07/17					<1.0	mg/L	NC	20
B442520	Alkalinity (Total as CaCO3)	2024/07/17			96	80 - 120	<1.0	mg/L	0.19	20
B442520	Bicarbonate (HCO3)	2024/07/17					<1.0	mg/L	0.19	20
B442520	Carbonate (CO3)	2024/07/17					<1.0	mg/L	NC	20
B442520	Hydroxide (OH)	2024/07/17					<1.0	mg/L	NC	20
B442537	Nitrate plus Nitrite (N)	2024/07/17	110	80 - 120	108	80 - 120	<0.020	mg/L	NC	25
B442570	Nitrite (N)	2024/07/17	104	80 - 120	105	80 - 120	<0.0050	mg/L	NC	20
B442630	Total Aluminum (Al)	2024/07/19	98	80 - 120	99	80 - 120	<3.0	ug/L	NC	20
B442630	Total Antimony (Sb)	2024/07/19	102	80 - 120	101	80 - 120	<0.50	ug/L	NC	20
B442630	Total Arsenic (As)	2024/07/19	103	80 - 120	100	80 - 120	<0.10	ug/L	NC	20
B442630	Total Barium (Ba)	2024/07/19	98	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B442630	Total Beryllium (Be)	2024/07/19	104	80 - 120	101	80 - 120	<0.10	ug/L	NC	20
B442630	Total Bismuth (Bi)	2024/07/19	95	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
B442630	Total Boron (B)	2024/07/19	96	80 - 120	97	80 - 120	<50	ug/L	NC	20
B442630	Total Cadmium (Cd)	2024/07/19	99	80 - 120	99	80 - 120	<0.010	ug/L	NC	20
B442630	Total Chromium (Cr)	2024/07/19	96	80 - 120	100	80 - 120	<1.0	ug/L	NC	20
B442630	Total Cobalt (Co)	2024/07/19	91	80 - 120	95	80 - 120	<0.20	ug/L	NC	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B442630	Total Copper (Cu)	2024/07/19	90	80 - 120	95	80 - 120	<0.50	ug/L	2.5	20
B442630	Total Iron (Fe)	2024/07/19	103	80 - 120	98	80 - 120	<10	ug/L	NC	20
B442630	Total Lead (Pb)	2024/07/19	97	80 - 120	97	80 - 120	<0.20	ug/L	NC	20
B442630	Total Lithium (Li)	2024/07/19	97	80 - 120	99	80 - 120	<2.0	ug/L	NC	20
B442630	Total Manganese (Mn)	2024/07/19	95	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
B442630	Total Molybdenum (Mo)	2024/07/19	107	80 - 120	103	80 - 120	<1.0	ug/L	NC	20
B442630	Total Nickel (Ni)	2024/07/19	93	80 - 120	98	80 - 120	<1.0	ug/L	NC	20
B442630	Total Phosphorus (P)	2024/07/19	104	80 - 120	99	80 - 120	<10	ug/L	NC	20
B442630	Total Selenium (Se)	2024/07/19	100	80 - 120	94	80 - 120	<0.10	ug/L	NC	20
B442630	Total Silicon (Si)	2024/07/19	105	80 - 120	102	80 - 120	<100	ug/L	NC	20
B442630	Total Silver (Ag)	2024/07/19	97	80 - 120	97	80 - 120	<0.020	ug/L	NC	20
B442630	Total Strontium (Sr)	2024/07/19	101	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B442630	Total Thallium (Tl)	2024/07/19	99	80 - 120	100	80 - 120	<0.010	ug/L	NC	20
B442630	Total Tin (Sn)	2024/07/19	100	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
B442630	Total Titanium (Ti)	2024/07/19	100	80 - 120	100	80 - 120	<5.0	ug/L	NC	20
B442630	Total Tungsten (W)	2024/07/19	101	80 - 120	99	80 - 120	<1.0	ug/L	NC	20
B442630	Total Uranium (U)	2024/07/19	97	80 - 120	98	80 - 120	<0.10	ug/L	NC	20
B442630	Total Vanadium (V)	2024/07/19	99	80 - 120	99	80 - 120	<5.0	ug/L	NC	20
B442630	Total Zinc (Zn)	2024/07/18	95	80 - 120	100	80 - 120	<5.0	ug/L	1.3	20
B442630	Total Zirconium (Zr)	2024/07/19	105	80 - 120	100	80 - 120	<0.10	ug/L	NC	20
B442803	Total Suspended Solids	2024/07/18	104	80 - 120	100	80 - 120	<1.0	mg/L	NC	20
B443191	Total Aluminum (Al)	2024/07/18	103	80 - 120	99	80 - 120	<3.0	ug/L	0.60	20
B443191	Total Antimony (Sb)	2024/07/18	102	80 - 120	103	80 - 120	<0.50	ug/L	NC	20
B443191	Total Arsenic (As)	2024/07/18	103	80 - 120	104	80 - 120	<0.10	ug/L	4.1	20
B443191	Total Barium (Ba)	2024/07/18	99	80 - 120	101	80 - 120	<1.0	ug/L	2.4	20
B443191	Total Beryllium (Be)	2024/07/18	104	80 - 120	103	80 - 120	<0.10	ug/L	NC	20
B443191	Total Bismuth (Bi)	2024/07/18	97	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B443191	Total Boron (B)	2024/07/18	101	80 - 120	98	80 - 120	<50	ug/L	NC	20
B443191	Total Cadmium (Cd)	2024/07/18	102	80 - 120	103	80 - 120	<0.010	ug/L	NC	20
B443191	Total Chromium (Cr)	2024/07/18	99	80 - 120	104	80 - 120	<1.0	ug/L	NC	20
B443191	Total Cobalt (Co)	2024/07/18	94	80 - 120	99	80 - 120	<0.20	ug/L	NC	20
B443191	Total Copper (Cu)	2024/07/18	94	80 - 120	99	80 - 120	<0.50	ug/L	6.0	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B443191	Total Iron (Fe)	2024/07/18	102	80 - 120	110	80 - 120	<10	ug/L	0.22	20
B443191	Total Lead (Pb)	2024/07/18	99	80 - 120	102	80 - 120	<0.20	ug/L	NC	20
B443191	Total Lithium (Li)	2024/07/18	100	80 - 120	102	80 - 120	<2.0	ug/L	0.79	20
B443191	Total Manganese (Mn)	2024/07/18	95	80 - 120	103	80 - 120	<1.0	ug/L	0.85	20
B443191	Total Molybdenum (Mo)	2024/07/18	105	80 - 120	107	80 - 120	<1.0	ug/L	NC	20
B443191	Total Nickel (Ni)	2024/07/18	96	80 - 120	102	80 - 120	<1.0	ug/L	NC	20
B443191	Total Phosphorus (P)	2024/07/18	102	80 - 120	101	80 - 120	<10	ug/L	3.3	20
B443191	Total Selenium (Se)	2024/07/18	101	80 - 120	107	80 - 120	<0.10	ug/L	NC	20
B443191	Total Silicon (Si)	2024/07/18	108	80 - 120	114	80 - 120	<100	ug/L	5.1	20
B443191	Total Silver (Ag)	2024/07/18	99	80 - 120	102	80 - 120	<0.020	ug/L	NC	20
B443191	Total Strontium (Sr)	2024/07/18	100	80 - 120	104	80 - 120	<1.0	ug/L	0.59	20
B443191	Total Thallium (Tl)	2024/07/18	100	80 - 120	104	80 - 120	<0.010	ug/L	NC	20
B443191	Total Tin (Sn)	2024/07/18	101	80 - 120	105	80 - 120	<5.0	ug/L	NC	20
B443191	Total Titanium (Ti)	2024/07/18	104	80 - 120	104	80 - 120	<5.0	ug/L	4.0	20
B443191	Total Tungsten (W)	2024/07/18	97	80 - 120	102	80 - 120	<1.0	ug/L		
B443191	Total Uranium (U)	2024/07/18	104	80 - 120	110	80 - 120	<0.10	ug/L	NC	20
B443191	Total Vanadium (V)	2024/07/18	100	80 - 120	103	80 - 120	<5.0	ug/L	NC	20
B443191	Total Zinc (Zn)	2024/07/18	102	80 - 120	105	80 - 120	<5.0	ug/L	NC	20
B443191	Total Zirconium (Zr)	2024/07/18	103	80 - 120	106	80 - 120	<0.10	ug/L	NC	20
B443397	Total Dissolved Solids	2024/07/19	100	80 - 120	97	80 - 120	<10	mg/L	0	20
B443543	Total Nitrogen (N)	2024/07/19	106	80 - 120	107	80 - 120	<0.020	mg/L	12	20
B443545	Total Nitrogen (N)	2024/07/19	92	80 - 120	109	80 - 120	<0.020	mg/L	3.4	20
B443699	Turbidity	2024/07/18			104	80 - 120	<0.10	NTU	2.1	20
B443717	Dissolved Fluoride (F)	2024/07/18	95	80 - 120	97	80 - 120	<0.050	mg/L	NC	20
B443802	Nitrate plus Nitrite (N)	2024/07/18	113	80 - 120	110	80 - 120	<0.020	mg/L	NC	25
B443829	Nitrite (N)	2024/07/18	108	80 - 120	105	80 - 120	<0.0050	mg/L	NC	20
B444257	Dissolved Fluoride (F)	2024/07/19	105	80 - 120	96	80 - 120	<0.050	mg/L	NC	20
B444339	Acidity (pH 4.5)	2024/07/19					<1.0	mg/L	NC	20
B444339	Acidity (pH 8.3)	2024/07/19			99	80 - 120	<1.0	mg/L	NC	20
B444456	Acidity (pH 4.5)	2024/07/19					<1.0	mg/L	NC	20
B444456	Acidity (pH 8.3)	2024/07/19			100	80 - 120	<1.0	mg/L	NC	20
B444500	Total Dissolved Solids	2024/07/18	98	80 - 120	98	80 - 120	<10	mg/L	6.1	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B444524	Total Organic Carbon (C)	2024/07/18	102	80 - 120	98	80 - 120	<0.50	mg/L	NC	20
B445151	Strong Acid Dissoc. Cyanide (CN)	2024/07/19	104	80 - 120	104	80 - 120	<0.00050	mg/L	20	20
B445386	Dissolved Organic Carbon (C)	2024/07/19	NC	80 - 120	96	80 - 120	<0.50	mg/L	2.3	20
B445995	Apparent Colour	2024/07/19			95	80 - 120	<2.0	PtCo units	7.1	20
B446050	Dissolved Organic Carbon (C)	2024/07/19	103	80 - 120	97	80 - 120	<0.50	mg/L	NC	20
B446199	True Colour	2024/07/19			97	80 - 120	<2.0	Col. Unit	0.83	20
B446363	Dissolved Cadmium (Cd)	2024/07/20			102	80 - 120	<0.010	ug/L		
B446363	Dissolved Copper (Cu)	2024/07/20			97	80 - 120	<0.20	ug/L		
B446674	Orthophosphate (P)	2024/07/20	123 (1)	80 - 120	97	80 - 120	<0.0030	mg/L	NC	20
B447464	Phenols	2024/07/22	82	80 - 120	99	80 - 120	<0.0015	mg/L	NC	20
B447484	Dissolved Mercury (Hg)	2024/07/22	112	80 - 120	114	80 - 120	<0.0019	ug/L	NC	20
B447677	Alkalinity (PP as CaCO3)	2024/07/22					<1.0	mg/L	NC	20
B447677	Alkalinity (Total as CaCO3)	2024/07/22			93	80 - 120	<1.0	mg/L	0.22	20
B447677	Bicarbonate (HCO3)	2024/07/22					<1.0	mg/L	0.22	20
B447677	Carbonate (CO3)	2024/07/22					<1.0	mg/L	NC	20
B447677	Hydroxide (OH)	2024/07/22					<1.0	mg/L	NC	20
B447682	pH	2024/07/22			100	97 - 103			0.18	N/A
B447728	Total Mercury (Hg)	2024/07/23	106	80 - 120	103	80 - 120	<0.0019	ug/L	6.2	20
B447766	Total Nitrogen (N)	2024/07/23	100	80 - 120	106	80 - 120	<0.020	mg/L	1.1	20
B447852	Chloride (Cl)	2024/07/22	NC	80 - 120	100	80 - 120	<1.0	mg/L		
B447852	Sulphate (SO4)	2024/07/22	NC	80 - 120	102	80 - 120	<1.0	mg/L	0.20	20
B448317	Total Ammonia (N)	2024/07/22	96	80 - 120	99	80 - 120	<0.015	mg/L	NC	20
B448334	Total Ammonia (N)	2024/07/22	96	80 - 120	99	80 - 120	<0.015	mg/L	NC	20

QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		Spiked Blank		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
B448448	Total Ammonia (N)	2024/07/22	97	80 - 120	101	80 - 120	<0.015	mg/L	NC	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

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C453348
2024/07/16 09:00

Bureau Veritas
4606 Canada Way, Burnaby, British Columbia Canada V5G 1K5 Tel:(604) 734 7276 Toll-free:800-563-6266 Fax:(604) 731 2386 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#9888 Palmer Environmental Consulting Group (PEC	Company Name		Quotation #	C40429	Bureau Veritas Job #	Bottle Order #:
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			728282
Address	#630 – 470 Granville Street Vancouver BC V6C 1V5	Address		Project #	1905903 Tenas 2024	Chain Of Custody Record	Project Manager
Phone	(604) 629-9075 Fax:	Phone	Fax:	Project Name		C#728282-02-01	Nahed Amer
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Site #			
				Sampled By	NICOLE ANASIS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other

Special Instructions

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ✓
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ☐
Rush Confirmation Number: (call lab for #)

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Barcode Label	Sample (Location) Identification	Date Sampled (mm/dd)	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Color (True) by Automated Analyzer	Colour (Apparent)	Hardness (calculated as CaCO3)	pH @25°C	Total Suspended Solids (NFR)	Total Dissolved Solids (Filt. Residue)	Turbidity	Acidity pH 4.5 & pH 8.3 (as CaCO3)	Alkalinity @25C (pp, total), CO3,HCO3,OH	Ammonia-N (Total)	# of Bottles	Comments
1	Site 2S	Tenas Four Creek	07/05	1300	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Groundwater
2	Site 2SW	TenasFour Creek	07/05	1300	SW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Surface Water
3	Site 4 upper S	Tenas Four Creek	07/07	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Groundwater
4	Site 4 upper SW	TenasFour Creek	07/06	1730	SW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Surface Water
5	Site 4 upperD	Tenas FourCreek	07/07	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3	1/2 1L Gen chem, 250 mL Gen chem FMetals
6	site5S	TenasFour Creek	07/07	1800	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
7	Site5SW	TenasFour Creek	07/07	1600	SW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
8	T95R-64	Tenas Four Creek	07/06	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
9		TRIP BLANK	07/09	1830	W	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
10	DUP-A	TenasFour Creek	07/08	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	

MVAN-2024-07-791

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
NICOLE ANASIS	2024/07/10	1:30	ALFRED NGAI	2024/07/16	09:00		☐	see ACTR	☐ Yes ☑ No N/A CS

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Bureau Veritas
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Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#9888 Palmer Environmental Consulting Group (PEC	Company Name		Quotation #	C40429	Bureau Veritas Job #	Bottle Order #:
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			726282
Address	#630 – 470 Granville Street	Address		Project #	1905903 Tenas 2024	Chain Of Custody Record	Project Manager
	Vancouver BC V6C 1V5			Project Name		C#726282-02-02	Nahed Amer
Phone	(604) 629-9075 Fax:	Phone	Fax:	Site #			
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Sampled By	NICOLE ANASIS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other

Special Instructions

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (If applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: ☐
Rush Confirmation Number: *(call lab for #)*

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Barcode Label	Sample (Location) Identification	Date Sampled (MM/dd)	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Nitrogen - Nitrate (as N)	Total TKN in Water	Orthophosphate by Automated Analyzer	Total Phosphorus	Chloride/Sulphate by Auto Colourimetry	Fluoride	Carbon (Total Organic)	Carbon (DOC)	CSR Dissolved Metals in Water with CV Hg	CSR Total Metals in Water with CV Hg	# of Bottles	Comments
1	Site 2S	Tenas Four Creek	07/05	1300	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Groundwater
2	Site 2SW	Tenas Four Creek	07/05	1300	SW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Surface Water
3	Site 4 upper S	Tenas Four Creek	07/07	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Groundwater
4	Site 4 upper SW	Tenas Four Creek	07/06	1730	SW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	Surface Water
5	Site 4 upper D	Tenas Four Creek	07/07	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	3	1/2 L Gen Chem, 250 Gen Chem F. Metals
6	Site 5S	Tenas Four Creek	07/07	1800	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
7	Site 5SW	Tenas Four Creek	07/07	1600	SW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
8	T95R-64	Tenas Four Creek	07/06	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
9		TRIP BLANK	07/09	1830	W		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	
10	DUP-A	Tenas Four Creek	07/06	1100	GW	Y	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
NICOLE ANASIS / VBT	2024/07/10	7:30	ALFRED NGAI	2024/07/16	09:00		☐	see ACTR	☐ Yes ☑ No N/A

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Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#9888 Palmer Environmental Consulting Group (PEC	Company Name		Quotation #	C40429	Bureau Veritas Job #	Bottle Order #:
Contact Name	Nathalie Brandebourger	Contact Name	Nathalie Brandebourger	P.O. #			728282
Address	#630 – 470 Granville Street Vancouver BC V6C 1V5	Address		Project #	1905903 Tenas 2024	Chain Of Custody Record	Project Manager
Phone	(604) 629-9075 Fax:	Phone	Fax:	Project Name		C#728282-02-03	Nahed Amer
Email	nathalie.brandebourger@pecg.ca	Email	nathalie.brandebourger@pecg.ca	Site #			
				Sampled By	NICOLE ANASIS		

Regulatory Criteria: ☐ CSR ☐ CCME ☐ BC Water Quality ☐ Other _____

Special Instructions:

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT: ☑
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests.
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
1 DAY ☐ 2 Day ☐ 3 Day ☐ Date Required: _____ ☐
Rush Confirmation Number: _____ *(call lab for #)*

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Barcode Label	Sample (Location) Identification	Date Sampled (yy/mm/dd)	Time Sampled	Matrix	Metals Field Filtered ? (Y / N)	Cyanide (total)	Phenols (4-AAP)	# of Bottles	Comments
1	Site 2S	Tenas Four Creek	07/05	1300	GW	Y	✓	✓	12	Groundwater
2	Site 2SW	Tenas Four Creek	07/05	1300	SW	Y	✓	✓	12	Surface water
3	Site 4 upper S	Tenas Four Creek	07/07	1100	GW	Y	✓	✓	12	Groundwater
4	Site 4 upper SW	Tenas Four Creek	07/06	1730	SW	Y	✓	✓	12	Surface water
5	site 4 upper D	Tenas Four Creek	07/07	1100	GW	Y	NO BOTTLE		3	½ 1L Gen Chem, 250mL Gen Chem F. Metals
6	site 5S	Tenas Four Creek	07/07	1800	GW	Y	✓	✓	12	
7	site 5 SW	Tenas Four Creek	07/07	1600	SW	Y	✓	✓	12	
8	T95R-64	Tenas Four Creek	07/06	1100	GW	Y	✓	✓	12	
9		TRIP BLANK	07/09	1830	W	Y	✓	✓	12	
10	DUP-A	Tenas Four Creek	07/06	1100	GW	Y	✓	✓	12	

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (°C) on Receipt	Custody Seal Intact on Cooler?
NICOLE ANASIS	2024/07/11	7:30	ALFRED NGAI	2024/07/16	09:00		☐	see ACTR	☐ Yes ☑ No NC

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Appendix D Summary of 2024 Field Conductivity Measurements

Four Creek Watershed

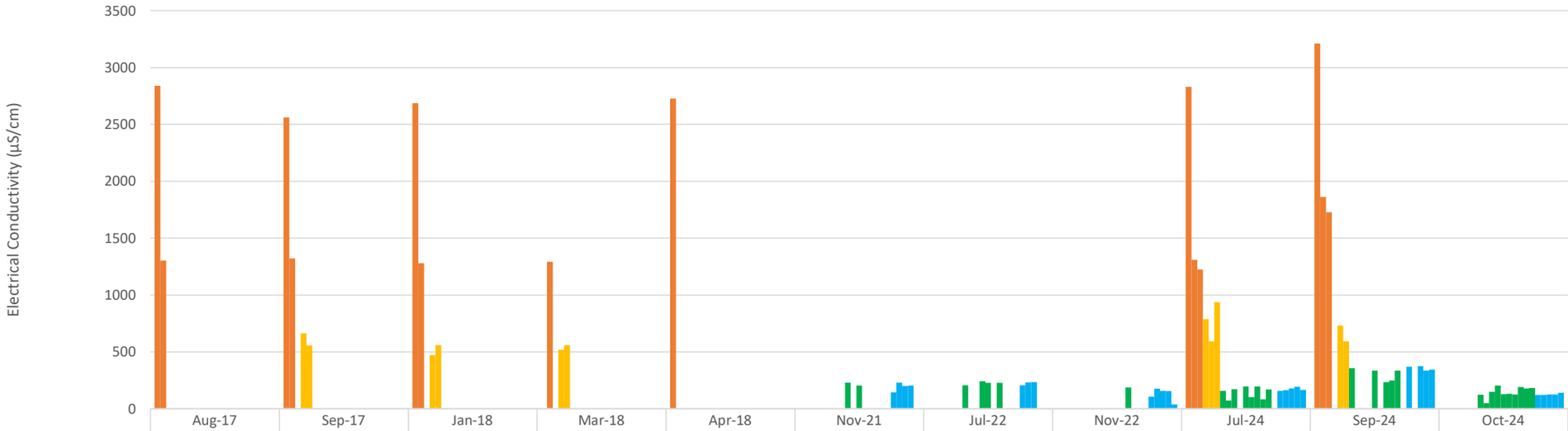
Groundwater Surface Water Interaction Investigation
and Water Balance Model Development

Telkwa Coal Limited

SLR Project No.: 201.V24219.00000

September 5, 2025

Tenas - Four Creek Watershed Conductivity Measurements



	Aug-17	Sep-17	Jan-18	Mar-18	Apr-18	Nov-21	Jul-22	Nov-22	Jul-24	Sep-24	Oct-24
T95R-40	2840	2560	2687		2726				2830	3212	
T95R-64	1303	1322	1279	1293					1308	1862	
T18-01D									1225	1727	
TOB96-01-05		663	472	518					788		
TOB96-02-06		557	558	559					594	731	
T19-18S									938	594	
Site 2 S GW							206		156	357	123
Site 2 D GW									72		49
Site 3 S GW						229			173		148
Site 3 D GW							242				204
Site 4 S GW						204	227		195	335	128
Site 4 D GW									102		131
Site 4 Upper S GW							227	188	196	235	125
Site 4 Upper D GW									82	250	191
Site 5 S GW									171	338	178
Site 5 D GW											181
Site 2 SW						146	206	106	158	369	123
Site 3 SW						230	232	176	165		121
Site 4 SW						200	235	157	179	375	125
Site 4 Upper SW						204		155	192	335	125
Site 5 SW								39.0	165	344.1	141

Appendix E Piper Diagrams

Four Creek Watershed

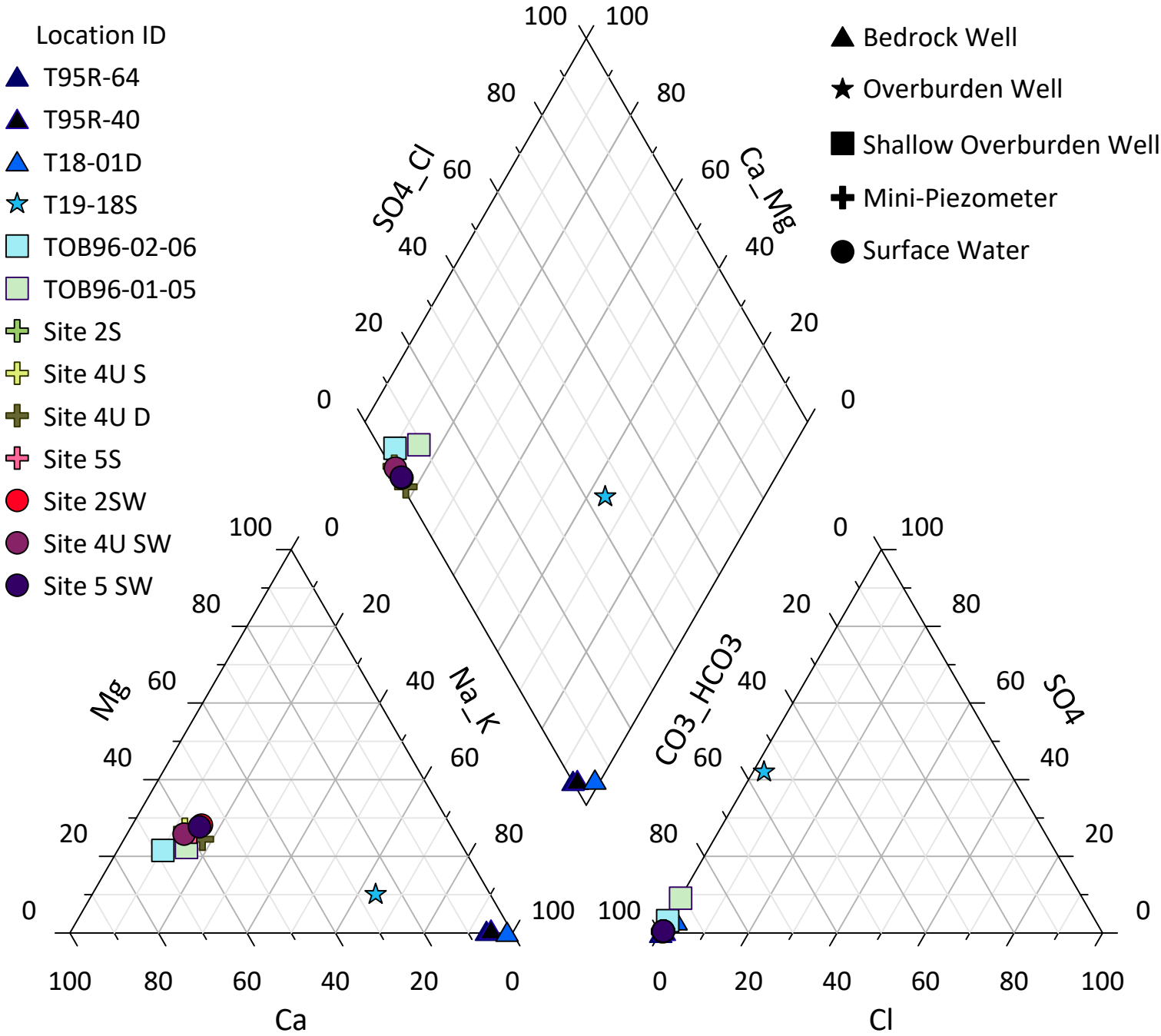
Groundwater Surface Water Interaction Investigation
and Water Balance Model Development

Telkwa Coal Limited

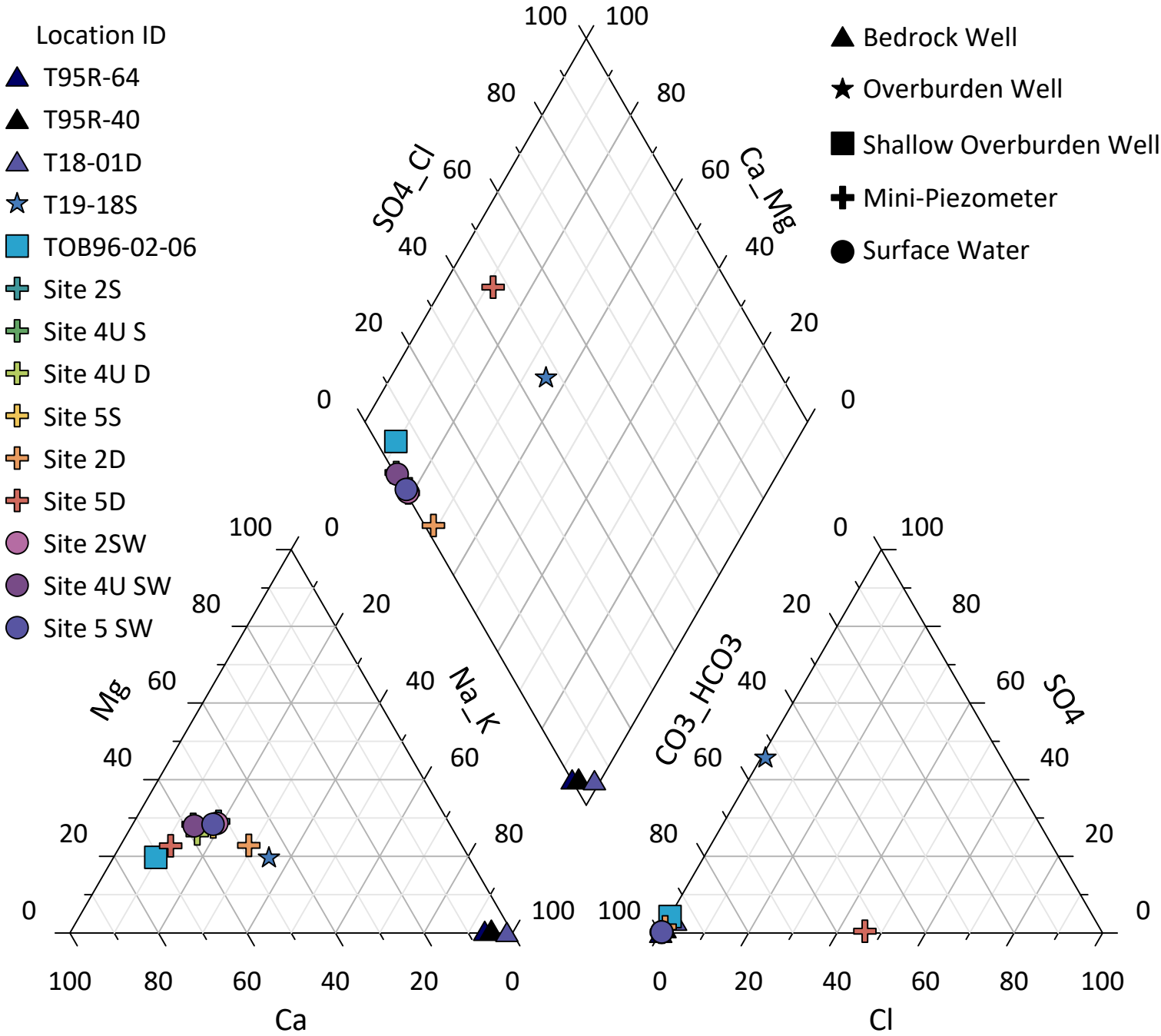
SLR Project No.: 201.V24219.00000

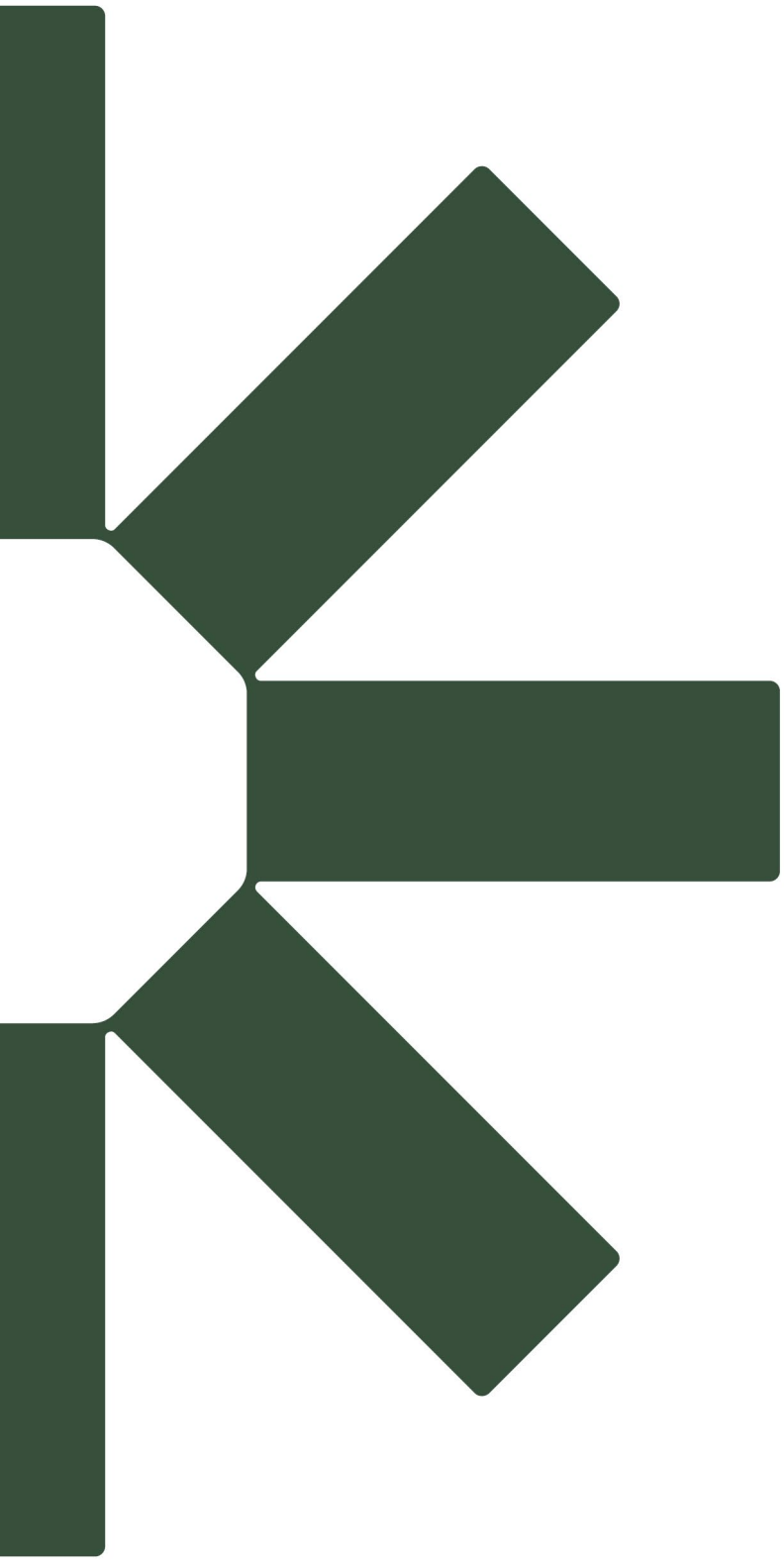
September 5, 2025

July 2024 Monitoring Wells and Mini Piezometers



September 2024 Monitoring Wells and Mini Piezometers





Making Sustainability Happen

APPENDIX 4.3-D: TENAS PROJECT – INITIAL DILUTION ZONE ASSESSMENT, SRK CONSULTING

Draft

Tenas Project – Initial Dilution Zone Assessment

Tenas Project, Canada

Telkwa Mining Limited Gold Inc.

SRK Consulting (Canada) Inc. ▪ CAPR002055 ▪ July 2025

srk consulting

Draft

Tenas Project – Initial Dilution Zone Assessment

Rainy River Mine, Canada

Prepared for:
Telkwa Mining Limited Gold Inc.
1415 Hankin AveTelkwa, BC V0J 2X0,
Canada

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Reviewer: Soren Jansen **Initials:** SJ

File Name:
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Suggested Citation:
SRK Consulting (Canada) Inc. 2025. Tenas Project – Initial Dilution Zone Assessment. Draft. Prepared for Telkwa Mining Limited Gold Inc.: 1415 Hankin AveTelkwa, BC V0J 2X0, . Project number: CAPR002055. Issued July. 2025.

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The opinions expressed in this document have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. While SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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Executive Summary

SRK Consulting (Canada) Inc. (SRK) completed an initial dilution zone (IDZ) study for the proposed Tenas Project (the Project) in northwest British Columbia to support the Environmental Assessment (EA) for the Project and address Joint Application Information Requirements (JAIR) in anticipation that the work will be used to support future permitting of the Project. This study updates the IDZ assessment based on latest findings of Best Achievable Technology (BAT) assessment and updated effluent discharge information from the Water and Load Balance (WLB) model for the Project. The assessment was carried out following the Technical Guidance 11 (TG11) produced by the BC Ministry of Environment and Parks.

The IDZ is in Goathorn Creek below the confluence with a tributary that receives Project discharge from the Tenas Control Pond (TCP) and North Management Pond (NMP) during operation and post closure, respectively. This also includes discharge from the sewage treatment plant during operation. To characterize and delineate the IDZ, three credible and conservative cases were considered:

- a worst case (very worst case)
- a reasonable worst case (worst case that typically can occur)
- an expected case (case corresponding to average conditions)

The cases were defined based on conservative assumptions considering the in-stream flow and water quality of Goathorn Creek, and discharge rate and quality of Project effluent.

Parameters of Concern (POCs) were selected based on the findings of BAT assessment, which identified POCs through screening Project discharge water quality results from WLB model against 80% of applicable Water Quality Guidelines (WQGs). WQGs were chosen according to the following order of preference:

- The lowest of BC Approved Water Quality Guidelines (BC AWQG) or BC Working Water Quality Guidelines (BC WWQG) for protection of freshwater aquatic life, except for molybdenum for which more stringent BC's ruminant (wildlife) was chosen.
- Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME WQG) y
- Environment and Climate Change Canada Water Quality Guidelines (ECCC WQG).

Parameters identified as POCs in the BAT assessment and considered in this study are listed below:

- Nitrogen Nutrients: Nitrate, Nitrite
- Sulphate
- Metals: Aluminum (total), Cobalt (total), Copper (dissolved), Iron (total), Nickel (dissolved), Zinc (dissolved)
- Oxyanions: Molybdenum (total), Selenium (total).

To characterize the Goathorn Creek IDZ, cross-sectional channel morphology was surveyed at regularly spaced transects near the discharge location. Based on these surveys, a hydrodynamic model was developed using HEC-RAS (version 6.6, USACE 2024). The estimated stream hydraulic properties were utilized in the mixing-dilution modeling. The water quality in the Goathorn Creek and its

mixing and dilution characteristics were modeled using CORMIX (version 12.0, Doneker and Jirka 2007). Estimates of the IDZ extent and corresponding plume features such as the flow occupied within the IDZ and its length and width were obtained considering the dilution required for each POC to meet WQGs.

The modeled water quality of each POC in the Goathorn Creek was compared with the IDZ evaluation criteria for flow occupied within the IDZ and its length and width, based on TG11 guidance. For the worst case, nitrite and selenium do not meet WQG after complete mixing and aluminum exceeds the IDZ criterion for 100 m length during operation, while aluminum and selenium do not meet WQG after complete mixing in post-closure. This case is very conservative and unlikely to occur during very dry periods. Emphasis was placed upon the reasonable worst case and the expected case, which are conservative but provides realistic evaluation scenario. The results are summarized below.

During Operation:

- IDZ criteria to meet applicable WQGs are satisfied for nitrate, nitrite, sulphate, aluminum, cobalt, iron, nickel, zinc and molybdenum for the reasonable worst and expected cases.
- The IDZ extent of selenium exceeds the TG11 guidance (100 m length) for the reasonable worst case (153 m length), but meets the guidance for the expected case. WQG is exceeded for dissolved copper due to background concentration higher than the WQG, but the effluent concentration reaches background concentration after complete mixing.

During-Post Closure:

- POCs including nitrate, nitrite, cobalt, molybdenum, nickel and zinc do not register an IDZ, as the effluent concentrations are below the corresponding WQGs for the IDZ cases.
- IDZ criteria based on TG11 guidance is met for sulfate, aluminum, iron and selenium for the reasonable worst and expected cases. The guidance is exceeded for dissolved copper with background concentration higher than the WQG, but remains close to the background level after complete mixing.

The analyses of this study provided a range for spatial extent of IDZ for conditions anticipated for worst to expected cases as outlined in TG11. Based on the reasonable worst case and the expected case, a minimum IDZ length of 153 m and 44 m would be needed during operation and post-closure, respectively, to meet the instream WQGs of the POCs.

1 Introduction

The Tenas Project (the Project) is a proposed open pit coal mine, located approximately 25 km southwest of Smithers near the Town of Telkwa, British Columbia. All surface water in the Project footprint area will be collected through a series of management and sedimentation control ponds. Excess water will be discharged via a tributary to Goathorn Creek.

An initial dilution zone (IDZ) assessment wasprepared for the Project discharge to support the Discharge Management Plan for the Tenas Project as part of the Environmental Assessment (EA). IDZ characterization is required to address the Joint Application Information Requirements (JAIR) for the EA. This assessment is intended to delineate the extent of IDZ for the effluent discharge from the Project under a range of discharge and mixing conditions in the receiving stream.

This technical report describes the approach, methodology, analyses and results completed to evaluate the IDZ development from the Tenas Project effluent discharge and its spatial extent in the receiving Goathorn Creek. The assessment was carried out following the Technical Guidance 11 (TG11) produced by the BC Ministry of Environment and Parks (ENV 2019).

1.1 Background and Scope

SRK previously completed an IDZ study for the Tenas Project in 2022 (SRK 2022) based on the information available at the time of study. The recently completed Best Achievable Technology (BAT) assessment (SRK 2025a) identified Parameters of Potential Concern (POCs) in the discharge of treated effluent from the Project, using the water quality model results from the Water and Load Balance (WLB) model developed for the Project (SRK 2025b). This study updates the IDZ assessment based on latest findings of BAT assessment and updated effluent discharge information from the WLB model for the Project.

The objective of the IDZ Assessment is to characterize the physical mixing of the Project discharge (effluent) into the Goathorn Creek (receiver) under different conditions and evaluate the IDZ extent for the treated effluent. The scope of this work includes the following:

- Characterization of effluent and receiver water quality and quantity to develop conservative cases for IDZ evaluation.
- Hydrodynamic mixing modeling to characterize effluent dispersion and dilution in the receiver.
- IDZ delineation to estimate the spatial extent of mixing zone downstream of the discharge point based on TG11 guidance.

1.2 Regulatory Context

The IDZ is a regulatory zone in the receiving aquatic environment where an effluent discharge is mixed and is delineated by the point at which the concentrations of parameters of concern in mixed waters are reduced above chronically toxic concentrations to below those limits. The release of POCs should not cause acute toxicity in the receiving environment and the discharge at the end of the pipe cannot

exceed acute toxicity limits prior to mixing. The BC Ministry of Environment and Parks (ENV) considers an IDZ for authorized project discharges based on the assessment of requested effluent releases according to Provincial guidance TG11 (ENV 2019).

The allowable extent of an IDZ depends on sensitivity and value of the receiving environment downstream of the discharge. TG11 provides some guidance on spatial dimensions for proposed IDZs. For rivers and streams (flowing water), the guidance recommends that an IDZ be limited within 25% of stream width, can occupy 25% of stream flow volume for low-flow conditions, and may extend up to 100 meters from the discharge point (ENV 2019). As outlined in TG11, these dimensions will vary on a case-by-case basis, depending on site-specific factors.

The potential for chronic toxicity is limited to the IDZ extent, without significantly affecting aquatic life and integrity of the water body as a whole (ENV 2019). Appropriate selection of water quality guidelines (WQGs) is therefore critical in determining the extent of an IDZ. Selection of receiving WQGs is described in SRK (2025b), where the long-term average BC Approved Water Quality Guidelines (BC AWQG) and the BC Working Water Quality Guidelines (BC WWQG) for freshwater aquatic life were considered. Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (CCME WQG) or Environment and Climate Change Canada Water Quality Guidelines (ECCC WQG) were used for parameters for which no BC AWQG or BC WWQG have yet been established.

1.3 Study Approach

TG11 provides guidance on the management of surface water quality, quantity, and discharge requirements for industrial effluent releases. Based on TG11 guidance, the following components were characterized for IDZ assessment:

- Receiver flow and water quality – estimation of flow statistics (i.e., monthly, annual) and 7Q20 low-flow, and evaluation of representative background concentrations with consideration of receiving water. A combination of conservative background water quality and low-flow conditions were used as a basis for IDZ assessment.
- Effluent discharge quantity and quality – assessment of maximum and expected discharge rates and concentrations, with consideration of site water management and long-term water quality.
- Mixing zone features – modeling and delineation of the size and extent of the mixing zone beyond which effluent dispersion restores the receiver's water quality to in-stream WQGs or background concentrations and the water is not chronically toxic.

TG11 specifies the presentation of worst, expected and best cases for an IDZ assessment. In this study, the IDZ delineation has been evaluated for 3 cases based on site-specific information. The cases presented include: a worst case (i.e., a very worst case), a reasonable worst case (i.e., worst case that typically can occur), and an expected case (i.e., case that corresponds to average conditions).

Table 1-1 lists the 3 cases and their corresponding flow and water quality conditions for Goathorn Creek and the discharge from the management ponds (i.e., Project Effluent). The flow and water

quality conditions have been described in the hydrometeorological baseline report (SRK 2024) and the water and load balance model results (SRK 2025b). Details of these cases are described in Sections 2.2 and 2.3.

Table 1-1: Definition of IDZ assessment cases

Cases	Goathorn Creek		Project Effluent	
	Flow condition	Water quality	Effluent discharge	Effluent quality
Worst case	7Q10 low-flow [1] of the lowest dilution month	75th percentile background concentration	Maximum discharge for lowest dilution month	Maximum concentration with typical source terms
Reasonable worst case	Lowest 7Q10 flow during open water months	50th percentile background concentration	Maximum discharge for the same lowest 7Q10 month (open water)	Maximum concentration with typical source terms
Expected case	Mean flow during effluent release period [2]	50th percentile background concentration	Average discharge during effluent release period	Average concentration with typical source terms

Source: Prepared in the text

Notes:

[1] 7Q10 low-flow: 7-day minimum flow that is expected to occur once every 10 years

[2] Open water season (May-Oct) is the effluent release period for operation, while year-round discharge occurs in post-closure

Mixing and dilution modeling was conducted to evaluate the IDZ extent for POCs for the worst, reasonable worst and expected cases and compared against TG11 guidance. The hydraulic and mixing modeling approach are presented in Section 3 and the IDZ delineation results are provided in Section 4.

2 Site Overview and Input Characterization

2.1 Site Description and Effluent Discharge

The management ponds (i.e., East, West and North Management Ponds) in the Project will collect all surface water from the mine area. The Tenas Control Pond (TCP) will be constructed downstream of all mining infrastructure and will collect water from the management ponds and all upstream mining activities prior to discharging excess water to the aquatic environment. Discharge will be directed towards a tributary of Goathorn Creek (Figure 2-1). Assessment of alternative discharge locations at a scoping level indicated that this location is beneficial in terms of water management and dilution capacity. A sewage treatment plant will operate onsite and will also discharge treated sewage effluent to the same tributary of Goathorn Creek during open-water season.

Goathorn Creek is a tributary of Telkwa River and flows along the eastern and northern extents of the Project. It is a braided creek with moderate width. Project discharge from the pond is conveyed to the creek through a tributary channel. This channel is typically steep, and the natural slope carries water downstream, ultimately discharging water along the left bank of Goathorn Creek. The tributary is not fish bearing, and erosion protection will be installed along the tributary to the confluence with Goathorn Creek (SRK 2021a). During operation (year xx to year yyy), the TCP discharges only in open water season months and mixes with treated sewage effluent in the tributary of Goathorn Creek. The TCP will be decommissioned upon closure (after year yyy) and, excess water will be released from the North Management Pond (NMP) through the same tributary channel towards Goathorn Creek.

Water quality in Goathorn Creek has the potential to be affected by mining operation. The primary pathways for potentially affecting water quality, sources and receptors to the creek have been described in the Tenas Project Conceptual Site Model (SRK 2021b). The identified receptors including mammals, fish, amphibians, and human health were considered in the selection of the most appropriate water quality threshold criteria for the IDZ assessment described in Section 2.3.1.

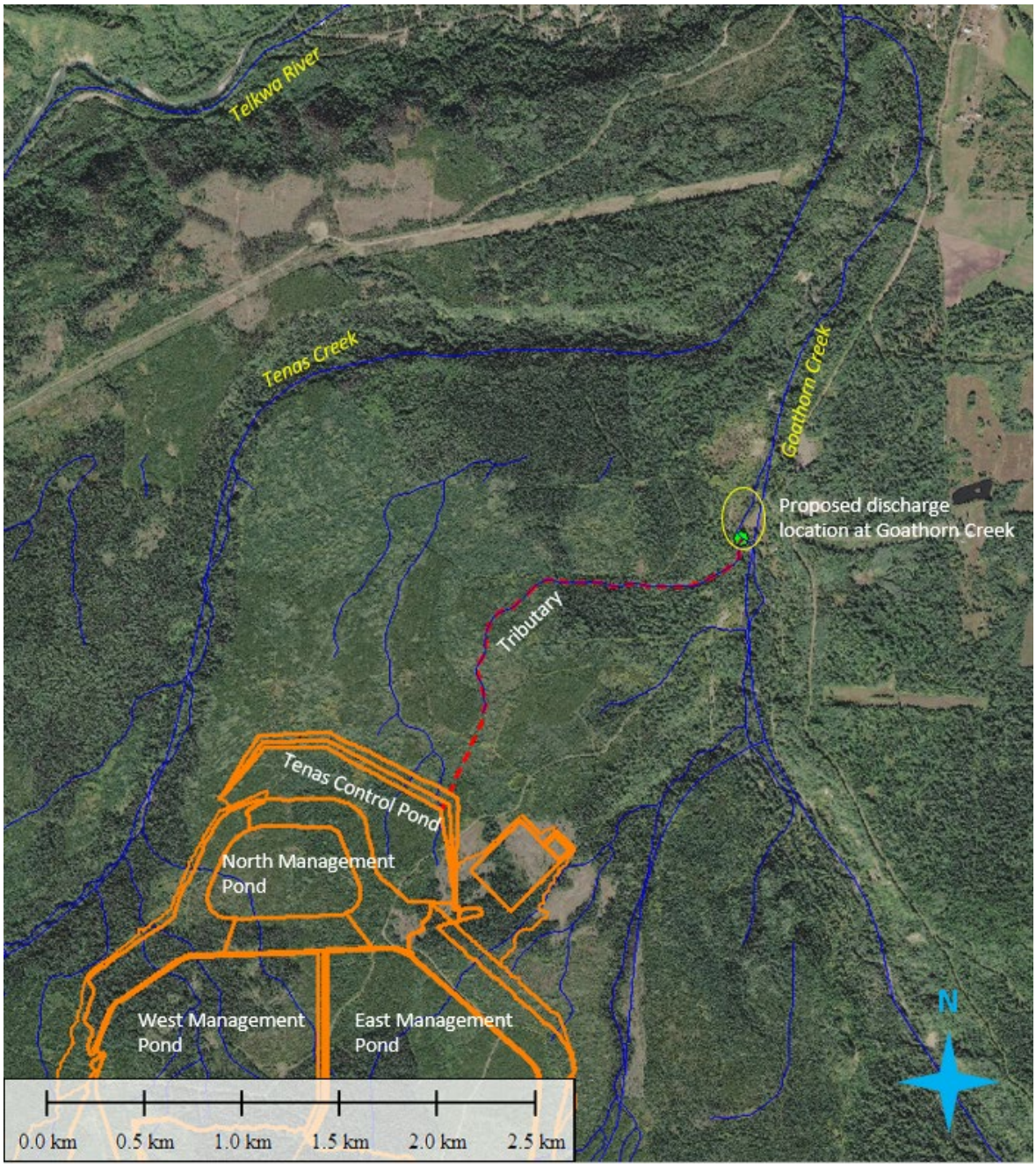


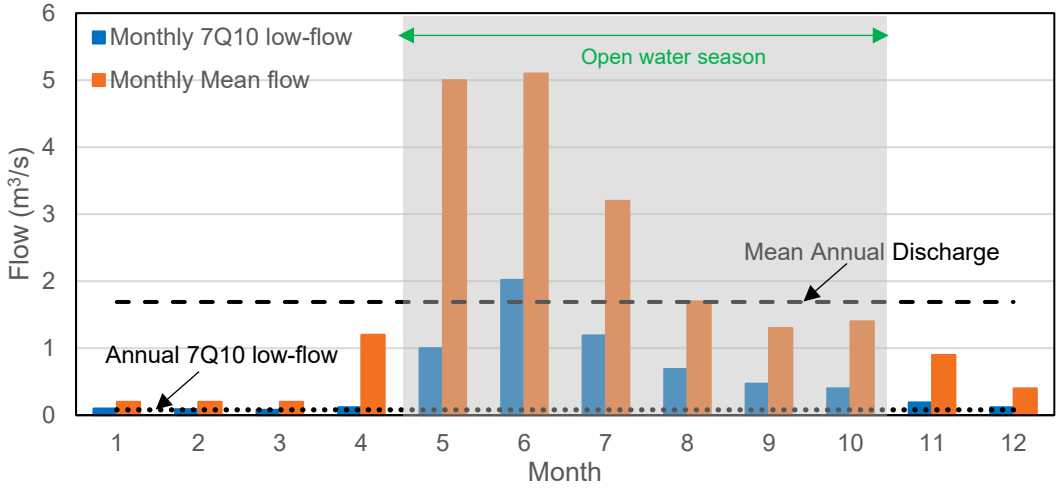
Figure 2-1. Location of proposed effluent discharge from the Tenas Project Management Ponds to Goathorn Creek

2.2 Flow Characterization

Goathorn Creek is the receiving environment for the Project discharge from TCP in during the operations phase and NMP upon closure. Hydrologic estimates for the creek were calculated based on the synthetic record of the Goathorn hydrologic station, which was developed based on scaling from the Goathorn Creek Water Survey of Canada (WSC) station long-term data. The hydrology and detailed flow estimates for the creek are described in the Hydrometeorological Baseline Report (SRK 2024).

The hydrograph of Goathorn Creek is dominated by meltwater in freshet (Figure 2-2), with a mean annual discharge of 1.69 m^3/s at the Goathorn hydrologic station (SRK 2024). Low flows typically occur in late fall and winter. The annual 7-day consecutive low flow during a 10-year return period (7Q10) is expected to be 0.08 m^3/s at the Goathorn hydrologic station.

Table 2-1 outlines the monthly and annual flow statistics based on Goathorn-Hydro station data. Monthly 7Q10 low-flow estimates range from 0.08 – 2.0 m^3/s. During the open water season (i.e., May – October), the monthly mean flow in the creek at Goathorn-Hydro station ranges between 1.1 and 5.1 m^3/s, with an average of 2.9 m^3/s.



Source: Z: \1CT027.003 Telkwa/2020 EA Water Management Support\900_Discharge_Mgmt\IDZ_study\InputDataAnalysis \TelkwaIDZ_InputSummary_rev08_rk.xlsm

Figure 2-2. Monthly Flow at Goathorn Hydrologic Station in Goathorn Creek

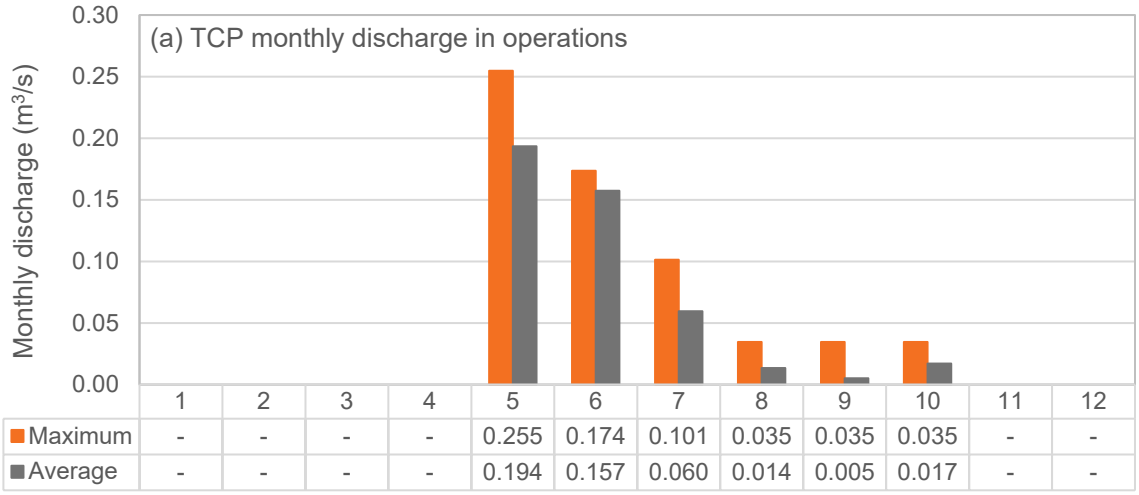
Table 2-1. Goathorn Creek Monthly and Annual Flow Statistics

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
7Q10	0.10	0.09	0.08	0.12	1.0	2.0	1.2	0.69	0.47	0.40	0.19	0.12	0.08
Average	0.22	0.18	0.19	1.4	5.1	5.1	3.1	1.5	1.2	1.1	0.79	0.34	1.7

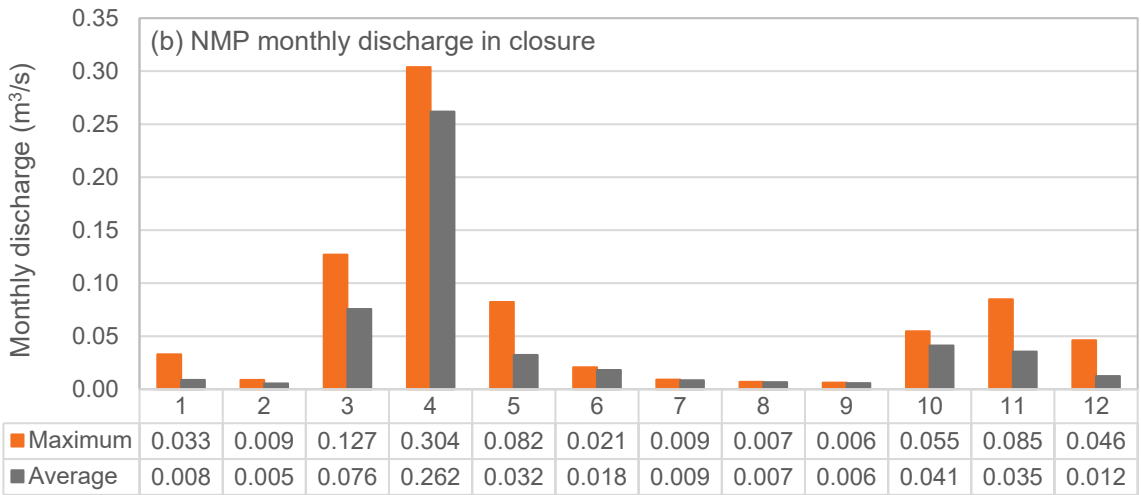
Source: SRK (2024)

Project discharge from the TCP (in operation) and the NMP (after closure) into the Goathorn Creek tributary was obtained from the water and load balance (WLB) model for the project footprint area. Long-term discharges to the receiving environment were estimated considering the Project Case conditions with expected groundwater seepage, typical source terms and average hydrology (SRK 2025b).

Monthly maximum and average discharges from the TCP (during operations until 2048) and the NMP (during Post-Closure after 2048) were obtained from the long-term WLB model results (Figure 2-3). TCP discharge in operation occur in the open water season. Based on average hydrologic condition predictions, discharge from TCP is highest in May, with maximum and average rate of 0.26 and 0.19 m^3/s, respectively. The closure discharge from NMP will be highest in April.



	1	2	3	4	5	6	7	8	9	10	11	12
Maximum	-	-	-	-	0.255	0.174	0.101	0.035	0.035	0.035	-	-
Average	-	-	-	-	0.194	0.157	0.060	0.014	0.005	0.017	-	-



	1	2	3	4	5	6	7	8	9	10	11	12
Maximum	0.033	0.009	0.127	0.304	0.082	0.021	0.009	0.007	0.006	0.055	0.085	0.046
Average	0.008	0.005	0.076	0.262	0.032	0.018	0.009	0.007	0.006	0.041	0.035	0.012

Source: Z: \1CT027.003 Telkwa/2020 EA Water Management Support\900_Discharge_Mgmt\IDZ_study\InputDataAnalysis \TelkwaIDZ_InputSummary_rev08_rk.xlsm

Figure 2-3. Monthly Project discharge from (a) Tenas Control Pond (TCP) in operation, and (b) North Management Pond (NMP) upon closure

The lowest dilution capacity occurs at low-flow in Goathorn Creek with high Project discharge. The IDZ evaluation cases for worst, reasonable worst and expected conditions were developed conservatively considering the low-dilution periods during operation and after closure.

Among the summer open-water season months (May – October) of effluent release in operation, the 7Q10 flow is lowest is October (Table 2-1). However, the dilution capacity is lowest in May, which corresponds to relatively low monthly 7Q10 condition (Figure 2-2) with maximum project discharge (Figure 2-3a). Conservative IDZ cases based on combinations of Project discharge rates and in-stream flow conditions were developed for operation as follows:

- Worst case: Maximum monthly Project discharge (May) with the May 7Q10 low-flow conditions, representing lowest dilution condition.
- Reasonable worst case: Lowest monthly 7Q10 flow during open water season (October) and the corresponding monthly maximum discharge during this time (October).
- Expected case: Mean streamflow during effluent release period (May – October) with average Project discharge over the same period.

Discharge from the NMP after closure is assumed to occur year-round with no operational controls in-place to store water. The dilution capacity is lowest in April, when the Project discharge is maximum and Goathorn Creek may still be flowing atblower pre-freshet flow. Conservative IDZ cases based on combinations of Project discharge rates and in-stream flow conditions were developed for post-closure as follows:

- Worst case: Maximum monthly Project discharge (April) with the April 7Q10 low-flow conditions, representing lowest dilution condition.
- Reasonable worst case: Lowest monthly 7Q10 flow during open water season (October) and the corresponding monthly maximum discharge during this time (October).
- Expected case: Mean annual flow in the stream (year-round effluent release) with average Project discharge over the same period (January – December).

Table 2-2 outlines the Goathorn Creek flow and Project discharge conditions selected for the IDZ evaluation cases. It should be noted that the worst case in post-closure corresponded to maximum discharge (0.30 m^3/s) from NMP during 7Q10 flow condition, with the discharge rate being 2.5 times higher than the in-stream flow (flow ratio 0.4:1). This case is not realistic as the WLB model predictions represent average hydrology conditions, and the 7Q10 flow is expected to occur only during a very dry period.

A WLB model simulation of 1-in-100-year dry period for two consecutive years indicated that the maximum discharge from the NMP would be 0.071 m^3/s which corresponds to a flow ratio of 1.7:1. Therefore, a conservative but realistic 1:1 flow ratio condition was also evaluated for the worst case in post-closure and modeled for IDZ delineation.

Table 2-2. Flow Summary for IDZ Evaluation Cases

Cases	Goathorn Creek		Effluent Release		Flow ratio [1]
	Flow condition	***Flow (m^3/s)***	***Discharge condition***	***Discharge (m^3/s)***	
Operation (discharge from Tenas Control Pond)					
Worst case	7Q10 low-flow of the lowest dilution month (May)	1.0	Maximum discharge for the lowest dilution month (May)	0.26	3.9:1
Reasonable worst case	Lowest 7Q10 flow during open water months (Oct)	0.4	Maximum discharge for the same open water month (Oct)	0.035	11.4:1
Expected case	Mean flow during effluent release period (May – Oct)	2.9	Average discharge during effluent release period (May – Oct)	0.074	38.6:1
Post Closure (discharge from North Management Pond)					
Worst case	7Q10 low-flow of the lowest dilution month (April)	0.12	Maximum discharge for the lowest dilution month (April)	0.30 (0.12)[2]	0.4:1 (1:1)[2]
Reasonable worst case	Lowest 7Q10 flow during open water months (Oct)	0.4	Maximum discharge for the same open water month (Oct)	0.055	7.3:1
Expected case	Mean flow during effluent release period (Jan – Dec)	1.7	Average discharge during effluent release period (Jan – Dec)	0.043	39.3:1

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\InputDataAnalysis\TelkwaIDZ_InputSummary_rev09_EAModel41.xlsm

Notes:

[1] Corresponds to ratio of Goathorn Creek flow to effluent discharge rate

[2] Represents a realistic case with 1:1 flow ratio

2.3 Water Quality Characterization

Water quality characterization for each of the IDZ cases, including background water quality in Goathorn Creek, water quality guidelines, water chemistry of the effluent releases and corresponding POCs, is discussed in the following sections.

2.3.1 Water Quality Guidelines

Water quality guidelines (WQG) for the Goathorn Creek receiving environment were established based on applicable provincial or federal guidelines. WQGs were chosen according to the following order of preference (SRK 2025a):

- The lowest of BC Approved Water Quality Guidelines (BC AWQG) or BC Working Water Quality Guidelines (BC WWQG) for protection of freshwater aquatic life,
- Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME WQG) when BC Guidelines are unavailable, or
- Environment and Climate Change Canada Water Quality Guidelines (ECCC WQG) when the above are unavailable.

The only exception to the use of BC WQG aquatic life guidelines was for molybdenum (total), for which BC's ruminant (wildlife) was chosen as the WQG as it was lower than aquatic receptors and was reasonably applicable for this Project (SRK 2025b). For guidelines that depend on toxicity-modifying factors, medium background values from baseline datasets within each creek were used.

The WQGs were applied to screen for POCs and delineate IDZ in the receiving environment of Goathorn Creek.

2.3.2 Parameters of Concern

POCs in the effluent releases were identified by screening Project discharge water quality results from the Tenas Project WLB model (SRK 2025b) against the WQGs. The BAT assessment used the modeled surface and groundwater discharge concentrations as a basis for identifying POCs (SRK 2025a). Parameters with modelled discharge concentrations greater than 80% of applicable WQGs were identified as POCs.

Parameters identified as POCs in the BAT assessment and considered in this study are listed below:

- Nitrogen Nutrients: Nitrate, Nitrite
- Sulphate: Sulphate
- Metals: Aluminum (total), Cobalt (total), Copper (dissolved), Iron (total), Nickel (dissolved), Zinc (dissolved)
- Oxyanions: Molybdenum (total), Selenium (total).

2.3.3 Background Water Quality

The background water quality information for Goathorn Creek has been described in SRK (2025b). Baseline water quality monitoring indicated that exceedances of WQGs have occurred historically in Goathorn Creek for total and dissolved aluminum, dissolved copper and total iron. In processing the receiving water quality data, values less than the method detection limit (MDL) were assumed to be equal to the MDL to remain conservative.

The IDZ assessment utilized the 50th (median) and 75th percentile concentrations of the water quality parameters, with the upper percentile used to represent the worst case as a conservative approach. The 50th percentile background concentration was used for the reasonable worst case and the expected case.

Long-term WQGs of Goathorn Creek and the 50th and 75th percentile background concentration of each POCs are presented in Table 2-3. These are utilized in evaluating exceedances and estimating IDZ extent for each case evaluated in the study. Among the POCs considered, background concentration of dissolved copper (50th and 75th percentile) was higher than the in-stream WQG.

Table 2-3. Background concentration and long-term water quality guidelines for Goathorn Creek

Parameter	Goathorn Creek Background Concentration (mg/L)		Water Quality Guideline (WQG)	
	50th Percentile	75th Percentile	Value (mg/L)	Source
Nitrate-nitrogen	0.041	0.054	3	BC AWQG
Nitrite-nitrogen	0.0005	0.0009	0.02	BC AWQG
Sulphate	24	31	218	BC AWQG
Aluminum, total[1]	0.092	0.23	0.27	BC AWQG
Cobalt, total	0.00005	0.00017	0.004	BC AWQG
Copper, dissolved[1, 2]	0.0014	0.0021	0.0013	BC AWQG
Iron, total	0.085	0.27	1	BC Acute WQG
Molybdenum, total	0.00047	0.00054	0.034	BC ruminant wildlife guideline
Nickel, dissolved[1]	0.00025	0.00025	0.0022	BC WWQG
Selenium, total	0.000086	0.00012	0.002	BC AWQG
Zinc, dissolved[1]	0.0010	0.0015	0.0074	BC AWQG

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\ CormixInput_WLBM\

Notes:

[1] Guideline dependent on toxicity-modifying factors, calculated based on medium background values from baseline dataset

[2] Background concentration higher than in-stream WQG

2.3.4 Effluent Water Quality

Long-term estimates of effluent water quality were developed from the WLB modeling results from pre-mining conditions, through operation and post-closure (SRK 2025b). These predictions incorporate variability in hydrologic conditions, groundwater conditions and geochemical source terms. Results were presented in terms maximum and average concentrations for expected source terms, considering two 6-month periods – the open water period, denoted as summer (i.e., May through October) and the winter period, where streamflow is dominated by groundwater recharge (i.e., November through April).

To represent the IDZ cases, statistics on the water quality time series were selected. Since project release from the TCP is discharged in open water season, summer statistics were used to define the IDZ cases in operation. Concentrations of the POCs for the worst case and the reasonable worst case were represented by maximum concentration, while expected case corresponded to average summer concentration with expected source term (Table 2-4).

After operation, the TCP is decommissioned, and discharge controls are no longer available. Project discharge from the NMP is high in March and April, which have the least dilution capacity after closure. Therefore, winter statistics were selected for IDZ post-closure cases, since these provide conservative estimates compared to summer concentrations. The winter maximum concentration was selected for the worst and reasonable worst cases, and the average concentration was used for the expected case.

Table 2-4: Effluent water quality characterization for the identified POCs

Parameter	Effluent Concentration (mg/L)					
Project Stage	Operation			Post Closure		
IDZ Case	Worst case	Reasonable worst case	Expected case	Worst case	Reasonable worst case	Expected case
Water Balance Result Statistics	Maximum	Maximum	Average	Maximum	Maximum	Average
Period	Summer	Summer	Summer	Winter	Winter	Winter
Nitrate-nitrogen	4.3	4.3	0.96	0.87	0.87	0.33
Nitrite-nitrogen	0.099	0.099	0.023	0.02	0.02	0.0077
Sulphate	410	410	220	220	220	190
Aluminum, total	0.39	0.39	0.38	0.39	0.39	0.38
Cobalt, total	0.0035	0.0035	0.0026	0.0013	0.0013	0.0012
Copper, dissolved	0.0015	0.0015	0.0011	0.0022	0.0022	0.0017
Iron, total	1.5	1.5	1.5	1.5	1.5	1.5
Molybdenum, total	0.036	0.036	0.018	0.0076	0.0076	0.0063
Nickel, dissolved	0.006	0.006	0.0037	0.0022	0.0022	0.0017
Selenium, total	0.022	0.022	0.011	0.008	0.008	0.0059
Zinc, dissolved	0.0088	0.0088	0.0055	0.0018	0.0018	0.0015

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\ CormixInput_WLBM\

2.4 Sewage Effluent

The sewage treatment plant (STP) will discharge treated effluent into the tributary of Goathorn Creek. The treated effluent is held in a pond over winter and discharged during the open-water season from May through September. The average discharge rate from the STP is 41.5 m^3/day (0.0005 m^3/s). The effluent water quality was obtained from WLB modeling (SRK 2025b) and is presented in Table 2-5. Considering TCP discharge rate (Table 2-2) and corresponding water quality (Table 2-4) for the three IDZ cases, concentrations in the tributary of Goathorn Creek were obtained based on mass balance approach assuming a fully mixed condition.

After mixing of sewage effluent and TCP discharge, total ammonia concentration in the tributary was below the WQG (1.5 mg/L). Ammonia was not considered a POC. Nitrate-nitrogen and nitrite-nitrogen was identified as POCs (refer to Section 2.3.2), and the mixed concentrations in the tributary were used for IDZ modeling at the Goathorn Creek.

According to BC Municipal Wastewater Regulation, a dilution ratio of 10:1 is required for sewage effluent (Radloff 2021), which will be supplied by the discharge from the Tenas Control Pond during operation. The dilution for the IDZ cases is high (> 70), and the required water to mix with sewage effluent will be met throughout operations based on available water in the TCP.

Table 2-5: Water quality of treated sewage effluent

Parameter	Cases	Effluent concentration (mg/L)		Concentration in tributary [1] (mg/L)	Dilution [2]
		STP	TCP		
Nitrate	Worst	36.9	4.3	4.4	532
	Reasonable worst	36.9	4.3	4.7	74
	Expected	36.9	1.2	1.2	155
Nitrite	Worst	0.1	0.099	0.099	532
	Reasonable worst	0.1	0.099	0.099	74
	Expected	0.1	0.023	0.023	155
Total ammonia	Worst	1.9	0.56	0.56	532
	Reasonable worst	1.9	0.56	0.58	74
	Expected	1.9	0.13	0.14	155

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\InputDataAnalysis\TelkwaIDZ_InputSummary_rev09_EAModel41.xlsm

Notes:

[1] Obtained from mass-balance considering discharge rate from sewage treatment plant (STP) and Tenas Control Pond (TCP)

[2] Considering TCP discharge rate and sewage effluent discharge rate

2.5 Stream Survey

A field survey was carried out on October 30, 2020, in Goathorn Creek by DWB (2020). During the survey, the average streamflow in the creek was 1.2 m^3/s, based on the real-time hydrometric monitoring at Water Survey of Canada station 08EE008 (WSC 2020). This is comparable to the flow rate used in the reasonable worst case (i.e., 0.99 m^3/s) which corresponds to the 7Q10 flow during freshet (May).

To obtain a detailed description of the Goathorn Creek IDZ, cross-sectional measurements were carried out at 5 locations upstream and downstream of the proposed discharge point (Figure 2-4). The tributary discharges from the left bank at the creek, and a section (denoted by section C) was measured at this discharge location. Two more sections upstream (sections A and B) and two sections downstream (sections D and E) were surveyed, covering about a 220 m reach near the discharge location. In each section, measurements were taken at close interval to capture the local variation of channel depth. Locations of the overbank points and water levels were also noted. The presence of boulders and cobbles in the creek makes the cross-sectional shapes highly irregular (Figure 2-4). The bed profile and the channel slope were obtained from these cross-sectional measurements. The estimated bed slope for the surveyed reach is about 2.3% (DWB 2020).

Figure 2-4: Surveyed cross sections near the Goathorn Creek discharge point

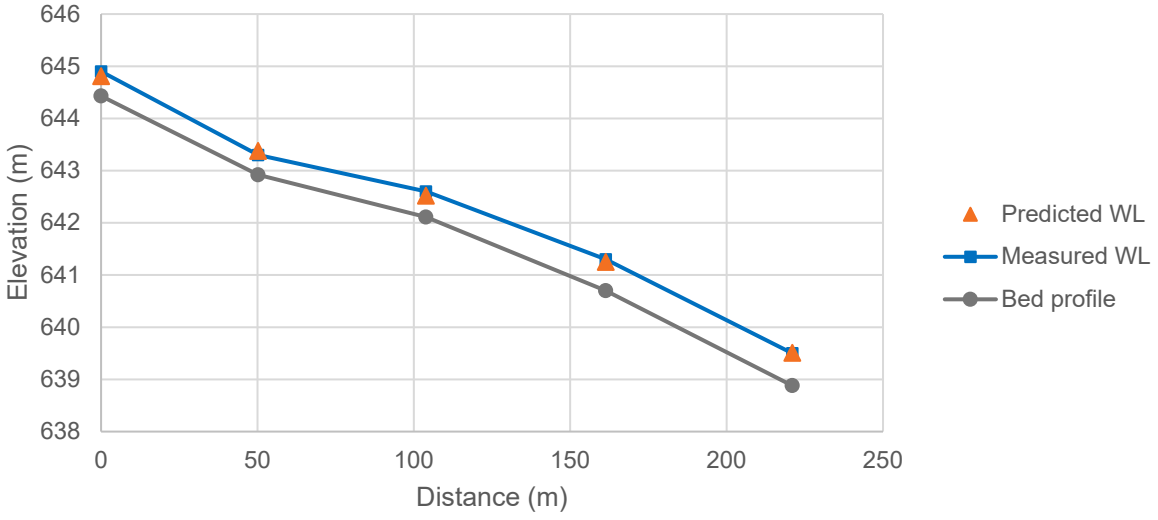
3 Hydraulic and Mixing Modeling

Stream hydraulic properties were utilized to develop mixing-dilution model, as these govern dispersion characteristics in the receiving environment. HEC-RAS (version 6.6, USACE 2024) was utilized to build a hydrodynamic model of the Goathorn Creek and develop inputs for mixing modeling. The water quality in the Goathorn Creek and its mixing and dilution characteristics were modeled using CORMIX (version 12.0, Doneker and Jirka 2007), which is a computer-aided system for the analysis, prediction, and design of regulatory mixing zones, and is supported by the US Environmental Protection Agency.

3.1 Hydraulic Model Development

The HEC-RAS model domain was constructed using the surveyed cross sections measured upstream and downstream of the discharge point, covering about 220 m long reach of the Goathorn Creek. Because of the highly irregular geometry, cross sections were interpolated to be 2 m spaced apart for better representation of hydraulic features. During the cross-section survey, average flow at the Goathorn Creek was 1.2 m^3/s, which was applied as the upstream boundary condition. The model was set to a normal depth boundary condition at the downstream model extent.

Since the IDZ assessment typically uses low-flow conditions, the variation in roughness between the channel and overbank locations is not very important, and a single channel roughness value was assigned for the entire reach. The model was calibrated by adjusting Manning's roughness coefficient 'n' to maintain observed water depths in the upstream sections. The estimated roughness coefficient was 0.14, typical of the large cobbles and boulders observed at the site. This also falls within the range of acceptable roughness values found in literature (USACE 2024). The measured and simulated water surface elevation agreed very well, with a correlation coefficient, $R^2 = 0.999$ (Figure 3-1), indicating appropriate selection of the model parameters.



Source: Z: \1CT027.003 Telkwa/2020 EA Water Management Support\900_Discharge_Mgmt\IDZ_study\Hydraulic Analysis\HEC-RAS Modeling\GHC_IDZ_hecras_calibration_rk.xlsx

Figure 3-1: Comparison between the measured and simulated water surface elevation

3.2 Hydraulic Characterization Results

The calibrated model was utilized to simulate the Goathorn Creek flow conditions for the three cases – worst, reasonable worst and expected conditions, during operation and post closure. For each case, the creek flow, and the corresponding effluent discharge rate (Table 2-2) were considered in the total flow. Various hydraulic parameters, such as depth, velocity, and width, were averaged over the IDZ reach downstream of the discharge location. Table 3-1 highlights the hydraulic characteristics for each case, which were utilized in the mixing-dilution modeling described in Section 3.3.

Table 3-1: Hydraulic features of Goathorn Creek for different cases

Parameter	Calibration	Operation			Post Closure		
		Worst case	Reasonable worst case	Expected case	Worst case	Reasonable worst case	Expected case
Total flow (m^3/s)	1.2	1.26	0.44	2.93	0.24[2]	0.46	1.73
Slope (m/m) [(1)]	0.023	0.023	0.025	0.023	0.025	0.025	0.023
Average Depth (m)	0.31	0.32	0.20	0.43	0.15	0.20	0.36
Average Velocity (m/s)	0.49	0.49	0.37	0.61	0.32	0.38	0.53
Average Width (m)	9.1	9.2	6.8	11.8	5.5	6.8	9.9

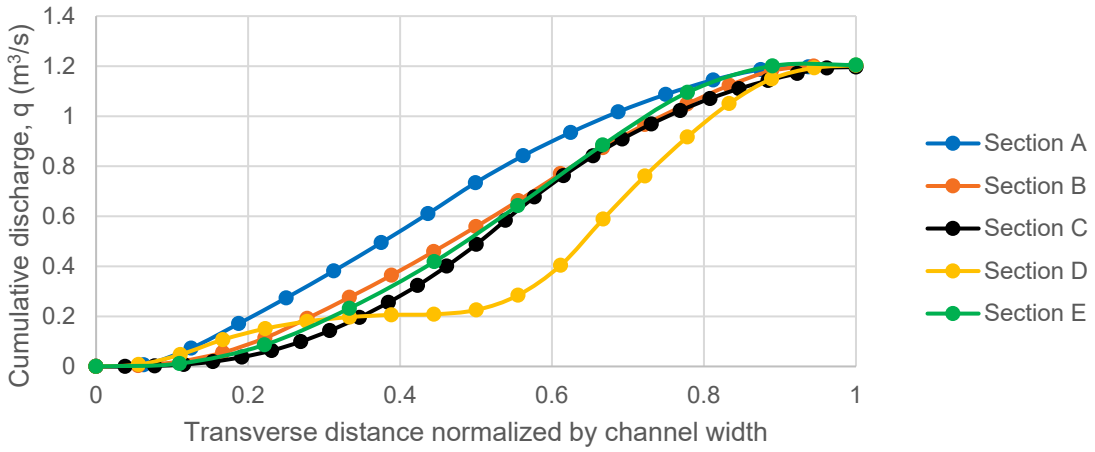
Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\HydraulicModeling\TelkwaIDZ_GHC_hecras_modeling_rev05_2025update.xlsx

Notes:

[1] Slope of the energy grade line

[2] Corresponds to the case with 1:1 flow ratio

Using the calibrated hydrodynamic model, velocity distribution and corresponding cumulative discharge were analyzed for the Goathorn Creek. The cumulative discharge, *q*, represents the volumetric flow rate which occurs between the bank and a given position within the channel, and is equal to zero on one bank and equal to the total discharge (*Q*) on the other bank. The cumulative discharge distribution at the surveyed sections of the Goathorn Creek is illustrated in Figure 3-2 where q = 0 at the left bank and q = 1.2 m^3/s at the right bank of the creek. The distribution is similar for most cases, except for section A (which is narrow) and section D (with divided flow).



Source: Z: \1CT027.003 Telkwa/2020 EA Water Management Support\900_Discharge_Mgmt\IDZ_study\ CORMIX_Modeling\ TelkwaIDZ_CORMIX_ModelResults_rev04_nst.xlsm

Figure 3-2: Cumulative discharge distribution at Goathorn Creek sections

The distribution of cumulative discharge lines in a channel provides an indication of the overall flow pattern that is important for constituent transport. The closely-spaced discharge lines, as shown in Figure 3-3, represent areas of large depth and higher velocities in the Goathorn Creek. Also, the sections are typically shallow towards the left bank, so wider plume widths are expected for effluent discharge, which exceeds that provided in the TG11 guidance. For example, section C (discharge location) and downstream sections occupy 37-56% channel width for 25% flow. As a result of this site-specific shallow-flow configuration, wider plume width criterion (40% of channel width) was used for IDZ delineation (see Table 4-1).

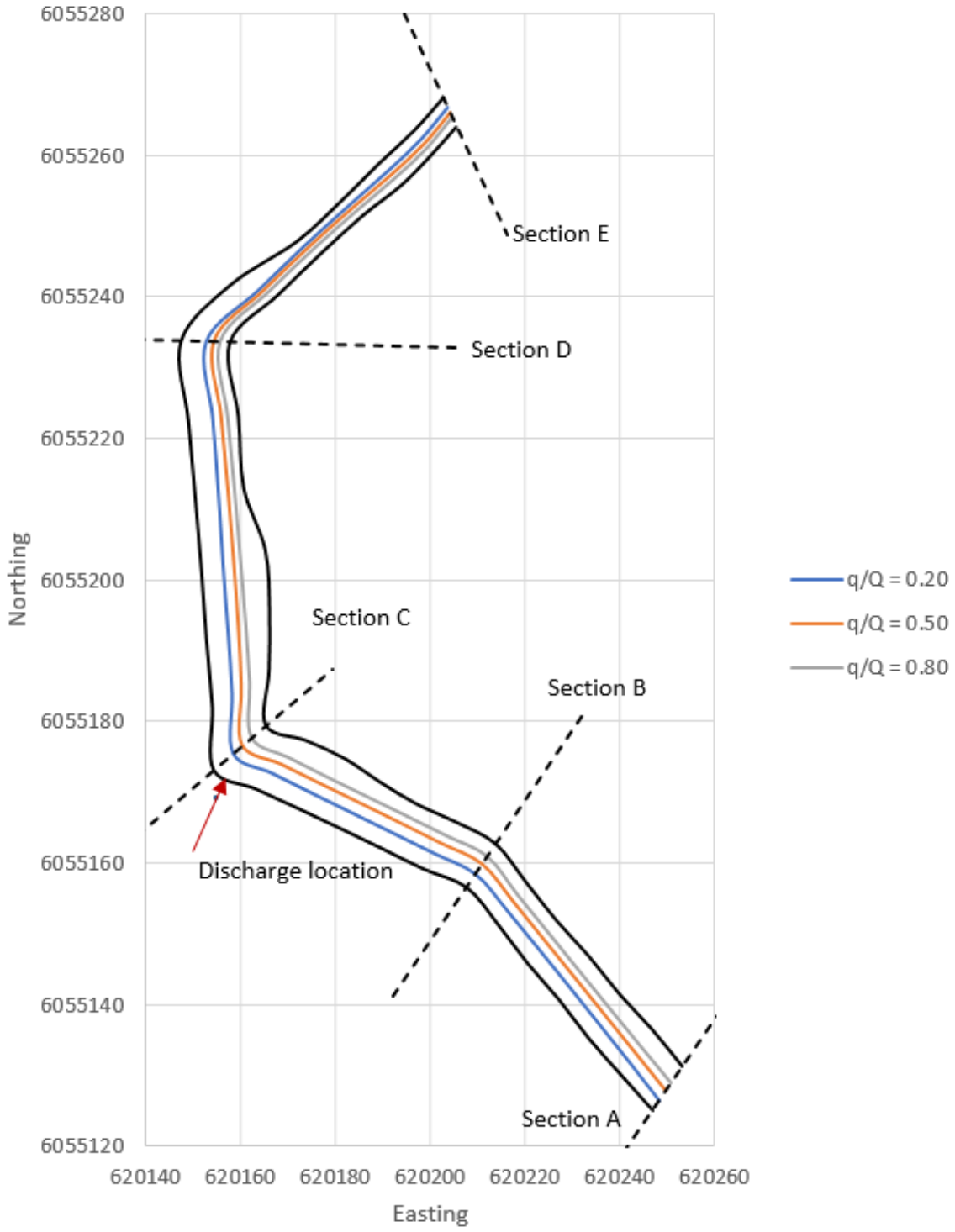


Figure 3-3: Illustration of cumulative discharge near the Goathorn Creek IDZ

3.3 Mixing Model Description

CORMIX employs jet integral model for near-field (Yotsukura and Sayre, 1976) and cumulative discharge method for far-field mixing processes (Doneker and Jirka, 2007). The program requires input on flow and discharge rate, hydraulic condition, simplified geometry of ambient and discharge channel, and water quality descriptions, among others.

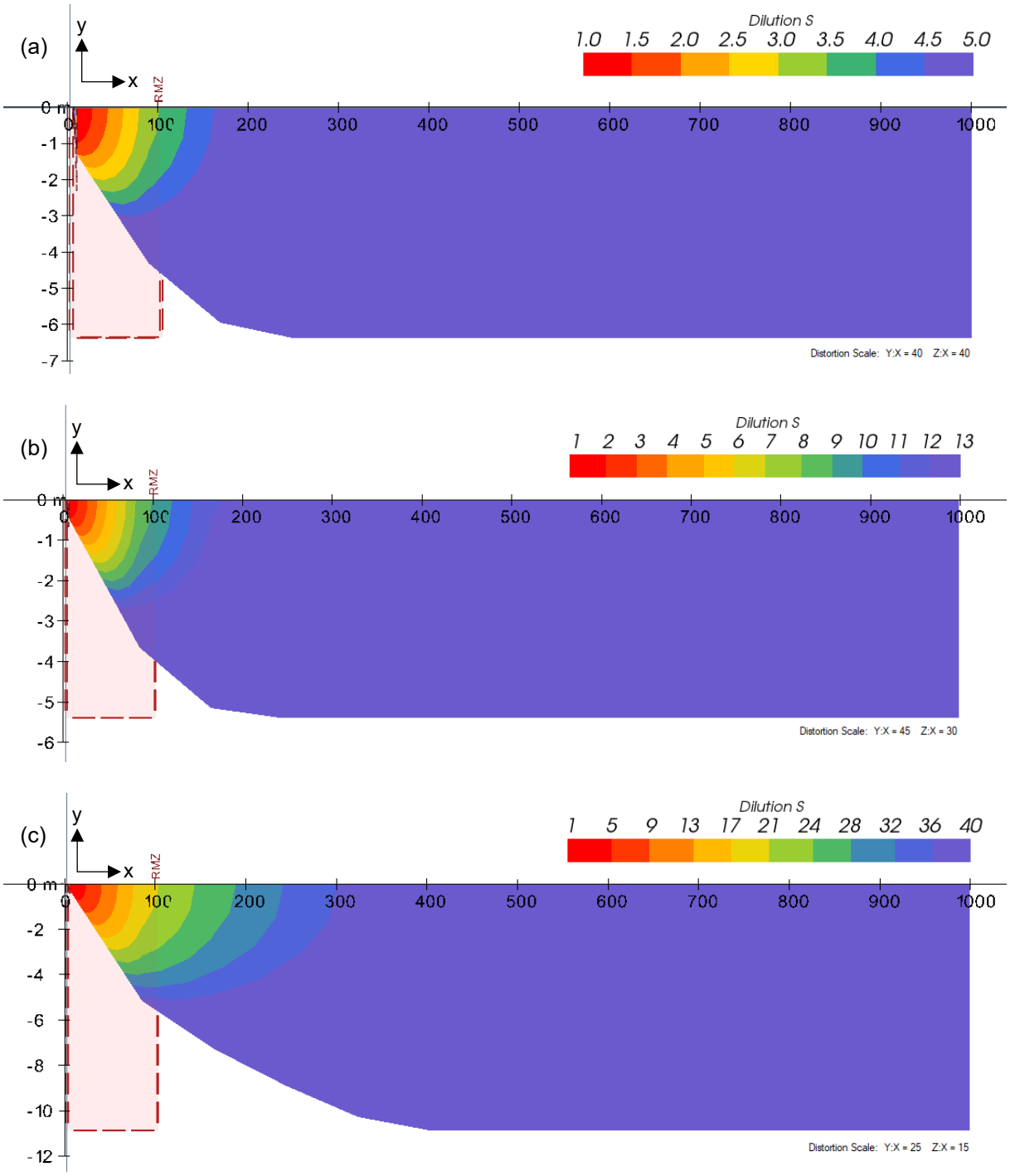
For the IDZ cases evaluated in this study, the model was configured as a slightly meandering channel (conservative assumption) to represent the Goathorn Creek, with Manning's roughness coefficient obtained from the hydraulic modeling (Section 3.1). The model geometry for each IDZ case was schematized as a rectangular cross-section keeping the depth-velocity conditions consistent with hydraulics of the creek (refer to Table 3-1). For the tributary (discharging channel), it was assumed that the velocity is the same as the creek, and the depth at the discharge location is similar to the mean depth of creek flow. The model domain was extended up to 1.5 km downstream of the discharge location.

For water quality prediction, parameter concentrations were specified for the effluent discharge with consideration of background water quality in the creek. With the mixing models set for the worst, reasonable worst and expected cases, in-stream water quality was evaluated for each POC. Estimates of the effluent plume were obtained at various distances downstream of the discharge location, and across the transverse direction of the creek.

3.4 Dilution Characterization

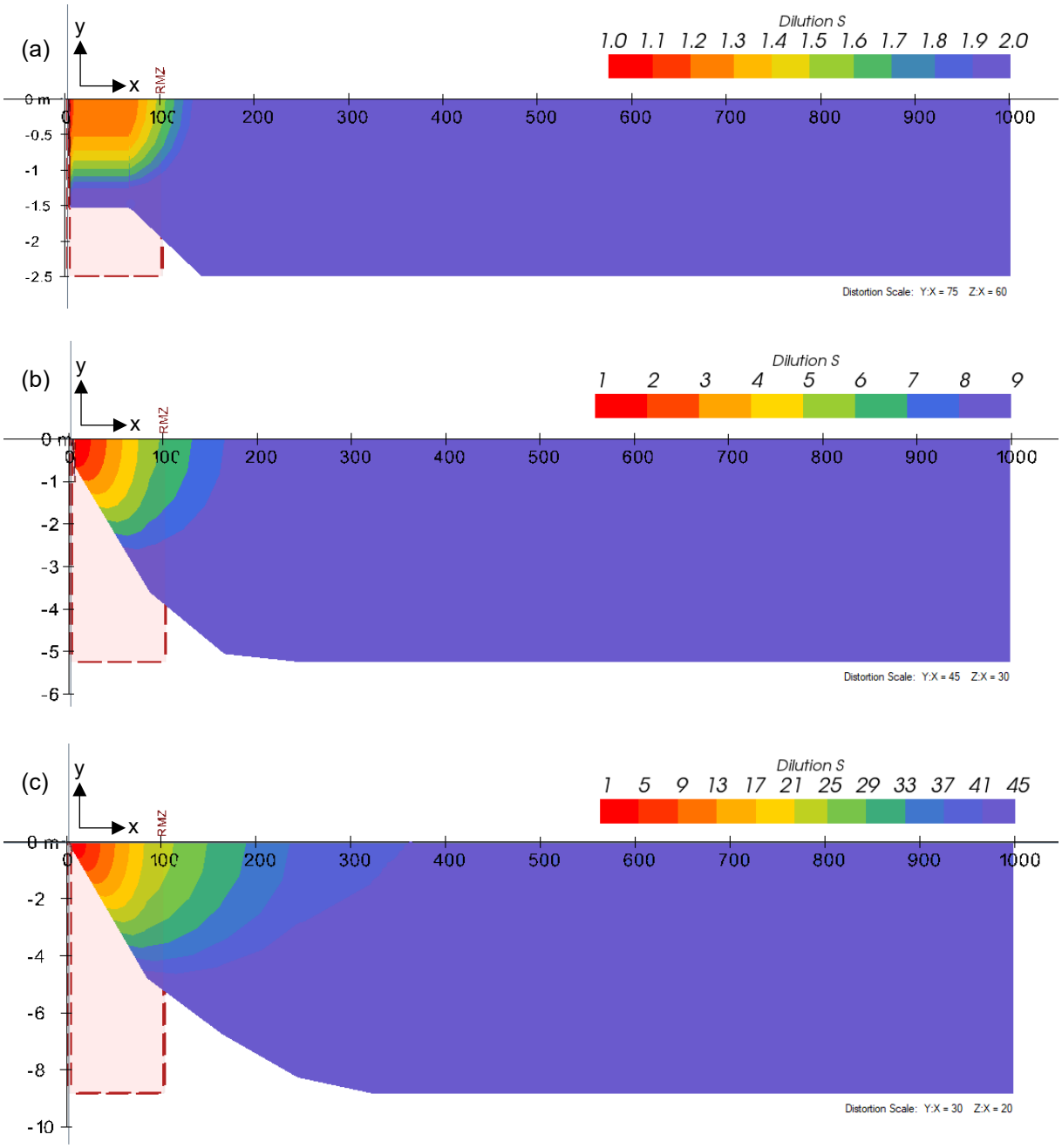
The developed CORMIX model was used to predict water quality in the Goathorn Creek as a result of effluent discharge from the TCP (during operation) and North Management Pond (during post closure). The model provided estimates of concentration change and corresponding dilution of the effluent plumes at downstream locations.

Figure 3-4 and Figure 3-5 illustrate dilution contours for the IDZ cases during operation and post-closure, respectively. The dilution (denoted as S) is defined as the effluent concentration (or initial concentration) over the concentration at a point resulting from mixing. Since CORMIX utilizes the 'cumulative discharge method', the transverse dimension illustrated in the figures represents relative width in terms of cumulative discharge across the creek. The actual width was obtained using the cumulative discharge distribution of the surveyed cross sections described in Section 3.2.



Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling

Figure 3-4. Model results showing dilution for the IDZ cases during operation – (a) worst case (S_{max} = 4.9), (b) reasonable worst case (S_{max} = 12.4), and (c) expected case (S_{max} = 39.6)



Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling

Figure 3-5: Model results showing dilution for the IDZ cases during post-closure – (a) worst case (1:1 flow ratio) (S_{max} = 2), (b) reasonable worst case (S_{max} = 8.3), and (c) expected case (S_{max} = 40.3)

As a result of turbulent mixing, the effluent plume is diluted downstream beyond the discharge location. The maximum dilution depends on the creek flow and the effluent discharge rate. Due to shallow depths, plumes become vertically well-mixed within shorter distances, and the dilution is governed by transverse mixing across channel width. The mixing coefficient for different cases varied from 0.014 to 0.05 m^2/s (Table 3-2), where the dimensionless mixing coefficient was about 0.5. This is a conservative estimate and falls within literature values. The dimensionless transverse mixing coefficients can vary from 0.3 to 0.6 for regular channels and 0.6 to 0.9 for gently-meandering channels (Fischer et al. 1979; Rutherford 1994).

Table 3-2: Mixing model results for various cases

Parameter	Operation			Post Closure		
	Worst case	Reasonable worst case	Expected case	Worst case[1]	Reasonable worst case	Expected case
Goathorn Creek Flow (m^3/s)	1	0.4	2.86	0.12	0.4	1.69
Effluent Discharge Rate (m^3/s)	0.26	0.035	0.074	0.12	0.055	0.043
Total Flow (m^3/s)	1.26	0.44	2.93	0.24	0.46	1.73
Transverse Mixing Coefficient (m^2/s)	0.042	0.021	0.066	0.014	0.022	0.050
Limiting Dilution, S_{max} [2]	4.9	12.4	39.6	2.0	8.3	40.3
Complete Mixing Length, L_{mix} (m)	192	179	362	122	177	277

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling\TelkwaIDZ_CORMIX_ModelResults_rev05_2025update.xlsm

Notes:

[1] Corresponds to the case with 1:1 flow ratio

[2] Maximum possible dilution for a given flow condition.

Table 3-2 shows the model predicts that complete mixing during operation will be achieved at 192 m, 179 m and 362 m downstream from the effluent source for the worst case, reasonable worst case and expected case, respectively. It remains in similar range for the reasonable worst case and expected case in post closure, but reduces to 122 m for the worst case with 1:1 flow ratio. These results suggested that complete mixing is not achieved within the 100 m length from the discharge. However, background and discharge water quality must be included in the assessment to determine if concentrations are likely to be below the WQG at the edge of the mixing zone at 100 m, as discussed in Section 4.

4 Initial Dilution Zone Assessment

The mixing and dilution of Project discharge and corresponding effluent plume were delineated based on the CORMIX model developed for the Goathorn Creek and compared with TG11 guidance. All POCs identified for the effluent discharge were considered for this assessment, as discussed in the following sections.

4.1 IDZ Delineation

Spatial extent of the IDZ and plume features such as the flow occupied within the IDZ and its length and width were estimated for the three IDZ cases. As outlined in TG11, these dimensions can vary depending on site-specific factors. Because of the shallow configuration near the left banks of Goathorn Creek (Section 3.2), plume widths are typically higher for a given flow condition, and 40% of channel width was considered for IDZ delineation. This width corresponds to 25% of total flow at the discharge location (section C, Figure 3-2). Emphasis was placed upon the IDZ length and flow criteria for evaluation. Table 4-1 outlines the evaluation criteria for the Goathorn Creek IDZ.

Table 4-1: Evaluation criteria for IDZ delineation

IDZ Feature	Criterion	Reference / Remark
Length	100 m	TG11 (ENV 2019)
Flow	25% of total flow	TG11 (ENV 2019)
Width	40% of channel width	Based on site-specific condition guided by TG11 (Section 3.5.2)

Source: Compiled in text

4.2 IDZ Results for Operation

4.2.1 Fully Mixed Conditions

Water quality in the Goathorn was analyzed using the mixing model and considering instream flow and background water quality as well as effluent concentration and discharge rate from the TCP during operation. The model estimated change in concentration as the effluent is diluted downstream as a result of turbulent mixing. The identified POCs were modeled for each IDZ cases to estimate concentrations after complete mixing and compared with in-stream WQGs (Table 4-2). The results are summarized below:

- Fully mixed concentration of nitrite and selenium exceeds the WQG for the worst case, but meets the guideline for the reasonable worst and expected cases.
- WQG is exceeded for dissolved copper in all cases due to high background concentration. Effluent concentrations for the IDZ cases are lower than the background level.
- All other parameters meet the respective WQGs for all IDZ cases after fully mixed condition is achieved.

Table 4-2. Fully Mixed Concentration of POCs in Goathorn Creek (Operation)

Parameter	WQG (mg/L)	Fully Mixed Concentration (mg/L)		
		Worst case (L_{mix} = 192 m)	Reasonable worst case (L_{mix} = 179 m)	Expected case (L_{mix} = 362 m)
Nitrate	3	0.94	0.42	0.07
Nitrite	0.02	**0.021**	0.0084	0.0011
Sulfate	218	108	55	29
Aluminum, total	0.27	0.26	0.12	0.10
Cobalt, total	0.004	0.00085	0.00033	0.00011
Copper, dissolved	0.0013	**0.0020**[1]	**0.0014**[1]	**0.0014**[1]
Iron, total	1	0.52	0.20	0.12
Molybdenum, total	0.034	0.0077	0.0033	0.0009
Nickel, dissolved	0.0022	0.0014	0.0007	0.0003
Selenium, total	0.002	**0.0046**	0.0018	0.0004
Zinc, dissolved	0.0074	0.0030	0.0021	0.0016

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling\TelkwaIDZ_CORMIX_ModelResults_rev05_2025update.xlsm

Notes: Orange Bolded value represents exceedance with respect to the WQG

[1] Exceedance resulted from high background concentration in Goathorn Creek

4.2.2 Mixing Zone Extent

The effluent concentration from the TCP and the Goathorn Creek background water chemistries were applied to the mixing model to delineate IDZ for each POC, considering the dilution required to meet the corresponding WQG. The IDZ extent was defined as the area downstream of discharge beyond which instream WQGs will be met. The modeled water quality of each POC and corresponding plume features (length and width of the mixing zone) in the Goathorn Creek was compared with the IDZ evaluation criteria (Table 4-1) based on TG11 guidance.

Although cobalt was identified as a POC based on 80% of WQG value, it does not constitute an IDZ as the effluent concentrations are below the WQG. The IDZ extent cannot be estimated for dissolved copper due to higher background concentration than the WQG. Figure 4-1 shows the delineated plumes (area with concentration higher than WQG) of the POCs for TCP discharge. The plume lines correspond to the lines where WQGs are met. IDZ criteria based on TG11 guidance are exceeded in operations for the following parameters:

- Worst case: Aluminum
- Reasonable worst case: Selenium

Table 4-3 compares the results of the IDZ delineation for each POC against the TG11 criteria for IDZ length, fraction of flow occupied and its width. For the worst case, nitrite and selenium do not meet WQG after complete mixing. The maximum IDZ length is 128 m which corresponds to Aluminum plume. Nitrite and aluminum meet IDZ criteria for the reasonable worst case, but the maximum IDZ length extends to 153 m to meet instream selenium WQG. All parameters meet the TG11 guidance for the expected case.

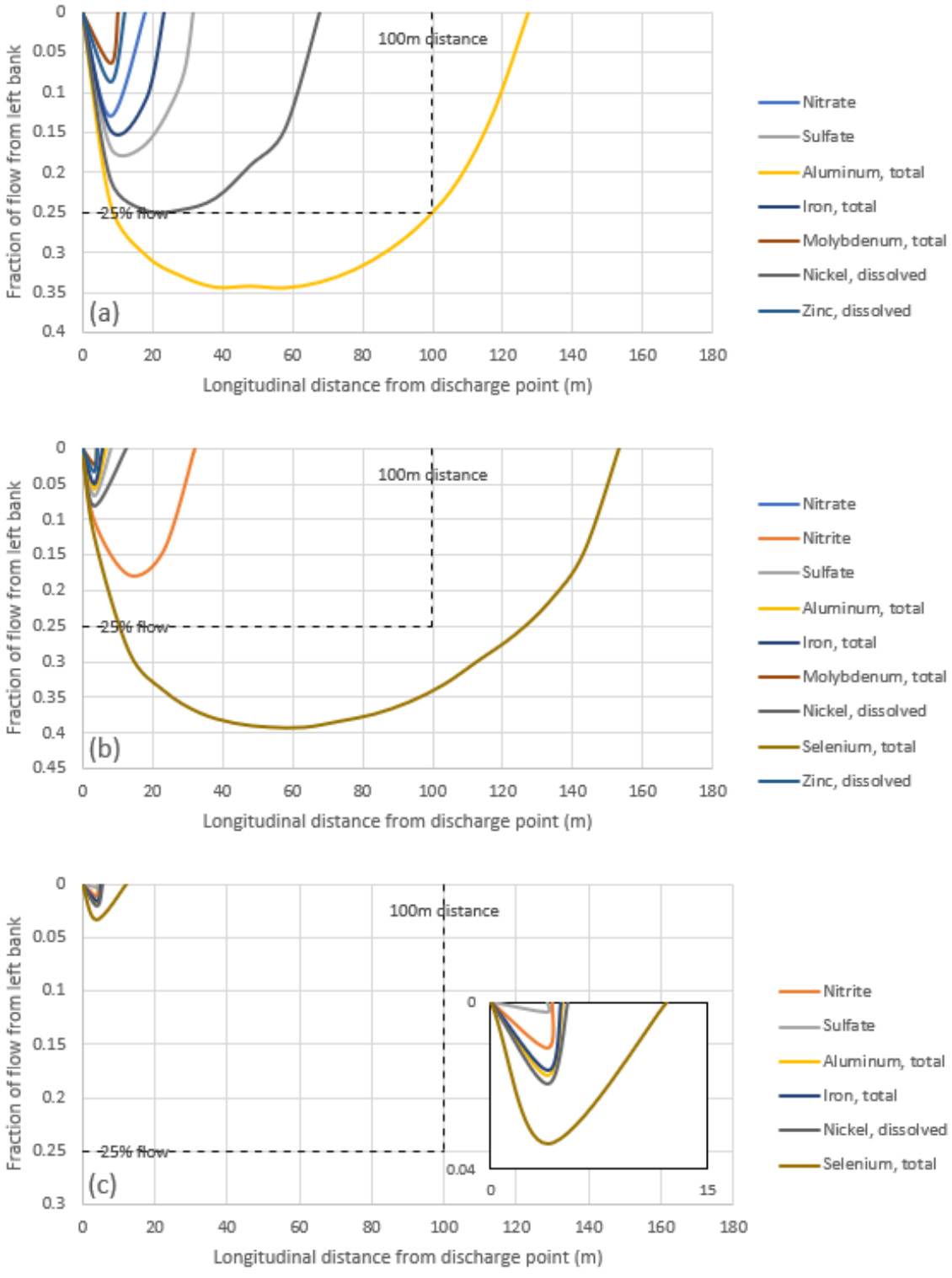


Figure 4-1. Plume delineation of POCs during operation – (a) worst case, (b) reasonable worst case, and (c) expected case

Table 4-3. IDZ Delineation Results for TCP Discharge in Operation

Parameter	Scenario	WQG (mg/L)	Background concentration (mg/L)	Effluent concentration (mg/L)	IDZ length (m)	IDZ flow (% of stream)	IDZ width (% of stream)
Nitrate *	Worst case	3	0.054	4.4	18	13	32
	Reasonable worst	3	0.041	4.7	6	5	23
	Expected case	3	0.041	1.2	n.a.	n.a.	n.a.
Nitrite *	Worst case	0.02	0.0009	0.099	Fully mixed concentration > WQG		
	Reasonable worst	0.02	0.0005	0.099	32	18	36
	Expected case	0.02	0.0005	0.023	< 5	1	13
Sulphate	Worst case	218	31	410	31	17	35
	Reasonable worst	218	24	410	8	7	25
	Expected case	218	24	220	< 5	< 1	8
Aluminum, total	Worst case	0.27	0.23	0.39	128	34	47
	Reasonable worst	0.27	0.092	0.39	7	6	24
	Expected case	0.27	0.092	0.38	5	2	16
Cobalt, total	Worst case	0.004	0.00017	0.0035	n.a.	n.a.	n.a.
	Reasonable worst	0.004	0.00005	0.0035	n.a.	n.a.	n.a.
	Expected case	0.004	0.00005	0.0026	n.a.	n.a.	n.a.
Copper, dissolved	Worst case	0.0013	0.0021	0.0015	Background concentration > WQG		
	Reasonable worst	0.0013	0.0014	0.0015	Background concentration > WQG		
	Expected case	0.0013	0.0014	0.0011	Background concentration > WQG		
Iron, total	Worst case	1	0.27	1.5	23	15	33
	Reasonable worst	1	0.085	1.5	6	5	23
	Expected case	1	0.085	1.5	5	2	15
Molybdenum, total	Worst case	0.034	0.00054	0.036	10	6	24
	Reasonable worst	0.034	0.00047	0.036	< 5	2	18
	Expected case	0.034	0.00047	0.018	n.a.	n.a.	n.a.
Nickel, dissolved	Worst case	0.0022	0.00025	0.006	68	25	41
	Reasonable worst	0.0022	0.00025	0.006	13	8	27
	Expected case	0.0022	0.00025	0.0037	5	2	16
Selenium, total	Worst case	0.002	0.00012	0.022	Fully mixed concentration > WQG		
	Reasonable worst	0.002	0.000086	0.022	153	39	49
	Expected case	0.002	0.000086	0.011	12	3	20
Zinc, dissolved	Worst case	0.0074	0.0015	0.0088	12	9	27
	Reasonable worst	0.0074	0.0015	0.0088	< 5	3	20
	Expected case	0.0074	0.0015	0.0055	n.a.	n.a.	n.a.

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling\TelkwaIDZ_CORMIX_ModelResults_rev05_2025update.xlsm

Notes: n.a. refers to not applicable when effluent concentration is equal or below WQG
* Effluent concentration considers discharge from sewage treatment plant

4.3 IDZ Results for Post Closure

4.3.1 Fully Mixed Conditions

Fully mixed condition in Goathorn Creek during post-closure was modeled for the IDZ cases, using instream flow and background quality as well as effluent concentration and discharge rate from the NMP. For the worst case, both the unrealistic (0.4:1 ratio of creek flow to effluent discharge rate) and the conservative realistic scenario (1:1 flow ratio) was evaluated for comparison (Table 4-4).

Comparison of the fully mixed concentrations of the POCs against WQGs showed all parameters met their respective WQG for all IDZ cases in closure, except for aluminum and selenium for the worst case. WQG is exceeded for iron in the worst case 0.4:1 flow ratio, but this condition is not realistic and unlikely to occur. Similar to operation, the fully mixed concentration of dissolved copper is higher than WQG due to elevated background concentration.

Table 4-4. Fully Mixed Concentration of POCs in Goathorn Creek (Post-closure)

Parameter	WQG (mg/L)	Fully Mixed Concentration (mg/L)			
		Worst case (0.4: 1)[1]	Worst case (1:1)[1] (L_{mix} = 122 m)	Reasonable worst (L_{mix} = 177 m)	Expected case (L_{mix} = 277 m)
Nitrate	3	0.64	0.46	0.14	0.05
Nitrite	0.02	0.015	0.010	0.003	0.001
Sulfate	218	166.5	125.5	47.7	28.1
Aluminum, total	0.27	**0.34**	**0.31**	0.13	0.10
Cobalt, total	0.004	0.00098	0.00074	0.00020	0.00008
Copper, dissolved	0.0013	**0.0022**[2]	**0.0022**[2]	**0.0015**[2]	**0.0014**[2]
Iron, total	1	**1.15**	0.89	0.26	0.12
Molybdenum, total	0.034	0.0056	0.0041	0.0013	0.0006
Nickel, dissolved	0.0022	0.0016	0.0012	0.0005	0.0003
Selenium, total	0.002	**0.0058**	**0.0041**	0.0010	0.0002
Zinc, dissolved	0.0074	0.0017	0.0017	0.0015	0.0015

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling\TelkwaIDZ_CORMIX_ModelResults_rev05_2025update.xlsm

Notes: Orange Bolded value represents exceedance with respect to the WQG

[1] Corresponds to ratio of Goathorn Creek flow to effluent discharge rate

[2] Exceedance resulted from high background concentration in Goathorn Creek

4.3.2 Mixing Zone Extent

For discharge from the North Management Pond during/after closure, POCs including nitrate, nitrite, total cobalt, total molybdenum, dissolved nickel and dissolved zinc do not register an IDZ, as the effluent concentrations are below the corresponding WQGs for the IDZ cases. The IDZ extent cannot be estimated for dissolved copper due to higher background concentration than the WQG.

POCs with IDZ in closure, along with plume delineation, are illustrated in Figure 4-2. Among these parameters, iron exceeds the flow criteria (IDZ flow > 25%) for the worst case, but the extent remains within the 100 m guidance value based on TG11 criteria. It meets the guidance for the reasonable and expected cases. Sulfate, aluminum and selenium meet the IDZ criteria for all cases.

Table 4-5 compares the results of the IDZ delineation for each POC against the TG11 criteria after closure. For the worst case, aluminum and selenium do not meet WQG after complete mixing, and maximum IDZ length is 95 m which corresponds to iron plume. The maximum IDZ extent for the reasonable worst case is 44 m based on selenium WQG requirement.

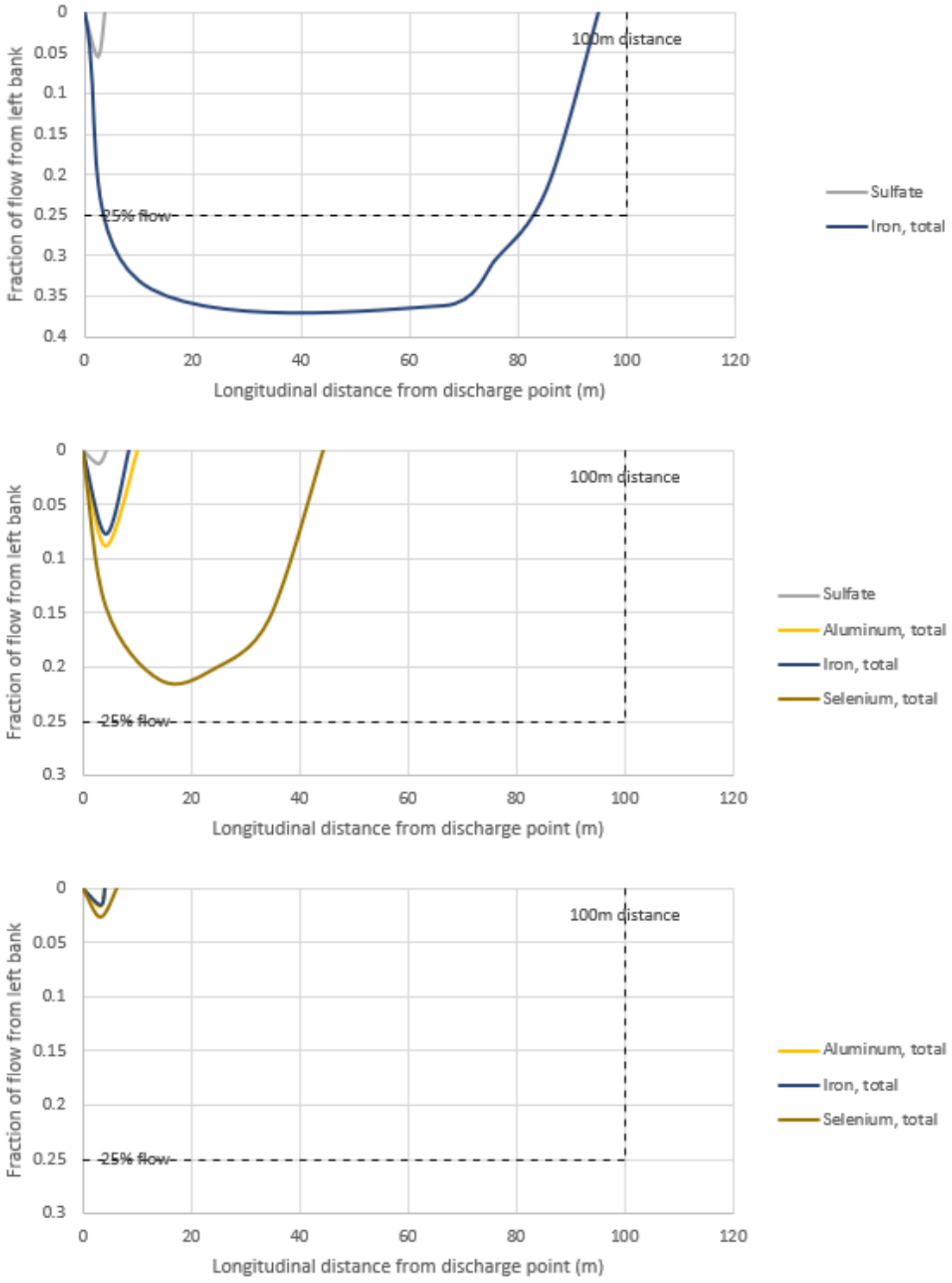


Figure 4-2. Plume delineation of POCs during post closure – (a) worst case (1:1 flow ratio), (b) reasonable worst case, and (c) expected case

Table 4-5: IDZ Delineation Results for NMP discharge after closure

Parameter	Scenario	WQG (mg/L)	Background concentration (mg/L)	Effluent concentration (mg/L)	IDZ length (m)	IDZ flow (% of stream)	IDZ width (% of stream)
Nitrate	Worst case	3	0.054	0.87	n.a.	n.a.	n.a.
	Reasonable worst	3	0.041	0.87	n.a.	n.a.	n.a.
	Expected case	3	0.041	0.33	n.a.	n.a.	n.a.
Nitrite	Worst case	0.02	0.0009	0.02	n.a.	n.a.	n.a.
	Reasonable worst	0.02	0.0005	0.02	n.a.	n.a.	n.a.
	Expected case	0.02	0.0005	0.0077	n.a.	n.a.	n.a.
Sulphate	Worst case	218	31	220	< 5	5	23
	Reasonable worst	218	24	220	< 5	1	14
	Expected case	218	24	190	n.a.	n.a.	n.a.
Aluminum, total	Worst case	0.27	0.23	0.39	Fully mixed concentration > WQG		
	Reasonable worst	0.27	0.092	0.39	10	9	28
	Expected case	0.27	0.092	0.38	< 5	2	16
Cobalt, total	Worst case	0.004	0.00017	0.0013	n.a.	n.a.	n.a.
	Reasonable worst	0.004	0.00005	0.0013	n.a.	n.a.	n.a.
	Expected case	0.004	0.00005	0.0012	n.a.	n.a.	n.a.
Copper, dissolved	Worst case	0.0013	0.0021	0.0022	Background concentration > WQG		
	Reasonable worst	0.0013	0.0014	0.0022	Background concentration > WQG		
	Expected case	0.0013	0.0014	0.0017	Background concentration > WQG		
Iron, total	Worst case	1	0.27	1.5	95	36	48
	Reasonable worst	1	0.085	1.5	8	8	26
	Expected case	1	0.085	1.5	< 5	2	15
Molybdenum, total	Worst case	0.034	0.00054	0.0076	n.a.	n.a.	n.a.
	Reasonable worst	0.034	0.00047	0.0076	n.a.	n.a.	n.a.
	Expected case	0.034	0.00047	0.0063	n.a.	n.a.	n.a.
Nickel, dissolved	Worst case	0.0022	0.00025	0.0022	n.a.	n.a.	n.a.
	Reasonable worst	0.0022	0.00025	0.0022	n.a.	n.a.	n.a.
	Expected case	0.0022	0.00025	0.0017	n.a.	n.a.	n.a.
Selenium, total	Worst case	0.002	0.00012	0.008	Fully mixed concentration > WQG		
	Reasonable worst	0.002	0.000086	0.008	44	21	38
	Expected case	0.002	0.000086	0.0059	6	3	18
Zinc, dissolved	Worst case	0.0074	0.0015	0.0018	n.a.	n.a.	n.a.
	Reasonable worst	0.0074	0.0015	0.0018	n.a.	n.a.	n.a.
	Expected case	0.0074	0.0015	0.0015	n.a.	n.a.	n.a.

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling\TelkwaIDZ_CORMIX_ModelResults_rev05_2025update.xlsm

Notes: n.a. refers to not applicable when effluent concentration is equal or below WQG

4.4 Evaluation of Results

BC provincial regulations recognize that dilution can play a role in mitigating the effects of effluents, and that an accepted area of higher concentrations of parameters can be present in an IDZ prior to full mixing. Evaluation of the IDZ cases based on BC's TG11 guidance indicated that, during the worst case scenario, Goathorn Creek exceeds WQG: for aluminum, nitrite and selenium in operation, and for aluminum and selenium during post-closure. It is important to note that the worst case is very conservative, as it considers the 7Q10 low flow combined with maximum discharge from the facility. It is unlikely water would need to be discharged from the facility during such a dry period. A WLB model run for 1-in-100-year dry event also confirmed that the discharge would be considerably lower than the projected maximum discharge based on average hydrology condition.

A more realistic case is the reasonable worst case for which IDZ criteria to meet WQG is exceeded for selenium during operations. The IDZ criteria is also exceeded for dissolved copper for all cases due to higher background concentration compared to the WQG. POCs with exceedances for the reasonable worst case are discussed below:

Dissolved copper: Background concentration of dissolved copper is higher than the WQG of 0.0013 mg/L, with 50th percentile and 75th percentile concentrations of 0.021 and 0.014 mg/L, respectively. This results in no dilution capacity available in the Goathorn Creek. Although the effluent concentration in operation and closure is higher than the WQG (except for the expected case in operation), the concentration is approximately equal to the creek background level after mixing (Table 4-6), and the baseline water quality is not further deteriorated.

Table 4-6. Evaluation of Dissolved Copper Concentrations for the IDZ Cases

IDZ Case	WQG (mg/L)	Background Concentration (mg/L)	Operation		Post-Closure	
			Effluent Concentration (mg/L)	Fully Mixed Concentration (mg/L)	Effluent Concentration (mg/L)	Fully Mixed Concentration (mg/L)
Worst case	0.0013	0.0021	0.0015	0.0020	0.0022	0.0022
Reasonable worst	0.0013	0.0014	0.0015	0.0014	0.0022	0.0015
Expected case	0.0013	0.0014	0.0011	0.0014	0.0017	0.0014

Source: NA CAPR002055 Telkwa Project General EA Support - IDZ update\MixingModeling\TelkwaIDZ_CORMIX_ModelResults_rev05_2025update.xlsm

Total selenium: The IDZ criteria based on TG11 guidance is exceeded for total selenium for the reasonable worst case during operation, with IDZ length of 153 m and the plume occupying 39% flow (Table 4-3). The reasonable worst-case scenario combines conservative conditions in both effluent quality (maximum concentration) and Goathorn Creek flows (7Q10 low-flow). The IDZ reduces to only 12 m for the expected case in operation. TG11 guidance is also met for the reasonable worst case and expected case after closure (Table 4-5).

5 Conclusions

The Goathorn Creek IDZ assessment was carried out following the TG11 guidance, produced by the BC Ministry of Environment and Parks. The assessment considers Tenas Project discharge during operation and after closure, with discharge from TCP and NMP, respectively. To characterize and delineate the extent of IDZ, three credible and conservative cases were considered, based on site-specific information:

- a worst case (very worst case)
- a reasonable worst case (worst case that typically occurs)
- an expected case (case corresponding to average conditions)

The IDZ assessment was carried out for POCs identified in the BAT assessment for the Project. The following parameters were identified as POCs: nitrate, nitrite, sulphate, aluminum (total), cobalt (total), copper (dissolved), iron (total), nickel (dissolved), zinc (dissolved), molybdenum (total) and selenium (total). Based on BAT assessment, cobalt was identified as a POC with respect to 80% of WQG, but do not develop an IDZ considering the actual WQG.

Hydrodynamic mixing modeling was conducted to evaluate the IDZ extent for POCs for the worst, reasonable worst and expected cases and compared against TG11 guidance. For the worst case, Goathorn Creek exceeds WQG for aluminum, nitrite and selenium in operation, and for aluminum and selenium during post-closure. This case is very conservative and unlikely to occur during very dry periods. Emphasis was placed upon the reasonable worst case and the expected case, which are conservative but provides realistic evaluation scenario. The results are summarized below.

During Operation:

- IDZ criteria to meet applicable WQGs are satisfied for nitrate, nitrite, sulphate, aluminum, cobalt, iron, nickel, zinc and molybdenum for reasonable worst and expected cases.
- The IDZ extent of selenium exceeds the TG11 recommended length of 100 m for the reasonable worst case and meets the instream WQG further downstream. The IDZ criteria is met for the expected case.
- WQG is exceeded for dissolved copper due to background concentration higher than the WQG, but the effluent concentration reaches background concentration after complete mixing.
- The maximum length of IDZ is 153 m and 12 m for the reasonable worst and expected cases, respectively (based on selenium).

During-Post Closure:

- POCs including nitrate, nitrite, cobalt, molybdenum, nickel and zinc do not register an IDZ, as the effluent concentrations are below the corresponding WQGs for the IDZ cases.
- IDZ criteria based on T11 guidance is met for sulfate, aluminum, iron and selenium for the reasonable worst and expected cases. The guidance is exceeded for dissolved copper with background concentration higher than the WQG, but remains close to the background level after complete mixing.

- The maximum length of IDZ is 44 m and 6 m for the reasonable worst and expected cases, respectively (based on selenium).

5.1 Limitations and Recommendations

- This IDZ assessment has been prepared based on the information available at the time of study. The assessment should be updated if any changes in the baseline condition or effluent discharge projections are expected.
- The CORMIX modeling work was carried out using geometry based on field measured cross sections. Uncertainty exists in the mixing and IDZ lengths presented herein, as the model does not account local variations (rapids, flow around cobbles and boulders) that impacts mixing. It is suggested to confirm the mixing zone lengths through field monitoring and tracer study program, particularly during low flow period.

Closure

This report, Tenas Project – Initial Dilution Zone Assessment, was prepared by

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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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APPENDIX 4.3-E: EFFECT OF MITIGATION CONTROLS ON WATER QUALITY AND QUANTITY OF THE TENAS PROJECT

FINAL

Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project

The Tenas Project, BC, Canada

Telkwa Mining Limited

SRK Consulting (Canada) Inc. ▪ CAPR002055 ▪ March 13, 2025

srk consulting

FINAL

Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project

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Appendix H Tenas Project Best available Technology assessment report (2025)

Useful Definitions

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

ANFO	Ammonium Nitrate/fuel oil
BAT	Best available Technology
BC	British Columbia
BMP	Best management practices
CPP	Coal Processing Pond
EAC	Environmental Assessment Certificate
EMP	East Management Pond
EoY	End of Year
GBR	Gravel Bed Reactor
IR	Information Request
MP	Management Pond
MC	Mitigation control
NMP	North Management Pond
Non-PAG	Non-Potentially acid generating (relating to rock)
PAG	Potentially acid generating (relating to rock)
POC	Parameter of Concern
TCP	Tenas Control Pond
TSS	Total Suspended Solids
WMP	West Management Pond
WQG	Water Quality Guidelines

Executive Summary

Telkwa Mining Limited (TML) is proposing to develop the Tenas Coal Project (the Project) located in northwest British Columbia 25 km Southwest of the town of Smithers, BC. In 2022, Telkwa Mining Limited (TML) applied for an Environmental Assessment Certificate (EAC) for the Project, which is currently under review. Throughout the Project definition and design, TML has focused on incorporating features and measures that would mitigate potential effects on water quality of effluent and in the environment downstream of the Project Area.

This report describes the mitigation controls and documents the beneficial effects these measures could have on effluent water quantity and quality as well as changes to water quality and streamflow in creeks and rivers downstream of the Project. The potential efficacy of several additional mitigation controls was evaluated using the Water and Load Balance Model developed for the Project (SRK 2022) with several updates as described below. The Water and Load Balance Model used to evaluate the additional mitigation controls is an updated version of the model issued 2022 (SRK 2022). Updates include:

- Updated source terms and background water quality data including seasonality (collected since 2022).
- Updated climate, flow and climate change estimates based on data collected up to 2023 and newly available climate change models from 2024.
- Updated calculations to estimate load in the creeks through groundwater seepages from the Project, and
- Updated assumptions regarding site operations that affect water and load balance modelling (e.g., date of Tenas Control Pond decommissioning).

Two categories of mitigation controls were considered in this analysis: best management practices (BMPs) and best achievable technologies (BAT). Model results are presented for both categories. However, recommendations are only provided on whether to adopt one or more of the evaluated BMPs in the Final EAC Project Case (2024). The evaluation, ranking, and selection of preferred BATs are addressed in the BAT assessment report, which is included in Appendix H.

Best management practices considered in this analysis are:

- Use of blasthole liners to reduce residual ammonia and nitrate loadings in contact water.
- Addition of freshet water to improve robustness of water cover in the water management ponds to reduce loadings in effluent.
- Increased process water usage in CPP plant, which would reduce the volume of effluent from the site.

Best Achievable Technologies considered in this analysis include:

- Modified liner design in the management and control ponds with Base Case.
- Active/Passive flocculation in sediment ponds with Base Case.
- In-situ Active gravel bed reactors in management ponds with Base Case.

- Active tank-based treatment with Base Case for end-of-pipe effluent (post Tenas Control Pond).

Water quality model results were produced for surface water discharge from Tenas Control Pond, as well as groundwater seepage (groundwater discharge) from the three management ponds (North, East and West) and from Tenas Control Pond. Water quality result for the Receiving Environment were examined for Tenas Creek, Four Creek and Goathorn Creek as these are the closest creeks downstream of the Project and most likely to see an effect from the site discharge.

Model results for the updated EAC Project Case (2024) indicated that no water quality guidelines are exceeded in the receiving environment downstream of the Project, except for dissolved copper in Goathorn Creek, which has naturally elevated background concentrations (that exceed the guideline). In the modelled effluent from the site (surface and groundwater), eleven parameters of concerns (POC) were identified in the different discharges (surface and groundwater) based on the current definition by BC ENV (2024) of 80% of the BC water quality guidelines for freshwater. The assessment of mitigation controls was focused on these POCs.

When compared to the Updated EAC Project case (2024), several mitigation controls affect streamflow (water quantity) in creeks downstream, particularly in Four Creek that naturally has low flows. Modelled reductions in flows in Four Creek were over 12.5% for the Updated EAC Project case as well as for the mitigation controls that included modified liner designs in the management and control ponds as well as the one including the improvement of water cover in management ponds. These mitigation controls lowered the streamflow up to an additional 20% during open water season over the Updated EAC Project Case (2024).

Modelled changes to water quality of effluent and downstream receiving waters, as compared to the Updated EAC Project Case (2024) are summarized in Table 1 below.

Based on the modelled results for the BMP measures, SRK recommends adopting blasthole liners as a mitigation control for the Project as it the only BMP mitigation control that significantly improves the water quality in the surface water discharges and groundwater seepages. Recommendations for BAT measures can be found in the BAT assessment report found in Appendix H.

Table 0-1: Impact of mitigation controls on water quality in effluent and in Receiving Environment

Mitigation Control ID	Positive	Negative	Recommended for Adoption?
Best Management Practices			
MC1: Improve Water Cover	- Reduces most POCs concentrations by a few percent in surface discharge in Tenas Control and North Management Ponds, as well as in groundwater seepage. - Reduces POCs in streams as well to varying degrees in Tenas and Four Creeks with no significant improvements in Goathorn Creek.	- Does not improve concentrations in NMP as it is not targeted.	No
MC4: Increase of process water to CPP	- No notable improvements of discharge water or water quality in the streams.	- none	No
MC5: Blasthole liners	- Reduces nitrogen concentrations in the discharge and the environment between 30 to 40%.	- none	Yes
Best Achievable Technologies (Candidates)			
MC2: Modified Liners in Management and Control Ponds (Option 1)	- Reduces POCs concentrations in Tenas and Four Creeks.	- Worsens TCP surface discharge for a few POCs. - Worsens POCs concentrations in groundwater seepage from TCP and WMP.	See BAT Assessment Report in Appendix H.
MC3: Modified Liners in Management and Control Ponds (Option 2)	- Greatest improvement for a single mitigation control in reducing concentrations of most POCs in Four Creek. - Reduction of POCs concentrations in Tenas Creek (less than in Four Creek).	- Worsens TCP surface discharge for a few POCs (more than MC2). - Worsens POCs concentrations in groundwater seepage from TCP and WMP (more than MC2).	
MC6: Active/Passive Flocculation in TCP	- Reduces total metals concentrations in the surface discharge of TCP (Operations) and Closure)	- No effect on seepage water quality	
MC7: In-situ Active GBR in MPs	- Greatest reduction in selenium, nitrite, and nitrate concentrations in Tenas Creek. - Some improvements in Four Creek water quality for selenium, nitrate, and nitrite. - Reduce maximum concentration of nitrate, selenium, and nitrite at groundwater discharge from both West Management and Tenas Control Ponds.	- none	
MC8: Active treatment post TCP	- Greatest improvement in surface discharge concentration of identified POCs, including nitrate, nitrite, total selenium, dissolved nickel. - Improvement in Goathorn Creek is like MC7 for nitrite, nitrate, and selenium, but targets other POCs as well such as total molybdenum.	- Slightly worsens POCs concentrations in the groundwater seepage for EMP and TCP.	

1 Introduction

1.1 Scope of Work

The Tenas Project (the Project) is a proposed open pit metallurgical coal mine located near Telkwa, British Columbia. In 2022, Telkwa Mining Limited (TML) applied for an Environmental Assessment Certificate (EAC) for the Project, which is currently under review. Throughout the Project definition and design, TML has focused on incorporating features and measures that would mitigate potential effects on water quality within or downstream of the Project Area.

Optimization and review of water quality mitigation controls has continued as part of the EAC application Information Request response process. The potential efficacy of suggested mitigation controls is evaluated using the Water and Load Balance Model developed for the Project (SRK 2022). The purpose of this report is to describe potential water quality mitigation controls and to estimate the performance of such measures in terms of improvements (or changes) to effluent water quantity and quality as well as changes to water quality and streamflow in creeks and rivers downstream of the Project.

1.2 Water and Load Balance Model Updates

SRK Consulting (Canada) Inc. (SRK) prepared the Water and Load Balance Model for the Tenas Project in support of the Environmental Assessment (EA) Application for Telkwa Mining Limited (TML) in 2022, which was based on site data collected up to 2020. Since 2020, the water and load balance has been revised in response to Information Requests from reviewers of the EAC Application and has been updated with new site data collected since 2020.

The following model updates have been completed since the original model report was issued in 2022:

- Updated source terms for the model as described in Appendices A and B, based on barrel data collected since 2019 (Appendix A) and new geochemical modelling based on reduced oxidation and water infiltration in the backfill of the open pit (Appendix B).
- Updated background parameter concentrations to seasonal source terms, overburden source term based on the barrel data, also updated with additional available water quality data collected until 2022.
- Updated synthetic climate time series for the Project Site and updated mean average precipitation for the Project.
- Updated the rainfall-runoff models for each catchment based on additional available flow data (up to 2023), updated water course baseflows, and with new synthetic climate timeseries.
- Updated the climate rate of change based on newly available climate models from 2024 (see Appendix C) as well as new evaporation rates.

Other changes include:

- Updated the method for estimating loadings that report to the receiving environment along groundwater flow paths based on updated groundwater modelling results (Appendix D). The estimates now include an appropriate proportionality between groundwater that originates from the Project and background groundwater/non-effected groundwater.
- Incorporation of progressive reclamation of the embankments, buttresses, and non-potentially acid generating (Non-PAG) backfill in the open pit,
- The decommissioning of Tenas Control Pond occurring in 2048 instead of 2044 as provided in the EAC Project Case (August 2022).
- Various minor changes to operation assumptions, e.g. including an assumed PAG rock water cover that fluctuates between 0.5 to 0.7m while PAG material is being placed in management ponds and/or confirmation of mine plan which affects rock placement on site.

Model results for the Updated EAC Project Case (2024) indicates that the mitigation controls included in the Project description would be protective of the downstream receiving environment and that discharges from the Project would not cause BC water quality guidelines (WQGs) to be exceeded in the creeks and rivers downstream of the Project. The only exceedance modelled in the downstream environment studied within the scope of this report is dissolved copper in Goathorn Creek (prediction node WQSEA1), but this exceedance is caused by background loadings (not by loadings from the Project).

1.3 Potential Additional Water Quality Mitigation Controls

Even though the Tenas Project is not modelled to cause WQG exceedances in the receiving environment, TML has identified additional potential mitigation controls that could further reduce loadings to the receiving environment as summarized by Table 1-1. Mitigation controls listed in Table 1-1 were evaluated using the water and load balance model and the results of the evaluation are presented in Section 3.

Table 1-1: Potential Additional Mitigation Controls

ID	Description	Candidate BAT or BMP
MC1	Improve the robustness of the water covers in the management ponds and reduce loadings from waste rock by increasing the site water inventory during freshet	BMP
MC2	Increase MP liner thickness and reduce seepage to streams (case 7)	BAT
MC3	Increase MP liner thickness and reduce seepage to streams (case 13)	BAT
MC4	Increase of process water intake to CPP plant	BMP
MC5	Addition of blasthole liners	BMP
MC6	Active/Passive flocculation in TCP	BAT
MC7	In-situ GBR Active in MPs	BAT

ID	Description	Candidate BAT or BMP
MC8	Active treatment post TCP	BAT

1.4 BMPs versus BATs

The mitigation controls in Table 1-1 can generally be categorized either as source control measures/best management practices (BMPs) or as potential best achievable technologies (BATs). This distinction is relevant because BC ENV[1] has issued guidance that requires the feasibility and performance of candidate BATs to be evaluated according to the BAT assessment methodology issued in November 2024 (BC ENV 2024), while BMPs must be evaluated separately and prior to a BAT assessment. The distinction between BMPs and BATs are not always well-defined. Table 1-1 indicates which of the two categories each of the mitigation controls belong to according to SRK's interpretation. In general, operational practices that are carried out on a day-to-day basis were considered BMPs, while mitigation controls that require construction of major infrastructure and implementation of water treatment equipment were candidate BATs.

The candidate BATs listed above were evaluated in a BAT assessment, which is included in Appendix H. The BAT assessment was completed in response to Information Requests (IR) 175, 176, 353, 355, and 514 provided by the EAO in their Water IR letter in November of 2022 (SRK 2025). Some of the results of the water and load balance model performance assessment described in this report were used to inform the scoring and ranking of candidate BATs.

As discussed above, BC ENV's BAT assessment guidance stipulates that BMPs should be excluded from consideration in a BAT assessment. However, no guidance on a stand-alone assessment of BMPs is available. Therefore, in the interest of excluding the BMPs from the BAT assessment, the merits of implementing the three BMPs identified were evaluated in this report (Section 4) while the suitability and feasibility of the candidate BATs were evaluated in the BAT assessment report.

[1] January 30th 2025 from BC ENV with review comments on a BAT Assessment summary presentation

2 Candidate Mitigation Controls

Details on candidate source controls, BMPs or BAT mitigation controls are summarized in the following sections.

2.1 Mitigation Control 1: Improve Robustness of the Water Covers of the Management Ponds by adding Freshet Inflows from Channel C02

The concept behind this mitigation control is to reduce potential loadings from rock stored in the management ponds by routing additional water to the management ponds during freshet to improve the robustness of their water covers. A reduction in loadings and an increase in the water inventory would improve the water quality in the management ponds during the Operation phase. This would be achieved by routing water collected in the Potable Water Storage Pond, located upstream of the East Management Pond, into Tenas Control Pond, East Management Pond, and West Management Pond successively during the freshet months of April and May. This additional water would reduce parameter concentrations in the management ponds but would result in more surface water being discharged throughout the remainder of the year.

The Potable Water Storage Pond will collect non-contact water captured in the C02 diversion channel (Figure 2-1). A portion of this water will be pumped to the Potable Water Treatment Plant, while most of the water would discharge via a channel to Four Creek. Before mining, this catchment area reports to Four Creek further downstream than where it will discharge from the Potable Water Storage Pond due to the Project. The discharge channel from the Potable Water Storage Pond into Four Creek is modelled to increase streamflow in the sections of Four Creek upstream of where this catchment naturally discharges. The Potable Water Storage Pond includes an emergency spillway into East Management Pond, which reduces the amount of runoff reporting to Four Creek during storm events equal to or greater than the 1 in 10-year return period event, to minimize the magnitude of high flows to limit potential erosion in Four Creek (SRK 2021).

This mitigation control uses a gate structure in the emergency spillway and in the discharge channel to Four Creek to enable the full flow from the Potable Water Storage Pond to be discharged directly to the East Management Pond. The model assumes this discharge to the East Management Pond would occur each year in April and May, and the remainder of the year water would report to Four Creek. Once the East Management Pond is covered for reclamation, this water would report to the West Management Pond via either a pipeline or a channel across the covered surface. Before East Management Pond gets built, the model assumes that the discharge goes from the gate structure goes to Tenas Control Pond via a pipeline or channel.

Both the East and West Management Ponds will operate with a target maximum and minimum water cover depth over the PAG rock layer during the active PAG rock deposition period. The minimum cover depth of 0.5 m is required to reduce the risk of oxidation of PAG material. The maximum water cover depth triggers a pumping system to limit the storage volume of water in the pond and thereby reduces the risk of erosion on the dam (maximum of 0.7m). The pumping system discharges water to the Tenas

Control Pond, which then discharges to Goathorn Creek. This mitigation control assumes that no pumping from the active management pond would occur during April and May, allowing the water cover depth to temporarily increase beyond 0.7m but remaining below the elevation of the emergency spillway and for pond water to mix with the non-contact water inflows from the Potable Water Storage Pond. The model assumes that pumping is reactivated in June, and the water cover depth is returned to its target level through the remainder of the open-water season.

Figure 2-1 shows the C02 channel and the discharge direction under Mitigation Control 1.

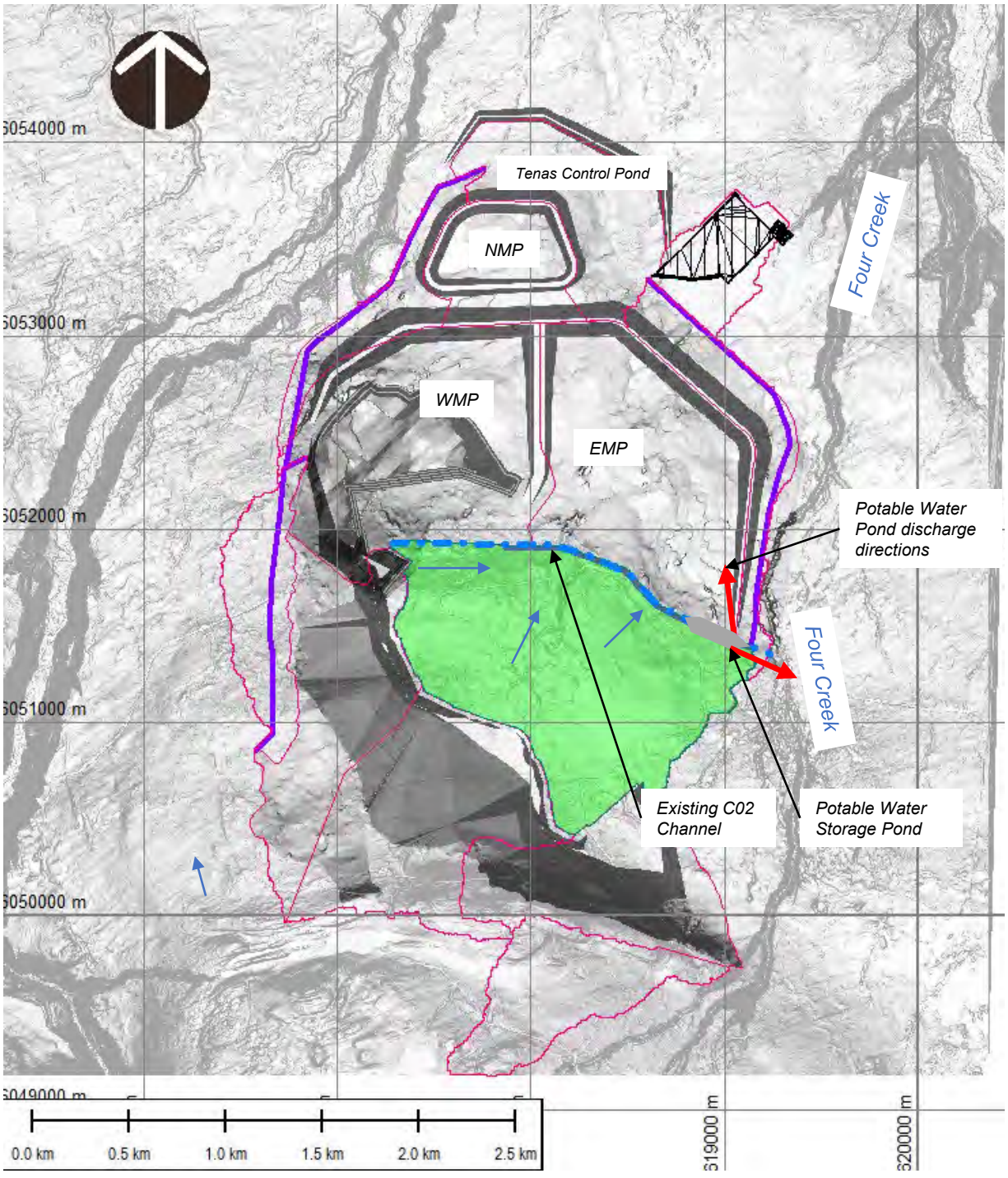


Figure 2-1: Mitigation Control 1 With Adjusted Discharge from Channel C02

2.2 Mitigation Controls 2, and 3: Modify Liner Design of the Management and Control Ponds

This control considers two liner modification options. Both options involve construction of a liner system in the management ponds and the Tenas Control Pond with a modified design that would improve on the performance assumed for the Updated EAC Project Case (2024). The liner systems considered include:

Updated EAC Project Case (2024):

- Soil-bentonite liner (0.3m) for EMP, NMP, and WMP (excluding WMP End Wall rock);
- Bituminous geomembrane liner for the Tenas Control Pond.

Mitigation Control 2:

- Soil-bentonite liner (0.56m) for EMP, NMP, and WMP (excluding WMP End Wall rock);
- Bituminous geomembrane liner on top of soil-bentonite liner (0.15m) for the Tenas Control Pond.

Mitigation Control 3:

- Bituminous geomembrane liner on top of soil-bentonite liner (0.3m) for EMP;
- Soil-bentonite liner (0.56m) for NMP, and WMP (excluding WMP End Wall rock);
- Bituminous geomembrane liner on top of soil-bentonite liner (0.15m) for the Tenas Control Pond

Mitigation Control 2 includes a thicker bentonite amended liner, covering the management pond bottoms, and upstream dam slopes in the EMP, NMP, WMP, as well as the in-pit overburden portion of the WMP. Liner thicknesses are assumed to be 560 mm in management ponds compared to 300 mm in the EAC Project Case (August 2022). The Tenas Control Pond contains an added soil-bentonite liner of 150mm thickness compared to none in the EAC Project Case (August 2022).

Mitigation Control 3 is the same as Mitigation Control 2 for NMP, WMP, and TCP. The only change is an additional bituminous geomembrane liner on top of the soil-bentonite liner with a reduced thickness of 300mm for the East Management Pond.

Liner seepage modeling and the site groundwater model were used to estimate the seepage losses from the facilities and the associated flow rates and loading in the receiving environment. Table 2-1 presents the revised groundwater inflows and outflows from lined facilities with the modified liners in Mitigation Controls 2 and 3, with the default values incorporated in the Updated EAC Project Case (2024) (as the base case) in brackets for comparison.

It is debatable whether a composite liner is a technology or if construction of such a liner is a BMP. Either way, Mitigation Controls 2 and 3 were included for consideration in the BAT assessment.

Table 2-1: Revised Groundwater Inflows and Outflows [m^3/day] from Project Facilities with Modified Liners in Mitigation Controls 2 and 3

Phase	WMP Case 2/Case 3 (base case)	NMP Case 2/Case 3 (base case)	EMP Case 2/Case 3 (base case)	Tenas Control Pond Case 2/Case 3 (base case)
Groundwater inflow to Facilities				
EoY1	0/0 (0)	0/0 (0)	0/0 (0)	0/0 (0)
EoY7	0/0 (0)	0/0 (0)	0/0 (0)	0/0 (0)
End of Mining	0/560 (139)	0/0 (0)	0/0 (0)	0/0 (0)
Post-Closure	129/119 (137)	0/0 (0)	0/0 (0)	0/0 (0)
Seepage outflow to Environment				
EoY1	0/0 (0)	0/0 (0)	0/0 (0)	8/8 (140)
EoY7	0/0 (0)	87/87 (0)	277/63 (458)	8/8 (140)
End of Mining	373/373 (836)	87/87 (0)	277/63 (458)	8/8 (140)
Post-Closure	692/709 (819)	87/87 (0)	277/63 (458)	0 (0)

Source: Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Inputs\Groundwater\Telkwa_Summary_2022_GW_model_results_20211103_sab.xlsx

The modified liners would reduce the seepage rate from the management and control ponds to the receiving environment, which reduces streamflow and concentrations of parameters influenced by the Project.

2.3 Mitigation Control 4: Increase of Process Water to CPP plant

The current EAC application has the CPP producing a dry (25% moisture) processed rock stream comprised of course and fine material that is then hauled and placed into the management ponds. The primary reason for this was to limit water use by the CPP. However, as the Project discharges water every year when in the Operation phase even during drought conditions there is an opportunity to go to a conventional wet slurry system for the fine processed rock stream. This will double the amount of water required by the CPP (360,000 m^3/year vs 180,000 m^3/year) with the benefit of permanently tying up this water into the coarse and fine processed rock products within the management ponds. Water is taken out of the Pit Sump, and out of Tenas Control Pond if there is not enough water in the Pit Sump for process make up water which would improve water quality discharged by the Project. The process water intake acts as a sink of water and load in the model and is modelled to reduce load overall for the Project.

2.4 Mitigation Control 5: Incorporation of Blasthole Liners

Blasting residuals (undetonated ammonium nitrate fuel oil (ANFO) explosives) is one of the two sources of nitrogen (nitrate, nitrite, and ammonium) in water on site and is accounted for in the source terms where rock is placed in different facilities (backfill pit, management ponds, dams, and buttresses). Exchangeable ammonia present in sedimentary rocks is another potential source of nitrogen for this Project.

Loadings of residual nitrogen species that leach from the rock can be decreased if blasthole liners are used as holes are loaded with explosives as they reduce the potential for dissolution of ANFO prior to blasting. In this mitigation control, the model assumes a total ANFO loss of 1.25% instead of 2% which is based on 75% effectiveness of the blasthole liners and that 50% of available nitrogen comes from blasting while the remaining 50% being sourced from exchangeable ammonia present in sedimentary rocks.

2.5 Mitigation Control 6: Active/Passive Flocculation in Tenas Control Pond

Sediment/Control ponds for the Project were designed based on the monthly mean maximum level of Total Suspended Solids (TSS) release of 35 mg/L to remain below the proposed federal Coal Mine Effluent Regulations for TSS. This mitigation control is modelled to reduce total parameter concentrations but will not affect dissolved parameter concentrations. This is one of the available additional mitigation controls reviewed during the BAT analysis (Appendix H).

In Mitigation Control 6, the model assumes that we are adding flocculants to the sediment pond (Tenas Control Pond), therefore allowing us to recalculate the total parameter concentrations based on a new threshold, which was estimated to be 5 mg/L on average.

2.6 Mitigation Control 7: In-situ Active Gravel-bed reactors in the management ponds

Mitigation Control 7 assumes that In-situ Active gravel-bed reactors (GBR) is an active water treatment measure that could be implemented within the management ponds to remove nitrate, nitrite, selenium and some metals. This is one of the mitigation controls considered in the BAT assessment (Appendix H).

A GBR is usually defined as an engineered semi-passive treatment system that contains a fixed-film bioreactor containing a uniform media such as gravel. These reactors usually use a simple organic substrate such as manure, hay, or straw to increase and sustain microbial growth and promote the reduction of parameters such as nitrate, and selenium. However, the GBRs envisioned for the Tenas Project would be actively operated by dosing degradable organic carbon such as methanol to improve the control of reducing conditions within the GBR. As such, the GBRs are considered an active water treatment technology.

PAG and Non-PAG rock is modelled to be the primary source of selenium, nitrogen species (nitrate, nitrite, and ammonia), and metals such as nickel. Non-PAG rock will be used for construction of management pond dams and buttresses as well as the Tenas Control Pond dam, while the remainder of Non-PAG rock is backfilled into the south end the open pit. PAG rock is contained in the management ponds, kept fully submerged after it is placed, and is only a source of selenium and nitrogen species with the initial flush of this rock while it is being submerged.

In the early Operation phase, the seepage from management pond and Tenas Control Pond dams and associated buttresses are the dominant sources of selenium, nitrite, sulphate, and nitrate loading in Project water. Once backfilling of the open pit begins, the open pit dewatering stream becomes additional source of selenium, nitrite, sulphate, and nitrate. Therefore, in addition to water contained in the management ponds, sources of mine water to be treated for the Project include:

- Seepage from the dams and buttresses surrounding Tenas Control Pond and the management ponds.
- Drainage from the open pit backfill reporting to the Pit sump, and
- Water reporting to the CPP Sedimentation Pond.

These water sources will be first be routed to the CPP Sedimentation Pond and then pumped to the active management pond for treatment. Loadings from the rock placed in the management ponds (primarily PAG with some non-PAG rock) as well as any water reporting through runoffs to the ponds, will be treated in-situ as well.

During freshet, it is assumed that runoff from the surrounding catchments bypasses treatment due to the short residence time in the system. Outside of freshet, any water pumped out of the In-situ Active GBR treatment system is assumed to be treated. Similarly, most of the water contained in the management ponds would be maintained in a state of mild reducing conditions, which will attenuate selenium, nitrate, and some metals species. Therefore, seepage from the management ponds that reports to the groundwater system is assumed to have a composition like treated GBR effluent.

NMP becomes active shortly after the Construction Phase and stops treating once the EMP becomes active, after two years of PAG placement in EMP. WMP also becomes active once it has had two years of PAG placement and remains active indefinitely, while EMP becomes inactive once WMP comes online.

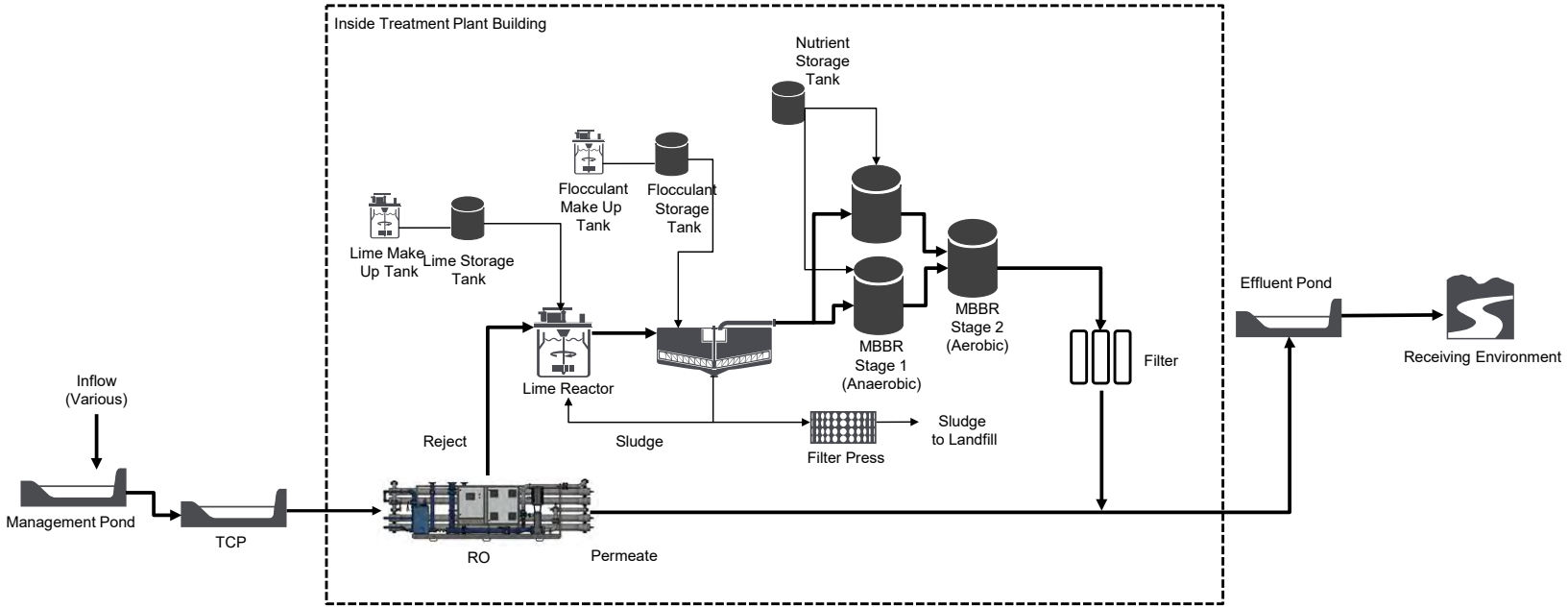
Constituents targeted by the active in-situ GBRs is assumed to be reduced to the following concentrations in the treated effluent:

- Nitrate: 1 mg/L
- Nitrite: 0.02 mg/L
- Selenium: 0.003 mg/L
- Other parameters that get removed but not specifically targeted: Aluminum (0.1 mg/L), Nickel (0.01 mg/L), and Iron (0.3 mg/L).

2.7 Mitigation Control 8: Active Tank-Based Treatment of Tenas Control Pond Effluent

Mitigation Control 8 assumes that an active water treatment plant will treat water surplus from Tenas Control Pond, before it is discharged to the receiving environment. Similarly to Mitigation Control 7, active treatment options were reviewed in the BAT assessment (Appendix H). The active treatment processes are assumed to operate indefinitely. To treat the Parameters of Concern based on the assumption that the treatment chain is as follows and as shown in Figure 2-2:

1. Reverse Osmosis (RO)
2. Moving Bed Biofilm Reactor (MBBR)
3. Lime High-Density Sludge plant.



Source:
https://srk.sharepoint.com/sites/NACAPR002055/Deliverables/Board%20Meeting%20Presentation%20Oct%202024/20241216%20Tenas%20BAT%20Assessment%20CAPR002055%20SRJ_CCM.pptx?web=1

Figure 2-2: Example of Flowsheet for Active Water Treatment with RO, Anaerobic Bioreactor, and Lime Treatment

Based on this conceptual active water treatment design chain, the water treatment plant would achieve the following treated effluent concentrations:

- Nitrate: 0.5mg/L
- Nitrite: 0.01mg/L
- Sulfate: 200mg/L
- Selenium: 0.001mg/L
- Aluminum: 0.05mg/L
- Cobalt: 0.003mg/L
- Copper: 0.0001mg/L
- Iron: 0.05mg/L
- Nickel: 0.005mg/L

The treatment rate is assumed to match the current surface discharge in the Updated EAC Project Case (2024) [10,000 to 12,000 m^3/d], which will be discharged to Goathorn Creek upstream of monitoring station WQSEA1 between May and October. The treatment rate was selected to ensure that there is no overflow from TCP during the Project's Operation and Post-Closure Phases to prevent the release of untreated effluent to the receiving environment.

2.8 Summary of Mitigation Control Scenarios

Mitigation Controls 1 through 8 described above were evaluated using the water and load balance model developed for the Project and compared against the Updated EAC Project Case (2024) to evaluate effects of the mitigation controls on downstream water quality and flow. The model was run using average hydrological conditions as well as with typical modelled source terms. The scenarios modelled are summarized by Table 2-2 along with comments on the modelled changes to streams and Project discharge.

Table 2-2: Summary of Mitigation Control Scenarios and Modelled Changes to Streams and Project Surface Water Discharge

ID	Description	Modelled Beneficial Changes	Modelled Adverse Changes
MC1	Improve the robustness of the water covers in the management ponds and reduce loadings from waste rock by increasing the site water inventory during freshet	- Improve winter month concentrations in Four and Tenas Creeks - Improves surface water discharge water quality	- Reduces streamflow in Four Creek during freshet
MC2	Modify MP and TCP liners and reduce seepage to streams	- Improves winter month concentrations in Four and Tenas Creeks	- Reduces winter baseflows in Tenas and Four Creeks - Increased surface water discharge flows and loads from TCP to Goathorn Creek
MC3	Modify MP and TCP liners and reduce seepage to streams	- Improves winter month concentrations in Four and Tenas Creeks	- Reduces winter baseflows in Tenas and Four Creeks - Increased surface water discharge flows and loads from TCP to Goathorn Creek
MC4	Increase of process water intake to CPP plant	- Reduced surface water discharged load to Goathorn Creek	- Reduces year-round streamflow in Goathorn Creek
MC5	Addition of blasthole liners	- Improved nitrogen (nitrate, nitrite, and ammonium) concentrations in groundwater seepage and surface water discharge pathways	- none
MC6	Active/Passive flocculation in TCP	- Lower total metal concentrations in surface water discharge to Goathorn Creek	- none
MC7	In-situ Active GBR in MPs	- Improves surface water discharge water quality for surface water and groundwater	- none
MC8	Active water treatment post TCP	- Improves surface water discharge water quality in Goathorn Creek	- none

3 Results

The following sections present the water and load balance results for each mitigation control along with the Updated EAC Project Case (2024) to evaluate the potential effects of each mitigation control on water quality and flow of effluent and the receiving environment. The results assume average hydrologic conditions and typical modelled geochemical source terms. Alternative assessment cases, such as low flows or high source terms will be presented in the updated Water and Load Model Report (SRK 2025).

WQGs that were used to evaluate water quality model results were selected based on the lowest value of BC Approved Water Quality Guidelines (BC ENV 2024a) or BC Working Water Quality Guidelines for freshwater aquatic life (BC ENV 2024b). For guidelines that depend on toxicity-modifying factors, medium background values from the baseline datasets within each creek were used.

A map of prediction nodes incorporated in the water and load balance model is presented in Figure 3-1. Details concerning the selection of prediction nodes are presented in SRK 2022 with the addition of WQSEA1 requested by regulatory agencies. Results for stream water quality are presented in Section 3.2 and Appendix E, following the description of the results for the Updated EAC Project Case (2024).

Streamflow results are also presented where a mitigation control would influence streamflow. Results consider the maximum monthly change in streamflow throughout the modelled period relative to baseline conditions (without effects of Project).

Discharge water quality results consider the end-of-pipe concentrations from the main site discharge point, which is the Tenas Control Pond (TCP) in operations and the North Management Pond (NMP) in Post-closure, as well as the groundwater seepage from the TCP and the three management ponds.

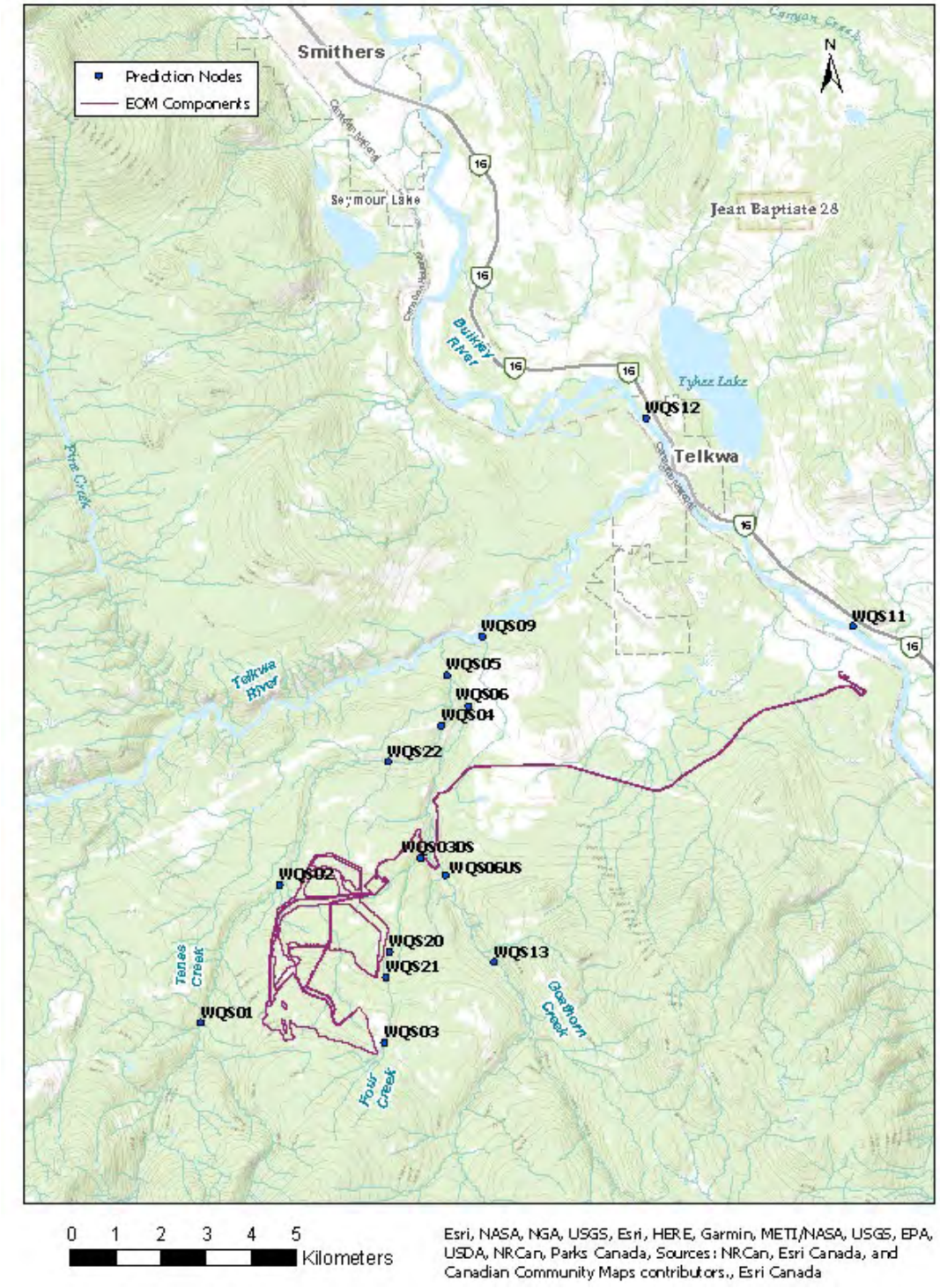


Figure 3-1: Map of Prediction Nodes in the Receiving Environment for the Tenas Project. Water and Load Balance Results are Produced for all Prediction Nodes that Have Water Quantity and Quality

3.1 Updated EAC Project Case (2024)

This section summarizes any modelled exceedances of WQGs in the environment for the Updated EAC Project Case (2024), as well as parameters of concern (POCs). POCs are identified as part of the BAT assessment process (Appendix H) and are the parameters that must be removed or reduced by candidate BATs. The Updated EAC Project Case (2024) is also referred to as the base case in this report.

3.1.1 Receiving Environment Results

The Updated EAC Project Case (2024) shows only one modelled WQG exceedance in the receiving environment in the three downstream creeks closest to the Project (Tenas, Four, and Goathorn Creeks) where the Project discharges directly either as surface water or groundwater. The modelled exceedance was for dissolved copper in Goathorn Creek with a maximum monthly average model result of 0.0021mg/L, which is greater than the calculated BC WQG of 0.0012mg/L for the Creek. However, background concentrations of dissolved copper are typically at similar levels that also exceed the WQG.

Tables summarizing modelled maximum monthly average parameter concentrations for each Creek is included in Appendix E.

3.1.2 Parameters of Concern (POC)

Table 3-1 summarizes POCs identified for the surface discharge (end-of-pipe) to the receiving environment or in pond seepage that reports to groundwater. POCs are defined as parameters in untreated effluent with concentrations greater than 80% of the BC WQGs (freshwater - aquatic life) or higher maximum monthly average model results. The maximum monthly average modelled results for the POCs can be found in Appendix E. Eleven POCs were identified based on the 80% of the BC WQG criteria and baseline conditions across the three Creeks (Goathorn, Tenas and Four Creek).

Table 3-1: Parameters of Concern in the Different Surface Water Discharges and Groundwater Seepages to the Receiving Environment

	Surface Water Discharges			Groundwater Seepages (Post-Closure)				Background / Baseline
Parameter	**TCP Discharge (Operation)**	**NMP Discharge (Post-Closure)**	**RLO discharge to ground – (Operation)**	**TCP Seepage**	**NMP Seepage**	**WMP Seepage**	**EMP Seepage**	**See Footnote**
Nitrogen Nutrients								
Nitrate	X			X		X		
Nitrite	X			X	X	X	X	
Sulphate								
Sulphate	X	X		X	X	X		
Metals								
Aluminum, total	X	X	X					X[A]
Cadmium, dissolved			X[D]					
Cobalt, total					X	X	X	
Copper, dissolved	X	X				X		X[B]
Iron, total	X	X	X					X[C]
Nickel, dissolved	X	X	X	X	X	X	X	
Zinc, dissolved	X			X	X	X		
Oxyanions								
Molybdenum, total	X			X				
Selenium, total	X	X		X	X	X	X	

Notes:
A - Background POC for Four, Goathorn, Tenas Creeks, Telkwa and Bulkley Rivers.
B - Background POC for Goathorn, Tenas Creeks, Telkwa and Bulkley Rivers.
C - Background POC for Four, Tenas Creeks, Telkwa and Bulkley Rivers.
D - Cd is POC for Rail Load Out only - it is therefore not considered in in this report

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20240925.xlsx]POC Condensed

3.2 Stream Water Quality

Since there are no modelled water quality exceedances in the receiving environment for the Updated EAC Project Case (2024) (except for dissolved copper in Goathorn Creek due to background concentrations), the relative change between the Updated EAC Project Case (2024) and the eight mitigation controls will be presented for the POCs identified in Section 3.1.2. These relative changes are presented for the Creeks affected the most by surface flow discharges or groundwater seepages due to their lower flows and proximity to the Project – Goathorn, Four, and Tenas Creeks. No notable effects on water quality are modelled downstream of the prediction nodes in these creeks and therefore will not be discussed further in this document (e.g., Telkwa, and Bulkley Rivers).

Results are summarized in Table 3-2 to Table 3-12 and figures showing modelled time series results for the three creeks are attached in Appendix F. The results are discussed in relation to the water quality guidelines in the respective streams and compared in terms of reduction in maximum monthly average modelled concentrations over the Updated EAC Project Case (2024).

General observations:

- As mentioned in Section 3.1.1, the only water quality exceedance is in Goathorn Creek for dissolved copper, and no mitigation control lowers the maximum monthly average modelled result for this POC.
- No additional exceedances are modelled in Goathorn, Four, or Tenas Creeks due to unintended effects of the mitigation controls considered.
- The mitigation controls with the most effect on groundwater seepages, and therefore Tenas and Four Creeks are Mitigation Controls 2 and 3 that include modified liners in the management ponds and the TCP, which reduce the seepage reaching Four and Tenas Creeks. The reduction in seepage and subsequent load decreases the concentrations of the POCs by 85% (Mitigation Control 3) of the concentration found in the Updated EAC Project Case (2024) for nitrate in Four Creek.
- The mitigation controls with the most effect on the surface water discharge are Mitigation Controls 7 and 8 (active treatment of Project water), which reduce the concentrations of most of the POCs in Goathorn Creek by 82% of the concentration found in Updated EAC Project Case (2024) for total selenium.
- Mitigation Control 1 (increase water inventory in management ponds) reduces concentrations of only some POCs (e.g. nitrate, sulphate, selenium total, nitrite, dissolved nickel) for Tenas and Four Creeks, but does not reduce the POC concentrations that are elevated in background waters such as total iron and dissolved copper since it is background water that is being added to the management ponds for this mitigation control.
- As expected, Mitigation Controls 5 and 6 reduces concentrations of nitrogen species or total metals, respectively.
- Mitigation Control 4 (increase of process water to CPP plant) had very minimal beneficial effect on POC concentrations and in some cases slightly worsened the conditions in the Creeks (Tenas and Four). This is because the seepage from the open pit backfill contains little load at the beginning of

mining (until 2029) and provides some dilution in the active management ponds, which in turn start to seep to the receiving environment. If less dilution is provided in the management ponds, the load seeping through the groundwater system to the receiving environment will therefore be higher, at the same seepage rate.

Table 3-2: Nitrite Stream Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.02 mg/l)			Tenas Creek (WQG = 0.02 mg/l)			Goathorn Creek (WQG = 0.02 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.015	0%	0.7	0.0090	0%	0.5	0.0058	0%	0.3
MC1	0.011	-28%	0.5	0.0079	-13%	0.4	0.0065	+11%	0.3
MC2	0.0084	-42%	0.4	0.0084	-6%	0.4	0.0068	+16%	0.3
MC3	0.0027	-81%	0.1	0.0080	-12%	0.4	0.0066	+14%	0.3
MC4	0.015	+4%	0.8	0.0091	+1%	0.5	0.0059	+0%	0.3
MC5	0.010	-35%	0.5	0.0060	-33%	0.3	0.0041	-30%	0.2
MC6	0.015	0%	0.7	0.0090	0%	0.5	0.0058	0%	0.3
MC7	0.010	-34%	0.5	0.0033	-63%	0.2	0.0036	-38%	0.2
MC8	0.015	+3%	0.8	0.0091	+0%	0.5	0.0037	-37%	0.2

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners in management and control ponds
4. MC3 = Modify liners in management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-3: Total Selenium Stream Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.002 mg/l)			Tenas Creek (WQG = 0.002 mg/l)			Goathorn Creek (WQG = 0.002 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.00081	0%	0.4	0.00078	0%	0.4	0.0015	0%	0.8
MC1	0.00063	-22%	0.3	0.00065	-18%	0.3	0.0015	-1%	0.8
MC2	0.00045	-44%	0.2	0.00072	-9%	0.4	0.0018	+16%	0.9
MC3	0.00013	-83%	0.1	0.00063	-19%	0.3	0.0017	+12%	0.8
MC4	0.00085	+5%	0.4	0.00082	+4%	0.4	0.0015	+0%	0.8
MC5	0.00081	0%	0.4	0.00078	0%	0.4	0.0015	0%	0.8
MC6	0.00081	0%	0.4	0.00078	0%	0.4	0.0015	-0%	0.8
MC7	0.00066	-19%	0.3	0.00033	-58%	0.2	0.00027	-82%	0.1
MC8	0.00085	+5%	0.4	0.00079	+1%	0.4	0.00034	-78%	0.2

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners in management and control ponds
4. MC3 = Modify liners in management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-4: Sulphate Stream Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 309 mg/l)			Tenas Creek (WQG = 218 mg/l)			Goathorn Creek (WQG = 218 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	33	0%	0.1	24	0%	0.1	62	0%	0.3
MC1	26	-19%	0.1	22	-5%	0.1	62	-1%	0.3
MC2	18	-43%	0.1	22	-9%	0.1	70	+14%	0.3
MC3	6	-82%	0.0	20	-15%	0.1	68	+10%	0.3
MC4	34	+3%	0.1	24	+1%	0.1	62	+0%	0.3
MC5	33	0%	0.1	24	0%	0.1	62	0%	0.3
MC6	33	0%	0.1	24	0%	0.1	62	0%	0.3
MC7	44	+36%	0.1	36	+53%	0.2	48	-22%	0.2
MC8	34	+3%	0.1	24	-0%	0.1	43	-30%	0.2

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners in management and control ponds
4. MC3 = Modify liners in management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-5: Total Aluminum Stream Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.69 mg/l)			Tenas Creek (WQG = 0.35 mg/l)			Goathorn Creek (WQG = 0.27 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.26	0%	0.4	0.11	0%	0.3	0.19	0%	0.7
MC1	0.25	-1%	0.4	0.11	0%	0.3	0.19	0%	0.7
MC2	0.26	+2%	0.4	0.11	+0%	0.3	0.20	+7%	0.7
MC3	0.27	+4%	0.4	0.11	+0%	0.3	0.20	+6%	0.7
MC4	0.26	0%	0.4	0.11	0%	0.3	0.19	0%	0.7
MC5	0.26	0%	0.4	0.11	0%	0.3	0.19	0%	0.7
MC6	0.26	0%	0.4	0.11	0%	0.3	0.13	-32%	0.5
MC7	0.26	0%	0.4	0.11	0%	0.3	0.19	-0%	0.7
MC8	0.26	+0%	0.4	0.11	0%	0.3	0.19	+1%	0.7

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-6: Nitrate Stream Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 3 mg/l)			Tenas Creek (WQG = 3 mg/l)			Goathorn Creek (WQG = 3 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.61	0%	0.2	0.37	0%	0.1	0.25	0%	0.1
MC1	0.43	-29%	0.1	0.32	-13%	0.1	0.27	+10%	0.1
MC2	0.34	-44%	0.1	0.35	-7%	0.1	0.29	+18%	0.1
MC3	0.09	-85%	0.0	0.33	-12%	0.1	0.29	+15%	0.1
MC4	0.63	+4%	0.2	0.38	+1%	0.1	0.25	+0%	0.1
MC5	0.38	-37%	0.1	0.24	-35%	0.1	0.17	-31%	0.1
MC6	0.61	0%	0.2	0.37	0%	0.1	0.25	0%	0.1
MC7	0.41	-33%	0.1	0.14	-64%	0.0	0.16	-37%	0.1
MC8	0.62	+3%	0.2	0.38	+0%	0.1	0.19	-22%	0.1

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-7: Dissolved Zinc Stream Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.014 mg/l)			Tenas Creek (WQG = 0.007 mg/l)			Goathorn Creek (WQG = 0.007 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.0026	0%	0.2	0.0019	0%	0.3	0.0021	0%	0.3
MC1	0.0026	-1%	0.2	0.0019	0%	0.3	0.0020	-3%	0.3
MC2	0.0027	+2%	0.2	0.0019	0%	0.3	0.0019	-6%	0.3
MC3	0.0027	+3%	0.2	0.0019	0%	0.3	0.0019	-6%	0.3
MC4	0.0026	+0%	0.2	0.0019	0%	0.3	0.0019	-6%	0.3
MC5	0.0026	0%	0.2	0.0019	0%	0.3	0.0021	0%	0.3
MC6	0.0026	0%	0.2	0.0019	0%	0.3	0.0021	0%	0.3
MC7	0.0028	+5%	0.2	0.0020	+5%	0.3	0.0019	-6%	0.3
MC8	0.0026	+0%	0.2	0.0019	0%	0.3	0.0022	+5%	0.3

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-8: Dissolved Copper Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.0047 mg/l)			Tenas Creek (WQG = 0.0026 mg/l)			Goathorn Creek (WQG = 0.0013 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.0024	0%	0.5	0.0015	0%	0.6	0.0021	0%	1.6
MC1	0.0024	+0%	0.5	0.0015	+0%	0.6	0.0021	0%	1.6
MC2	0.0024	+2%	0.5	0.0015	-1%	0.6	0.0021	0%	1.6
MC3	0.0025	+3%	0.5	0.0015	-1%	0.6	0.0021	0%	1.6
MC4	0.0024	0%	0.5	0.0015	0%	0.6	0.0021	0%	1.6
MC5	0.0024	0%	0.5	0.0015	0%	0.6	0.0021	0%	1.6
MC6	0.0024	0%	0.5	0.0015	0%	0.6	0.0021	0%	1.6
MC7	0.0024	0%	0.5	0.0016	+2%	0.6	0.0021	-0%	1.6
MC8	0.0024	0%	0.5	0.0015	+0%	0.6	0.0020	-2%	1.6

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. Cells highlighted in orange indicate an exceedance over the water quality guideline.

Table 3-9: Dissolved Nickel Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.005 mg/l)			Tenas Creek (WQG = 0.0025 mg/l)			Goathorn Creek (WQG = 0.0022 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.0011	0%	0.2	0.00068	0%	0.3	0.00065	0%	0.3
MC1	0.0010	-14%	0.2	0.00063	-8%	0.3	0.00065	-1%	0.3
MC2	0.0007	-34%	0.2	0.00065	-4%	0.3	0.00072	+10%	0.3
MC3	0.0006	-50%	0.1	0.00062	-9%	0.2	0.00070	+7%	0.3
MC4	0.0012	+2%	0.2	0.00069	+2%	0.3	0.00065	+0%	0.3
MC5	0.0011	0%	0.2	0.00068	0%	0.3	0.00065	0%	0.3
MC6	0.0011	0%	0.2	0.00068	0%	0.3	0.00065	0%	0.3
MC7	0.0013	+14%	0.3	0.00083	+22%	0.3	0.00054	-17%	0.2
MC8	0.0011	+2%	0.2	0.00068	+0%	0.3	0.00086	+33%	0.4

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-10: Total Molybdenum Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.034 mg/l)			Tenas Creek (WQG = 0.034 mg/l)			Goathorn Creek (WQG = 0.034 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.0012	0%	0.03	0.00084	0%	0.02	0.0022	0%	0.1
MC1	0.0010	-18%	0.03	0.00072	-14%	0.02	0.0021	-1%	0.1
MC2	0.0007	-38%	0.02	0.00079	-6%	0.02	0.0025	+14%	0.1
MC3	0.0004	-66%	0.01	0.00068	-19%	0.02	0.0024	+10%	0.1
MC4	0.0012	+6%	0.04	0.00089	+6%	0.03	0.0022	+0%	0.1
MC5	0.0012	0%	0.03	0.00084	0%	0.02	0.0022	0%	0.1
MC6	0.0012	0%	0.03	0.00084	0%	0.02	0.0022	-0%	0.1
MC7	0.0024	+102%	0.07	0.00197	+135%	0.06	0.0014	-37%	0.0
MC8	0.0012	+5%	0.04	0.00084	+1%	0.02	0.0019	-13%	0.1

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-11: Total Iron Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 1 mg/l)			Tenas Creek (WQG = 1 mg/l)			Goathorn Creek (WQG = 1 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.24	0%	0.2	0.068	0%	0.1	0.43	0%	0.4
MC1	0.24	-1%	0.2	0.068	-0%	0.1	0.43	0%	0.4
MC2	0.25	+2%	0.2	0.068	+0%	0.1	0.49	+13%	0.5
MC3	0.25	+4%	0.3	0.068	+0%	0.1	0.48	+12%	0.5
MC4	0.24	0%	0.2	0.068	+0%	0.1	0.43	0%	0.4
MC5	0.24	0%	0.2	0.068	0%	0.1	0.43	0%	0.4
MC6	0.24	0%	0.2	0.068	0%	0.1	0.13	-71%	0.1
MC7	0.24	0%	0.2	0.068	+0%	0.1	0.43	-0%	0.4
MC8	0.24	0%	0.2	0.068	0%	0.1	0.49	+13%	0.5

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

Table 3-12: Total Cobalt Stream Water Quality Results with Mitigation Controls

Case	Four Creek (WQG = 0.004 mg/l)			Tenas Creek (WQG = 0.004 mg/l)			Goathorn Creek (WQG = 0.004 mg/l)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	WQG Exceedance Multiplier
Base Case	0.00068	0%	0.2	0.00034	0%	0.1	0.00039	0%	0.1
MC1	0.00056	-17%	0.1	0.00031	-10%	0.1	0.00039	-0%	0.1
MC2	0.00041	-39%	0.1	0.00032	-6%	0.1	0.00044	+12%	0.1
MC3	0.00021	-70%	0.1	0.00030	-11%	0.1	0.00043	+10%	0.1
MC4	0.00069	+2%	0.2	0.00035	+3%	0.1	0.00040	+0%	0.1
MC5	0.00068	0%	0.2	0.00034	0%	0.1	0.00039	0%	0.1
MC6	0.00068	0%	0.2	0.00034	0%	0.1	0.00028	-28%	0.1
MC7	0.00075	+10%	0.2	0.00041	+19%	0.1	0.00033	-16%	0.1
MC8	0.00069	+2%	0.2	0.00034	+0%	0.1	0.00065	+63%	0.2

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify liners of the management and control ponds
4. MC3 = Modify liners of the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case

3.3 Streamflow

Mitigation Controls 1, 2, 3, 4, 7, and 8 have the potential to change the streamflow in the receiving environment.

- Mitigation Control 1 could reduce the natural runoff discharging into Four Creek, which would change streamflow at prediction nodes WQS21 (directly downstream of the C02 Channel discharge) through WQS03DS (the furthest downstream prediction node in Four Creek).
- Mitigation Control 2 and 3 could reduce flows discharging through the liners of the management ponds, which would change the baseflow rates into Four Creek at the downstream prediction node (WQS03DS) and Tenas Creek at the downstream prediction node (WQS04).
- Mitigation Control 4 could reduce the amount of surface discharge from the Project as more water is sent to the CPP plant overall in Goathorn Creek.
- Mitigation Control 7 changes the way the flows are routed within the Project, and therefore could affect timing and magnitude of surface discharge to Goathorn Creek.
- Mitigation Control 8 prevents any overflow from the TCP and therefore also changes timing and magnitude of surface discharge to Goathorn Creek, despite mimicking as closely as possible the discharge plan from the TCP in the Updated EAC Project Case (2024).

Change in streamflow is calculated based on the relative change between monthly average flow with the Project and its associated mitigation controls and the base case without the Project. The comparison presented below focuses on the maximum monthly reduction in streamflow for each month during the Operation phase of the Project. These effects are shown for three Creeks: Four, Tenas, and Goathorn Creek.

During the Decommissioning and Reclamation phase, the Channel C02 in Mitigation Control 1 would discharge to Four Creek year-round. For this reason, no change is modelled relative to the Updated EAC Project Case (2024) during the Post-closure period. The thicker liners in Mitigation Control 2 and 3 would result in a similar reduction to winter baseflows in Post-closure as in Operation phases in both streams.

Table 3-13 presents the maximum monthly reduction in streamflow at the upstream and downstream prediction nodes in Tenas Creek (WQS04, WQS02). Mitigation Controls 2 and 3 are the only cases modelled to influence flows in Tenas Creek.

Table 3-14 presents the maximum monthly reduction in streamflow results in Four Creek for the prediction node directly downstream of channel C02 (WQS21) and the furthest downstream prediction node (WQS03DS).

Table 3-15 presents the maximum monthly reduction in streamflow results in Goathorn Creek for the prediction node the most upstream in Goathorn Creek (WQS06US) and directly downstream of the surface discharge from the Project (WQSEA1).

Tenas Creek flows could be reduced up to 11.6% relative to baseline conditions during operations, which is about 4% more than under the Updated EAC Project Case (2024) (without additional mitigation controls). The effect is most prominent for the downstream prediction node WQS04.

Four Creek winter flows could be reduced by up to 37.8% in the Operation phase, which is about 3% more than under the Updated EAC Project Case (2024) for the upstream prediction node WQS21, and up to 40% for the downstream prediction node WQS03_DS in August, which is 20% more than under the Updated EAC Project Case (2024). Since Mitigation Control 1 only changes the C02 Channel discharge around freshet, only this period is affected in the Operation Phase, and shows minimal reduction in freshet streamflow. The change to the management pond liners results in minimal changes in streamflow during the open-water season (April through October) for the upstream prediction nodes but reflect significant changes in the downstream prediction nodes.

Goathorn Creek maximum monthly reduction shows very minimal changes for any mitigation control. The biggest reduction in flow compared to Updated EAC Project Case (2024) is for Mitigation Control 1 in March for the downstream prediction node WQSEA1. The flow is reduced by up to 10% in the Operation Phase, which is about 3% reduction compared to the Updated EAC Project Case (2024).

Table 3-13: Monthly Maximum Change (%) in Streamflow Relative to Baseline Conditions in Tenas Creek

	Stream	Upstream Tenas Creek (WQS02)							Downstream Tenas Creek (WQS04)						
Period	**Case**	Base Case	MC1	MC2	MC3	MC4	MC7	MC8	Base Case	MC1	MC2	MC3	MC4	MC7	MC8
Operations	January	-3.9	-3.9	-5.1	-5.2	-3.9	-3.9	-3.9	-5.5	-5.5	-8.8	-9.1	-5.5	-5.5	-5.5
	February	-3.9	-3.9	-5.1	-5.2	-3.9	-3.9	-3.9	-5.5	-5.5	-8.8	-9.1	-5.5	-5.5	-5.5
	March	-3.9	-3.9	-5.1	-5.2	-3.9	-3.9	-3.9	-8.3	-8.3	-11.3	-11.6	-8.3	-8.3	-8.3
	April	-1.6	-1.6	-1.9	-1.9	-1.6	-1.6	-1.6	-11.0	-11.0	-11.2	-11.2	-11.0	-11.0	-11.0
	May	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-1.5	-8.1	-8.1	-8.2	-8.2	-8.1	-8.1	-8.1
	June	-1.5	-1.5	-1.6	-1.6	-1.5	-1.5	-1.5	-6.8	-6.8	-6.8	-6.8	-6.8	-6.8	-6.8
	July	-1.7	-1.7	-1.9	-1.9	-1.7	-1.7	-1.7	-7.2	-7.2	-7.6	-7.7	-7.2	-7.2	-7.2
	August	-1.8	-1.8	-1.9	-2.0	-1.8	-1.8	-1.8	-7.8	-7.8	-8.3	-8.4	-7.8	-7.8	-7.8
	September	-2.0	-2.0	-2.3	-2.3	-2.0	-2.0	-2.0	-8.2	-8.2	-9.0	-9.1	-8.2	-8.2	-8.2
	October	-2.1	-2.1	-2.3	-2.3	-2.1	-2.1	-2.1	-8.4	-8.4	-9.0	-9.1	-8.4	-8.4	-8.4
	November	-4.0	-4.0	-5.1	-5.1	-4.0	-4.0	-4.0	-7.3	-7.3	-10.2	-10.5	-7.3	-7.3	-7.3
	December	-3.9	-3.9	-5.1	-5.2	-3.9	-3.9	-3.9	-5.5	-5.5	-8.8	-9.1	-5.5	-5.5	-5.5

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MonthlyChange_Mitigations_v40_20241209.xlsm

Notes
12. MC1 = Improve robustness of water cover in management ponds with freshet flows from channel CO2
13. MC2 and MC3 = modify liners in the management and control ponds
14. MC4 = Increase of process water to CPP
15. MC7 = In-situ Active GBR in management ponds
16. MC8 = Active water treatment of Tenas Control Surface Water Discharge
17. Base Case = Updated EAC Project Case (2024)
18. Red highlighted text indicates where streamflow reduction is greater than or equal to 12.5%

Table 3-14: Monthly Maximum Change (%) in Streamflow Relative to Baseline Conditions in Four Creek

	Stream	Upstream Four Creek (WQS21)							Downstream Four Creek (WQS03_DS)						
Period	**Case**	Base Case	MC1	MC2	MC3	MC4	MC7	MC8	Base Case	MC1	MC2	MC3	MC4	MC7	MC8
Operations	January	-33.6	-33.6	-36.4	-37.1	-33.6	-33.6	-33.6	-5.0	-5.0	-26.3	-36.4	-5.0	-5.0	-5.0
	February	-33.6	-33.6	-36.4	-37.2	-33.6	-33.6	-33.6	-5.0	-5.0	-26.4	-36.4	-5.0	-5.0	-5.0
	March	-13.3	-22.9	-15.1	-15.5	-13.3	-13.3	-13.3	-9.1	-15.3	-25.9	-32.4	-9.1	-9.1	-9.1
	April	0.0	-3.2	-0.1	-0.1	0.0	0.0	0.0	-24.7	-37.5	-25.0	-25.1	-24.7	-24.7	-24.7
	May	0.0	-3.5	-0.3	-0.3	0.0	0.0	0.0	-24.8	-37.5	-25.3	-25.5	-24.8	-24.8	-24.8
	June	-0.1	-8.4	-0.6	-0.6	-0.1	-0.1	-0.1	-24.9	-37.9	-29.2	-30.9	-24.9	-24.9	-24.9
	July	-0.2	-11.7	-1.1	-1.1	-0.2	-0.2	-0.2	-24.7	-38.2	-31.5	-34.1	-24.7	-24.7	-24.7
	August	-5.3	-25.0	-7.2	-7.7	-5.3	-5.3	-5.3	-19.7	-35.1	-33.8	-40.6	-19.7	-19.7	-19.7
	September	-3.2	-21.6	-4.8	-5.2	-3.2	-3.2	-3.2	-21.2	-38.0	-32.0	-37.7	-21.2	-21.2	-21.2
	October	-6.2	-23.0	-7.9	-8.3	-6.2	-6.2	-6.2	-15.8	-23.9	-32.0	-38.2	-15.8	-15.8	-15.8
	November	-32.5	-32.5	-35.5	-36.2	-32.5	-32.5	-32.5	-6.6	-9.3	-28.9	-37.7	-6.6	-6.6	-6.6
	December	-34.4	-34.4	-37.1	-37.8	-34.4	-34.4	-34.4	-5.0	-5.0	-26.7	-36.7	-5.0	-5.0	-5.0

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MonthlyChange_Mitigations_v40_20241209.xlsm

Notes
1. MC1 = Improve robustness of water cover in management ponds with freshet flows from channel CO2
2. MC2 and MC3 = modify liners in the management and control ponds
3. MC4 = Increase of process water to CPP
4. MC7 = In-situ Active GBR in management ponds
5. MC8 = Active water treatment of Tenas Control Surface Water Discharge
6. Base Case = Updated EAC Project Case (2024)
7. Red highlighted text indicates where streamflow reduction is greater than or equal to 12.5%

Table 3-15: Monthly Maximum Change (%) in Streamflow Relative to Baseline Conditions in Goathorn Creek

	Stream	Upstream Goathorn Creek (WQS06US)							Downstream Goathorn Creek (WQSEA1)						
Period	**Case**	Base Case	MC1	MC2	MC3	MC4	MC7	MC8	Base Case	MC1	MC2	MC3	MC4	MC7	MC8
Operations	January	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.5	-0.5	-2.0	-2.8	-0.5	-0.5	-0.5
	February	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.5	-0.5	-2.0	-2.8	-0.5	-0.5	-0.5
	March	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-7.6	-10.9	-9.1	-9.8	-7.6	-7.6	-7.6
	April	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.3	-10.2	-4.3	-4.4	-4.3	-4.3	-1.3
	May	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0
	June	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
	July	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	-0.1	0.0
	August	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	-0.4	-0.6	-0.7	-0.4	-0.3	-0.3
	September	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.6	-0.8	-1.2	-1.5	-0.6	-0.6	-0.4
	October	-0.1	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.5	-0.6	-1.0	-1.3	-0.5	-0.5	-0.1
	November	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.5	-0.5	-2.0	-2.8	-0.5	-0.5	-0.5
	December	-0.2	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.5	-0.5	-2.0	-2.8	-0.5	-0.5	-0.5

Source: CAPR002055/Internal/Water Balance Modelling/Results/12_03_24_Mitigations/Results_Streams_MonthlyChange_Mitigations_v40_20241209.xlsm

Notes
1. MC1 = Improve robustness of water cover in management ponds with freshet flows from channel CO2
2. MC2 and MC3 = modify liners in the management and control ponds
3. MC4 = Increase of process water to CPP
4. MC7 = In-situ Active GBR in management ponds
5. MC8 = Active water treatment of Tenas Control Surface Water Discharge
6. Base Case = Updated EAC Project Case (2024)
7. Red highlighted text indicates where streamflow reduction is greater than or equal to 12.5%

3.4 End of Pipe Surface Water Discharge and Groundwater Seepage Water Quality

The primary surface discharge location is from the Tenas Control Pond during the Operation phase, and the North Management Pond during the Post-closure phase (if the Tenas Control Pond is decommissioned). In Mitigation Control 8 (active treatment post-TCP) the Tenas Control Pond would not be decommissioned as it is required for the operation of an active water treatment plant and therefore remains the surface discharge location to Goathorn Creek in the Post-closure phase. As highlighted in section 3.2.1, other discharges from the Project occur through groundwater seepages from the main facilities (TCP and the management ponds), and the modelled results for parameter concentrations for groundwater seepages are also presented here.

Model water quality results from each facility were compiled under each mitigation control listed above and screened against the BC water quality guidelines (freshwater protection of aquatic life). The model does not predict TSS concentration, but the Tenas Control Pond is designed to provide sufficient retention time for particles to settle within the pond to meet the maximum discharge target of 35 mg/L.

The following sections present the results for total selenium, nitrate, and dissolved nickel. The modelled results for the other POCs can be found in Appendix G.

3.4.1 Selenium

Maximum average monthly total selenium concentration results for each mitigation control and the Updated EAC Project Case (2024) are presented in Table 3-16 for the surface discharge from the Tenas Control Pond (Operation phase final discharge point) and the North Management Pond (Post-closure phase final discharge point). These results are also shown for groundwater seepages for all facilities (TCP and management ponds) in Table 3-17 and Figure 3-3 during operations and in closure, respectively.

Modelled concentrations that are greater than 80% of the BC WQG of 0.002 mg/L are highlighted in orange which result in total selenium being a POC in the context of the BAT. Model results show that Tenas Control Pond selenium end of pipe concentrations could only be lowered to less than the BC WQG with implementation of Mitigation Control 8 (active treatment) during operations and closure. For other mitigation controls the model results indicate that selenium concentrations would remain higher than the BC WQG in the Tenas Control Pond's end of pipe flows(Table 3-16, Figure 3-2 and Figure 3-3).

No mitigation control achieves total selenium concentration in the groundwater discharge below the BC WQG of 0.002 mg/L during operations (Table 3-17). Mitigation Control 7 (GBR in management ponds) is assumed to lower total selenium by 75% from the Updated EAC Project Case (2024) but remains as high as 0.006 mg/L in the TCP seepage. This is mainly because it was estimated that a GBR could achieve to a treated concentration of 0.003 mg/L, which is higher than the BC WQG. During closure, Mitigation Control 7 does achieve total selenium concentrations lower than the BC WQG in the seepage of most facilities beside west management pond which continues to receive water containing selenium from the reclaimed backfill (Table 3-18 and Figure 3-4).

Table 3-16: Selenium End of Pipe Surface Water Discharge Quality Results with Mitigation Controls

Case	Tenas Control Pond (Operation Phase)			North Management Pond (Post-Closure Phase)		
	Max Monthly Average Concentration [mg/l]	Change from Base Case	Limit Exceedance Multiplier	Max Monthly average Concentration [mg/l]	Change from Base Case	Limit Exceedance Multiplier
Base Case	**0.024**	0%	11.9	**0.0082**	0%	4.1
MC1	**0.021**	-10%	10.7	**0.0082**	0%	4.1
MC2	**0.032**	+36%	16.2	**0.0077**	-6%	3.8
MC3	**0.030**	+28%	15.2	**0.0070**	-15%	3.5
MC4	**0.024**	+1%	12.0	**0.0082**	0%	4.1
MC5	**0.024**	0%	11.9	**0.0082**	0%	4.1
MC6	**0.024**	-0%	11.9	**0.0082**	-0%	4.1
MC7	**0.006**	-75%	3.0	**0.0022**	-73%	1.1
MC8	0.001	-96%	0.5	0.0010 (Base Case = 0.0085)	-88%	0.5

Source: CAPR002055/Internal/WaterBalanceModelling/Results/12_03_24_Mitigations/Results_MMPs_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold text** indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)
13. Green highlighted text show results for TCP discharge, not NMP, as mitigation control 8 assumes that TCP does not get decommissioned. In brackets is the modelled results for the Base Case in TCP during closure

Table 3-17: Total Selenium Concentration in Groundwater Seepages - Water Quality Results with Mitigation Controls (Operation Phase)

Case	Tenas Control Pond (Seepage)			North Management Pond (Seepage)			East Management Pond (Seepage)			West Management Pond (Seepage)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Max Monthly Concentration [mg/l]	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Reduction over Base Case	Limit Exceedance Multiplier	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	**0.024**	0%	11.9	**0.0069**	0%	3.4	**0.0051**	0%	2.6	**0.0082**	0%	4.1
MC1	**0.021**	-10%	10.7	**0.0069**	0%	3.4	**0.0049**	-5%	2.5	**0.0081**	-1%	4.0
MC2	**0.032**	+36%	16.2	**0.0064**	-8%	3.2	**0.0047**	-8%	2.4	**0.0101**	+24%	5.1
MC3	**0.030**	+28%	15.2	**0.0064**	-7%	3.2	**0.0045**	-12%	2.2	**0.0087**	+6%	4.3
MC4	**0.024**	+1%	12.0	**0.0069**	+0%	3.4	**0.0055**	+6%	2.7	**0.0082**	+0%	4.1
MC5	**0.024**	0%	11.9	**0.0069**	0%	3.4	**0.0051**	0%	2.6	**0.0082**	0%	4.1
MC6	**0.024**	0%	11.9	**0.0069**	0%	3.4	**0.0051**	0%	2.6	**0.0082**	0%	4.1
MC7	**0.006**	-75%	3.0	**0.0031**	-54%	1.6	**0.0038**	-26%	1.9	**0.0033**	-60%	1.6
MC8	**0.025**	+4%	12.3	**0.0069**	-0%	3.4	**0.0064**	+25%	3.2	**0.0082**	-0%	4.1

Source: CAPR002055/Internal/WaterBalanceModelling/Results/12_03_24_Mitigations/Results_MMPsSEEP_MitigationOptions_EAModel_V40_20241209.xlsm

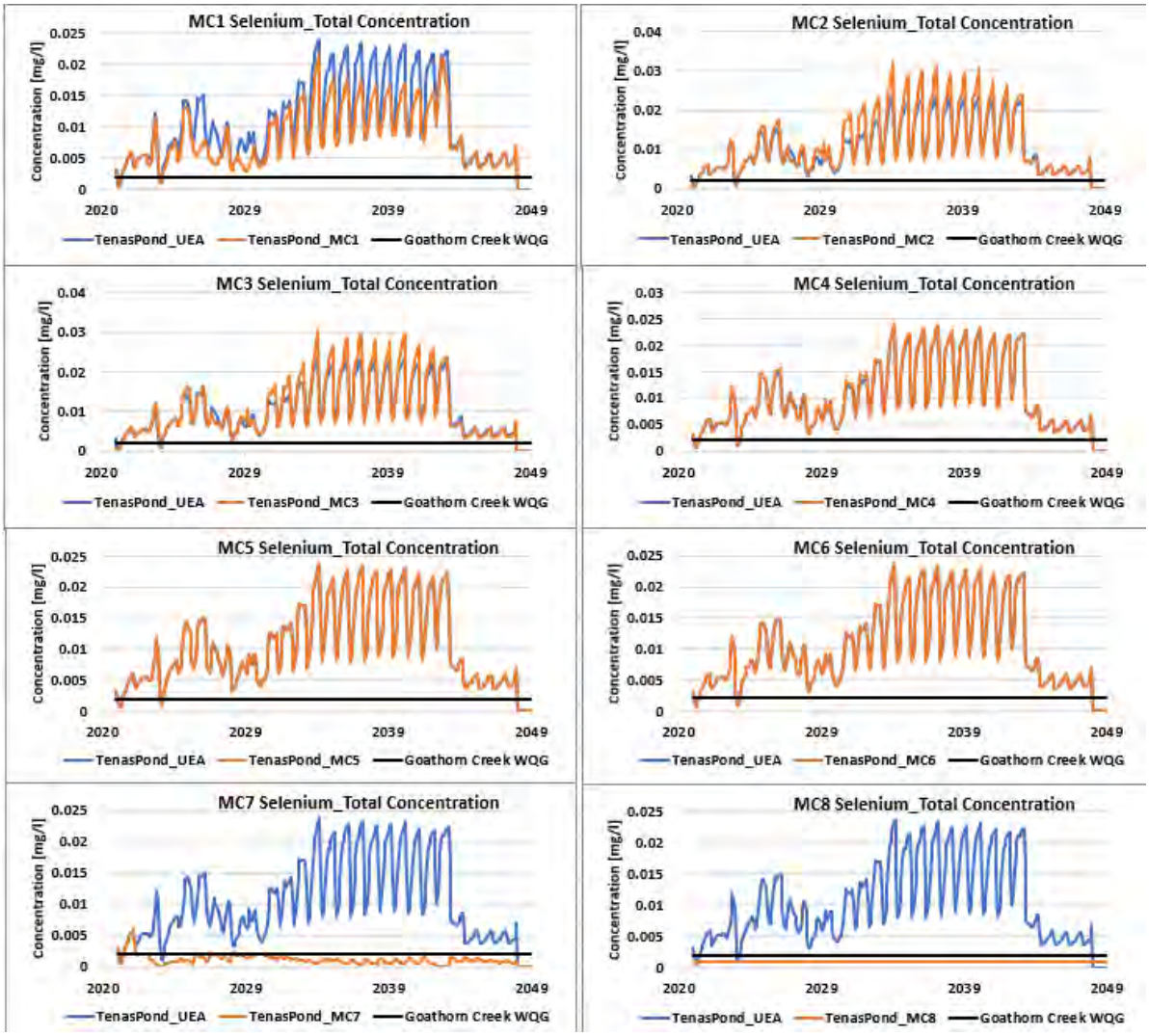
Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold text** indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)

Table 3-18: Total Selenium in Groundwater Seepages - Water Quality Results with Mitigation Controls (Post-Closure Phase)

Case	Tenas Control Pond (Seepage)			North Management Pond (Seepage)			East Management Pond (Seepage)			West Management Pond (Seepage)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Max Monthly Concentration [mg/l]	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Reduction over Base Case	Limit Exceedance Multiplier	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	**0.0085**	0%	4.3	**0.0059**	0%	2.9	**0.0020**	0%	1.0	**0.0082**	0%	4.1
MC1	**0.0084**	-1%	4.2	**0.0059**	0%	2.9	0.0015	-23%	0.8	**0.0081**	-1%	4.0
MC2	**0.0079**	-8%	3.9	**0.0053**	-9%	2.7	**0.0026**	+35%	1.3	**0.0097**	+19%	4.9
MC3	**0.0075**	-12%	3.8	**0.0050**	-15%	2.5	**0.0037**	+91%	1.9	**0.0085**	+4%	4.3
MC4	**0.0085**	-1%	4.2	**0.0059**	0%	2.9	**0.0021**	+5%	1.0	**0.0082**	+0%	4.1
MC5	**0.0085**	0%	4.3	**0.0059**	0%	2.9	**0.0020**	0%	1.0	**0.0082**	0%	4.1
MC6	**0.0085**	0%	4.3	**0.0059**	0%	2.9	**0.0020**	0%	1.0	**0.0082**	0%	4.1
MC7	0.0015	-83%	0.7	0.0010	-84%	0.5	0.0016	-17%	0.8	**0.0033**	-60%	1.6
MC8	**0.0088**	+3%	4.4	**0.0059**	-0%	2.9	**0.0021**	+5%	1.0	**0.0082**	-0%	4.1

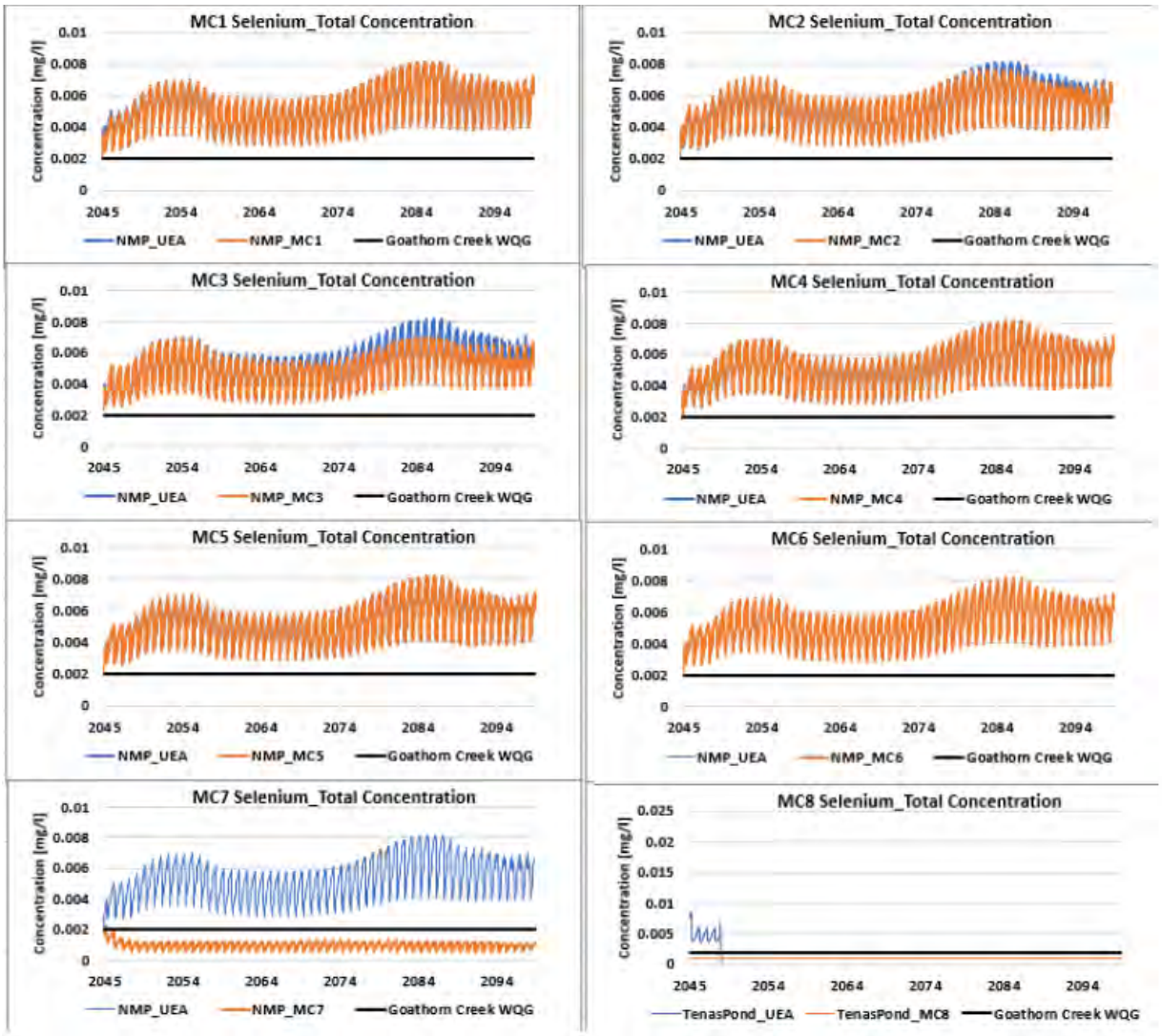
Source: CAPR002055/Internal/WaterBalanceModelling/Results/12_03_24_Mitigations/Results_MMPsSEEP_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in management and control ponds
4. MC3 = Modify the liners in management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold highlighted** text indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)



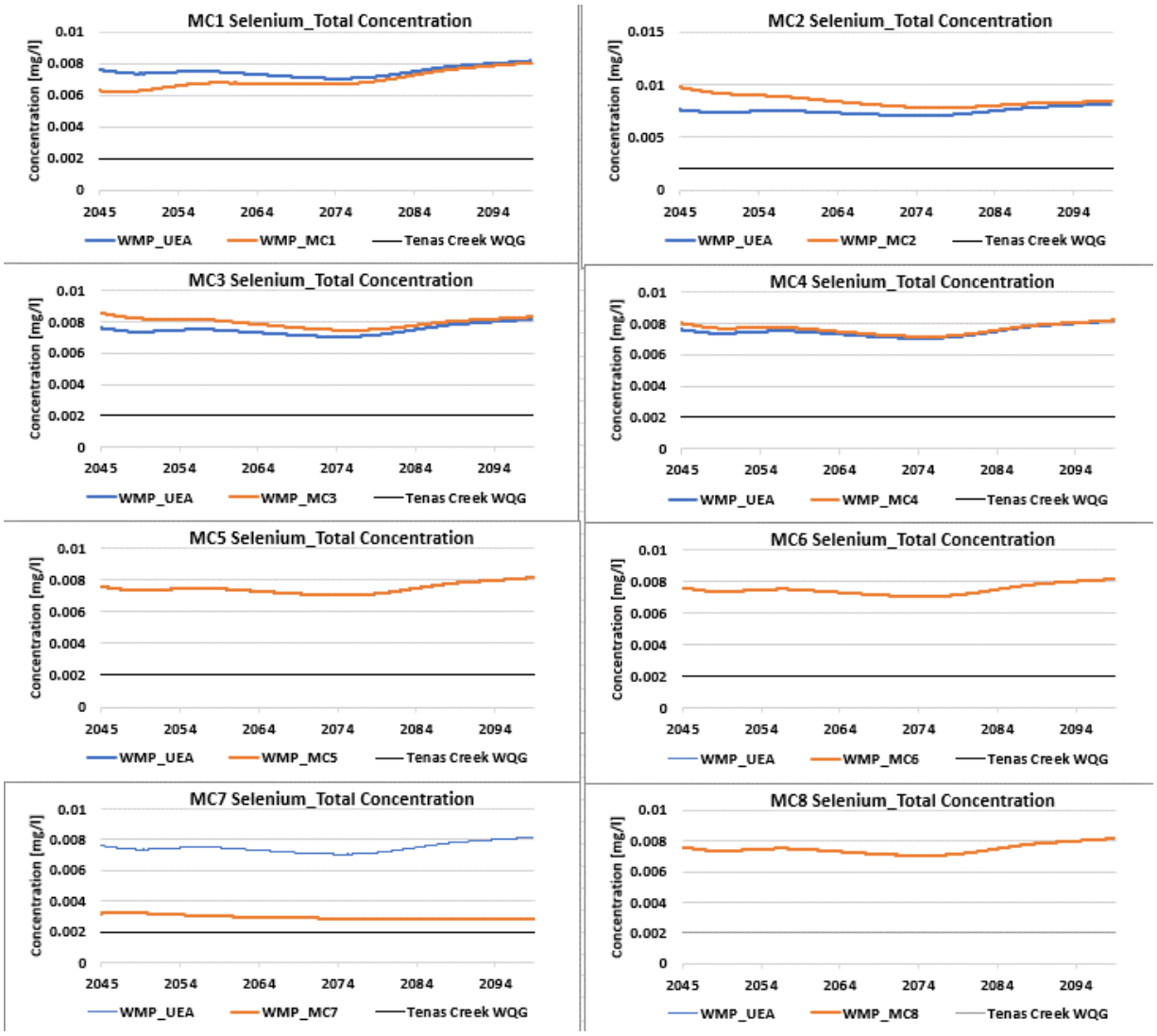
Source:
https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/12_03_24_Mitigations/Results_MMPs_MitigationOptions_EAModel_V40_20241209.xlsm?web=1

Figure 3-2: Total Selenium Water Quality Results for Tenas Control Pond During the Operation Phase for Surface Water Discharge



Source:
https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/12_03_24_Mitigations/Results_MMPs_MitigationOptions_EAModel_V40_20241209.xlsm?web=1

Figure 3-3: Total Selenium Water Quality Results for the North Management Pond (and TCP for MC8) During the Post-Closure Phase for Surface Water Discharge



Source:
https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/12_03_24_Mitigations/Results_MMPsSEEP_MitigationOptions_EAModel_V40_20241209.xlsm?web=1

Figure 3-4: Total Selenium Water Quality Results for the West Management Pond During the Post-Closure Phase in Groundwater Seepage

3.4.2 Nitrate

Model results for maximum monthly average nitrate concentrations with each mitigation control and the Updated EAC Project Case (2024) are presented in Table 3-19 for the surface discharge from the Tenas Control Pond (Operation phase final discharge point) and the North Management Pond (Post-closure phase final discharge point). These results are also shown for groundwater seepages for all facilities (TCP and management ponds) in Table 3-20 and Table 3-21 during operations and in closure, respectively.

Nitrate concentrations that are modelled to be higher than 80% of the BC WQG of 3 mg/L are highlighted in orange which result in nitrate being a POC in the context of the BAT. Model results show that Tenas Control Pond nitrate concentrations could only be lowered to level less than the BCWQG with implementation of Mitigation Control 7 or 8 (active treatment) during operations. During closure, nitrate concentrations remain lower than the BC WQG in all cases including the Updated EAC Project Case (2024) because the source of nitrate has been eliminated with the end of mining (Table 3-19, Figure 3-5 and Figure 3-6).

In the groundwater seepage, only Mitigation Control 7 (In-situ GBR Active) lowers nitrate concentrations below the BC WQG of 3 mg/L during operations for the TCP and WMP (Table 3-20). Nitrate in the NMP groundwater seepage remains below the BC WQG throughout operations. Nitrate in EMP groundwater seepage is lowered through Mitigation Controls 5 and 7 (addition of blasthole liners and passive treatment) in operations.

During closure, nitrate in the groundwater seepage remains below the BC WQG for TCP, NMP and EMP in the Updated EAC Project Case (2024) and all other mitigation controls (Table 3-21). In WMP, the groundwater seepage is above the BC WQG at the beginning of closure beside Mitigation Controls 5, and 7 (blasthole liner and passive treatment) (Table 3-21 and Figure 3-4). WMP is the facility where the last of the PAG and Non-PAG rock will be placed, and therefore the nitrate load flushing from the rock placed in the pond tails off during Post-closure but eventually lowers to below BC WQG 10 years past Closure in the Updated EAC Project Case (2024) please see Figure 3-7.

Table 3-19: Nitrate (as Nitrogen) End of Pipe Surface Water Discharge Quality Results with Mitigation Controls

Case	Tenas Control Pond (Operation Phase)			North Management Pond (Post-Closure Phase)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	**13.0**	0%	4.3	2.54	0%	0.8
MC1	**12.2**	-6%	4.1	2.32	-9%	0.8
MC2	**18.8**	+45%	6.3	2.70	+6%	0.9
MC3	**16.2**	+25%	5.4	2.61	+3%	0.9
MC4	**14.1**	+9%	4.7	2.55	+1%	0.9
MC5	**8.1**	-37%	2.7	1.59	-37%	0.5
MC6	**13.0**	0%	4.3	2.54	0%	0.8
MC7	2.7	-79%	0.9	1.79	-29%	0.6
MC8	0.5	-96%	0.2	0.5 (Base Case = 1.8 mg-N/L)	-72%	0.2

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/500_Water_Balance/Results/Feb2022_MitigationControls/Results_MMPs_MitigationOptions_EAModel30_20220811.xlsm

Notes
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold text** indicates exceedance of end of pipe limit of 80% of WQG (Limit exceedance multiplier > 1)
13. Green highlighted text show results for TCP discharge, not NMP, as mitigation control 8 assumes that TCP does not get decommissioned. In brackets is the modelled results for the Base Case in TCP during closure

Table 3-20: Nitrate (as Nitrogen) in Groundwater Seepages – Water Quality Results with Mitigation Controls (Operations)

Case	Tenas Control Pond (Seepage)			North Management Pond (Seepage)			East Management Pond (Seepage)			West Management Pond (Seepage)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Max Monthly Concentration [mg/l]	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Reduction over Base Case	Limit Exceedance Multiplier	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	**13.0**	0%	4.3	2.32	0%	0.8	**3.45**	0%	1.1	**4.60**	0%	1.5
MC1	**12.2**	-6%	4.1	2.31	-0%	0.8	**3.05**	-12%	1.0	**3.96**	-14%	1.3
MC2	**18.8**	+45%	6.3	2.11	-9%	0.7	**3.37**	-2%	1.1	**4.96**	+8%	1.7
MC3	**16.2**	+25%	5.4	2.15	-7%	0.7	**3.05**	-12%	1.0	**4.60**	+0%	1.5
MC4	**14.1**	+9%	4.7	2.42	+4%	0.8	**3.58**	+4%	1.2	**4.65**	+1%	1.5
MC5	**8.1**	-37%	2.7	1.46	-37%	0.5	2.16	-37%	0.7	**2.88**	-37%	1.0
MC6	**13.0**	0%	4.3	2.32	0%	0.8	**3.45**	0%	1.1	**4.60**	0%	1.5
MC7	2.7	-79%	0.9	1.77	-24%	0.6	2.29	-34%	0.8	1.29	-72%	0.4
MC8	**13.8**	+7%	4.6	2.36	+2%	0.8	**3.55**	+3%	1.2	**4.62**	+0%	1.5

Source;
CAPR002055/Internal/WaterBalanceModelling/Results/12_03_24_Mitigations/Results_MMPsSEEP_MitigationOptions_EAModel_V40_20241209.xlsm

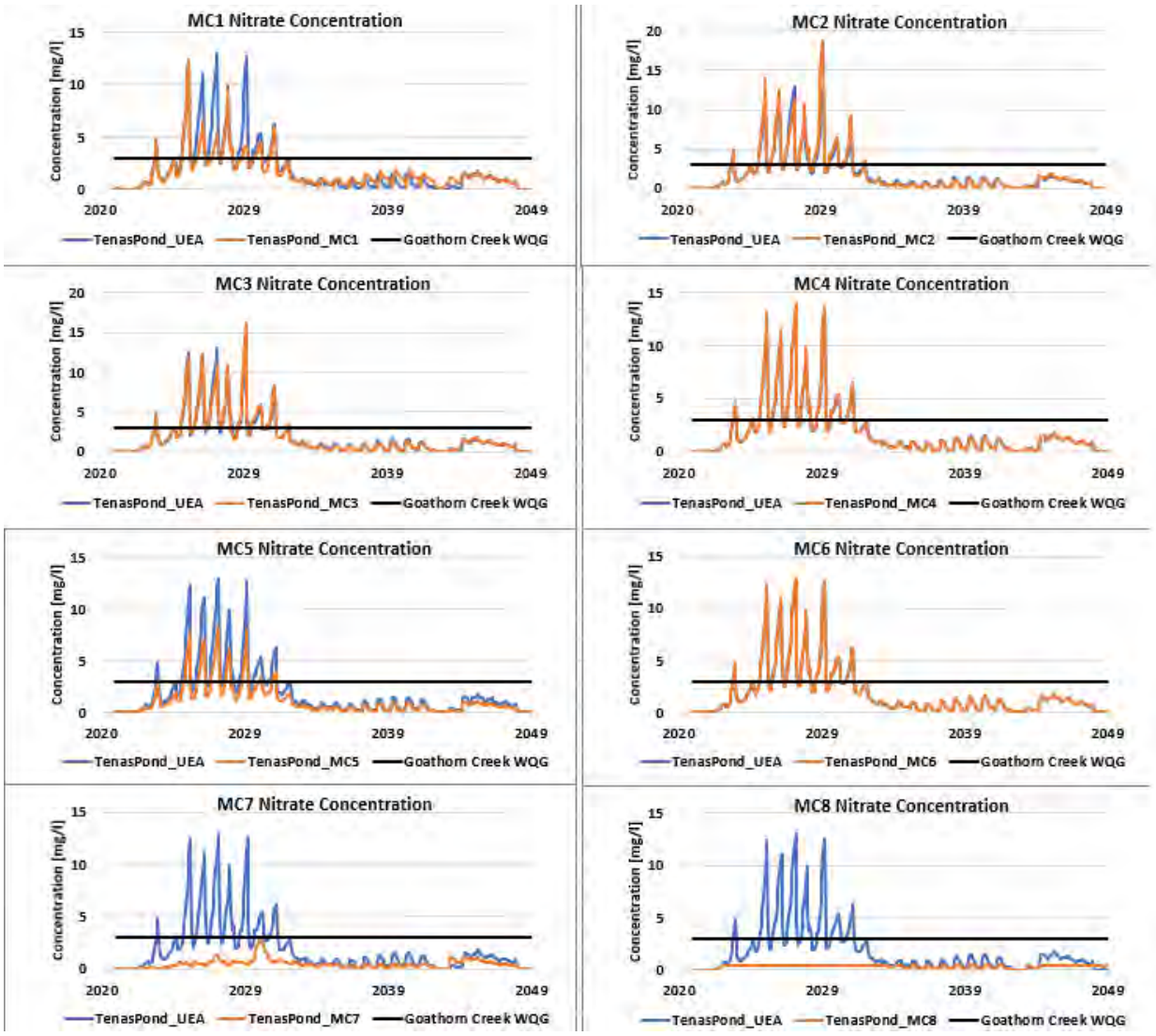
Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold text** indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)

Table 3-21: Nitrate (as Nitrogen) in Groundwater Seepages – Water Quality Results with Mitigation Controls (Post-Closure)

Case	Tenas Control Pond (Seepage)			North Management Pond (Seepage)			East Management Pond (Seepage)			West Management Pond (Seepage)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Max Monthly Concentration [mg/l]	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Reduction over Base Case	Limit Exceedance Multiplier	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	1.8	0%	0.6	1.02	0%	0.3	1.69	0%	0.6	**4.51**	0%	1.5
MC1	1.6	-8%	0.5	0.99	-3%	0.3	1.18	-30%	0.4	**3.87**	-14%	1.3
MC2	1.9	+6%	0.6	1.31	+28%	0.4	2.19	+30%	0.7	**4.82**	+7%	1.6
MC3	1.8	-1%	0.6	1.31	+29%	0.4	2.77	+64%	0.9	**4.55**	+1%	1.5
MC4	1.8	+0%	0.6	1.02	0%	0.3	1.75	+3%	0.6	**4.55**	+1%	1.5
MC5	1.1	-37%	0.4	0.64	-37%	0.2	1.06	-37%	0.4	2.83	-37%	0.9
MC6	1.8	0%	0.6	1.02	0%	0.3	1.69	0%	0.6	**4.51**	0%	1.5
MC7	1.2	-31%	0.4	0.76	-26%	0.3	1.16	-31%	0.4	1.29	-71%	0.4
MC8	1.7	-3%	0.6	1.02	0%	0.3	1.73	+3%	0.6	**4.52**	+0%	1.5

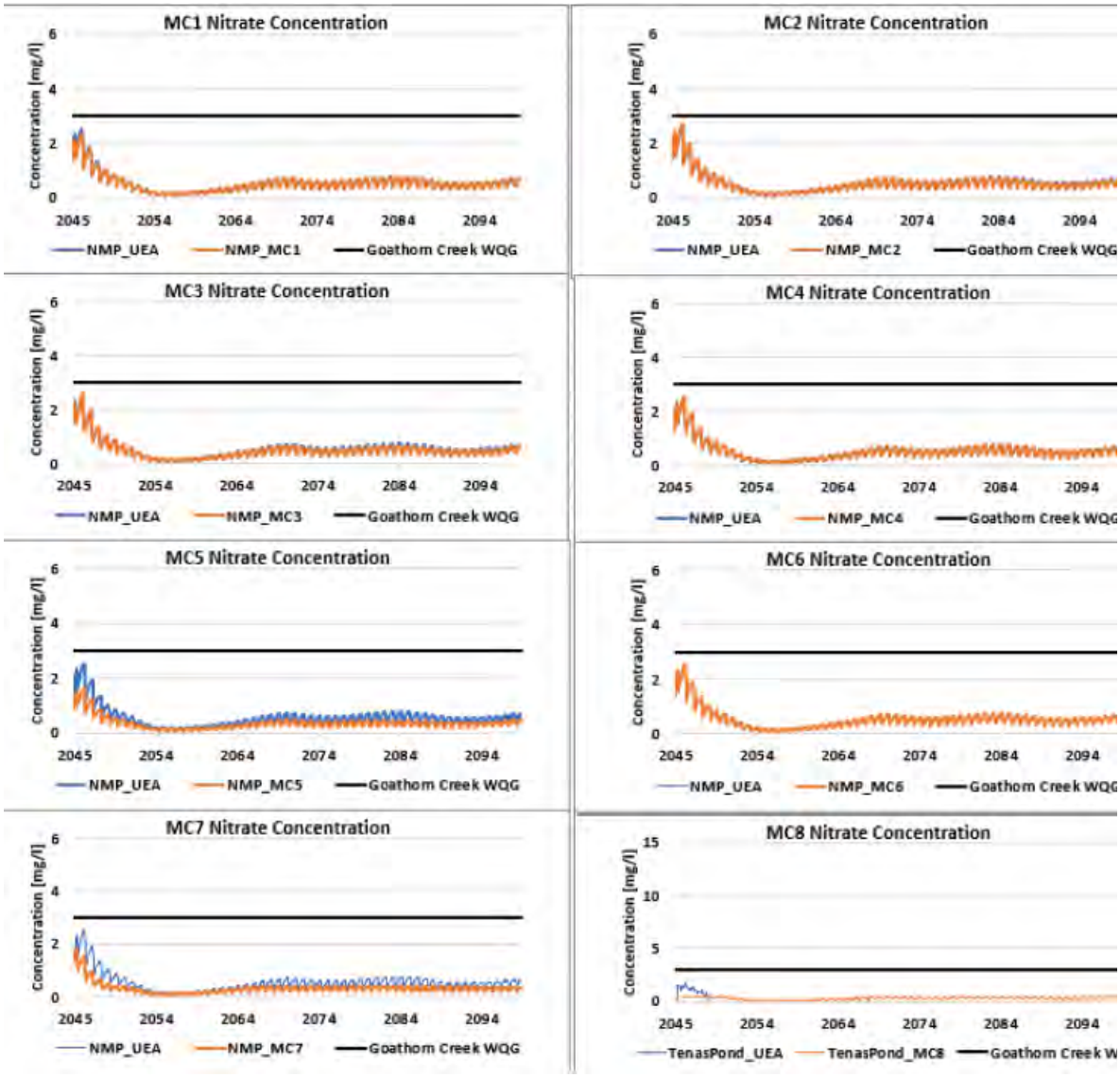
Source: CAPR002055/Internal/WaterBalanceModelling/Results/12_03_24_Mitigations/Results_MMPsSEEP_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active/Passive flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold text** indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)



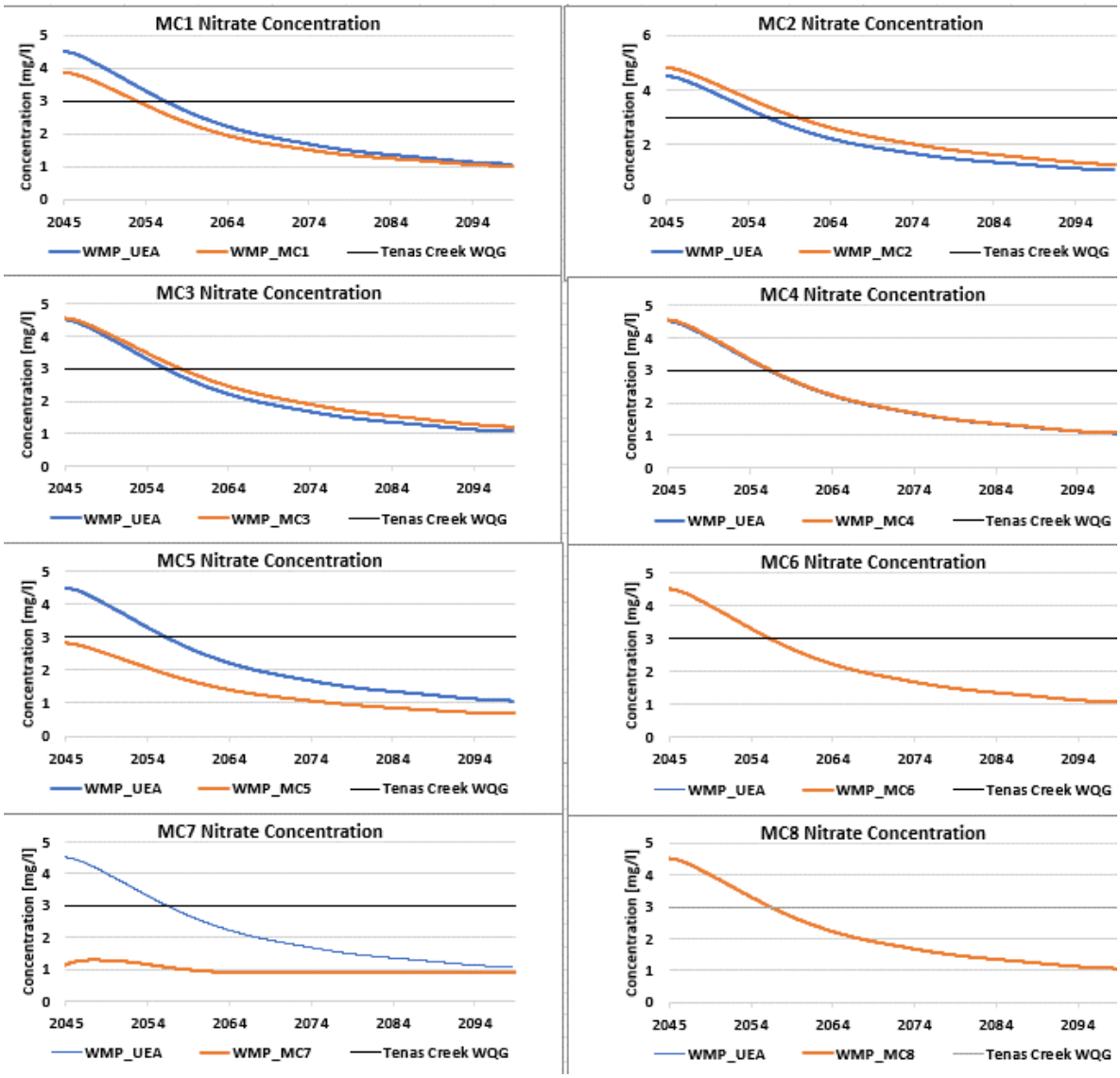
Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/500_Water_Balance/Results/Feb2022_MitigationControls/Results_MMPs_MitigationOptions_EAModel29_20220207.xlsm

Figure 3-5: Nitrate Water Quality Results at Tenas Control Pond During the Operation Phase for Surface Water Discharge



Source:
https://srk.sharepoint.com/sites/NA1CT027.003/Internal/500_Water_Balance/Results/Feb2022_MitigationControls/Results_MMPs_MitigationOptions_EAModel30_20220811.xlsm

Figure 3-6: Nitrate Water Quality Results at North Management Pond (and TCP for MC8) During the Post-Closure Phase for Surface Water Discharge



Source:
https://srk.sharepoint.com/sites/NA1CT027.003/Internal/500_Water_Balance/Results/Feb2022_MitigationControls/Results_MMPs_MitigationOptions_EAModel30_20220811.xlsm

Figure 3-7: Nitrate Water Quality Results at West Management Pond During the Post-Closure Phase for Groundwater Seepage

3.4.3 Dissolved Nickel

Model results for maximum monthly average dissolved nickel concentration are listed in Table 3-19 for each mitigation control and the Updated EAC Project Case (2024) the Tenas Control Pond (Operation phase final discharge point) and the North Management Pond (Post-closure phase final discharge point). These results are also shown for groundwater seepages for all facilities (TCP and management ponds) in Table 3-23 and Table 3-24 during operations and in closure, respectively.

Results exceeding 80% of the BC water quality guideline for dissolved nickel, calculated based on the biotic ligand model[2] (BC ENV 2024) are highlighted in orange. Model results show that concentrations of dissolved nickel in the Tenas Control Pond are greater than the BC WQG even with Mitigation Controls during operations and hovers around the BC WQG calculated for Goathorn Creek (0.0022mg/L) in Post-Closure (Table 3-22, Figure 3-8 and Figure 3-9). The greatest modelled concentration reduction in TCP for dissolved nickel is noted for Mitigation Control 7 (In-situ Active GBR treatment), which is likely linked to the re-routing of mine water away from the TCP to the management ponds for in-situ treatment of nitrate and selenium in the In-situ Active GBRs in the management ponds, and not actual treatment of dissolved nickel (see Section 2.6). These results are expected as the treated effluent target for dissolved nickel (Mitigation Control 8) at 0.005 mg/L is higher than the BC WQG calculated value of 0.0022 mg/L for Goathorn Creek.

Similarly, for the groundwater seepage, all cases (including the Updated EAC Project Case (2024) and mitigation controls remain above the BC WQG for dissolved nickel during operations (Table 3-23). However, dissolved nickel is equal to or below the BC WQG for most cases (Updated EAC Project Case (2024) included) in the groundwater seepage for TCP, NMP and EMP. Dissolved nickel in WMP groundwater seepage during Post-Closure (Table 3-24) remains above the BC WQG calculated for Four Creek (at 0.0025 mg/L) in all cases, which is due to the continued input of impacted water containing nickel from the reclaimed backfill during the Post-Closure Phase. Dissolved nickel concentrations eventually decrease in the groundwater seepage for the Post-Closure phase approximately 30 years after closure for most cases, except Mitigation Controls 2, 3, and 7. In Mitigation Controls 2, and 3, it is because the liners reduce seepage to the environment and therefore keep a higher load in the management ponds. In Mitigation Control 7, the re-routing of water from the dams and buttresses for all facilities to the WMP result in a higher load of dissolved nickel compared to the Updated EAC Project Case (2024).

[2] Each facility discharges into a specific Creek for which the dissolved nickel guideline was calculated based on the median for historic measured water quality for hardness, Dissolved organic Carbon and temperature individual or each Creek. Surface discharge water is compared to Goathorn Creek nickel dissolved guideline, and for the groundwater seepage, it is compared to the most upstream point where the groundwater seepage connects with the creek. For NMP, WMP and TCP, it is compared to Tenas Creek, and for EMP it is compared to Four Creek.

Table 3-22: Dissolved Nickel End of Pipe Surface Water Discharge Quality Results with Mitigation Controls

Case	Tenas Control Pond (Operation Phase)			North Management Pond (Post-Closure Phase)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	**0.0060**	0%	2.7	**0.0023**	0%	1.0
MC1	**0.0058**	-4%	2.6	**0.0023**	0%	1.0
MC2	**0.0078**	+29%	3.5	**0.0022**	-4%	1.0
MC3	**0.0074**	+22%	3.4	**0.0021**	-7%	1.0
MC4	**0.0061**	+0%	2.8	**0.0023**	0%	1.0
MC5	**0.0060**	0%	2.7	**0.0023**	0%	1.0
MC6	**0.0060**	0%	2.7	**0.0023**	0%	1.0
MC7	**0.0037**	-40%	1.7	**0.0023**	+3%	1.1
MC8	**0.0050**	-17%	2.3	**0.0023 (Base Case = 0.0022 mg/L)**	+4%	1.0

Source: https://srk.sharepoint.com/sites/NA1CT027.003/Internal/500_Water_Balance/Results/Feb2022_MitigationControls/Results_MMPs_MitigationOptions_EAModel30_20220811.xlsm

Notes
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold text** indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)
13. Green highlighted text show results for TCP discharge, not NMP, as Mitigation Control 8 assumes that TCP does not get decommissioned. In brackets is the modelled results for the Base Case in TCP during closure

Table 3-23: Dissolved Nickel in Groundwater Seepages - Water Quality Results with Mitigation Controls (Operations)

Case	Tenas Control Pond (Seepage)			North Management Pond (Seepage)			East Management Pond (Seepage)			West Management Pond (Seepage)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Max Monthly Concentration [mg/l]	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Reduction over Base Case	Limit Exceedance Multiplier	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	**0.0060**	0%	2.7	**0.0065**	0%	2.9	**0.0053**	0%	1.1	**0.0056**	0%	2.2
MC1	**0.0058**	-4%	2.6	**0.0065**	-0%	2.9	**0.0051**	-2%	1.1	**0.0054**	-4%	2.1
MC2	**0.0078**	+29%	3.5	**0.0061**	-6%	2.8	**0.0050**	-4%	1.1	**0.0074**	+32%	3.0
MC3	**0.0074**	+22%	3.4	**0.0061**	-5%	2.8	**0.0051**	-4%	1.1	**0.0058**	+4%	2.3
MC4	**0.0061**	+0%	2.8	**0.0065**	+1%	3.0	**0.0053**	+1%	1.1	**0.0060**	+7%	2.4
MC5	**0.0060**	0%	2.7	**0.0065**	0%	2.9	**0.0053**	0%	1.1	**0.0056**	0%	2.2
MC6	**0.0060**	0%	2.7	**0.0065**	0%	2.9	**0.0053**	0%	1.1	**0.0056**	0%	2.2
MC7	**0.0037**	-40%	1.7	**0.0076**	+17%	3.4	**0.0060**	+14%	1.3	**0.0069**	+22%	2.7
MC8	**0.0062**	+2%	2.8	**0.0065**	+1%	3.0	**0.0060**	+14%	1.3	**0.0057**	+2%	2.3

Source:CAPR002055/Internal/WaterBalanceModelling/Results/12_03_24_Mitigations/Results_MMPsSEEP_MitigationOptions_EAModel_V40_20241209.xlsm

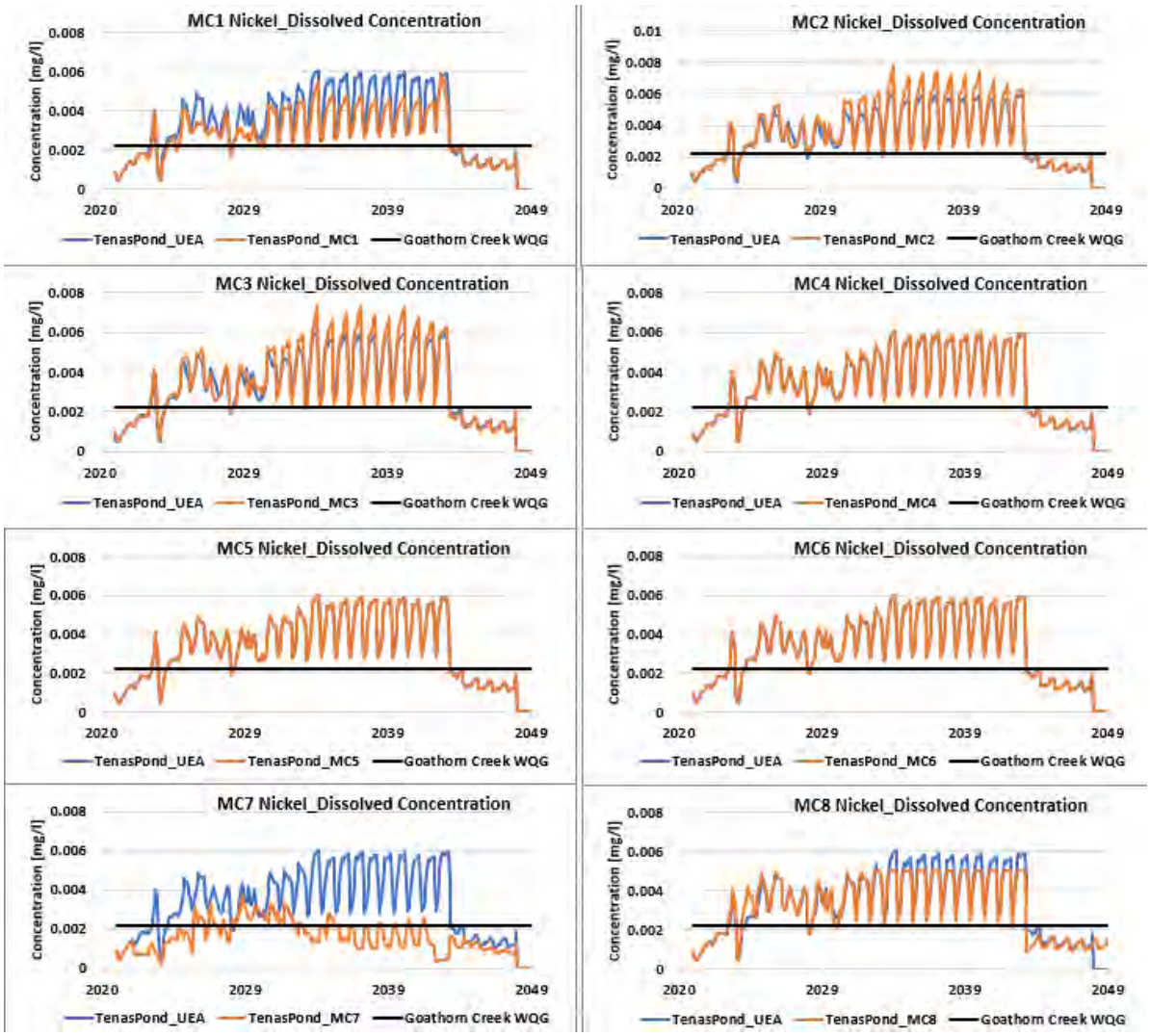
Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control pondsMC4 = Increase of process water to CPP
5. MC5 = Blasthole liners
6. MC6 = Active flocculation in TCP
7. MC7 = In-situ Active GBR in management ponds
8. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
9. Base Case = Updated EAC Project Case (2024)
10. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
11. **Orange bold text** indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)

Table 3-24: Dissolved Nickel in Groundwater Seepages - Water Quality Results with Mitigation Controls (Closure)

Case	Tenas Control Pond (Seepage)			North Management Pond (Seepage)			East Management Pond (Seepage)			West Management Pond (Seepage)		
	Max Monthly Concentration [mg/l]	Reduction over Base Case	Max Monthly Concentration [mg/l]	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier	Reduction over Base Case	Limit Exceedance Multiplier	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Base Case	Limit Exceedance Multiplier
Base Case	**0.0022**	0%	1.0	0.0017	0%	0.8	0.0021	0%	0.4	**0.0044**	0%	1.8
MC1	**0.0023**	+5%	1.0	0.0017	0%	0.8	0.0017	-20%	0.4	**0.0038**	-13%	1.5
MC2	**0.0021**	-1%	1.0	**0.0023**	+37%	1.0	0.0028	+35%	0.6	**0.0051**	+16%	2.0
MC3	0.0020	-6%	0.9	**0.0023**	+39%	1.1	0.0042	+100%	0.9	**0.0047**	+7%	1.9
MC4	**0.0021**	-1%	1.0	0.0017	0%	0.8	0.0021	+2%	0.5	**0.0046**	+5%	1.8
MC5	**0.0022**	0%	1.0	0.0017	0%	0.8	0.0021	0%	0.4	**0.0044**	0%	1.8
MC6	**0.0022**	0%	1.0	0.0017	0%	0.8	0.0021	0%	0.4	**0.0044**	0%	1.8
MC7	0.0017	-23%	0.8	0.0015	-9%	0.7	0.0025	+19%	0.5	**0.0068**	+56%	2.7
MC8	**0.0023**	+4%	1.0	0.0017	0%	0.8	0.0021	+2%	0.5	**0.0044**	+0%	1.8

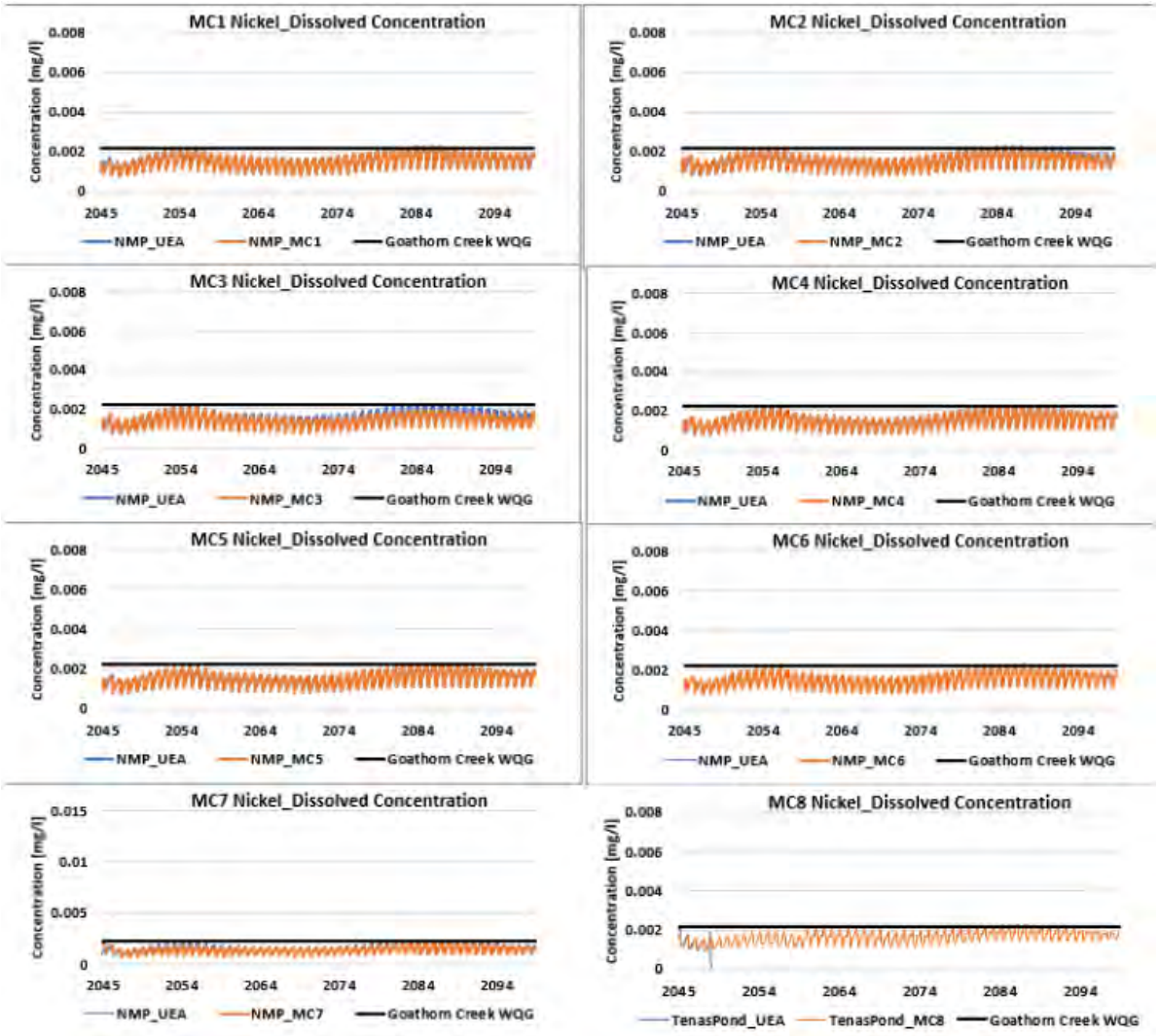
Source: CAPR002055/Internal/WaterBalanceModelling/Results/12_03_24_Mitigations/Results_MMPsSEEP_MitigationOptions_EAModel_V40_20241209.xlsm

Notes:
1. WQG = water quality guideline, calculated based on the median hardness from baseline monitoring in each stream
2. MC1 = Improve robustness of water cover in management ponds with freshet inflows from channel C02
3. MC2 = Modify the liners in the management and control ponds
4. MC3 = Modify the liners in the management and control ponds
5. MC4 = Increase of process water to CPP
6. MC5 = Blasthole liners
7. MC6 = Active flocculation in TCP
8. MC7 = In-situ Active GBR in management ponds
9. MC8 = Active Water Treatment of Tenas Control Pond Surface Water Discharge
10. Base Case = Updated EAC Project Case (2024)
11. Negative value represents reduction over Base Case. Positive value is an increase over Base Case
12. **Orange bold text** indicates exceedance of 80% of the WQG (Limit exceedance multiplier >1)



Source:
https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/12_03_24_Mitigations/Results_MMPs_MitigationOptions_EAModel_V40_20241209.xlsm?web=1

Figure 3-8: Dissolved Nickel Water Quality Results for Tenas Control Pond During the Operation Phase for Surface Water Discharge



Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water%20Balance%20Modelling/Results/12_03_24_Mitigations/Results_MMPs_MitigationOptions_EAModel_V40_20241209.xlsm?web=1

Note : Blue line is behind the orange line – showing no change from base case

Figure 3-9: Dissolved nickel Water Quality Results for North Management Pond (and TCP for MC8) During the Post-Closure Phase for Surface Water Discharge

3.5 Summary

This section summarizes the results of the water quality model assessment of the potential mitigation controls that were identified for the Tenas Project to help improve water quality in the receiving environment relative to conditions presented in Updated EAC Project Case (2024). As there are no modelled exceedances of BC WQG in the downstream receiving waters, the effectiveness of each mitigation control was evaluated in terms of improving the surface water discharge (end-of-pipe) and groundwater seepages from the Project, in Goathorn Creek, Tenas Creek and Four Creek, along with any associated changes to streamflow or Project surface water discharge and groundwater seepage.

In summary, the mitigation controls include:

- Improve the robustness of the water covers of the management ponds by adding freshet inflows from Channel C02.
- Modifying liners constructed for the management and control ponds to reduce seepage rates to the receiving environment.
- Increase of process water usage by the CPP by changing the deposition method for the CPP tailings.
- Use of blasthole liners to decrease nitrogen loads.
- Active/Passive flocculation with the Base Case to reduce total metals concentrations in surface discharge.
- Treating water collected in the open pit, as well as dams and buttresses seepage with the Base Case
  - through In-situ Active GBR treatment in the management ponds for both surface water discharge and groundwater seepage, or
  - through active water treatment post TCP (for surface water discharge treatment)

Table 3-25 summarizes changes to stream water quality and quantity.

Table 3-25: Summary of Mitigation Control Results

Mitigation Control ID	Positive	Negative
MC1: Improve Water Cover	- Reduces most POCs concentrations by a few percent for surface water discharge from the Tenas Control and North Management Ponds, as well as in groundwater seepages. - Reduces POCs in streams as well to varying degrees in Tenas and Four Creeks with no significant improvements in Goathorn Creek.	- Reduces streamflow in Four Creek during the open-water season months. - Does not improve POC concentrations for NMP as it is not targeted.

Mitigation Control ID	Positive	Negative
MC2: Modified Liners in Management and Control Ponds (Option 1)	- Reduces POCs concentrations in Tenas and Four Creeks.	- Changes flows for the streams, with main effect on Four Creek (>12.5% reduction of flows, and further reduction over the Updated EAC Project Case (2024)). - Worsens TCP surface water discharge for a few POCs. - Worsens POCs concentrations in groundwater seepage from TCP and WMP.
MC3: Modified Liners in Management and Control Ponds (Option 2)	- Greatest improvement for a single mitigation control in reducing concentrations of most POCs in Four Creek. - Reduction of POCs concentrations in Tenas Creek (less than in Four Creek).	- Changes for stream flows, primarily Four Creek (>12.5% reduction of flows, and further reduction over the Updated EAC Project Case (2024)) (more than MC2). - Worsens TCP surface water discharge for a few POCs (more than MC2). - Worsens POCs concentrations in groundwater seepage from TCP and WMP (more than MC2).
MC4: Increase of process water to CPP	- No notable improvements of discharge water or water quality in the streams.	- Increased water usage by the Project.
MC5: Blasthole liners	- Reduces nitrogen concentrations in the surface water discharge and the environment between 30 to 40%.	- none
MC6: Active/Passive Flocculation in TCP	- Reduces total metals concentrations in the surface water discharge of TCP (Operations).	- No effect on seepage water quality - No effect on dissolved POC concentrations
MC7: In-situ Active GBR in MPs	- Greatest reduction in selenium, nitrite, and nitrate concentrations in Tenas Creek. - Some improvements in Four Creek water quality for selenium, nitrate, and nitrite. - Reduce maximum concentration of nitrate, selenium, and nitrite at groundwater discharge from both West Management and Tenas Control Ponds.	- none
MC8: Active treatment post TCP	- Greatest improvement in surface water discharge concentration of identified POCs, including nitrate, nitrite, total selenium, dissolved nickel. - Improvement in Goathorn Creek like MC7 for nitrite, nitrate, and selenium, but targets other POCs as well such as total molybdenum.	- Slightly worsens POCs concentrations in the groundwater seepage for EMP and TCP.

4 BMP Evaluation

As discussed in Section 1.4, the merits and feasibility of implementing the mitigation controls that were considered BMPs are evaluated here, while the mitigation controls that were candidate BATs were evaluated as part of the BAT assessment (Appendix H).

In summary, the BMP mitigation controls include:

- MC1: Improve the robustness of the water covers in the management ponds and reduce loadings from submerged rock by increasing the Project's water inventory during freshet.
- MC4: Increase of process water intake to CPP plant.
- MC5: Addition of blasthole liners.

Based on the results presented in Section 3, only MC5 (blasthole liners) was considered suitable and feasible as a mitigation control. Reducing loss and dissolution of ANFO is a true source control measure that would reduce loadings of ammonia, nitrite, and nitrate in Project water on site. Mitigation Control 5 (blasthole liners) was therefore recommended to be introduced into the Final EAC Project Case (2024) for subsequent information request responses.

The water and load balance model results showed that the option of improving the robustness of the water cover in the management ponds would cause an apparent reduction in POC concentrations but only because of dilution by additional non-contact water during freshet. Since this option in effect amounts to the addition of fresh dilution water to the management ponds, it was not considered to be consistent with best management practices and was therefore not pursued. Additionally, the model results indicated that increasing the process water intake by the CPP would have no to little effect on the quality of Project water and was also therefore not included either in the Final EAC Project Case (2024).

Evaluation of the water quality mitigation controls that are candidate BATs are discussed in the BAT assessment report (**Appendix H**). This report will recommend if further changes to the Updated EAC Project Case (2024) are required for the Final EAC Project Case (2024).

If any mitigation control or combination thereof is selected for implementation in the Tenas water management strategy, additional modeling is required to consider the effects on the mixing zone in Goathorn Creek, as well as varied hydrologic conditions (i.e., low flows) and source terms, like the scenarios considered and presented in SRK 2022. This will be provided in the Final Water and Load Balance Report (SRK 2025) for the Final EAC Project Case (2024).

5 Conclusion

This report summarizes the performance of water quality mitigation controls in terms of improvements (or changes) to effluent water quantity and quality as well as changes to water quality and streamflow in creeks and rivers downstream of the Project. Results were produced using the Water and Load balance model (SRK 2025) and compared against the Updated EA Case (2024) which was used as the Base Case.

The mitigation controls were divided in two categories – Best Management Practices (BMP) and Best Achievable Technologies (BAT). BMP mitigation controls included addition of blasthole liners, improvement of water cover robustness by adding freshet flows to management and control ponds, as well as increased use of process water by CPP from the Project Area. BAT measures included the use of modified liners in the management and control ponds, Active/Passive flocculation in the Tenas Control Pond, In-situ Active Gravel Bed Reactors in the management ponds, as well as active water treatment of end-of-pipe effluent.

Of the BMPs, blasthole liners were recommended to be adopted by the Final EA Case (2024) as other BMPs yielded unchanged to marginally improved water quality. The results for the BATs were presented in this report, but final recommendations as to whether to incorporate these mitigation controls by the Final EA Case (2024) were addressed in the BAT report (Appendix H).

Closure

This report, Effect of Mitigation Controls on Water Quality and Quantity of the Tenas Project, was prepared by

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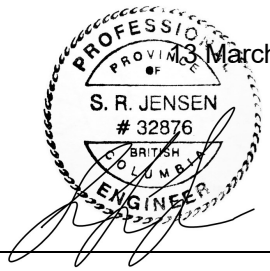

13 March 2025

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All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendix A Updated Water Quality Model Source Terms

FINAL. Prepared for : Telkwa Mining Ltd. Project number: CAPR0029337. Issued June. 2024. (SRK Consulting (Canada) Inc. 2024)

FINAL

Updated Water Quality Model Source Terms

Tenas Project, British Columbia, Canada

Telkwa Mining Ltd.

SRK Consulting (Canada) Inc. ▪ CAPR002933 ▪ June 2024

srk consulting

FINAL

Updated Water Quality Model Source Terms

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Useful Definitions

This list contains definitions of symbols, units, abbreviations, and terminology that may be unfamiliar to the reader.

EMA	Environmental Management Act
EMP	East Management Pond
EOM	End of Mining
FS	Feasibility Study
HCT	Humidity cell testing
MA	Mines Act
Non-PAG	Non-potentially acid generating
NMP	North Management Pond
PAG	Potentially acid generating
TML	Telkwa Mining Limited
TSS	Total suspended solids

1 Introduction

Telkwa Mining Ltd (TML) submitted an Environmental Assessment Certificate (EAC), application for the Tenas Project, located at the Telkwa Property, near the town of Telkwa, British Columbia in May of 2022. In support of the EA application, SRK Consulting (Canada) Inc. (SRK) developed geochemical source terms (SRK 2022a) that formed the basis for evaluating changes to water quality in downstream receptors. The source terms were based on humidity cell testing (HCT) results. In parallel to the geochemical characterization testing program that was used to support the EAC application, TML initiated a field barrel testing program in late 2019. Release rates from the barrel testing program were compared to the scaled results that formed the basis of the source terms that were developed to support the EAC application. The outcomes indicated that the scaled HCT release rates were underestimated for some constituents while overestimated for others. Updated source terms were developed using the barrel release rates to reflect release rates more accurately under field conditions.

This report describes the conceptual models, methods and assumptions used to derive the site water quality model source term inputs based on the field barrel testing results. The site wide water quality model development and results are described in SRK (2024a).

2 Project Background

2.1 Geological Setting

2.1.1 Bedrock Geology

The Tenas Project is located within the northeast/southwest trending Skeena Arch, which separates Jurassic-age sedimentary rocks of the Bowser Basin in the north from the Jurassic to Cretaceous-age sedimentary rocks of the Nechako Basin to the south. The coal-bearing sedimentary rock sequence of the Project is associated with the Lower Cretaceous age Skeena Group, and unconformably overlies the Jurassic-age Hazelton volcanic group, which will be below the proposed pit limit. A simplified stratigraphic column of the Project's deposit is presented in Figure 2-1.

Jurassic Hazelton Volcanic Group

The volcanic rocks include andesite, trachyte, and basalt with associated tuffs and breccias.

Lower Cretaceous Skeena Group

The Lower Cretaceous Skeena Group includes marine and continental sediments interbedded with coal seams, often correlated over long lateral distances. It is subdivided into four units (Units I through IV) and a unit of undivided sediments overlying the four units (Figure 2-1).

The economic coal seams in the Tenas area are located within Coal Zone 1 of Unit I and include two seams: C seam and 1 seam (upper and lower). Coal Zones 2 through 10, located in Unit III (Figure 2-1), are absent from the Tenas area. Units I through IV are summarized below.

- The Unit I consists of more than 100 m of fine to coarse-grained cross-bedded sandstone, conglomerate, siltstone, mudstone, and coal (coal zone 1). Overall, Unit I fines upward, from primarily conglomerate and sandstone to almost entirely carbonaceous mudstone, seatearth and coal (1A to 1G). The conglomerate and sandstone were deposited in braided channels and bars, and mudstone accumulated in floodplains. Thin coal seams formed in poorly drained, peat-forming backswamps, and seatearths formed under leaching conditions in less submerged areas. With denudation of the volcanic source area, braid plains were abandoned and extensive low-energy, peat-forming swamps were established, resulting in the formation of thick coal seams in the upper part of the Unit.
- The Unit II separates coal zone 1 and coal zone 2. It consists of up to 140 m of primarily monotonous silty mudstone, occasionally interbedded with beds of chert-rich, micaceous, bioturbated or cross-bedded sandstone. The sediments were deposited in a deltaic/shallow marine environment following a regional marine transgression. The mudstone accumulated in bays, and the sandstones in distributary channels and mouthbars. Locally, thin discontinuous peat beds formed in salt marshes.
- Unit III comprises about 90 m of chert-rich, micaceous sandstone, siltstone, and mudstone, and up to nine coal zones (coal zones 2 through 10). The sandstone and mudstone were deposited and biogenically reworked in a tidal flat environment; siltstone accumulated in a restricted, nearshore marine environment. Peat accumulated in freshwater coastal marshes which periodically prograded over tidal flats.

- Unit IV consists of approximately 150 m of a laterally extensive, bright green, chert-rich, chloritic sandstone or siltstone bed at the base, overlain by massive grey silty mudstone like that of Unit II. The basal sandstone is a transgressive lag deposit, and silty mudstone, the predominant lithofacies, was deposited in a quiet, nearshore, shallow marine environment.

Intrusions

Tertiary and Cretaceous-age porphyritic dykes and sills commonly intrude this sequence, the most notable of which includes a Tertiary granodiorite intrusion located on the north side of the Telkwa River. These intrusions are not present in the Tenas area.

Geological Structures

The sedimentary sequence in the Tenas area is folded into a syncline in which the gently (typically 10 to 20°) northeast-dipping western limb of the syncline subcrops on the western side of the pit area, while the moderately (40 to 45°) southwest-dipping eastern limb subcrops on the eastern side of the pit. Faulting is generally near-vertical, and can be subdivided into two main groups, one which strikes approximately northwest/southeast and the other which strikes approximately northeast/southwest. A few east/west striking faults have also been interpreted.

The Goathorn area is located within an outlier of the Lower Cretaceous Skeena Group. The structural geology is somewhat more complex than the Tenas area and is characterized by a complex series of sub-parallel north-south trending reverse faults, and to a lesser extent east-west, trending normal faults.

Northeast striking faults are related to emplacement of the Bulkley intrusions in the Late Cretaceous.

2.1.2 Surficial Geology

The surficial geology in the Project area consists primarily of two types of deposits, glacial clay- or silt-rich till, and sand and glaciofluvial sand and gravel outwash. At upper elevations and south of the proposed pit, the terrain is mapped as having bedrock outcrops to a limited extent or thin mantles of clay- and silt-rich tills deposits, between 3 m and 10 m thick. North of the proposed pit and towards Tenas Creek and Goathorn Creek, drillholes report thin mantles of clay- and silt-rich tills deposits, between 3 m and 10 m thick underlain by a thick sand and gravel outwash deposit that can exceed 100 m.

Other types of deposits are present locally. Patches of glaciolacustrine deposits are scattered throughout the morainal landscape in low ridges and in depressions; the sediments comprise bedded and laminated mud, and minor sand and gravel (Clague 1984). Recent fluvial deposits form the narrow floodplains of Goathorn Creek and Tenas Creek, which are 40 m to 80 m deep incised into the subdued morainal landscape, and the wide floodplains of the Telkwa and Bulkley Rivers. The fluvial deposits range from extremely coarse, poorly sorted gravel on steep alluvial fans to moderately to well-sorted sand and mud on low-gradient floodplains (Clague 1984).

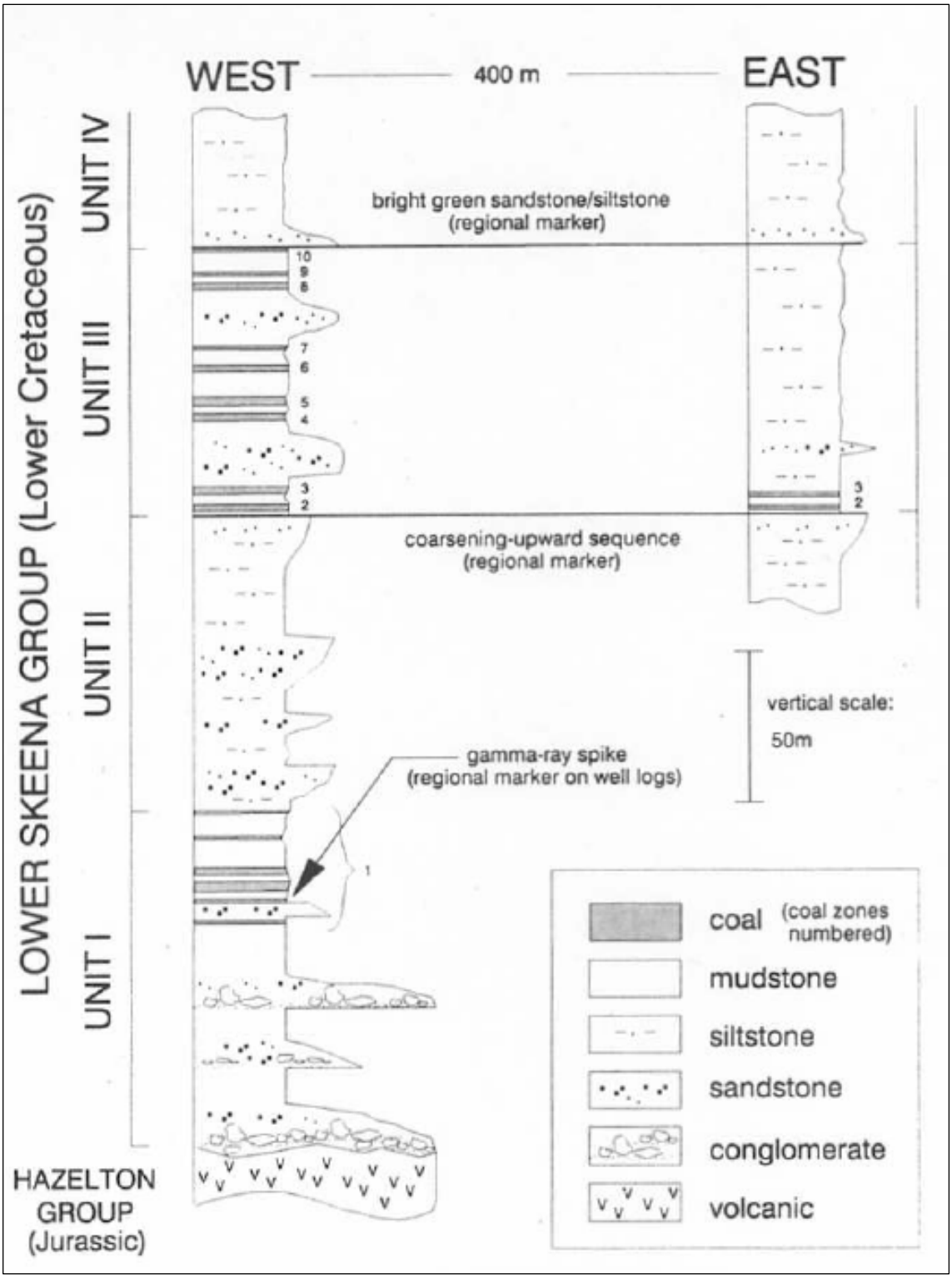


Figure 2-1. Stratigraphic Sequence of Lower Cretaceous Skeena Group Sediments.

Source: Telkwa Coal Ltd.

2.1.3 Material Zone Designations

Geochemical properties are stratigraphically constrained in coal deposits versus lithologically constrained. For example, the deposition environment of the Tenas Deposit includes marine and deltaic sedimentary sequences and rocks formed in these two different environments will be compositionally different. The deposit was demarcated into stratigraphic zones of sedimentary sequences between the mineable coal seams. The stratigraphic zones were further divided into additional zones if they had different distinct geochemical properties (e.g., Zone 1 and Zone 1a) or grouped if geochemical properties were similar between zones identified between coal seams (e.g., Zone 2 and Zone 3). The stratigraphic zones and classification of PAG and non-PAG based on an NPR of 2.0 identified for the Project are presented in Figure 2-2.

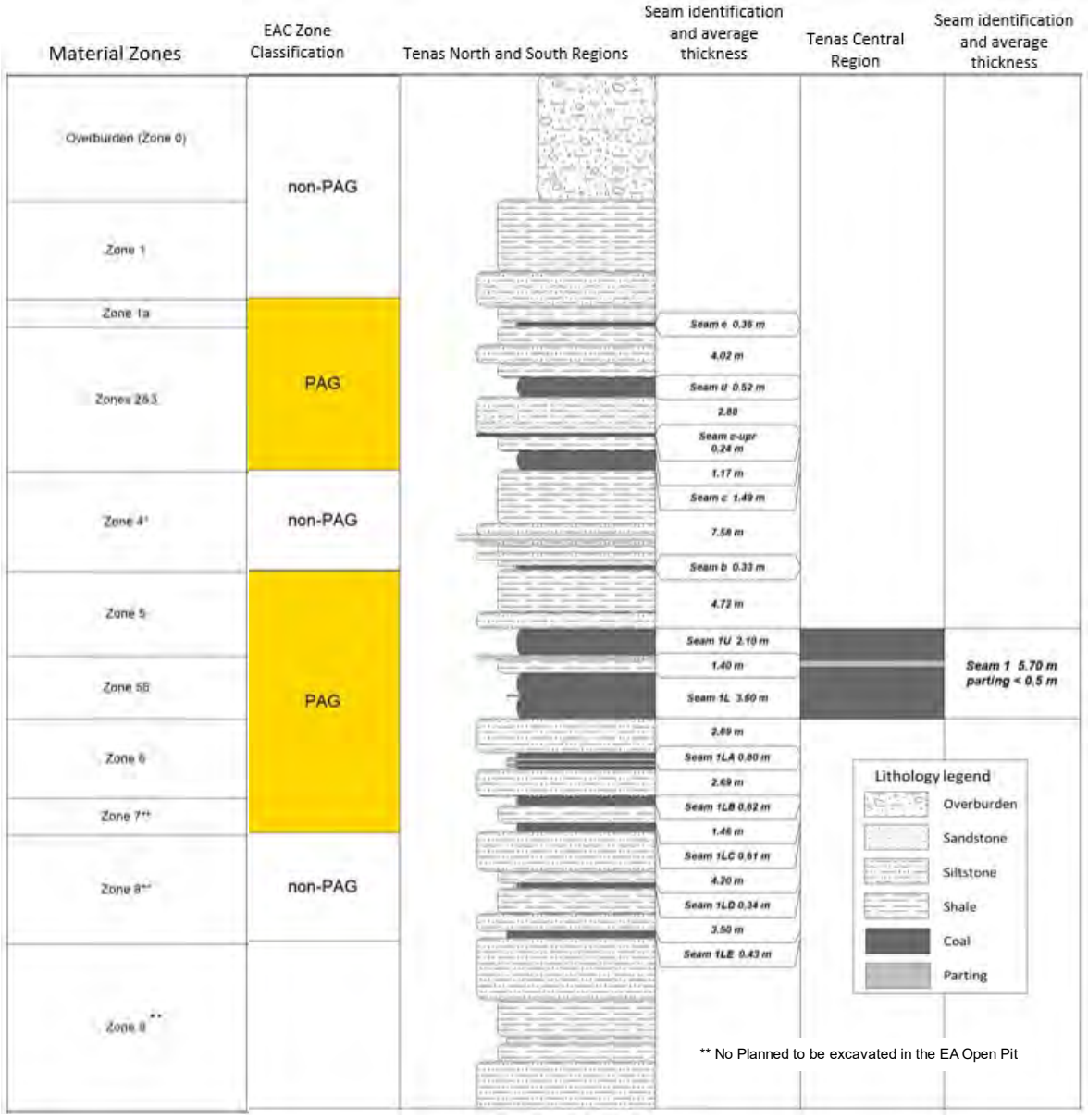


Figure 2-2. Tenas Deposit Stratigraphic Zones

2.2 Geochemical Characterization Study

Two geochemical studies have been completed to characterize the acid generating and metal leaching potential of the Tenas deposit:

- Norecol Dames and Moore (1999). Draft Report. Assessment of ARD Potential and Water Quality Predictions. Telkwa Coal Project.
- SRK (2022b). Telkwa Coal – Tenas Project Supplemental Geochemical Characterization.

The Norecol Dames and Moore (1999) study included the collection and analysis of over 700 samples. An additional 173 samples were collected as part of the supplemental geochemical characterization study (SRK 2022b). The supplemental samples were used to confirm the results of the 1999 study and correlate the test results to more up-to-date testing methods. For example, samples collected as part of the Norecol Dames and Moore (1999) study were analyzed for total sulfur only and neutralization potential was determined using the Sobek-NP (1978) method. Results from both studies were combined to form a robust geochemical characterization that is reported in SRK (2022b). The reader is referred to SRK (2022b) for additional detail on the geochemical characterization program including sample selection, collection, testing and results.

The outcomes of these studies indicated that a large volume of the rock to be mined from the Tenas deposit is potentially acid generating (PAG) and that acid generating potential is stratigraphically constrained in zones generally separated by coal seams. The geochemical properties of the deposit were therefore described based on mineable stratigraphical zones. The geochemical testing results indicate that all zones contain some PAG rock; however, there are units that are predominantly PAG versus non-PAG. Based on the site-specific neutralization potential ratio of 2.0 (NPR) and the average bulk geochemical properties, the following zones were characterized as PAG and non-PAG:

- Non-PAG: Zone 1, 4 and 8;
- PAG: Zones 1a 2/3, 5, 55, 6 and 7.

The geochemical characterization results also indicate that coarse and fine processed rock are PAG and overburden samples tested are non-PAG, including construction materials.

2.3 Summary of Mine Material Management Plan

Mining of the Tenas deposit will produce mine rock and processed rock materials. Previous geochemical testing (Norecol Dames & Moore 1999) indicates that the coarse and fine processed rock and a component of the mine rock will be PAG, and management will be required. Management of mine rock and coarse and fine processed rock are summarized in the following sections.

2.3.1 Management of PAG Rock

In advance of, and during mining, TML proposes to progressively construct Management Ponds with a combination of excavation and embankments with buttresses (Figure 2-3). The purpose of the management ponds is to store PAG and processed rock in saturated conditions preventing sulfide oxidation, limiting acidic drainage from occurring. Three management ponds will be constructed including the North, West and East Management Ponds. The North Management pond will be constructed first and is located north of the West Management Pond and is external to the open pit. The East Management is constructed next and is south of the NMP and external of the open pit. The last management pond, which is the West Management Pond which is constructed from a combination of excavation for the open pit for the North Phase and construction of an embankment external to the open pit.

PAG rock will first be placed in North Management Pond. PAG rock will be progressively placed in lifts and flooded as each lift is completed so that exposure of rock to atmospheric oxygen is minimized. TCL is proposing to place PAG rock including processed rock underwater before it becomes acid generating.

Once the storage capacity of the pond has been reached, storage will begin in the East Management pond and then the West Management Pond. The three management ponds will be independent of one another allowing different water levels and PAG material levels in each of the ponds as conditions require. The Management Ponds will be maintained with at least a two-metre water cover once PAG material disposition has been completed.

2.3.2 Management of non-PAG Rock and Overburden

Non-PAG rock will be used to progressively backfill the open pit during operations and for constructing portions of the embankments and buttresses for the Management Ponds and Control Ponds. Some non-PAG rock will also be used to cap PAG material in the management ponds once the PAG material has reached its design elevation. Non-PAG rock will be placed in lifts into water, keeping the water level at least 1 metre above PAG rock and at or below the non-PAG placement platform. A 1.5 metre thickness was selected for non-PAG as this is below the expected change in water levels during the Post-closure phase so that this material is never above water.

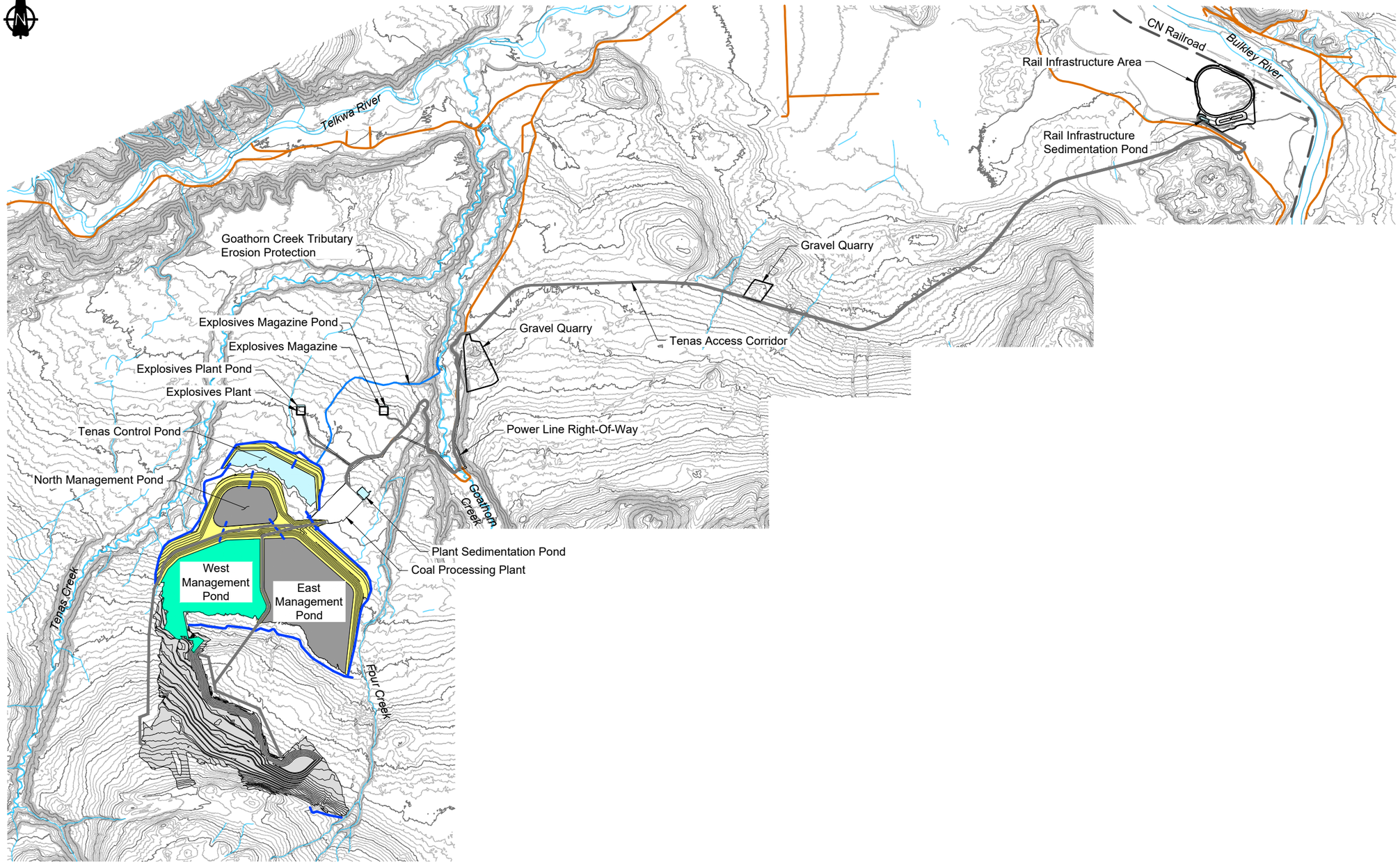
Overburden will be stored in the buttresses during operation and used as a cover material over non-PAG rock placed in the management ponds.

2.3.3 Management of Processed Rock

Coarse and fine processed rock materials are expected to be PAG and will also be placed in the Management Ponds with the PAG rock (Figure 2-3).

2.3.4 Open Pit Walls

Most of the open pit will be backfilled during the Operation phase. However, a small portion of the hanging wall will exist at post-closure. Meteoric water contacting the open pit walls will report to the end pit lakes, with one of them draining northwards by gravity and mix with Management Pond water prior to discharging into the surrounding environment while the other one discharges to Four Creek once its water quality meets regulatory requirements. Until this time, this end pit lake also drains toward the north.



LEGEND

- Water Management Feature
- Spillway
- Existing Watercourse
- Existing Road
- Proposed Road
- Dams and Buttresses
- Sedimentation Pond
- Active Management Pond
- Backfill / NAG Pile
- Covered Inactive Management Pond

NOTES

1. Contours shown at 5.0m intervals.
2. All dimensions shown in meters unless otherwise stated.
3. Pile designs by SRK Consulting Ltd.

REFERENCE

NAD83 UTM Zone 9.

0m 500 1000 1500 2000

srk consulting

TELKWA MINING LIMITED

Geochemical Source Terms

Mine Site Facilities

SRK JOB NO.: CAPR002933

FILE NAME: 1CT027.003 Overview.dwg

Tenas Project

DATE: 2024/05/1

APPROVED: MH

FIGURE: 2-3

\\srk.ad\DFS\vancan\Projects\01_SITES\Telkwa Coal\1040_AutoCAD\Water Management\1CT027.003 Overview.dwg

3 Conceptual Model

3.1 Unsaturated Mine Rock & Processed Rock

Pyrite (FeS_2) is the main sulfide mineral in PAG rock and processed rock at the Project (SRK 2022b). Under natural conditions, pyrite is stable in bedrock where it is isolated from atmospheric oxygen. However, following blasting and excavation of the bedrock, pyrite in the rock mined will be exposed to atmospheric oxygen prior to being placed in the management ponds and will begin to oxidize producing sulfate, ferrous iron, and acidity (Rxn1).

$$FeS_{2\,(s)} + \frac{7}{2}O_{2\,(g)} + H_2O_{\,(l)} \leftrightarrow Fe^{2+}{}_{(aq)} + 2SO_4{}^{2-}{}_{(aq)} + 2H^+{}_{(aq)} \text{ (Rxn 1)}$$

Under oxidizing conditions, ferrous iron liberated during sulfide oxidation will subsequently oxidize to ferric iron in neutral pH producing additional acidity according to the following reaction:

$$Fe^{2+}{}_{(aq)} + \frac{1}{4}O_{2\,(g)} + 2\frac{1}{2}H_2O_{\,(l)} \leftrightarrow Fe(OH)_{3\,(s)} + 2H^+{}_{(aq)} \text{ (Rxn 2)}$$

Although oxidation of mine rock and processed rock for the Project will release acidity, acidic conditions are not predicted to occur immediately since these materials also contain carbonate minerals that will neutralize the acid according to the following reactions:

$$CaCO_{3(s)} + H^+{}_{(aq)} \leftrightarrow HCO_3{}^-{}_{(aq)} + Ca^{2+}{}_{(aq)} \text{ (Rxn 3)}$$

$$CaCO_{3(s)} + 2H^+{}_{(aq)} \leftrightarrow H_2CO_{3(aq)} + Ca^{2+}{}_{(aq)} \text{ (Rxn 4)}$$

Depletion calculations (SRK 2022b) indicate that the lag times to acid generation are on the order of years (>5 years based on the average bulk rock properties). The lag time to acid generation prediction based on HCTs was confirmed by the barrel testing results. Barrel 6, which is a composite sample of rock from Zones 6 and 7, became acid generating in October 2023, four years after the barrel program was initiated. SRK (2022b) indicated that these zones were non-PAG based on their average bulk geochemical properties. However, the weighted barrel 6's NPR (0.5) was more closely aligned with the minimum and P5 NPR observed for these zones (see Table 4 in SRK (2022b)). The lag times to the onset of acid generation based on the Zone 6 and 7 minimum NPRs ranged from 3 to 5 years.

TML proposes to place PAG rock identified by verification testing and processed rock in the management ponds under saturated conditions within an average of six months after blasting but no more than 12 months. Theoretically, this will limit sulfide oxidation (i.e., oxygen becomes a limited reactant in reaction 1 limiting oxidation of the PAG rock and coarse and fine processed rock precluding acidic conditions at the Project. However, any oxidation products that are produced prior to placement of PAG rock and processed rock underwater will be flushed and dissolve in water stored in the management ponds.

At closure TML will cap saturated PAG rock and coarse and fine processed rock in the management ponds with non-PAG rock. The non-PAG rock will be below the active water level in the management ponds and will be saturated. Any oxidation products that have accumulated on non-PAG rock surfaces will also be flushed when the rock is placed in the management pond.

3.2 Unsaturated Non-PAG Rock

Non-PAG rock that is not used in the management pond cover will be used to backfill the open pit and used in portions of the embankments and buttresses with approximately 50% remaining unsaturated in

post-closure. Under these conditions, the rock will continually oxidize according to Reaction 1 (see Section 3.1) producing oxidation products that will be dissolved in meteoric water contacting the rock. However, non-PAG rock contains more neutralization potential than acid generating potential and the sulfide is predicted to be consumed prior to the neutralization potential (SRK 2022b) and acidic drainage from exposed non-PAG rock will not occur. The non-PAG rock will provide a continuous source of element load under neutral conditions.

3.3 Overburden

Overburden that is stripped during mining will be mixed with unsaturated waste rock for use in the buttresses and open pit backfill. Overburden has been characterized as having low sulfur content (SRK 2022b) and is classified as non-PAG. The small amount of sulfide in the overburden will oxidize according to Reaction 1 producing oxidation products that will be solubilized by incident precipitation. Like unsaturated waste rock, the overburden will provide a continuous source of element load that is soluble under neutral conditions.

3.4 Open Pit Wall Rock Runoff

Mining of the Tenas Project will result in open pit walls that are exposed to atmospheric oxygen until they are progressively covered with non-PAG rock and/or overburden during the Operation phase with any remaining uncovered open pit walls being covered in the Decommissioning and Reclamation phase. Sulfides that are present in the open pit wall rock will oxidize according to reaction 1 (Section 3.1) producing sulfate, acidity, ferrous iron, and release of trace chalcophile elements. Soluble oxidation products will be flushed from exposed open pit wall surfaces in meteoric water contacting the wall rock.

The open pit will be progressively backfilled with non-PAG rock and/or overburden during operations reducing the exposure of open pit wall to atmospheric oxygen. Oxidation of open pit wall rock that is covered with backfill will be reduced by limiting oxygen ingress.

At closure, two end pit lakes will form in the backfilled open pit. A footwall will exist above the end pit lakes composed mainly of Zone 6 sedimentary rock. Based on the site-specific NPR criterion (2.0), this unit PAG; however, as discussed in Section 2.3.4, the majority of the exposed pit walls will be covered. The end pit lake will be a mixture of wall rock runoff, direct precipitation and runoff from non-PAG backfill.

The pit lake will drain by gravity and mix with the Management Pond before being discharged during closure.

3.5 Processed Coal Stockpile Runoff

Processed coal will be temporarily stored at the Rail Infrastructure area in two stockpiles prior to being transported from the site to Ridley terminals. While the processed coal is stored, it will oxidize but long-term oxidation is not a concern since processed coal will only be stored for short durations prior to being loaded into rail cars. Soluble load from the processed coal stockpiles will be collected in the Rail Infrastructure Sedimentation Pond to allow suspended solids to settle.

4 Source Term Derivation Methods

Consistent with SRK (2022b), source terms using the barrel testing results were developed in two ways: concentrations and load flushing rates. Unsaturated mine rock, overburden and wall rock runoff source terms were expressed as concentrations. Concentrations were estimated by scaling barrel testing results and mixing estimated annual loads in predicted annual volumes of water and evaluating if the predicted concentrations would be limited by secondary mineral precipitation. PAG rock, coarse and fine processed rock and some non-PAG rock will be stored permanently underwater in the management ponds. Solute produced through oxidative weathering once these materials have been exposed will be flushed from rock surfaces when they are placed in the management ponds. The source term for these materials is therefore represented by a flushing term in milligrams per bank cubic metre (mg/bcm) of rock, also estimated using scaled barrel testing results.

Processed rock (e.g., coal and rejects) barrels were not constructed since there was insufficient material available. Source terms for coal and rejects have therefore not been updated. The reader is referred to SRK (2022a) for the coal and reject source terms. The particulate concentrations source term has also not been updated since it is independent of kinetic testing release rates (i.e., it was derived based solid-phase static testing results) and is not included in this report. The reader is referred to SRK (2022a) for details on the derivation methods and results of these source terms.

The following subsections provide the inputs and assumptions for each of the source terms based on the barrel testing results.

4.1 Mine Rock Solute Release Rates

A key input into the source term calculations is the mine rock solute release rates. Barrels were constructed from rock representative of each rock zone and the barrel release rates were used to represent the release rates from individual rock zones. Composite samples for each barrel were prepared from excess sample stored at Bureau Veritas Laboratories in Burnaby, British Columbia. Sample, varying in mass from one to 110 kg were selected for use in the barrels until a minimum mass of 200 kg was achieved. Zones with insufficient sample mass to achieve 200 kg (e.g., Zone 4 PAG and Zone 4 non-PAG) were supplemented with sample from other zones with similar geochemical properties (SRK 2024b).

Leachate sampling from the barrels has been conducted intermittently since October 2019 until present. The source terms only consider samples collected until November 2023. Seven to nine samples have been collected from each barrel during this period. The monitoring results from these sampling events was used to estimate barrel release rates according to the following formula:

$$L_j = C_j * \frac{V}{m} / t \qquad \text{(EQ 1)}$$

Where:

L_j is the load of parameter j expressed in mg/kg/week

C_j is the concentration of parameter j in the leachate sample in mg/L

V is the volume of the sample in L

m is the total mass in the barrel in kg

t is the time between sample events in weeks

The average release rate calculated from each sampling event was used in the source term calculations. As noted in Section 3.1, Barrel 6 began to produce acidic leachate in October 2023. Release rates from this sampling event were not included in the average barrel release rate calculations since the conceptual model for the Project is rock will be managed to minimize acid generation and release rates under acidic conditions are not expected to occur.

As noted above, the barrels were constructed of crushed drill core. This results in the barrel samples having a higher reactive surface area in comparison to rock that will be blasted and used in the pit backfill or construction of the buttresses. Scaling factors were applied to the barrel release rates to account for this difference. Details of the scaling factors that were used are discussed in the following subsections.

4.2 Unsaturated Mine Rock and Overburden

4.2.1 Base Case Source Term

Unsaturated non-PAG rock and overburden will be used as backfill in the open pit as well as in construction of the management pond buttresses. The backfill will become partially saturated as the open pit floods at closure. Unsaturated portions of the backfill will continue to oxidize and produce soluble load that will be mobilized in meteoric water interacting with the mine rock.

Annual unsaturated mine rock concentrations were estimated as follows:

$$C_{j=\frac{L_{j,annual}}{Q_{annual}}} \quad \text{(Eq 2)}$$

Where: C_j is the concentration of constituent j

$L_{j,annual}$ is the annual load of constituent j released from exposed mine rock and/or overburden

Q_{annual} is the annual average flow contacting exposed mine rock and overburden

Source term concentrations using Equation 2 were estimated for the following timeframes:

- Pit Backfill
  - End of East Management Pond (EMP)
  - End of Mining (EOM)
- Buttresses
  - End of North Management Pond (NMP)
  - End of EMP
  - End of West Management Pond (WMP)

These periods were selected to evaluate changes to water quality throughout the life of mine (LOM) at key stages of the mine development. In the source term calculations, mine rock and overburden present in the above timeframes was assumed to be unsaturated and produce soluble load. In reality, a portion of the waste rock will become inundated as the pit is progressively backfilled. This assumption results in a conservative estimate of the pit backfill and buttress drainage water quality.

The mine plan indicates that the buttresses will be constructed using overburden and mine rock sourced from Zones 1 and 4. Table 4-1 provides a summary of the cumulative mine rock and overburden volumes and tonnages associated with each of the model timeframes. Mine rock tonnages were estimated using an assumed density of 2.55 grams per bank cubic centimetre (g/bcc) and a density of 2.0 g/bcc was assumed to estimate overburden tonnages (TML 2024, pers. comm.). The respective barrel release rates were prorated in proportions estimated based on the volumes provided in Table 4-1 to estimate the unit solute release rates for the backfill and buttresses at each of the model timeframes. This rate was multiplied by the total mass at each timeframe to estimate the annual load produced.

As noted in Section 4.1, scaling factors were applied to the barrel release rates to account for testing and operational field differences. A generic scaling factor of 0.2, based on SRK's experience at other coal mines in British Columbia, was applied to account for grain size differences between the barrel tests and mine rock that will be produced during operations. Channelization and temperature scaling factors, which were applied to the HCT release rates (SRK 2022b), were not applied to the barrel release rates. Due to the size of the tests, the barrels will have a higher degree of flushing in comparison to rock stored in the backfill and in the buttresses and additional channelization is expected to occur under operational conditions. It is difficult to quantify the degree of flushing in the barrels and a channelization factor was conservatively not included in the barrel release rate estimates.

The barrels only contain 200 kg of material and will therefore be more susceptible to temperature variations in comparison to the rock and overburden used in the backfill and buttresses which will exhibit internal heating from sulfide oxidation. However, the average temperature of the water samples collected from the barrel tests was approximately 10°C. It is assumed a similar internal temperature will occur in the mine rock backfill and buttresses from oxidation of sulfide minerals and carbonaceous rock and release rates were therefore not corrected for temperature differences.

Table 4-1. Summary of Unsaturated Mine Rock & Overburden Quantities

Facility	Cumulative Volume (bcm)			Cumulative Tonnage (Mt)		
	Mine Rock		Overburden	Mine Rock		Overburden
	Zone 1	Zone 2		Zone 1	Zone 2	
Backfill						
End of EMP	279,370	812,529	500,000	0.7	2.7	1.0
EOM	13,194,743	6,667,067	8,727,775	34	17	17
Buttresses						
End of NMP	706,410	---	2,302,531	1.8	---	4.6
End of EMP	2,043,701	---	5,753,394	5.2	---	12
End of WMP	3,621,260	---	10,666,841	9.2	---	21

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/[Telkwa_backfill_buttress_volume_summary_CAPR002933_mkh_r0.xlsx

The annual scaled release rate was divided by the annual average volume of water contacting unsaturated mine rock (SRK 2024a) using Equation 2 to estimate the annual average constituent concentrations in drainage from unsaturated mine rock and overburden. Predicted water qualities were entered into the publicly available speciation and mass transfer code PHREEQC v.3 (Parkhurst and Appelo 1999), developed by the United States Geological Survey (USGS), to evaluate mineral and gas phases that were supersaturated in solution. The mineral and gas phases included in the model are presented in Table 4-2. Supersaturated mineral phases were allowed to precipitate from solution and

sorption to ferrihydrite was also considered using the default values of Dzombak and Morel (1990). Sorption to ferrihydrite will limit parameters that form oxyanions (e.g., arsenic) and other ligands from remaining in solution.

Table 4-2. Model Equilibrium Phases

Mineral	Empirical Formula	Mineral	Empirical Formula	Mineral	Empirical Formula
Carbon Dioxide	CO_2 (g)	Chalcanthite	$CuSO_4 \cdot 5H_2O$	Calcium Molybdenum Oxide	$CaMoO_4$
Gibbsite	$Al(OH)_3$	Ferrihydrite	$Fe(OH)_3$	Nickel Hydroxide	$Ni(OH)_2$
Otavite	$CdCO_3$	Melanterite	$FeSO_4 \cdot 7H_2O$	Zinc Hydroxide	$Zn(OH)_2$
Brochantite	$Cu_4SO_4(OH)_6$	Anglesite	$PbSO_4$	Smithsonite	$ZnCO_3$
Copper Hydroxide	$Cu(OH)_2$	Birnessite	$MnO_2 \cdot nH_2O$	Goslarite	$ZnSO_4 \cdot 7H_2O$
Malachite	$Cu_2(CO_3)(OH)_2$	Manganite	MnO(OH)	Gypsum	$CaSO_4 \cdot 2H_2O$
Azurite	$Cu_3(CO_3)_2(OH)_2$	Lead Molybdenum Oxide	$PbMoO_4$		

4.2.2 High Case Source Term

To account for variability in the source term inputs, a high case source term was developed. The high case source term was estimated by increasing sulfate concentrations to concentrations that are in equilibrium with gypsum (i.e., sulfate concentrations are assumed to be saturated in solution) under the assumed pH and redox conditions. Equilibrium with gypsum was achieved by incrementally adding anhydrite ($CaSO_4$) to the predicted base case solution (Section 4.2.1) until sulfate concentrations reached steady state. Concentrations of other elements were scaled up in the high source term by preserving the metal sulphate ratios (M/SO_4) in the base case source term. A key assumption in this approach is that elements in the solution are chalcophile which could result in an overprediction of non-chalcophile elements. Mineral saturation was evaluated by equilibrating the high case unsaturated mine rock water quality with the same mineral phases (Table 4-2) as the base case solution.

4.3 Saturated Mine Rock

4.3.1 PAG Rock Flushing Source Term

PAG rock produced during mining of the Tenas deposit will be permanently stored in saturated conditions in the management ponds. Placement of PAG rock in the management ponds will result in flushing of oxidation products accumulating on the surfaces of the PAG following exposure during mining. A unit annual flushing rate, in kilograms per tonne of rock (kg/tonne), was estimated by proportioning scaled barrel solute release rates (Section 4.1) in the relative proportion of each zone to be mined in each year (Table 4-3). The same grain size factor used to estimate loadings from unsaturated waste rock (Section 4.2.1) was applied to estimate the mass flushed from PAG rock.

A key input to the PAG rock flushing source term is the exposure time prior to placement in the management ponds. TCL proposes to have PAG rock including processed rock placed in the management ponds within an average of six months which was used when developing the PAG rock flushing source term. Like the unsaturated mine rock source term, a high case was also developed where PAG mine rock was assumed to be exposed for 12 months.

Table 4-3. Annual PAG Rock Volumes and Relative Proportions

Year	Mine Rock Volume (bcm)								Mine Rock Proportion						
	Zone 1a	Zone 2	Zone 3	Zone 4 (PAG)	Zone 5	Zone 55	Zone 6	Total	Zone 1A	Zone 2	Zone 3	Zone 4 (PAG)	Zone 5	Zone 55	Zone 6
-0.5	---	---	---	77,481	120,526	129,135	---	327,142	---	---	---	0.24	0.37	0.39	---
0	---	101,036	116,673	276,461	270,055	271,264	178,523	1,214,012	---	0.083	0.096	0.23	0.22	0.22	0.15
1	---	179,056	229,804	620,602	320,738	99,933	99,320	1,549,453	---	0.12	0.15	0.4	0.21	0.064	0.064
2	21,889	285,673	321,699	472,335	345,853	151,588	112,489	1,711,526	0.013	0.17	0.19	0.28	0.2	0.089	0.066
3	27,407	155,626	308,582	663,762	353,038	165,727	94,900	1,769,042	0.015	0.088	0.17	0.38	0.2	0.094	0.054
4	130,618	312,373	397,354	613,605	290,367	160,116	75,573	1,980,006	0.066	0.16	0.2	0.31	0.15	0.081	0.038
5	68,844	381,138	593,269	214,295	250,877	182,880	79,710	1,771,013	0.039	0.22	0.33	0.12	0.14	0.1	0.045
6	52,353	327,938	705,510	---	321,128	178,341	175,380	1,760,650	0.03	0.19	0.4	---	0.18	0.1	0.10
7	18,042	198,457	378,872	---	378,932	89,907	66,893	1,131,103	0.016	0.18	0.33	---	0.34	0.079	0.059
8	37,018	388,733	629,396	---	439,200	71,890	151,249	1,717,486	0.022	0.23	0.37	---	0.26	0.042	0.088
9	55,727	316,821	466,150	---	428,117	74,035	97,842	1,438,692	0.039	0.22	0.32	---	0.3	0.051	0.068
10	98,303	381,613	547,361	238,780	386,869	55,623	148,670	1,857,219	0.053	0.21	0.29	0.13	0.21	0.03	0.08
11	76,587	223,829	298,043	569,289	532,297	16,062	116,153	1,832,260	0.042	0.12	0.16	0.31	0.29	0.0088	0.063
12	308,172	257,049	167,938	---	264,424	29,924	119,692	1,147,199	0.27	0.22	0.15	---	0.23	0.026	0.1
13	146,459	198,589	397,430	---	523,609	---	61,069	1,327,156	0.11	0.15	0.3	---	0.39	---	0.046
14	325,128	307,724	365,342	---	495,915	---	95,471	1,589,580	0.2	0.19	0.23	---	0.31	---	0.06
15	201,789	146,756	226,844	---	481,190	---	102,576	1,159,155	0.17	0.13	0.2	---	0.42	---	0.088
16	377,112	302,140	282,975	---	186,028	36,948	55,034	1,240,237	0.3	0.24	0.23	---	0.15	0.03	0.044
17	162,336	261,355	238,266	419,874	434,193	49,875	136,393	1,702,292	0.095	0.15	0.14	0.25	0.26	0.029	0.08
18	55,193	165,578	202,373	386,347	183,975	143,569	69,979	1,207,014	0.046	0.14	0.17	0.32	0.15	0.12	0.058
19	33,669	271,177	390,325	437,687	185,176	101,005	55,193	1,474,232	0.023	0.18	0.26	0.3	0.13	0.069	0.037
20	---	---	---	495,776	188,053	102,575	135,720	922,124	---	---	---	0.54	0.2	0.11	0.15
Total	2,196,646	5,162,661	7,264,206	5,486,294	7,380,560	2,110,397	2,227,829	31,828,593	0.07	0.16	0.23	0.17	0.23	0.07	0.07

Source: P:\01_SITES\Telkwa Coal\1CT027.007_2021 Geochemistry Support\Task 500 - Source Term Memo\Tenas_source_term_rpt_tables_1ct027.007_MKH_r1.xlsx

4.3.2 Non-PAG Rock Flushing Source Term

As PAG material reaches its designed elevation, non-PAG rock will then be placed in lifts above the saturated PAG. Once this lift is completed, overburden is then placed in a maximum of a 3 metre lift to form dry land reclamation. Surface soils will then be placed in a lift thickness of approximately 30 centimetres. The non-PAG rock will be placed in aqueous conditions and the majority of the overburden will be unsaturated. Oxidation products that have accumulated on the non-PAG mine rock following exposure during mining will be flushed from the surfaces as the rock is placed in the management pond.

TML proposes to use non-PAG rock source from Zone 1 in the management pond cover. A unit flushing rate, in kg/tonne, was estimated by scaling the Zone 1 average barrel release rates results to account for differences between testing and operational field conditions. The same scaling factor used to estimate the PAG rock flushing term was applied (i.e., grain size factor). Flushing rates were estimated for six- and 12-month exposure periods.

4.3.3 Flooded non-PAG Rock Backfill

Approximately 50% of the non-PAG rock in the backfill will become flooded in Post-closure. Mass that accumulates in the backfill will be flushed during flooding. As discussed in Section 4.2.1, unsaturated mine rock is not assumed to have a channelization factor and is assumed to have a high leaching efficiency since there is uncertainty in quantifying the degree of channelization in the barrel tests. This provides a conservative estimate of the drainage quality from unsaturated materials, but no mass accumulation will occur using this approach. Therefore, flushing of submerged mass is not accounted for in the source terms.

The water balance model (SRK 2021) indicates there is no hydraulic connection of water stored in the flooded backfill to the management ponds. However, a small volume of the flooded backfill water will report to the groundwater system. Water balancing modelling indicates that the water losses from the flooded backfill represent less than one percent (i.e., 0.4%) of the total flow to the groundwater system. As noted above, there is a high degree of uncertainty in estimating the residual load that will be flushed from the flooded backfill and since the flow is effectively negligible to other flows, a source term was not developed for the flooded non-PAG rock backfill.

4.4 Wall Rock Runoff

Exposed wall rock surfaces will produce oxidative load that will be flushed by meteoric water. An annual pit wall drainage water quality was estimated using equation 2; however, in this instance $L_{j,annual}$ is the annual load of constituent j released from exposed wall rock surfaces and Q_{annual} is the annual average flow contacting the exposed wall rock. TML proposes to progressively backfill the open pit during operations. This will continually change the areas of rock exposed in the pit walls. To evaluate changes to the wall rock runoff composition, source terms were developed for the following time periods, which correspond to backfilling of different areas and volumes placed in the open pit:

- End of placement of PAG rock in the North Management Pond (NMP)
- End of placement of PAG rock in the East Management Pond (EMP)
- End of the Operation Phase (EOM)

The reactive mass of each stratigraphic zone in the open pit walls was estimated by multiplying the exposed surface area of each of the zones in the open pit walls by an assumed depth of fractured rock for each of the above time periods. Surface areas for each time period are provided in Table 4-4. The fractured rock depth was assumed to be two metres for blasted areas and five centimetres for free dig areas and the floor of the pit. A density of 2.55 g/cc was assumed to estimate the reactive mass exposed in the pit walls.

The average release rates from each barrel were prorated in relative proportions calculated based on the exposed surface areas (Table 4-4) to estimate the unit solute release rates for the backfill. As discussed in Section 4.1, barrels tests are not available for processed rock. The approach described in SRK (2022a) was used to represent loadings from exposed coal seams. This rate was multiplied by the total reactive mass in the open pit walls to estimate the annual load produced. The annual load was scaled to field conditions using the grain size differences. Since HCT release rates were used to represent release rates from exposed coal seams, a temperature factor was applied to coal (SRK 2022a). It was assumed that the entire fractured rock zone in the open pit walls would be flushed, and a channelization factor was not included.

The annual scaled release rate was divided by the annual average volume of water contacting wall rock runoff (SRK 2022) to estimate drainage concentrations using equation 2. The annual volume for each time period is presented in Table 4-5. Mineral solubility was evaluated and phases that were identified to be supersaturated in solution were allowed to precipitate or off-gas (for gas phases). Mineral phases that were considered are provided in Table 4-2. Sorption to ferrihydrite was also included when this mineral phase precipitated.

Like the unsaturated mine rock source term, a high case wall rock source term was estimated by forcing the predicted solutions to gypsum saturation through incremental anhydrite addition in PHREEQC. Element sulfate ratios in the base case source term were assumed when calculating concentrations of other constituents. The scaled-up solution was subsequently equilibrated with the mineral phases presented in Table 4-2 and sorption to ferrihydrite was permitted when this mineral phase precipitated.

During operations it is assumed that the pit backfill will be fully oxygenated. Therefore, the wall rock that is below the backfill will also be reactive. A load from the backfilled pit walls was also estimated using the same assumptions as exposed wall rock. The annual load originating from covered walls at the end of EMP and EOM was added to unsaturated mine rock load (Section 4.2). The load was estimated by prorating the scaled barrel loads (and HCT for exposed coal seams) in proportions calculated based on the backfilled pit wall surface areas (Table 4-6).

Table 4-4. Exposed Open Pit Wall Surface Areas (m^2)

Layer	Type	End of NMP	End of EMP	EOM
Zone 1	Blasted Wall	34,151	92,219	15,722
Zone 1a	Blasted Wall	---	3,711	---
Zone 2	Blasted Wall	6,392	22,123	---
Zone 3	Blasted Wall	5,780	33,356	---
Zone 4	Blasted Wall	10,798	47,774	---
Zone 5	Blasted Wall	8,489	25,854	---
Zone 6	Free Dug Wall	356,326	627,457	---
Overburden	Free Dug Wall	81,128	239,685	27,065
Seam C	Free Dug Wall	554	3,197	---
Seam 1U	Free Dug Wall	841	4,412	---
Zone 55	Free Dug Wall	2,697	11,130	---
Seam 1L	Free Dug Wall	1,200	6,944	---

Note: Areas presented in m^2

Table 4-5. Annual Wall Rock Runoff Volumes

Time Period	Volume (m^3/year)
End of NMP	302,720
End of EMP	514,842
EOM	116,847

Table 4-6. Backfilled Open Pit Wall Surface Areas (m^2)

Layer	Type	End of EMP	EOM
Zone 1	Blasted Wall	---	93,749
Zone 1a	Blasted Wall	---	13,191
Zone 2	Blasted Wall	4	9,111
Zone 3	Blasted Wall	54	8,074
Zone 4	Blasted Wall	967	12,457
Zone 5	Blasted Wall	1,088	4,654
Zone 6	Blasted Wall	---	10,331
Zone 7	Blasted Wall	---	36,728
Zone 6	Free Dug Wall	320,672	1,686,406
Overburden	Free Dug Wall	12,000	164,165
Seam C	Free Dug Wall	93	2,515
Seam 1U	Free Dug Wall	233	1,557
Zone 55	Free Dug Wall	1,041	449
Seam 1L	Free Dug Wall	280	3,201
Seam 1	Free Dug Wall	---	1,426

Note: Areas presented in m^2

5 Source Terms

The following sections present the Tenas Project source terms. The source terms do not represent discharge water quality and how the mine rock flushing source terms influence site drainage water quality cannot be quantified until they are carried forward into the site wide water and load balance. Therefore, limited interpretation of the source terms is included in the following sections. Detailed interpretations of the site wide water and load balance model results using these source terms are included in SRK (2024a).

5.1 Unsaturated Mine Rock & Overburden

5.1.1 Pit Backfill Source Term Water Quality

The base case and high case pit backfill source terms for end of EMP and EOM are provided in Table 5-1. The charge imbalance for the base case and high case solutions were less than 10%. This is considered acceptable for a modelled solution that have average inputs from multiple sampling rounds and charge imbalances were not corrected. The pH of solutions is alkaline (8.2 to 8.5) and all modelled constituent concentrations are higher in the high case in comparison to the base case source terms since gypsum was not predicted to be supersaturated in the base case source term and the scaling method (i.e., preserving element/sulfate ratios; see Section 4.2.2) results in constituent concentrations being higher in the high case solutions. Predicted constituent concentrations are higher at the EOM in comparison to the end of EMP source terms because of increased reactive mass in the pit backfill (Table 4-1).

Table 5-1. Pit Backfill Source Term Water Quality

Parameter	Units	Non-PAG Backfill - End of EMP		Non-PAG Backfill - End of EOM	
		Typical	High	Typical	High
Conventional					
pH	s.u.	8.2	8.4	8.3	8.5
% Error	%	-0.3	-0.3	-0.2	-0.2
Alkalinity	mg $CaCO_3$/L	1904	3398	2953	4468
Major Ions					
Calcium	mg/L	53	95	79	119
Magnesium	mg/L	32	57	48	72
Potassium	mg/L	13	23	20	31
Sodium	mg/L	1614	2881	2505	3790
Chloride	mg/L	24	43	37	56
Sulfate	mg/L	1803	3218	2772	4193
Dissolved Elements					
Aluminum	mg/L	0.0045	0.0072	0.0064	0.0089
Antimony	mg/L	0.0029	0.0052	0.0045	0.0069
Arsenic	mg/L	0.0043	0.0078	0.0067	0.01
Barium	mg/L	0.045	0.08	0.069	0.1
Boron	mg/L	0.45	0.8	0.7	1.1
Cadmium	mg/L	0.000095	0.00017	0.00014	0.00021
Chromium	mg/L	0.0018	0.0033	0.0029	0.0043
Cobalt	mg/L	0.015	0.026	0.02	0.03
Copper	mg/L	0.016	0.029	0.025	0.037
Iron	mg/L	0.00012	0.0001	0.00011	0.0001
Lead	mg/L	0.0048	0.0085	0.0074	0.011
Lithium	mg/L	0.14	0.24	0.21	0.32
Manganese	mg/L	0.11	0.19	0.12	0.18
Mercury	mg/L	0.00001	0.000018	0.000016	0.000023
Phosphorus	mg/L	0.026	0.046	0.04	0.06
Molybdenum	mg/L	0.17	0.3	0.26	0.39
Nickel	mg/L	0.029	0.051	0.04	0.061
Selenium	mg/L	0.089	0.16	0.14	0.21
Silica	mg/L	4.6	8.3	7.1	11
Silver	mg/L	0.000074	0.00013	0.00011	0.00017
Strontium	mg/L	0.83	1.5	1.3	1.9
Tin	mg/L	0.00078	0.0014	0.0012	0.0018
Thallium	mg/L	0.000078	0.00014	0.00012	0.00018
Uranium	mg/L	0.019	0.034	0.029	0.044
Vanadium	mg/L	0.004	0.0072	0.0062	0.0095
Zinc	mg/L	0.032	0.058	0.046	0.07

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

5.1.2 Dam/Buttress Source Term Water Quality

The base case and high case dam/buttress source term water quality for end of NMP, end of EMP and end of WMP are provided in Table 5-2. The charge imbalance for the base case and high case solutions were less than 10%. This is considered acceptable for a modelled solution mixing average inputs from multiple HCTs and charge imbalances were not corrected. The pH of solutions is alkaline ranging from 7.6 to 8.3.

The trends in predicted concentrations are like the pit backfill water quality. For example, the modelled constituent concentrations are higher in the high case in comparison to the base case source terms since gypsum was not predicted to be supersaturated in the base case scenario. Constituent concentrations are predicted to increase throughout the LOM because of the reactive mass increasing (Table 4-1).

Table 5-2. Dam/Buttress Source Term Water Quality

Parameter	Units	Dam/Buttress Infiltration - End of NMP		Dam/Buttress Infiltration - End of EMP		Dam/Buttress Infiltration - End of WMP	
		Typical	High	Typical	High	Typical	High
Conventional							
pH	s.u.	7.6	8.2	7.8	8.2	8.0	8.3
% Error	%	-1.5	-1.5	-1.3	-1.4	-1.4	-1.4
Alkalinity	mg $CaCO_3$/L	448	1848	761	2167	1074	2458
Major Ions							
Calcium	mg/L	33	134	50	141	71	163
Magnesium	mg/L	17	69	26	73	37	84
Potassium	mg/L	3.6	15	5.9	17	8.3	19
Sodium	mg/L	334	1380	577	1643	812	1859
Chloride	mg/L	6.5	27	11	31	15	35
Sulfate	mg/L	432	1784	725	2065	1026	2348
Dissolved Elements							
Aluminum	mg/L	0.0017	0.0044	0.0023	0.005	0.0029	0.0055
Antimony	mg/L	0.00064	0.0026	0.0011	0.0031	0.0015	0.0035
Arsenic	mg/L	0.00092	0.0038	0.0015	0.0043	0.0021	0.0049
Barium	mg/L	0.017	0.072	0.028	0.079	0.039	0.09
Boron	mg/L	0.099	0.41	0.17	0.48	0.24	0.55
Cadmium	mg/L	0.000021	0.000089	0.000036	0.0001	0.000051	0.00012
Chromium	mg/L	0.00045	0.0019	0.00076	0.0022	0.0011	0.0025
Cobalt	mg/L	0.0025	0.01	0.0043	0.012	0.0061	0.014
Copper	mg/L	0.01	0.043	0.016	0.046	0.023	0.053
Iron	mg/L	0.00032	0.00012	0.00021	0.00012	0.00017	0.00011
Lead	mg/L	0.001	0.0043	0.0018	0.0051	0.0025	0.0058
Lithium	mg/L	0.028	0.11	0.048	0.14	0.067	0.15
Manganese	mg/L	0.034	0.14	0.052	0.15	0.074	0.17
Mercury	mg/L	0.0000031	0.000013	0.000005	0.000014	0.0000071	0.000016
Phosphorus	mg/L	0.014	0.056	0.021	0.059	0.03	0.069
Molybdenum	mg/L	0.034	0.14	0.058	0.16	0.082	0.19
Nickel	mg/L	0.0055	0.023	0.0093	0.027	0.013	0.03
Selenium	mg/L	0.028	0.12	0.045	0.13	0.065	0.15
Silica	mg/L	2.3	9.6	3.6	10	5.2	12
Silver	mg/L	0.000018	0.000073	0.00003	0.000085	0.000042	0.000096
Strontium	mg/L	0.27	1.1	0.43	1.2	0.61	1.4
Tin	mg/L	0.00019	0.00077	0.00032	0.0009	0.00045	0.001
Thallium	mg/L	0.000018	0.000073	0.00003	0.000085	0.000042	0.000096
Uranium	mg/L	0.0049	0.02	0.0082	0.023	0.012	0.026
Vanadium	mg/L	0.00088	0.0036	0.0015	0.0042	0.0021	0.0048
Zinc	mg/L	0.009	0.037	0.015	0.042	0.021	0.047

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

5.2 Saturated Mine Rock

Saturated rock flushing terms are presented in kg/tonne. The influence of flushing of rock as it is placed in the management ponds cannot be quantified until it is carried forward into the water and load balance. Annual PAG rock flushing rates for the six- and 12-month exposure periods are provided in Table 5-3 and Table 5-4, respectively. The non-PAG rock flushing source terms are provided in Table 5-5, respectively.

Table 5-3. PAG Rock Annual Flushing Source Term – Six Month Average Exposure

Parameter	Units	-0.5	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Conventional																							
Alkalinity	kg CaCO3/tonne	0.005	0.005	0.008	0.006	0.008	0.006	0.003	0.001	0.001	0.001	0.001	0.003	0.006	0.001	0.001	0.001	0.001	0.001	0.005	0.007	0.006	0.011
Major Ions																							
Calcium	kg/tonne	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Magnesium	kg/tonne	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0009	0.001	0.00
Potassium	kg/tonne	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Sodium	kg/tonne	0.009	0.0087	0.01	0.009	0.01	0.011	0.008	0.007	0.007	0.007	0.007	0.009	0.011	0.015	0.01	0.013	0.012	0.015	0.0116	0.01082	0.01	0.012
Chloride	kg/tonne	0.00012	0.00012	0.00014	0.00013	0.00014	0.00014	0.00011	0.0001	0.0001	0.0001	0.0001	0.00012	0.00014	0.00014	0.00011	0.00013	0.00012	0.00014	0.00014	0.00014	0.00013	0.00016
Sulfate	kg/tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.03	0.03	0.03	0.04	0.02	0.021	0.02	0.02
Elements																							
Aluminum	kg/tonne	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.00000	0.00000	0.0000	0.00000	0.00000	0.00000	0.000001	0.00000	0.00000	0.00000	0.0000001	0.00000	0.0000008	0.000001	0.000001	0.000002
Antimony	kg/tonne	9.9E-09	0.00000001	1.3E-08	1.1E-08	1.3E-08	1.2E-08	0.00000001	0.0000000	0.0000000	3.7E-09	4.1E-09	7.4E-09	1.2E-08	7.6E-09	5.3E-09	6.7E-09	6.3E-09	8.1E-09	1.1E-08	0.00000001	1.1E-08	1.7E-08
Arsenic	kg/tonne	1.0E-08	0.00000001	0.00000001	1.1E-08	1.3E-08	1.2E-08	0.00000001	0.0000000	0.0000000	3.9E-09	4.2E-09	7.5E-09	1.2E-08	7.7E-09	5.4E-09	6.8E-09	6.5E-09	8.2E-09	1.1E-08	1.2E-08	0.00000001	0.00000002
Barium	kg/tonne	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.000000	0.00000	0.00000	0.0000001	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000001	0.00000	0.0000001	0.00000
Boron	kg/tonne	0.000002	0.000001	0.000002	0.000002	0.000002	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.000002	0.000002	0.000003
Cadmium	kg/tonne	4.3E-10	8.9E-10	7.0E-10	0.0000000	0.0000000	6.2E-10	5.3E-10	0.0000000	5.0E-10	5.9E-10	0.0000000	6.5E-10	0.0000000	0.0000000	0.0000000	6.3E-10	0.0000000	0.0000000	7.4E-10	6.7E-10	5.8E-10	0.0000000
Chromium	kg/tonne	8.8E-09	8.5E-09	1.1E-08	9.2E-09	1.0E-08	0.00000001	0.00000001	0.00000001	0.00000001	5.9E-09	6.2E-09	8.0E-09	1.0E-08	9.8E-09	7.4E-09	8.8E-09	8.4E-09	1.0E-08	1.0E-08	1.0E-08	9.6E-09	1.2E-08
Cobalt	kg/tonne	0.00000	0.0000005	0.00000	0.00000	0.00000	0.00000	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.00000	0.000001	0.000001	0.000001	0.000001	0.00000	0.0000005	0.0000004	0.00000	0.00000
Copper	kg/tonne	0.00000003	0.00000002	0.00000004	0.00000003	0.00000004	0.00000003	0.00000002	0.00000001	0.00000001	0.00000001	0.00000001	0.00000002	0.00000003	0.00000002	0.00000001	0.00000001	0.00000001	0.00000002	2.9E-08	0.00000003	0.00000003	0.00000005
Iron	kg/tonne	0.000001	0.000001	0.000002	0.000002	0.000002	0.000002	0.000001	0.00000	0.00000	0.00000	0.00000	0.000001	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.0000019	0.000002	0.000003
Lead	kg/tonne	1.3E-08	1.3E-08	2.1E-08	1.5E-08	2.0E-08	1.7E-08	8.0E-09	2.1E-09	2.1E-09	2.1E-09	2.2E-09	8.4E-09	1.7E-08	4.0E-09	2.8E-09	3.5E-09	3.3E-09	4.3E-09	1.4E-08	1.8E-08	1.6E-08	2.8E-08
Lithium	kg/tonne	0.0000011	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000011	0.000001	0.000001	0.000001
Manganese	kg/tonne	0.0000	0.00001	0.000	0.000	0.000	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.00000518	0.000	0.000
Mercury	kg/tonne	4.2E-11	3.8E-11	4.5E-11	3.9E-11	4.4E-11	4.0E-11	3.0E-11	2.4E-11	2.5E-11	2.4E-11	2.5E-11	3.0E-11	4.1E-11	2.6E-11	2.6E-11	2.6E-11	2.7E-11	2.5E-11	3.8E-11	4.1E-11	3.8E-11	5.3E-11
Phosphorus	kg/tonne	0.000000	0.000000	0.0000001	0.000000	0.0000001	0.0000001	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.0000001	0.0000001	0.000000	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001
Molybdenum	kg/tonne	0.00000043	0.0000004	0.00000067	0.00000047	0.00000063	0.00000055	0.00000023	0.00000004	0.00000004	0.00000003	0.00000004	0.00000025	0.00000054	0.00000013	0.00000007	0.00000011	9.9E-08	1.4E-07	4.6E-07	0.0000006	0.00000051	0.00000089
Nickel	kg/tonne	0.00000	0.000001	0.000001	0.0000	0.0000	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.00000054	0.000001	0.0000
Selenium	kg/tonne	0.00000046	0.0000004	0.00000044	0.00000043	0.00000049	0.00000066	0.00000044	0.00000035	0.00000032	0.00000032	0.00000041	0.00000051	0.00000057	0.00000138	0.00000073	0.00000112	0.00000101	0.00000151	0.00000077	0.0000006	0.00000046	0.00000053
Silica	kg/tonne	0.00001	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002
Silver	kg/tonne	4.9E-10	4.4E-10	5.0E-10	4.7E-10	5.1E-10	5.6E-10	4.4E-10	3.8E-10	3.8E-10	3.7E-10	4.0E-10	4.7E-10	5.3E-10	7.6E-10	5.2E-10	6.6E-10	6.3E-10	8.1E-10	5.9E-10	5.4E-10	4.8E-10	5.6E-10
Strontium	kg/tonne	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00002	0.00002	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001
Tin	kg/tonne	0.0000000	0.0000000	0.00000001	0.0000000	0.00000001	0.00000001	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.0000000	0.00000001
Thallium	kg/tonne	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Uranium	kg/tonne	0.00000006	0.00000005	0.00000008	6.5E-08	8.3E-08	0.00000008	0.00000004	0.00000002	0.00000002	0.00000002	0.00000002	4.8E-08	7.7E-08	7.1E-08	4.0E-08	5.9E-08	5.3E-08	7.9E-08	7.7E-08	0.00000008	7.0E-08	0.00000011
Vanadium	kg/tonne	0.00000002	0.00000002	0.00000002	0.00000002	0.00000003	0.00000003	0.00000002	0.00000002	0.00000002	0.00000002	0.00000002	0.00000002	0.00000003	0.00000004	0.00000003	0.00000003	0.00000003	0.00000004	2.9E-08	0.00000003	2.4E-08	0.00000003
Zinc	kg/tonne	0.00000	0.0000007	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000006	0.000001	0.000001

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

Table 5-4. PAG Rock Annual Flushing Source Term – 12 Month Average Exposure

Parameter	Units	-0.5	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Conventional																							
Alkalinity	kg $CaCO_3$/tonne	0.011	0.01	0.016	0.012	0.015	0.013	0.006	0.001	0.001	0.001	0.001	0.006	0.013	0.002	0.002	0.002	0.002	0.002	0.011	0.013	0.012	0.021
Major Ions																							
Calcium	kg/tonne	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Magnesium	kg/tonne	0.001	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.003	0.003	0.003	0.002	0.003	0.002	0.0018	0.002	0.001
Potassium	kg/tonne	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
Sodium	kg/tonne	0.019	0.0174	0.02	0.019	0.021	0.023	0.017	0.014	0.013	0.013	0.015	0.018	0.021	0.029	0.019	0.025	0.024	0.031	0.0233	0.02164	0.019	0.024
Chloride	kg/tonne	0.00024	0.00024	0.00029	0.00026	0.00029	0.00029	0.00023	0.0002	0.00019	0.00019	0.0002	0.00024	0.00028	0.00027	0.00022	0.00025	0.00024	0.00028	0.00028	0.00028	0.00027	0.00032
Sulfate	kg/tonne	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.07	0.05	0.06	0.06	0.07	0.05	0.042	0.04	0.04
Elements																							
Aluminum	kg/tonne	0.000002	0.000002	0.000003	0.000002	0.000002	0.000002	0.000001	0.00000	0.0000	0.00000	0.00000	0.000001	0.000002	0.00000	0.00000	0.00000	0.0000001	0.00000	0.0000017	0.000002	0.000002	0.000004
Antimony	kg/tonne	2.0E-08	0.00000002	2.7E-08	2.1E-08	2.6E-08	2.4E-08	0.00000001	0.00000001	0.00000001	7.5E-09	8.1E-09	1.5E-08	2.4E-08	1.5E-08	1.1E-08	1.3E-08	1.3E-08	1.6E-08	2.2E-08	0.00000002	2.2E-08	3.4E-08
Arsenic	kg/tonne	2.0E-08	0.00000002	0.00000003	2.1E-08	2.6E-08	2.4E-08	0.00000001	0.00000001	0.00000001	7.7E-09	8.4E-09	1.5E-08	2.4E-08	1.5E-08	1.1E-08	1.4E-08	1.3E-08	1.6E-08	2.2E-08	2.4E-08	0.00000002	0.00000003
Barium	kg/tonne	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.0000001	0.00000	0.00000	0.0000003	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000002	0.00000	0.0000002	0.00000
Boron	kg/tonne	0.000003	0.000003	0.000004	0.000003	0.000004	0.000004	0.000002	0.000001	0.000001	0.000001	0.000001	0.000002	0.000004	0.000002	0.000002	0.000002	0.000002	0.000002	0.000003	0.000004	0.000003	0.000005
Cadmium	kg/tonne	8.7E-10	1.8E-09	1.4E-09	0.0000000	0.0000000	1.2E-09	1.1E-09	0.0000000	1.0E-09	1.2E-09	0.0000000	1.3E-09	0.0000000	0.0000000	0.0000000	1.3E-09	0.0000000	0.0000000	1.5E-09	1.3E-09	1.2E-09	0.0000000
Chromium	kg/tonne	1.8E-08	1.7E-08	2.1E-08	1.8E-08	2.1E-08	0.00000002	0.00000002	0.00000001	0.00000001	1.2E-08	1.2E-08	1.6E-08	2.0E-08	2.0E-08	1.5E-08	1.8E-08	1.7E-08	2.1E-08	2.0E-08	2.1E-08	1.9E-08	2.5E-08
Cobalt	kg/tonne	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000009	0.0000009	0.000001	0.000001
Copper	kg/tonne	0.00000005	0.00000005	0.00000007	0.00000006	0.00000007	0.00000006	0.00000004	0.00000002	0.00000002	0.00000002	0.00000002	0.00000004	0.00000006	0.00000003	0.00000002	0.00000003	0.00000003	0.00000003	5.7E-08	0.00000006	0.00000006	0.00000009
Iron	kg/tonne	0.000003	0.000003	0.000004	0.000003	0.000004	0.000004	0.000002	0.000001	0.000001	0.000001	0.000001	0.000002	0.000004	0.000002	0.000001	0.000001	0.000001	0.000002	0.000003	0.0000037	0.000003	0.000006
Lead	kg/tonne	2.7E-08	2.6E-08	4.2E-08	3.0E-08	4.0E-08	3.4E-08	1.6E-08	4.2E-09	4.1E-09	4.1E-09	4.4E-09	1.7E-08	3.4E-08	8.1E-09	5.6E-09	7.1E-09	6.7E-09	8.6E-09	2.9E-08	3.5E-08	3.2E-08	5.5E-08
Lithium	kg/tonne	0.0000022	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.000002	0.0000023	0.000002	0.000002	0.000002
Manganese	kg/tonne	0.00001	0.00001	0.000	0.000	0.000	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.000	0.000	0.000	0.00001	0.000	0.000	0.00001	0.00001037	0.000	0.000
Mercury	kg/tonne	8.4E-11	7.7E-11	9.0E-11	7.7E-11	8.8E-11	8.0E-11	6.0E-11	4.8E-11	5.0E-11	4.8E-11	4.9E-11	6.1E-11	8.2E-11	5.3E-11	5.2E-11	5.2E-11	5.4E-11	5.1E-11	7.6E-11	8.2E-11	7.7E-11	1.1E-10
Phosphorus	kg/tonne	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000001	0.0000002	0.0000001	0.0000001	0.0000001	0.0000002	0.0000001	0.0000001	0.0000001	0.0000001
Molybdenum	kg/tonne	0.00000086	0.0000008	0.00000134	0.00000095	0.00000127	0.00000109	0.00000047	0.00000007	0.00000008	0.00000007	0.00000009	0.0000005	0.00000108	0.00000026	0.00000015	0.00000021	2.0E-07	2.8E-07	9.2E-07	0.0000011	0.00000101	0.00000178
Nickel	kg/tonne	0.000001	0.000001	0.000001	0.0000	0.0000	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.0000	0.0000	0.0000	0.000001	0.0000	0.0000	0.000001	0.00000109	0.000001	0.0000
Selenium	kg/tonne	0.00000092	0.0000008	0.00000087	0.00000086	0.00000099	0.00000132	0.00000089	0.00000071	0.00000064	0.00000064	0.00000081	0.00000102	0.00000115	0.00000277	0.00000145	0.00000223	0.00000202	0.00000303	0.00000154	0.0000012	0.00000091	0.00000106
Silica	kg/tonne	0.00002	0.00002	0.00003	0.00002	0.00003	0.00003	0.00002	0.00001	0.00001	0.00001	0.00001	0.00002	0.00003	0.00001	0.00001	0.00001	0.00001	0.00001	0.00002	0.00003	0.00003	0.00004
Silver	kg/tonne	9.7E-10	8.9E-10	9.9E-10	9.4E-10	1.0E-09	1.1E-09	8.9E-10	7.7E-10	7.5E-10	7.4E-10	8.1E-10	9.3E-10	1.1E-09	1.5E-09	1.0E-09	1.3E-09	1.3E-09	1.6E-09	1.2E-09	1.1E-09	9.7E-10	1.1E-09
Strontium	kg/tonne	0.00003	0.00003	0.00002	0.00002	0.00002	0.00002	0.00003	0.00003	0.00003	0.00003	0.00003	0.00003	0.00002	0.00004	0.00003	0.00004	0.00004	0.00004	0.00003	0.00002	0.00002	0.00002
Tin	kg/tonne	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000001	0.00000002	0.00000001	0.00000001	0.00000001	0.00000002	0.00000001	0.00000001	0.00000001	0.00000001
Thallium	kg/tonne	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Uranium	kg/tonne	0.00000012	0.00000011	0.00000017	1.3E-07	1.7E-07	0.00000016	0.00000009	0.00000004	0.00000004	0.00000004	0.00000005	9.6E-08	1.5E-07	1.4E-07	7.9E-08	1.2E-07	1.1E-07	1.6E-07	1.5E-07	0.00000016	1.4E-07	0.00000021
Vanadium	kg/tonne	0.00000005	0.00000004	0.00000005	0.00000005	0.00000005	0.00000006	0.00000004	0.00000004	0.00000004	0.00000004	0.00000004	0.00000005	0.00000005	0.00000008	0.00000005	0.00000007	0.00000006	0.00000008	5.9E-08	0.00000005	4.8E-08	0.00000006
Zinc	kg/tonne	0.000001	0.0000014	0.000001	0.000001	0.000001	0.000001	0.000001	0.000002	0.000001	0.000002	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.000001	0.0000011	0.000001	0.000001

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

Table 5-5. Non-PAG Rock Flushing Source Term

Parameter	Units	Six Month Exposure	Twelve Month Exposure
Conventional			
Alkalinity	kg $CaCO_3$/tonne	0.019	0.0381
Major Ions			
Calcium	kg/tonne	0.00	0.00
Magnesium	kg/tonne	0.0001	0.00
Potassium	kg/tonne	0.00012	0.00024
Sodium	kg/tonne	0.01607	0.03214
Chloride	kg/tonne	0.00022	0.00044
Sulfate	kg/tonne	0.016	0.03
Elements			
Aluminum	kg/tonne	0.0000032	0.000006
Antimony	kg/tonne	2.8E-08	5.6E-08
Arsenic	kg/tonne	2.8E-08	5.6E-08
Barium	kg/tonne	0.0000003	0.000001
Boron	kg/tonne	0.0000044	0.000009
Cadmium	kg/tonne	7.9E-10	1.6E-09
Chromium	kg/tonne	1.8E-08	3.6E-08
Cobalt	kg/tonne	0.00000011	0.00000022
Copper	kg/tonne	7.8E-08	0.00000016
Iron	kg/tonne	0.0000048	0.00001
Lead	kg/tonne	4.9E-08	9.9E-08
Lithium	kg/tonne	0.0000013	0.0000026
Manganese	kg/tonne	0.00000	0.000001
Mercury	kg/tonne	7.3E-11	1.5E-10
Phosphorus	kg/tonne	0.00000011	0.0000002
Molybdenum	kg/tonne	1.6E-06	0.00000324
Nickel	kg/tonne	0.00000024	0.0000005
Selenium	kg/tonne	0.00000069	0.0000014
Silica	kg/tonne	0.000029	0.00006
Silver	kg/tonne	7.1E-10	1.4E-09
Strontium	kg/tonne	0.000006	0.00001
Tin	kg/tonne	0.00000001	0.00000001
Thallium	kg/tonne	0.0000000	0.0000000
Uranium	kg/tonne	1.8E-07	3.7E-07
Vanadium	kg/tonne	3.6E-08	7.1E-08
Zinc	kg/tonne	0.00000024	0.0000005

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

5.3 Open Pit Wall Rock Runoff

The base case and high case open pit wall rock runoff source terms for the End of NMP, End of EMP and EOM are provided in Table 5-6. The charge balance in of the wall rock source terms is less than 10%, which is considered reasonable for solutions based on averaging several release rates in the field barrel tests. The pH of solutions was alkaline (7.4 to 8.1) and maximum pit wall runoff concentrations occurred at the end of the EMP since this timeframe represents the maximum exposure of pit wall and has the highest reactive mass (Table 4-6).

Most of the constituents were higher in the high case source term in comparison to the base case. Concentrations of iron were lower in the high case source terms. Iron concentrations are low in both scenarios since it is solubility constrained through ferrihydrite ($Fe(OH)_3$) precipitation. Lower iron concentrations occur in the high case source term since these solutions are more alkaline reducing the ferrihydrite solubility (i.e., more ferrihydrite is predicted to precipitate in the high case scenario).

Table 5-6. Open Pit Wall Rock Runoff Source Terms

Parameter	Units	Open Pit Wall Runoff - End of NMP		Open Pit Wall Runoff - End of EMP		Open Pit Wall Runoff - EOM	
		Typical	High	Typical	High	Typical	High
Conventional							
pH	s.u.	7.4	7.8	7.6	7.8	7.4	8.1
% Error	%	-0.3	-0.3	0.5	0.5	-0.3	-0.3
Alkalinity	mg $CaCO_3$/L	24	837	40	718	27	1662
Major Ions							
Calcium	mg/L	2	58	4	65	0	15
Magnesium	mg/L	2	53	3	61	0	13
Potassium	mg/L	0	7	0	7	0	11
Sodium	mg/L	26.3	906.0	47	856	23	1404
Chloride	mg/L	0.4	12.7	0.7	11.8	0.3	19.2
Sulfate	mg/L	42	1442	81	1469	23	1432
Dissolved Elements							
Aluminum	mg/L	0.0013	0.0024	0.0016	0.0022	0.0014	0.0041
Antimony	mg/L	0.00004	0.00136	0.00007	0.00122	0.00004	0.00246
Arsenic	mg/L	0.00005	0.00167	0.0001	0.002	0.00	0.002
Barium	mg/L	0.0006	0.0193	0.0011	0.0198	0.0005	0.03
Boron	mg/L	0.01	0.21	0.01	0.19	0.01	0.39
Cadmium	mg/L	0.0000	0.00013	0.00001	0.00015	0.0000	0.00007
Chromium	mg/L	0.00003	0.00097	0.00005	0.00089	0.00003	0.00156
Cobalt	mg/L	0.001	0.034	0.0017	0.0306	0.0002	0.0098
Copper	mg/L	0.0001	0.0038	0.0002	0.0035	0.0001	0.0068
Iron	mg/L	0.00047	0.00021	0.00031	0.00024	0.00042	0.00013
Lead	mg/L	0.00006	0.00219	0.0001	0.0019	0.00007	0.00432
Lithium	mg/L	0.003	0.09	0.005	0.09	0.0019	0.12
Manganese	mg/L	0.01	0.43	0.022	0.4	0.0005	0.03
Mercury	mg/L	0.00000	0.000005	0.00000	0.000006	0.00000	0.000006
Phosphorus	mg/L	0.0002	0.007	0.0004	0.0074	0.0002	0.0096
Molybdenum	mg/L	0.0021	0.0725	0.0035	0.0636	0.0023	0.1413
Nickel	mg/L	0.001	0.047	0.0023	0.041	0.0003	0.021
Selenium	mg/L	0.001	0.04	0.002	0.042	0.001	0.06
Silica	mg/L	0.05	1.6	0.1	1.5	0.04	2.5
Silver	mg/L	0.0000012	0.0000425	0.0000023	0.0000411	0.000001	0.000062
Strontium	mg/L	0.02	0.79	0.05	0.82	0.01	0.52
Tin	mg/L	0.00002	0.00062	0.00004	0.00074	0.00001	0.00065
Thallium	mg/L	0.000003	0.000108	0.000008	0.000152	0.000001	0.000062
Uranium	mg/L	0.00024	0.00829	0.0004	0.0075	0.0003	0.0161
Vanadium	mg/L	0.0001	0.0022	0.0001	0.0022	0.0001	0.0031
Zinc	mg/L	0.001	0.049	0.0025	0.0448	0.0003	0.0211

Source: https://srk.sharepoint.com/sites/NACAPR002933/Internal/Task 500 Source Term Updates/01_Source_term_updates/02_Input_files/[TelkwaSourceTerms_Barrel_Loads_Sc2_CAPR002933_mkh_r4.xlsx

6 Summary

SRK (2022a) developed geochemical source terms by scaling HCT testing results to field conditions. A comparison to the scaled HCT and barrel testing results indicated that the release rates of some constituents are higher in the barrels in comparison to the HCT. The geochemical source terms were updated using the barrel release rates. The barrel release rates are considered more appropriate for estimating site drainage water quality because they are more representative of solute release rates under field conditions.

Barrels were constructed using mine rock sample rejects and overburden. Insufficient processed rock (e.g., coal, coarse rejects, etc.) sample precluded barrels being constructed for these materials. Base The following source terms were updated using the barrel testing results:

- Unsaturated non-PAG & overburden
  - Pits backfill
  - Dams/buttresses
- Saturated non-PAG rock
- Saturated PAG rock
- Open pit wall rock runoff

The following source terms were not updated and the SRK (2022a) source terms remain current:

- Processed rock
- Processed coal stockpile runoff
- Particulate concentrations

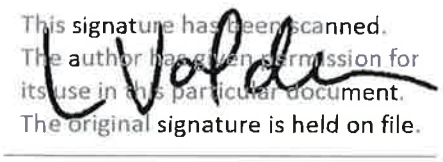
The above source terms will be carried forward into the site wide water and load balance to evaluate the mixed project discharge water quality. To evaluate uncertainty in the model, both the base case and high case scenarios should be evaluated.

Closure

This report, Updated Water Quality Model Source Terms, was prepared by

Michael Herrell, MSc, PGeo
Principal Consultant (Geochemistry)

and reviewed by



Laura Volden, MSc, PGeo
Senior Consultant (Geochemistry)

EGBC Permit to Practice Reg. No.: EGBC 1003655

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendix B Tenas Project - Suboxic Evaluation of Non-Acid Generating Mine Rock

Prepared for Telkwa Mining Ltd. OKane August 2024

Tenas Project - Suboxic Evaluation of Non-Acid Generating Mine Rock

August 2, 2024

TELKWA MINING LIMITED

okane

Integrated Mine Closure and Relinquishment Solutions

Tenas Project - Suboxic Evaluation of Non-Acid Generating Mine Rock

1288-221-002

August 2024

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Rev. #	Status	Rev. Date	Author	Reviewer Sign-off	Major Changes
A	Draft	April 11, 2024	J. Steeves / J. Paulsen	J. Robertson	Initial Version
B	Draft	May 14, 2024	J. Paulsen / T. Tuchiwsky	J. Robertson / M. O'Kane	Minor Edits / Section 6
C	Draft	June 28, 2024	J. Paulsen / J. Steeves	J. Robertson / R. Shurniak	Adding Additional Scenarios

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EXECUTIVE SUMMARY

Okane Consultants (Okane) are providing support to evaluate the development of suboxic conditions for the backfill of non-potentially acid generation (NAG) mine rock into the Open Pit for Telkwa Mining Limited (Telkwa) at their proposed Tenas Project in northwest British Columbia. The current scope focuses on placement of NAG mine rock. The objective of the scope was to develop geochemical source terms for the backfilled mine rock that reflect the construction and reclamation schedule, and the resulting hydrological and oxygen conditions of the backfill.

The source terms were developed using a two-dimensional oxygen model to evaluate the size, location, and timing of suboxic (low oxygen concentration) conditions within the NAG backfill. The formation of suboxic conditions limits oxidation rates of sulfide minerals and decreases the loads of constituents of interest released from sulfide oxidation to the receiving environment. The source terms will be used as inputs for the site-wide water quality model that integrates seepage and chemical loads from all mine domains to understand the overarching water quality effects of the Project on the receiving environment. All years presented herein refer to mine plan years.

Three scenarios were chosen to evaluate the development of suboxic conditions. The three scenarios were:

- Scenario #1: Poorly graded till and sandstone mine rock;
- Scenario #2: Well graded till and mine rock mix (60% siltstone, 35% mudstone, and 5% sandstone);
- Scenario #3: Well graded till and mine rock mix (60% siltstone, 35% mudstone, and 5% sandstone) with no internal cover layers.

During the covered time period for all modelled scenarios, two sequential cover surface conditions (grass cover followed by the establishment of mature forest) were used to simulate the maturing of vegetation on the cover system. These surface conditions affected how oxygen and water move into the cover material and underlying NAG backfill. For a five-year period directly after cover placement the simulation used a grass surface; following this five-year period, a forest surface was used for the remainder of the model timeframe.

GoldSim seepage modelling for the NAG backfill demonstrated a significant reduction in stabilized seepage rates between the modelled scenarios. Stabilized seepage rates for Scenarios #2 and #3 were approximately half of the stabilized rates for Scenario #1. The modelling also demonstrated that the NAG backfill will be wetted up after approximately 40 years in Scenario #1 and approximately 80 years in Scenarios #2 and #3 due to differences in material texture in the cover system. Modelling demonstrated that suboxic conditions within Scenario #1 took approximately 15 years to develop and approximately 13 years in Scenarios #2 and #3 once the cover system was placed. Depths to suboxic conditions varied between the scenarios due to differences in oxygen ingress and net percolation. Scenario #1 had a

long-term depth to suboxia of approximately 15 m while Scenarios #2 and #3 had a long-term depth to suboxia of approximately 3 m.

Estimated stored water volumes increase as mine rock is placed during construction and stabilize after approximately 15 years when construction has ended. Similar to seepage results, the stored water volumes stabilize after approximately 40 years for Scenario #1 and 70-80 years for Scenarios #2 and #3. Stored water volumes in the NAG backfill are predicted to be lower in Scenarios #2 and #3 relative to Scenario #1.

Source terms were developed for Scenarios #1, #2, and #3 using a reactive transport modelling approach. Reactive transport modelling was used to simulate the weathering of sulfide and carbonate minerals and resulting concentrations of related dissolved constituents using mechanistic kinetic weathering rates controlled by the geochemical setting of the NAG backfill. For constituents not directly controlled by sulfide oxidation and carbonate dissolution, a constant loading rate scale-up model was used to develop source terms. The geochemical models were calibrated to on-site kinetic barrel tests containing NAG mine rock and subsequently applied to the full-scale NAG backfill geometry.

The geochemical model incorporated changing cover system surface conditions by changing net percolation into the model for each time period (bare mine rock, grass coverage, and forest coverage). The effects of suboxic zones were simulated by limiting pyrite oxidation to depths where oxygen models simulated oxic conditions.

In general, concentrations for modelled parameters were similar between all scenarios. Although it was evident that less pyrite oxidation was occurring in the Scenario #2 and #3 models due to the larger suboxic zones, which resulted in lower mass release of oxidation products, decreased infiltrating water volumes (i.e., less dilution) in these scenarios resulted in similar concentrations as seen in Scenario #1. The primary benefit of the well-graded cover system scenarios is the overall decrease of released load of oxidation products (e.g., selenium and sulfate) from the NAG backfill. Scenarios #2 and #3 consistently had lower chemical loading relative to Scenario #1 resulting in approximately half the mass of oxidation products released from the NAG backfill on an annual basis. Scenarios #2 and #3 had similar chemical loading due to similar lag-times to suboxic zone development and depth to suboxic conditions. Additionally, geochemical source terms of the NAG backfill from the current model were comparable, although generally slightly lower, than source terms initially developed for the backfill (SRK, 2022a). The NAG backfill source terms from this modelling work will be integrated into the site wide load balance model to quantify the effects of the backfill on water quality around the Tenas project.

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1 INTRODUCTION

1.1 Project Description

Telkwa Mining Limited (Telkwa) are proposing to develop the Tenas Project (Project), located approximately 25 km southwest of the town of Smithers in northwest British Columbia (BC) within the Telkwa and Bulkley River watersheds. The Project consists of an open pit, backfill, external stockpiles, water management ponds, control ponds, coal processing plant, and rail infrastructure. Elevation of the Project ranges from 750 to 1,050 meters above sea level (masl), with a median elevation of 800 masl. The Project is within the Ministry of Environment and Climate Change Strategy (MECCS) Zone 8 – Nechako Plateau, close to the border with Zone 9 – Southern Hazelton Mountains (Ahmed and Jackson, 2013). The MECCS hydrological zones are areas of homogeneous hydrologic and geomorphic characteristics.

1.2 Project Objectives and Scope

Okane Consultants (Okane) is providing support to develop source terms for three scenarios of backfill NAG mine rock in lifts using bottom-up construction methodology with overburden covers within the Open Pit provided by Telkwa. The objective of the backfilled design is to limit oxygen and water ingress to minimize the release of potential contaminants of concern such as selenium and sulfate to the receiving environment.

A geochemical model that incorporated both a mechanistic reactive transport model and geochemical scale-up model was developed to simulate long-term water quality of mine rock backfilled into the Open Pit. Seepage water quality results from the geochemical model were developed as source terms to be used in the Tenas site-wide water quality model developed by SRK Consulting (SRK).

1.3 Report Organization

For convenient reference, this report has been subdivided into the following sections:

- Section 2 – Provides pertinent background information for this study;
- Section 3 – Description of modelling processes;
- Section 4 – Modelling results and discussion; and
- Section 5 – Conclusions of the modelling work.

2 BACKGROUND

Source control of contaminants of interest (COIs) is a cutting-edge practice. It demonstrates a significant commitment to minimizing water quality impacts in the region to both regulators and stakeholders. Okane has extensive experience in implementing closure strategies to mine storage facilities, ultimately limiting oxygen ingress and net percolation into the underlying waste material. This working experience has led to development of fully integrated models that link hydrology, oxygen conditions, material properties, mine rock structure and climate to develop source terms for site-wide water quality models.

Okane's experience has shown that there are solutions available to improve source control and water quality, therefore, providing the opportunity to relinquish the site at the end of the mine life versus treating water from the mine rock into perpetuity. Such solutions can include progressive reclamation and the application of oxygen-limiting cover systems which can lead to the development of suboxia within the NAG mine rock storage facilities (MRSFs) to help improve long-term seepage quality by inhibiting the oxidation of sulfide minerals within the SOZ, decreasing the release and production of metal leaching in the lower zones of the MRSF.

Currently for the Project, suboxia is defined as pore gas oxygen concentrations less than 1 vol.%, which results in a dissolved oxygen concentration in pore water of less than 1 mg/L. The NAG mine rock is a large porous mass, which during placement will have oxygen concentration in pore spaces reflecting ambient conditions, or near to ambient conditions. Oxygen within NAG mine rock pore spaces will be depleted because of sulfide (pyrite) oxidation.

2.1 Net Percolation and Oxygen Ingress Classifications

The term 'net percolation' (NP) is used throughout this memo and is defined as presented in Figure 2.1. Precipitation (PPT) that reaches the cover system surface will either be intercepted by vegetation, run off (RO), or infiltrate into the cover system. A portion of the water that infiltrates will be stored in an active zone (ΔS) where water is actively cycled within the soil profile and into the atmosphere. Water stored in the active zone can be evaporated (AE) into the overlying atmosphere or can be removed by plant transpiration (AT); the combination of evaporation and transpiration is referred to as actual evapotranspiration (AET). Water in the cover system can also potentially move laterally as interflow. Water that moves below the active zone and is no longer available to be removed from the system via AET or laterally is defined as NP. NP is infiltrating water expressed as a percentage of average annual precipitation (PPT) that will migrate beyond the active zone because of gravity overcoming the influence of evapotranspiration, resulting in flow of water into the underlying NAG mine rock and overburden cover.

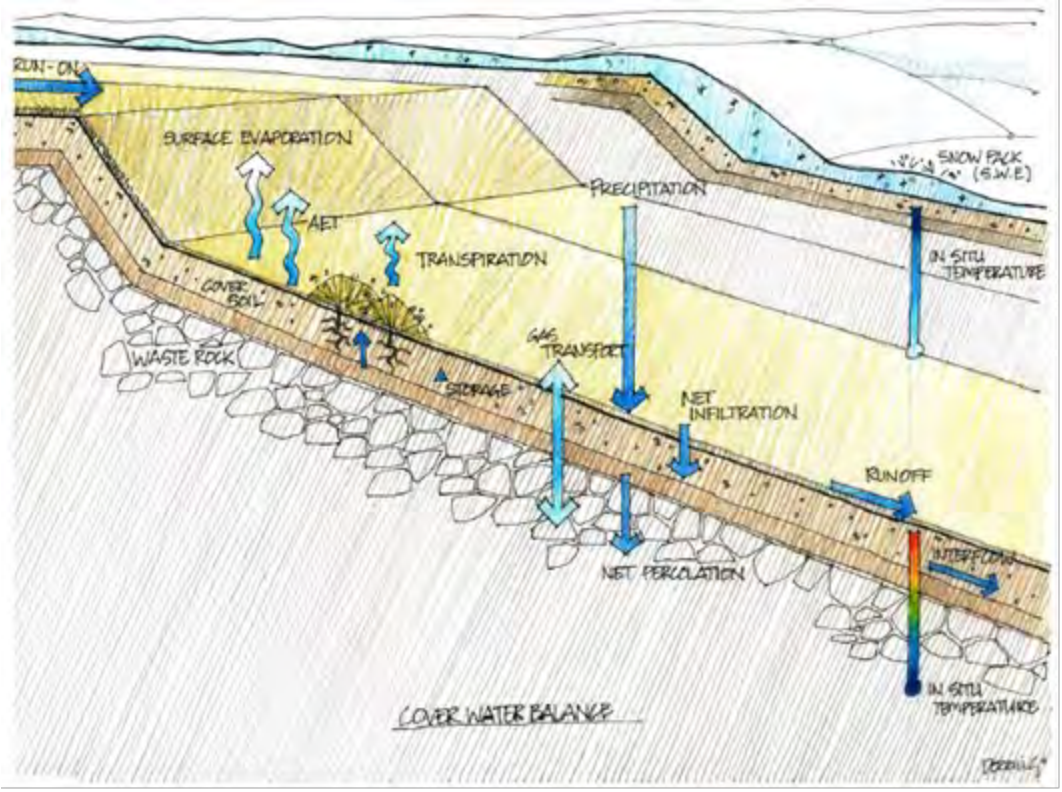

Figure 2.1: Schematic of hydraulic processes that influence performance of a cover system (from INAP, 2017)

As shown by the Project climate data described later in this report, the Project is classified as subarctic (Dfc) using the Köppen-Geiger climate classification (Peel *et al.,* 2007). Based on this classification, the range of cover system performance for the Tenas Project is presented conceptually, as defined in the Global Cover System Design Technical Guidance Document (INAP, 2017), as follows:

- "Very High" NP is greater than 50% PPT;
- "High" NP is between 25% PPT and 50% PPT;
- "Moderate" NP is between 15% PPT and 25% PPT;
- "Low" NP is between 5% PPT and 15% PPT; and
- "Very Low" NP is less than 5% PPT.

Within a single climatic regime, the same range of NP rates may be a result of the influence of differing abilities of a cover system to evapotranspirate water, and to promote runoff and interflow (i.e., lateral flow within the cover system) from the landform. Net percolation rates will also vary from year to year. For example, a high rainfall year (or, more specifically, several successive wetter than average climate

years) may result in a moderate net percolation rate for the year, even for a cover system scenario classified, on average, as having a low net percolation rate.

Cover performance with respect to oxygen (O_2) ingress can also be classified using the Global Cover System Design Technical Guidance Document (INAP, 2017) as follows:

- "Very High" O_2 ingress is greater than 100 mol/m^2/year;
- "High" O_2 ingress is between 50 and 100 mol/m^2/year;
- "Moderate" O_2 ingress is between 10 and 50 mol/m^2/year;
- "Low" O_2 ingress is between 1 and 10 mol/m^2/year; and
- "Very Low" O_2 ingress is less than 1 mol/m^2/year.

Limiting oxygen ingress is often achieved by limiting diffusion or restricting air flow by reducing pressure and/or thermal gradients. Usually, the most effective way to limit oxygen ingress is to create and sustain saturated conditions in a layer within the cover system. O_2 ingress is less challenging to limit in wetter environments where a tension-saturated layer is more easily maintained, and finer-textured material together with the tension saturated conditions will lead to reduced air permeability and therefore, advective gas transport. A similar range of performance exists for O_2 ingress as for NP where rates will vary from year to year. For example, a low rainfall year or several successive drier than average years will reduce the degree of saturation maintained within the cover system and may increase the predicted oxygen ingress rate for the year.

Limiting NP and O_2 ingress are not necessarily mutually beneficial and achieving reductions in either or both is site specific. Depending on available materials for cover system construction, limiting NP may result in less water available to maintain a saturated layer, whereas limiting O_2 ingress may require promoting additional NP. Hence, a technical assessment is required to make decisions on how best to optimize these two aspects to best take advantage of how each facet enhances performance for a particular project.

2.2 Site Specific Attributes

Assessment of the NAG backfill and cover system performance requires analysis of site attributes that constrain design alternatives to achieve the desired performance (INAP, 2017). The following site-specific attributes will be used to define performance of the NAG backfill design at Tenas:

- Climate;
- Hydrogeological setting;

- Materials;
- Vegetation; and,
- Geochemistry.

These key site attributes are described in the following sections based on background data provided by Telkwa.

2.3 Climate

The regional climate is a subarctic climate where winters are cold, averaging around -5°C during the period of November through February with temperatures potentially dropping to -30°C or colder, and summers are warm, with average temperatures greater than 20°C and highs of greater than 30°C are possible. Precipitation occurs as rain during the warmer months, accounting for 60-65% of annual precipitation. Snow accounts for 35-40% of annual precipitation with maximum accumulation of snow occurring in February-March.

The Project falls near the intersection of Dfc (subarctic climate) and Dsc (Mediterranean-influenced subarctic climate) of the Köppen-Geiger climate classification system (Peel *et al.*, 2007) where:

- D – 'continental' where average temperature of the coolest month is < -3 °C, and average temperature of the warmest month is > 10 °C;
- f – 'without dry season' where precipitation is evenly distributed throughout the year;
- s – 'dry summer' where precipitation of the driest month in summer is less than 40 mm and is also less than a third of the precipitation of the wettest month in winter; and
- c – 'cold summer' where one to three months average temperature reach >10 °C but < 22 °C.

2.4 Hydrogeological Setting

The results of historical hydrogeological investigations and *in-situ* testing are presented in Table 2.1. Surficial material is primarily sandy till to silty clay (Piteau, 1997), which is underlain by fractured sedimentary bedrock consisting of mudstones, siltstones, and sandstones (Klohn, 1985; Piteau, 1997; SRK 2018; 2019). *In-situ* hydraulic conductivity of the bedrock ranged from 6.0×10^{-6} m/s to 1.0×10^{-10} m/s.

Using the British Columbia Groundwater Wells Database, a search was completed, and 11 water wells were found in the vicinity of the mining operations. Nine domestic drinking water wells and two commercial water wells were found to be in the area N-NE of the mine site. Four of the wells are just south of the Telkwa River and west of Tenas Creek while the remaining seven (7) wells are east of Goathorn Creek. The range in finished depth of the water wells is 12 to 43 m below ground level (mbgl),

with a range of static head of 5.5 to 39 m below top of casing (btc), and an estimated yield range from 15 to 114 L/min.

Table 2.1 Record of hydrogeological investigations and *in-situ* testing.

Location and Geology	Hydrogeological Instrumentation	Groundwater Flow and Piezometric Surface	*In-Situ* Hydraulic Conductivity (K) and Linear Flow Velocity (V)
Telka Site (Klohn, 1985) Variable thicknesses of glacial till and gravel overlying sequences of sandstones, siltstones, mudstones, and coal. Bedrock dips 15-20 degrees to the east and is structurally dominated by several N-S trending reverse faults and normal faults which trend N-S and EW. Bedrock is of low permeability and contains no stratigraphically definable aquifers. The groundwater table is at or close to ground surface for much of the eastern part of the site. Breccia filled fault zones are expected to be significant conductors of groundwater.	16 piezometers installed (*none of the piezometers are still functional)	23 rural households within 3 km of the mine area obtain their domestic water supplies from groundwater, either by dug wells (2 to 6 m depth) or by drilled wells (less than 50 m depth) Domestic well records indicate that groundwater in the area is at about 12.5 m depth within a gravel layer.	Coefficient of permeability, Coal: 5×10^{-7} to 5×10^{-9} m/s Siltstone, Mudstone Sandstone: 2×10^{-7} to 1×10^{-10} m/s Recharge was estimated as 3% of annual precipitation based on the estimated groundwater flux and a value for hydraulic conductivity derived from the packer tests.
Tenas Pit (Piteau, 1997) Telkwa coal lease is underlain by coal-bearing sedimentary sequence comprising siltstone, sandstone, mudstone, and shale strata of the Lower Cretaceous age Skeena Group (Units 1-4). Economic coal seams in Unit 1 – 120 mm thick sequence of interbedded coal and sedimentary rocks. Faulting is near vertical, one group strikes ~NW/SE and other group strikes ~NE/SW. Few E/W striking faults. Surficial deposits are primarily till ranging from sandy silt to silty clay with minor gravel with range in thickness from less than 3 m to more than 10 m.	4 piezometers within coal seam #1 in 1995 5 piezometers in the major coal seams at three new locations in 1996	NE direction with horizontal hydraulic gradient of ~0.1. Flowing artesian conditions exist in all but 3 piezometers completed in coal seam #1.	K range of 2.1×10^{-8} to 6.0×10^{-6} m/s Average V is 115 m/year but does not consider local fault or fracture zones. V in the range of 10 to 250 m/year may be expected.

Location and Geology	Hydrogeological Instrumentation	Groundwater Flow and Piezometric Surface	*In-Situ* Hydraulic Conductivity (K) and Linear Flow Velocity (V)
Waste Dumps (Piteau, 1997) Waste dump sites underlain by till from 3.75 - 13.5 m thick. Thinnest till blanket is deposited directly on the bedrock surface and thickest till deposit overlies outwash sediments. East side of Tenas pit, thin 6.0 m till overlies permeable sands and gravels. Where overburden is more than 10 m thick, bedrock is overlain by high permeability sand and gravel outwash deposits. The thickest of which (106 m) is in the NW corner of the Tenas waste dump sites where a buried channel (clays, sands, and gravels) exists where the depth to bedrock exceeds 117 m. Bedrock from 4.6 - 117 m consists of either volcanic ash or interbedded sequences of siltstone and mudstone with occasional sandstone.	11 holes drilled at 9 locations	Interpreted to follow topography within surficial sediments between 0.5 - 2.0 m. Depending on location, shallow groundwater flow will either be in a northwesterly or northeasterly direction towards Tenas Creek or Four Creek. At one piezometer nest, strong downward vertical gradients indicative of groundwater recharge conditions exist between upper and lower water-bearing deposits. Due to upland topography of the waste dump sites, groundwater recharge conditions are expected to prevail.	Three single well response tests indicated K of the upper water-bearing till deposit to be in the range of 2.8×10^{-9} to 7.2×10^{-7} m/s. These values are low and thus vertical infiltration rates through this deposit would similarly be expected to be low.
Pit 3 (Piteau, 1997) Bedrock: alternating sequence of siltstone, mudstone, sandstone, and coal with sporadic volcanic tuffs throughout the sequence. Complex series of sub-parallel, N-S trending reverse faults and N-S, and to a lesser extend E-W, trending normal faults. Bedrock overlain by ~10 - 15 m of silty clay till with minor coarse fragments and sand.	5 piezometers installed at 3 locations in Pit 3. At each location, a piezometer was completed across coal seam #2 A second piezometer was installed across coal seam #4 at two locations.	Within coal units, groundwater flow is interpreted to be in a north to northwesterly direction. Horizontal hydraulic gradient of ~0.04. Depth to water ranged from 7.55 - 36.73 mbgs.	From one single well response test, K of coal seam #2 estimated at 4.3×10^{-10} m/s. From two single well response tests, K of coal seam #4 estimated at 8.5×10^{-7} m/s and 3.7×10^{-6} m/s. Average V in coal seams estimated range 20-100 m/year.
Mine rock dumps and sediment ponds (SRK, 2018)	13 sonic drillholes to depths between 9.0 m and 30.8 m upon reaching bedrock or sufficiently high soil density.	Two sonic piezometers were dry, one had water up to ground level and the last had a depth to water of ~14 m.	-

Location and Geology	Hydrogeological Instrumentation	Groundwater Flow and Piezometric Surface	*In-Situ* Hydraulic Conductivity (K) and Linear Flow Velocity (V)
	4 standpipe piezometers were installed for groundwater monitoring in 2017. 8 diamond drillholes with lengths from 70 m to 213.7 m were drilled. 3 of these drillholes had piezometers installed in them.		
Management ponds, sediment ponds, external soil/rock piles and infrastructure pad (SRK, 2019)	12 sonic drillholes were terminated at depths between 10.7 m and 67.1 m upon reaching bedrock. 12 standpipe piezometers were installed for groundwater monitoring in 2018.	The shallowest groundwater levels were approximately 14 mbgs but the piezometric table was located between 20 m and 40 m within the overburden soils.	-

2.5 Materials

Site-specific material characterization and availability are the two main elements for cover system design. Material selection and strategic placement is a key control on cover system performance and is used to provide a means for functions such as vegetation establishment, erosion control, and drainage where required in the cover system design (MEND, 2004).

Surficial deposits (overburden) within the Project Area are primarily till ranging from sandy silt to silty clay with minor gravel (and less than 5% cobbles and boulders) with a range in thickness over the Tenas Project Area from 4 m to 100 m (SRK, 2018). Recent drilling investigations (SRK, 2018; 2019) of the overburden material are in agreement with historical investigations (Klohn, 1985; Piteau, 1997) except for no sand and gravel outwash deposits in the northwest of the project site reported in Piteau (1997) being encountered in current drill holes (SRK, 2018; 2019). The till surface deposits will be excavated in the mining process and stockpiled for later use in the cover systems or direct placed from mining.

The bedrock in the Tenas Open Pit is of the early Cretaceous-aged Skeena Group and consists of alternating sequences of siltstone, mudstone, sandstone, and conglomerates with inter-bedded, bituminous coal seams (SRK, 2018). In Unit 1 a sedimentary sequence from 50 m to 120 m in thickness is interbedded with Coal Seam 1 (Seamas 1A-1F) with individual thicknesses of 1 m to 3 m (SRK, 2018). To access the inter-bedded coal layers, the bedrock will be excavated becoming mine rock to be placed in lifts and covered with the till material.

Particle size distribution (PSD) data was only available for the overburden till material and no information was available for the mine rock. The overburden material can be grouped into two categories based on the PSD data, a poorly-graded till and a well-graded till. Figure 2.2 shows the range of PSDs for each group based on the testing completed by SRK in 2019 (SRK, 2019). Following completion of sample compaction tests, four till samples were assessed for permeability, the results ranged from 1.04×10^{-7} m/s to 1.18×10^{-10} m/s (SRK, 2018).

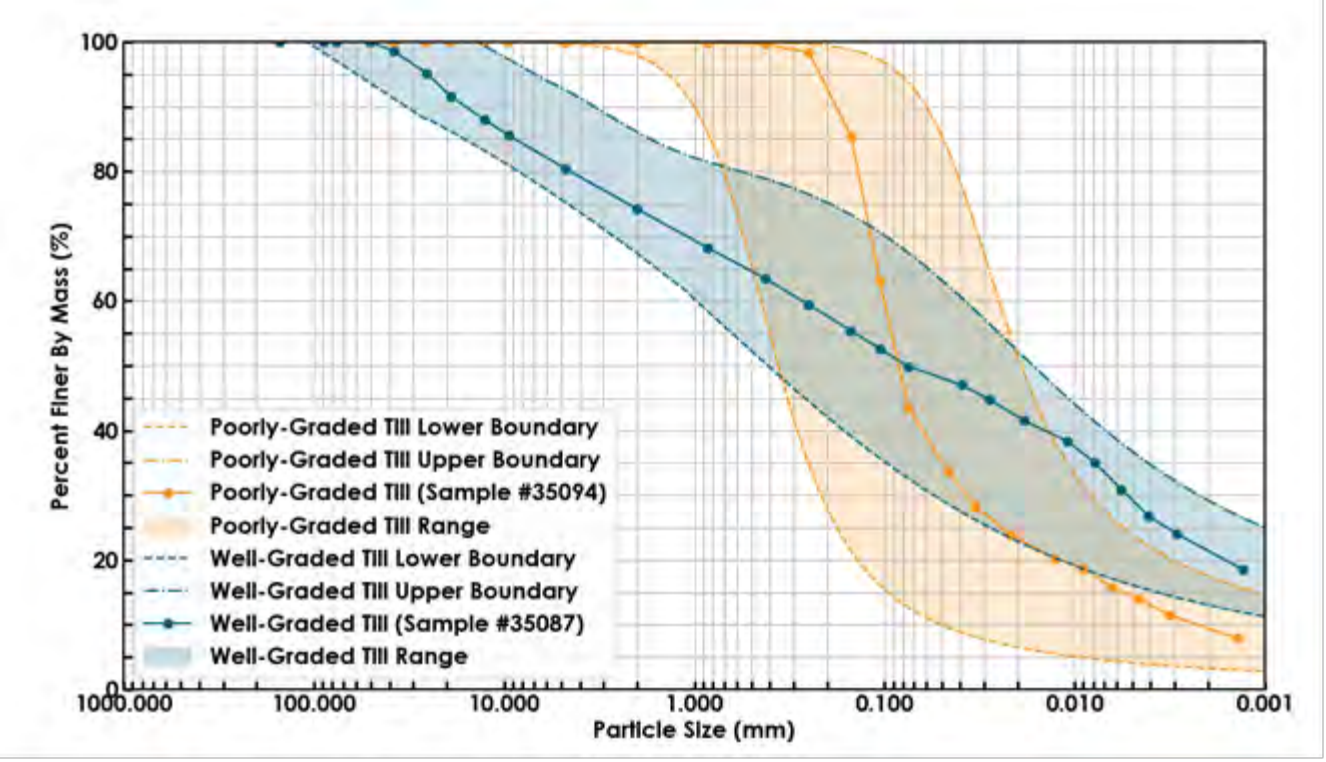

Figure 2.2: Range of PSDs for Poorly-Graded and Well-Graded Till based on SRK (2019).
(adapted from SRK, 2019)

2.6 Vegetation

The Project is located within the Sub-Boreal Spruce (SBS) zone of the biogeoclimatic zones of British Columbia. The dominant coniferous tree species in this zone include hybrid white spruce (hybrid of Engelmann spruce and white spruce), sub-alpine fir, lodgepole pine, and occasionally, black spruce and Douglas-fir (BC Ministry of Forests, 1998). Deciduous species include trembling aspen and paper birch.

2.7 Geochemistry

Non-potentially acid generating mine rock will be used as backfill into the Open Pit. Although sulfide minerals are present (and sulfide oxidation is expected), these materials contain an excess of neutralization potential (at least 2x) relative to the acid potential (AP) and are not expected to generate acidic drainage (Price, 2009). However, sulfide oxidation products will still be generated and transported through the mine rock by contact water. Concentrations of select dissolved trace metals and sulfate will be constrained by secondary mineral precipitation (e.g., gypsum and metal hydroxide phases) and adsorption to iron hydroxides that typically precipitate in circum-neutral mine waters. However, even with these solubility controls, metal loads from pyrite oxidation could still pose a risk to downstream

receptors. A conceptual model of geochemical reactions occurring along a typical flow path within the Tenas NAG mine rock is shown in Figure 2.3.

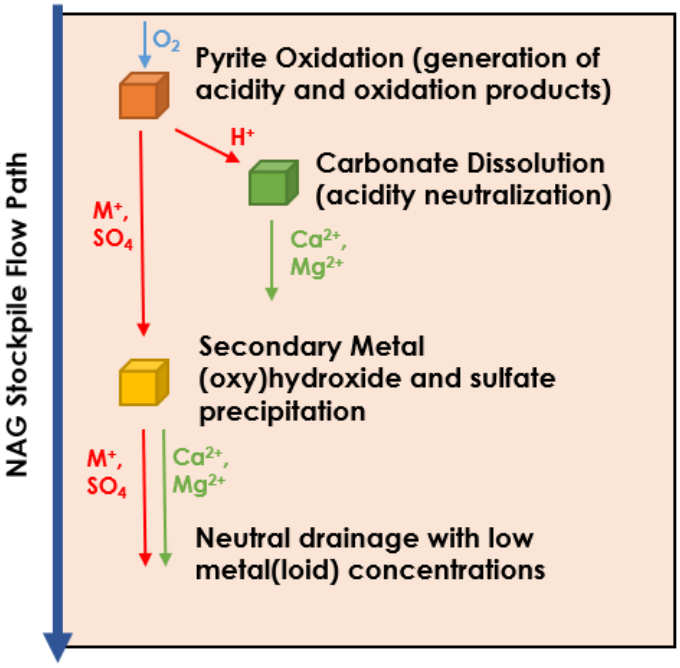

Figure 2.3: Geochemical conceptual model for Tenas NAG mine rock flow path.

Parameters that were elevated above typical crustal concentrations within the Project Area were: arsenic, phosphorus, sulfur, and selenium. Although elevated solid-phase concentrations do not necessarily imply that these species will be mobilized and result in elevated concentrations in contact water, solid-phase metals analysis was completed to flag potential contaminants of concern to evaluate in further geochemical testing.

Current geochemical characterization recommended the use of a neutralization potential ratio (NPR) > 1.60 to classify mine rock as NAG (where, NPR = neutralization potential / acid potential) during verification testing completed during the Operations phase of the Project. For planning and the EAC submission, an NPR cutoff of 2.0 was used to classify mine rock as NAG or PAG, with values > 2.0 considered NAG. This is based on a strong correlation between NP_{XRD} and modified NP following correction for iron carbonates and was developed using calcium and magnesium molar ratios in humidity cell tests (HCTs; SRK, 2022b).

Dolomite-ankerite and calcite are the most abundant carbonate minerals with lesser amounts of siderite in NAG mine rock while PAG mine rock has a higher siderite content. Dolomite-ankerite content ranged from 0.3 to 23.8 wt.% (median = 14.0 wt.%), while calcite ranged from below detection (BD) to 4.4 wt.% (median = 1.4 wt.%). Siderite content ranged from 0.2 to 12.6 wt.% (median = 2.0 wt.%). It is worth noting that siderite does not provide net neutralization to acidity generated from sulfide oxidation. This is because Fe(II) released from siderite dissolution typically oxidizes to Fe(III) which precipitates Fe(III)

hydroxide phases, releasing acidity. Therefore, the bulk of acidity neutralization in the NAG mine rock will come from the dissolution of calcite and dolomite. The primary sulfide mineral in the PAG mine rock is pyrite, which ranges from 0.3 to 2.5 wt.% (median = 0.8 wt.%).

3 DESCRIPTION OF MODELLING PROCESSES

To estimate seepage quantity and quality for the backfilled NAG mine rock in the Open Pit, Okane used the following numerical models and modelling process.

1) *One-Dimensional (1D) Soil-Plant-Atmosphere (SPA) Models* using components of the GeoStudio FLOW (Bentley Systems, 2022) modelling suite (namely, SEEP/W and TEMP/W) to simulate the NP rate.

2) *Two-Dimensional (2D) Oxidation Model* using the GeoStudio FLOW suite, including SEEP/W, TEMP/W, CTRAW/W, AIR/W, and the Gas Consumption and Exothermic Reactions Add-In Module to evaluate the size and development of suboxic conditions.

3) *Three-Dimensional (3D) GoldSim Oxidation, Wetting-Up and Draindown Model* to determine a range for potential seepage and oxygen consumption based on hundreds of realizations of the model, using the GoldSim Monte-Carlo formulation (GoldSim, 2021).

4) The *Geochemical Model* using a combination of both a *mechanistic reactive transport model* and a *scale-up geochemical model* to evaluate the evolution of water quality moving through the overburden cover and into the backfilled NAG mine rock.

The source terms from the geochemical model will be provided to SRK to be used in the site-wide water quality model to evaluate the potential effects of key mine facilities on the receiving environment. The following sections describe the numerical models in more detail.

3.1 1D Soil-Plant-Atmosphere Model with GeoStudio SEEP/W and TEMP/W

In combination, SEEP/W and TEMP/W are a 2D finite element model (which can also perform 1D simulations) that predict suction in the material profile in response to climatic forcing (such as evaporation) and lower boundary conditions (such as a water table). A key feature of the software is the ability of the model to predict actual evapotranspiration (AET) based on potential evaporation (PE) and predicted suction, as opposed to the user being required to input these surface flux boundary conditions. The AET rate from the surface material is below the potential rate during prolonged dry periods because the suction, or negative pore water pressure, in the material profile increases as the surface desiccates. In addition, SEEP/W and TEMP/W together form a fully coupled (through the vapour pressure term) heat and mass transfer model, which can predict water vapour movement and the influence of freeze/thaw on hydraulic conditions through reductions in the hydraulic conductivity. The 1D SPA models provide runoff and NP estimates, which are used as inputs in the 2D Oxidation and 3D GoldSim Oxidation, Wetting-Up, and Draindown models.

3.2 2D Oxidation Models

The 2D oxidation modelling was completed using the GeoStudio FLOW suite (SEEP/W, TEMP/W, CTRAN/W, and AIR/W) and the Gas Consumption and Exothermic Reaction Add-In to evaluate the size and development of suboxic zones within the NAG backfill. The models will account for annual material placement and provide estimates of the timing and depth to the suboxic zones, which are used in the 3D GoldSim model, as well as an estimate of cumulative oxygen (O_2) consumption with time, which is used to calibrate and validate the 3D GoldSim results.

3.3 3D GoldSim Oxidation, Wetting-Up and Draindown Model

The 3D model is a wetting-up and drain-down model developed by Okane in GoldSim to simulate the water movement in mine rock based on climate data and material properties. In the model, gravity-driven water flow depends on the NP rate and hydraulic conductivity. The hydraulic conductivity of each layer of mine rock is calculated based on the following formula with measured material properties:

$$k(h) = k_s S_e^l \left[1 - \left(S_e^{\frac{1}{m}}\right)^m\right]^2 \quad (1)$$

where S_e is the effective saturation, k_s is the saturated hydraulic conductivity (LT^{-1}), n and m are van Genuchten's equation parameters, and l is the pore-connectivity parameter. The effective saturation, S_e, within the layer is defined as:

$$S_e = \frac{\theta_w - \theta_{wr}}{\theta_s - \theta_{wr}} \quad (2)$$

where θ_w is the volumetric water content of the layer, θ_{wr} is the residual volumetric water content (L^3/L^3), and θ_s is the saturated volumetric water content (L^3/L^3). The van Genuchten equation parameter m is defined as a function of n as:

$$m = 1 - \frac{1}{n} \quad (3)$$

In the modelling process, hydraulic conductivity is calculated based on the water content of each layer of mine rock. This parameter is then used to calculate the flow rate of water between layers of mine rock. The change in water content due to the placement of new mine rock can also be simulated as part of the hydrogeology model. The Monte-Carlo formulation is used to vary the material properties for each lift of material within an anticipated range to produce a more realistic estimate of overall backfill performance.

The 3D models were extended an additional 50 years to 2150 using stochastic net percolation inputs based on the 1D water balance to ensure that steady state seepage was reached.

3.4 Geochemical Model

The evolution of water quality in the backfilled NAG mine rock was evaluated using a combination of both a mechanistic reactive transport model and a scale-up geochemical model.

The *Mechanistic Reactive Transport Model* was constructed with PHREEQC v.3 (Parkhurst and Appelo, 2013) and accounts for geochemical characteristics such as mineralogy, reaction kinetics, transport time, and oxygen conditions of the mine rock. This model incorporates key reactive minerals including sulfides and carbonates, chronology of the NAG mine rock placement, and cover system placement and source control implementation leading to suboxic zone development.

The *Scale-up Geochemical Model* was completed to estimate parameters that were not modelled using the Mechanistic Geochemical Model, and generally consist of parameters not directly influenced by sulfide oxidation or carbonate mineral dissolution. Parameter concentrations were calculated based on field barrel leachate quality and scaled-up based on the physicochemical differences between the smaller scale test conditions and expected field conditions of the NAG backfill.

3.5 Model Inputs

3.5.1 Base Case Geometry

The in-pit NAG backfill will be constructed as 120 m wide by 36 m high cells, with a 3 m cover of compacted overburden on the slope of the cell and 1 m of compacted overburden on the plateau of each cell. The cells will be built starting with the face of the slope as a 4 m by 50 m lift / road (1 in Figure 3.1). The overburden and NAG mine rock will be end dumped and compacted in 1.33 m lifts. The second lift will be a 4 m by 39 m lift (2 in Figure 3.1) on top of the first lift, followed by a third lift of 4 m by 28 m (3 in Figure 3.1). The remaining space within the cell will be end dumped as a 12 m high standard dump (4 in Figure 3.1). This process is planned to occur three times per cell, resulting in a 35 m high cell. The last step of each cell is the addition of a 1 m compacted overburden layer, completing the 36 m high cell.

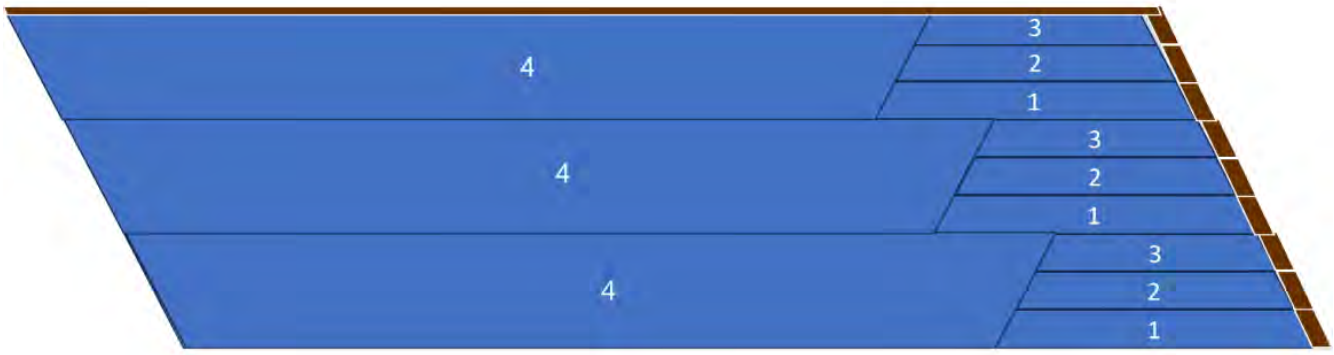

Figure 3.1: Building plan for the cells within the backfilled open pit NAG mine rock landform.

Cells will be stacked and reach an approximate height of three 36 m cells to complete the backfill within the Open Pit, as the bottom and top cells are anticipated to be half height, as shown in Figure 3.2, due to the pit bottom shape and final reclamation goals.

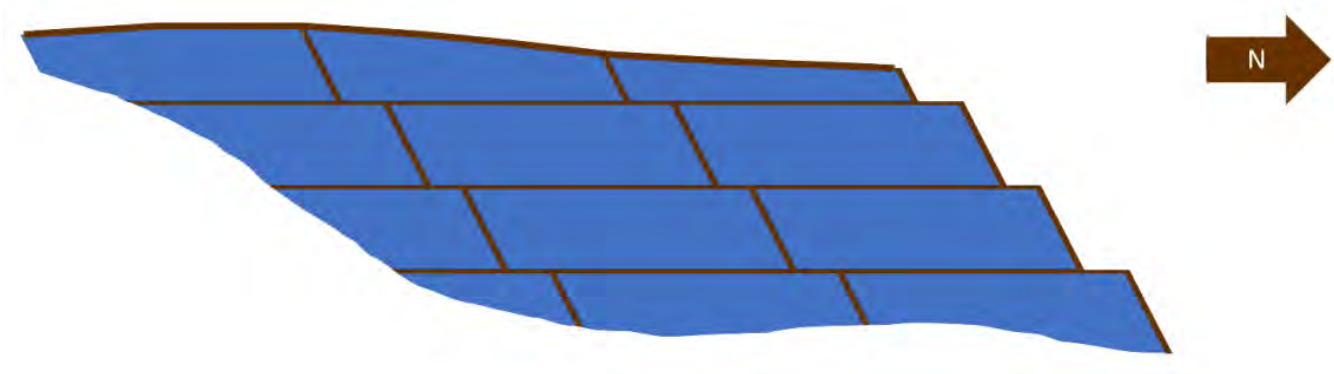

Figure 3.2: Encapsulation plan for NAG in-pit mine rock.

The final cover system on the landform will be 3 m of overburden overlain by approximately 0.3 m of surface soils (topsoil). The 1D models were constructed as 35 m of mine rock with the final cover system at the surface. These models were used to investigate the different material combinations.

A cross-section through the NAG backfill was modelled in 2D to determine the development and extent of the suboxic zone within the backfill. Figure 3.3 shows the approximate location of the cross section while Figure 3.4 shows the 2D geometry that was modelled.

An additional scenario that did not include the internal overburden layers was also modelled. This scenario assumed that the Open Pit would be backfilled following the same procedure as outlined above, but the entire 36 m cell would be composed of mine rock, with only the final cover system being composed of overburden.

Figure 3.3: Plan view of the backfill open pit NAG mine rock showing the strips and approximate location of the projected cross section.

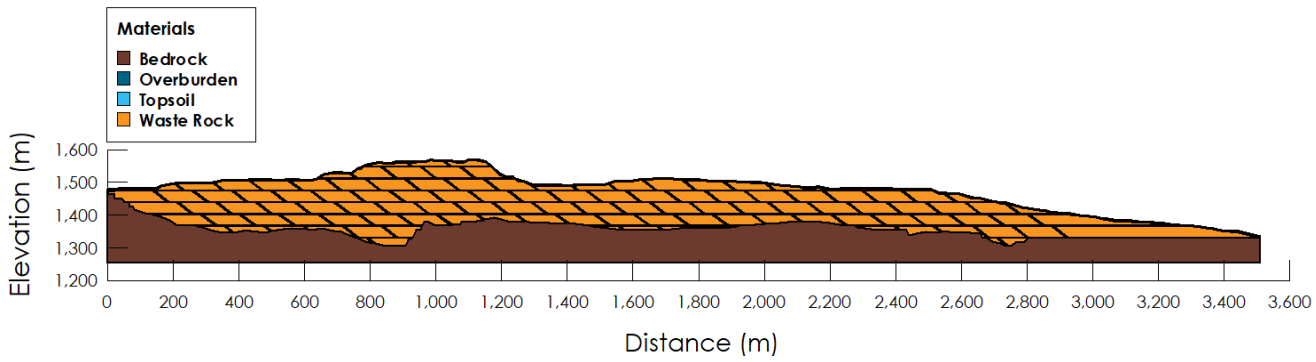

Figure 3.4: Geometry of the project 2D cross section. It should be noted that bedrock refers to bedrock of open pit, waste rock is the NAG mine rock and topsoil includes surface soils.

Within the 3D GoldSim model, the backfilled NAG mine rock was simulated by subdividing its area into 23 main strips, with each strip representing areas with similar timing of cover placement (Figure 3.3). The construction schedule for each strip was assumed based on the filling volumes and timing provided by Telkwa. The following assumptions were made regarding the placement of NAG mine rock for the GoldSim simulations:

- Construction of the NAG backfill is strip dependent, but in general, begins in Year 6 for the main strips and continues until the completion of the Operation phase in Year 21;
- Cover system placement is strip dependent and will be assumed to occur over one year (*e.g.*, cover placement that occurred in Year 8 will be assumed to occur at a uniform rate from January 1 to December 31 of Year 8). Cover system placement is assumed to occur in the year following completion of each strip due to model limitations; and
- Daily NP rate inputs will be derived separately from the 1D GeoStudio model results. In general, daily stochastic inputs will be setup for each day of the year based on the results of the GeoStudio models.

The assumed height of NAG mine rock and overburden in each strip with time, based on the volume of material placed and the surface area of the strip is shown in Figure 3.5. The surface area, total NAG mine rock and overburden volumes, and timing of cover system placement are listed in Table 3.1. For the no internal layers scenario, the internal layer volume was assumed to be NAG mine rock rather than overburden.

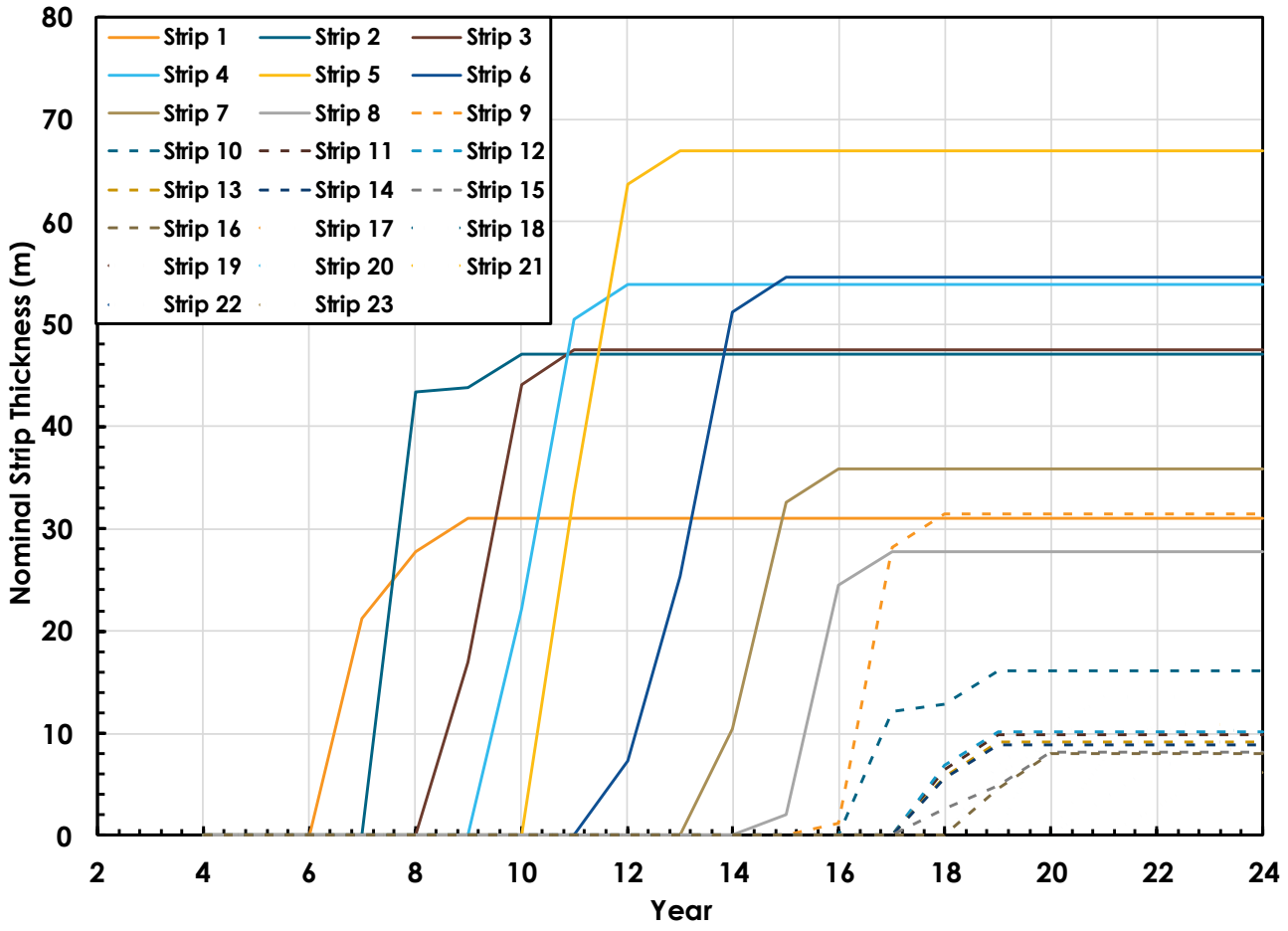

Figure 3.5: Evolution of nominal strip thickness within the GoldSim model for each strip.

Table 3.1: Surface area, volume, and nominal thickness of each strip, along with year of cover system placement.

Strip	Strip Surface Area (m^2)	Mine Rock Volume (m^3)	Internal Layers Overburden Volume (m^3)	Cover System Overburden Volume (m^3)	Total Strip Volume[1] (m^3)	Nominal Thickness (m)	Year of Cover Placement
1	41,897	1,065,383	95,548	71,661	1,232,593	31	Year 8
2	49,774	2,035,361	143,168	107,376	2,285,907	47	Year 9
3	61,199	2,529,237	171,692	128,769	2,829,695	47	Year 10
4	71,013	3,336,530	250,260	150,156	3,736,944	54	Year 11
5	78,079	4,660,016	305,995	183,597	5,149,606	67	Year 12
6	95,072	4,580,978	288,455	173,073	5,042,504	55	Year 14
7	95,482	2,895,869	209,244	156,933	3,262,049	36	Year 15
8	92,182	2,102,945	155,400	116,550	2,374,893	28	Year 16
9	61,588	1,611,409	123,760	92,820	1,827,988	31	Year 17
10	93,728	1,077,586	123,928	92,946	1,294,461	16	Year 18

Strip	Strip Surface Area (m^2)	Mine Rock Volume (m^3)	Internal Layers Overburden Volume (m^3)	Cover System Overburden Volume (m^3)	Total Strip Volume[1] (m^3)	Nominal Thickness (m)	Year of Cover Placement
11	132,059	684,134	173,334	86,667	944,138	10	Year 18
12	100,087	562,842	127,240	95,430	785,515	10	Year 18
13	105,498	486,553	126,556	94,917	708,023	9	Year 18
14	104,842	461,895	126,664	94,998	683,556	9	Year 18
15	105,081	387,746	121,744	91,308	600,798	8	Year 19
16	95,046	343,940	98,832	98,832	541,604	8	Year 19
17	91,078	368,246	96,090	96,090	560,424	8	Year 19
18	87,435	506,810	108,252	81,189	696,251	10	Year 19
19	88,006	412,599	108,160	81,120	601,876	9	Year 19
20	102,696	899,529	155,640	93,384	1,148,551	14	Year 20
21	162,765	1,054,401	184,100	110,460	1,348,963	11	Year 21
22	120,549	336,966	106,156	79,617	522,740	7	Year 21
23	324,682	755,903	157,040	235,560	1,148,505	6	Year 22
Total	*2,359,838*	*33,156,878*	*3,557,258*	*2,613,453*	*39,327,584*	-	-

1 - Includes total NAG mine rock and overburden volumes.

3.5.2 Material Properties

The hydraulic properties or functions required for modelling of overburden and NAG mine rock material are as follows:

- Water retention curve (WRC – volumetric water content versus matric suction): a continuous function relating energy and the state of water, and hence describes the water content of a material as a function of the soil suction, or negative pore-water pressure. It is central to the design of an unsaturated soil system.

- Hydraulic conductivity function (k-function – hydraulic conductivity versus matric suction): a measure of the ability of a soil or rock material to transmit water and is a maximum for saturated soil or rock materials. The saturated hydraulic conductivity (k_{sat}) and unsaturated hydraulic conductivity function are key input parameters to numerical models analyzing hydraulic performance.

For the best results, WRC and k_{sat} should be measured in the laboratory and field for each material of interest. In this case, only particle size distribution (PSD) data was available for the overburden material and no information was available for the NAG mine rock. Two PSDs for the overburden material were used as representative samples for well-graded (sample# 35087) and poorly-graded (sample# 35094) till found in the SRK 2019 field investigations (Figure 2.2).

For the overburden material the WRC (Figure 3.6) and k-function (Figure 3.7) were estimated from the PSD (both well-graded and poorly-graded) using the Fredlund and Xing (1994) pedotransfer functions in SVSOILS™ Software (Plaxis, 2022). The k_{sat} was estimated using Kozeny (1962) with PSD data as the input.

As no lab or field information was available for the NAG mine rock, three proxy materials (mudstone, siltstone, and sandstone) were provided by Okane based on field testing completed at several mine sites. A well-graded mixed material based on core logs consisting of 35% mudstone, 60% siltstone, and 5% sandstone (D. Farmer, 2024, pers. comm.) was also estimated. The WRC and k-functions for the mine rock proxy materials are found in Figure 3.6 and Figure 3.7, respectively.

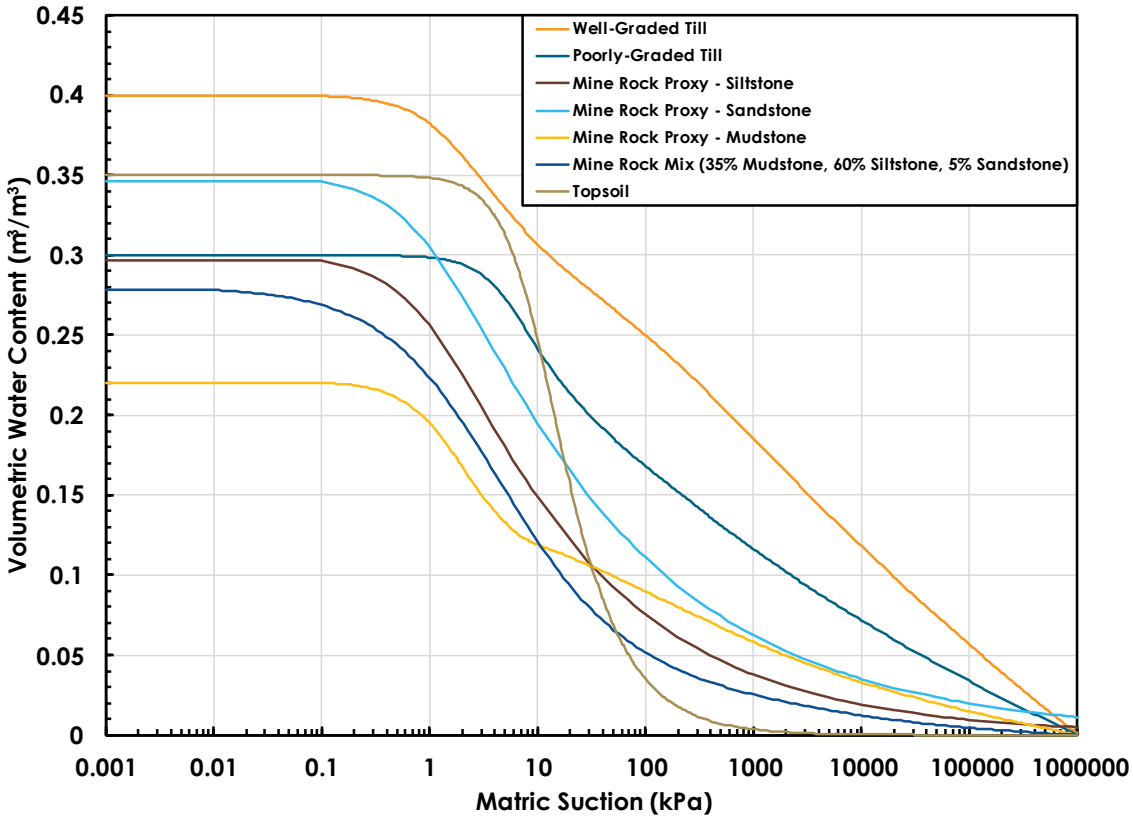

Figure 3.6: Estimated overburden (till) and proxy mine rock water retention curves.

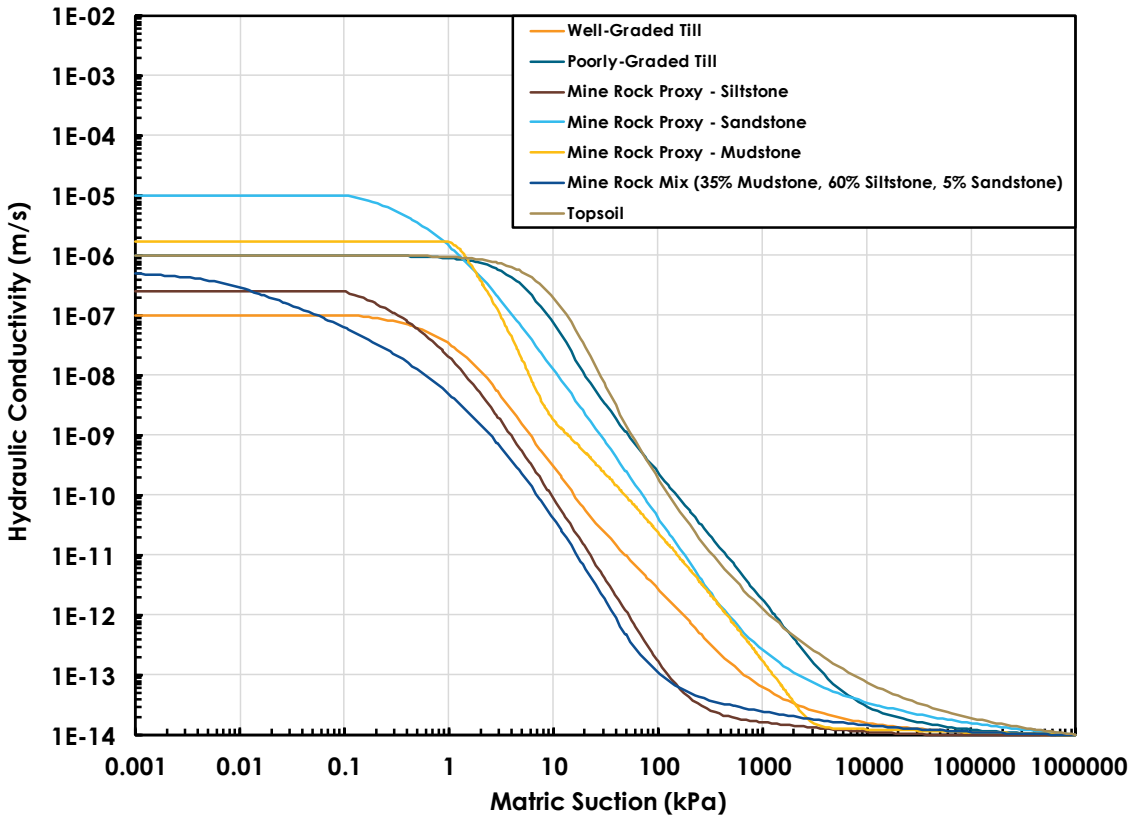

Figure 3.7: Estimated overburden (till) and proxy mine rock k-functions.

3.5.3 Climate Model Inputs

SRK (2022c) developed a project-specific synthetic historical climate database based on transposing regional datasets to the site and adjusting for orographic effects. The historical dataset spans 77 years from 1943 to 2020 and is summarized in Table 3.2.

SRK (2022c) also completed a climate change assessment for the project using the fifth version of the Coupled Model Intercomparison Project (CMIP5) and Representative Concentration Pathway (RCP) 4.5 of the Intergovernmental Panel on Climate Change (IPCC) fifth Assessment Report (AR5) (IPCC, 2014). Monthly rates of changes relative to baseline conditions (1981-2010) were calculated for temperature and precipitation based on the median values of an ensemble of 29 CMIP5 models. Projected climate change effects were evaluated for three consecutive 30-year forecast periods, defined as follows:

- Baseline period from 1981 to 2010 (CMIP5), centred on 1995;
- First forecast period from 2011 to 2040 (CMIP5), centred on 2025;
- Second forecast period from 2041 to 2070 (CMIP5), centred on 2055; and

- Third forecast period from 2071 to 2100 (CMIP5), centred on 2085.

Monthly changes relative to monthly baseline data for RCP4.5 are shown in Table 3.3 for temperature and Table 3.4 for precipitation. A long-term daily dataset (SRK, 2023a) was developed by applying the monthly changes to the average monthly values from the baseline period.

This climate change dataset was used directly as the upper boundary condition in the 1D SPA modelling through the Land-Climate Interaction (LCI) and Surface Energy Balance (SEB) boundary conditions to develop the surface water and energy balance, which was used as the upper boundary conditions in the 2D and 3D models.

Table 3.2 Monthly summary of historical climate database.

Month	Air Temperature (°C)		Precipitation[1] (mm)				Solar Radiation (W/m²)	Relative Humidity (%)	Lake Evaporation (mm)	Wind Speed (m/s)
	Maximum	Minimum	Mean	Rainfall	Snowfall	Total				
January	-5.8	-12.6	-9.2	6.1	53.9	60.0	38	83.6	0	2.0
February	-1.8	-10.4	-6.1	1.0	33.9	34.9	64	79.3	0	1.9
March	2.2	-7.5	-2.7	0.3	26.5	26.8	114	71.2	0	2.0
April	7.4	-3.1	2.1	12.5	19.6	32.2	173	63.3	60	2.2
May	12.9	0.8	6.8	41.5	8.3	49.8	220	61.3	97	2.1
June	16.5	4.7	10.7	68.7	1.2	69.9	224	65.7	108	1.9
July	19.0	6.9	13.0	57.3	0.0	57.3	224	68.8	116	1.7
August	18.6	6.4	12.5	55.2	0.1	55.3	201	72.1	99	1.5
September	13.7	3.1	8.4	63.9	3.5	67.4	134	79.5	50	1.5
October	6.5	-1.4	2.6	42.4	42.0	84.3	73	82.1	0	1.9
November	-0.8	-6.8	-3.8	5.4	67.3	72.7	40	85.9	0	1.9
December	-4.6	-11.2	-7.9	2.1	53.7	55.8	34	85.4	0	2.0
Annual	*7.0*	*-2.6*	*2.2*	*356.4*	*310.0*	*666.4*	*128*	*74.8*	*529*	*1.9*

(SRK, 2022c)

[1]Total precipitation was updated by SRK (SRK, 2023b) in November 2023 based on analysis against measured data at Tenas Deposit Station. Rainfall and snowfall were calculated by Okane assuming a threshold temperature of 0 °C.

Table 3.3 Monthly average temperature increase from the baseline period for RCP4.5 (in °C).

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
2011-2040	1.25	1.23	1.16	1.13	1.35	1.44	1.35	1.21	1.00	0.97	1.02	0.86	1.2
2041-2070	2.89	2.16	2.42	2.30	2.60	2.51	2.45	2.39	2.11	2.07	2.26	2.48	2.4
2071-2100	3.45	2.79	3.01	3.04	3.14	3.13	3.24	2.99	2.72	2.56	2.85	2.97	3.0

Table 3.4 Monthly average precipitation variation from the baseline period for RCP4.5 (in %) (from SRK, 2022c).

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
2011-2040	5%	7%	6%	0%	14%	2%	1%	-1%	5%	7%	4%	3%	+5%
2041-2070	12%	8%	14%	14%	34%	33%	-5%	0%	10%	12%	11%	12%	+12%
2071-2100	12%	11%	16%	9%	48%	23%	-23%	2%	14%	18%	16%	18%	+15%

3.5.4 Vegetation Model Inputs

Vegetation model inputs were based on the SBS bio-geoclimatic zone. Prior to reclamation, no vegetation was assumed. Once areas are reclaimed, vegetation was simulated to re-establish and grow.

To simulate the vegetation re-establishment the following assumptions were made:

- The year after cover system placement, grasses and shrubs are assumed to establish and grow.
- Grasses and shrubs are assumed to be the predominant vegetation for the first five years following cover system placement.
- Forest species are assumed to be the predominant vegetation after the grasses.

3.5.4.1 Rooting Depth and Distribution

The rooting depth and distribution was described by the work of Jackson *et al.* (1996) using the equation:

$$Y = 1 - \beta d \qquad (4)$$

where Y is the cumulative root fraction (a proportion between 0 and 1) from the soil surface to depth d (cm), and β is the fitted 'extinction coefficient', which Jackson *et al.* (1996) estimates as 0.943 for both grassland and boreal forest biomes. Hence, the same rooting depth and distribution (Figure 3.8) were used to represent both grasses and forest growth.

The maximum rooting depth is approximately 1.2 m, with 95% in the top 0.5 m of the cover system. This is like the root characteristics described in Klinka *et al.* (2000) for tree species in the region.

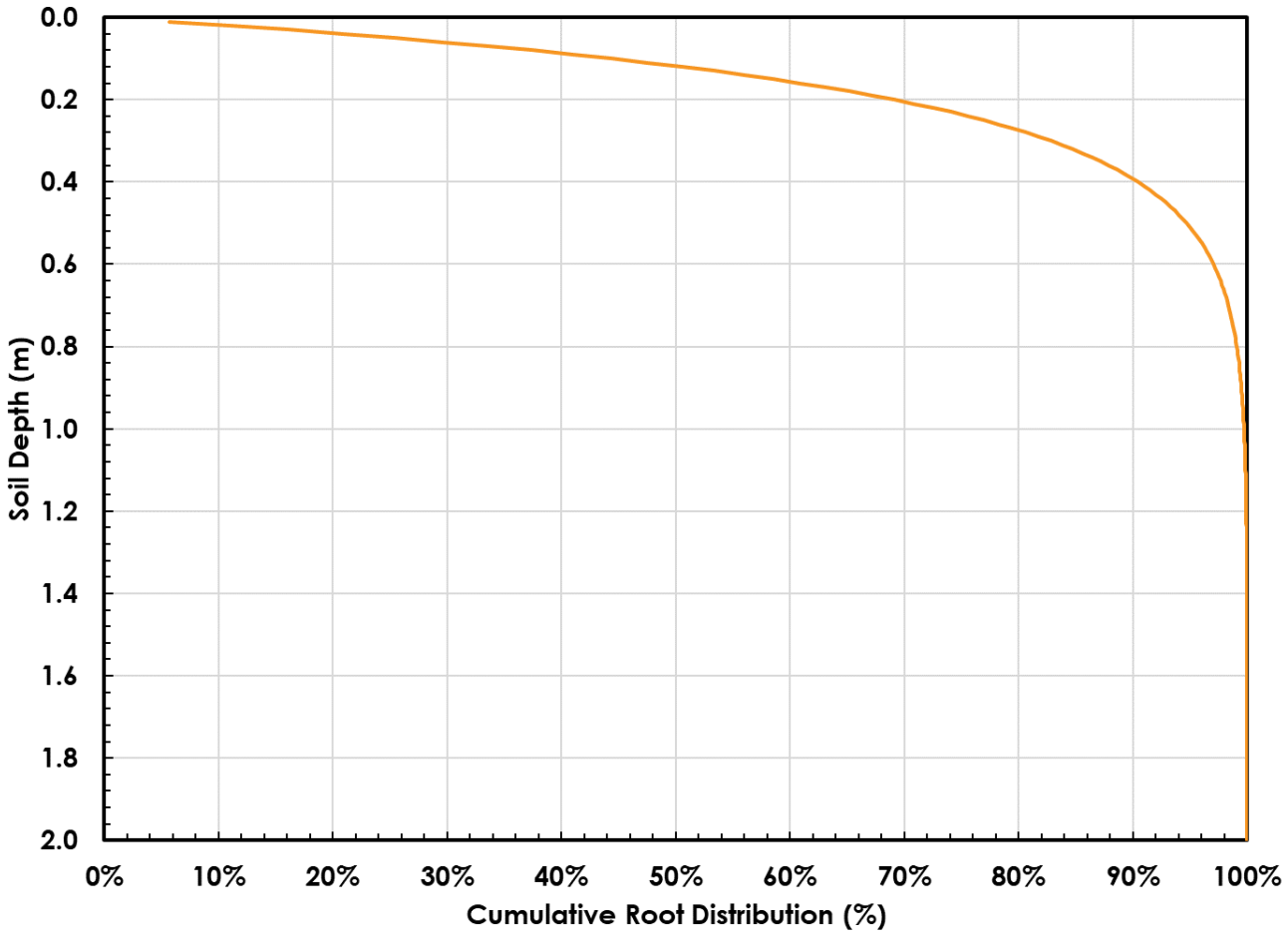

Figure 3.8: Estimated rooting depth and distribution for grasses and forest growth at Tenas Project.

3.5.4.2 Leaf Area Index and Percent Ground Cover

The Leaf Area Index (LAI) for grasses is estimated to be 1.7 with a percent ground cover of 70%. Once forest and understory species establish, LAI is estimated to increase to 2.3 with a percent ground cover of 85%. During the first seven years of vegetation, the LAI was increased annual by 0.3, starting at an LAI of 0.3, to gradually reach the mature forest vegetation LAI of 2.3.

3.5.4.3 Plant Water Limiting Function

Lack of available water and/or high evaporative demands will cause most plants to biologically react by closing stoma, reducing transpiration, and reducing metabolic reactions (Saxton, 1982). Under continued and increasing stress, the plant will reach its permanent wilting point (PWP), at which point transpiration is estimated to cease. The plant water limiting function (PWLF) defines the reduction in transpiration due to increased soil suction conditions. In general, the PWLF is defined to start to reduce at 10 kPa and stop transpiration entirely at a PWP of 1,500 kPa. This function was used to simulate grasses

growing on the cover system. Lopushinsky and Klock (1974) measured the PWLF for conifer species, which produced the PWLF (Figure 3.9). This PWLF was used to simulate forest growth.

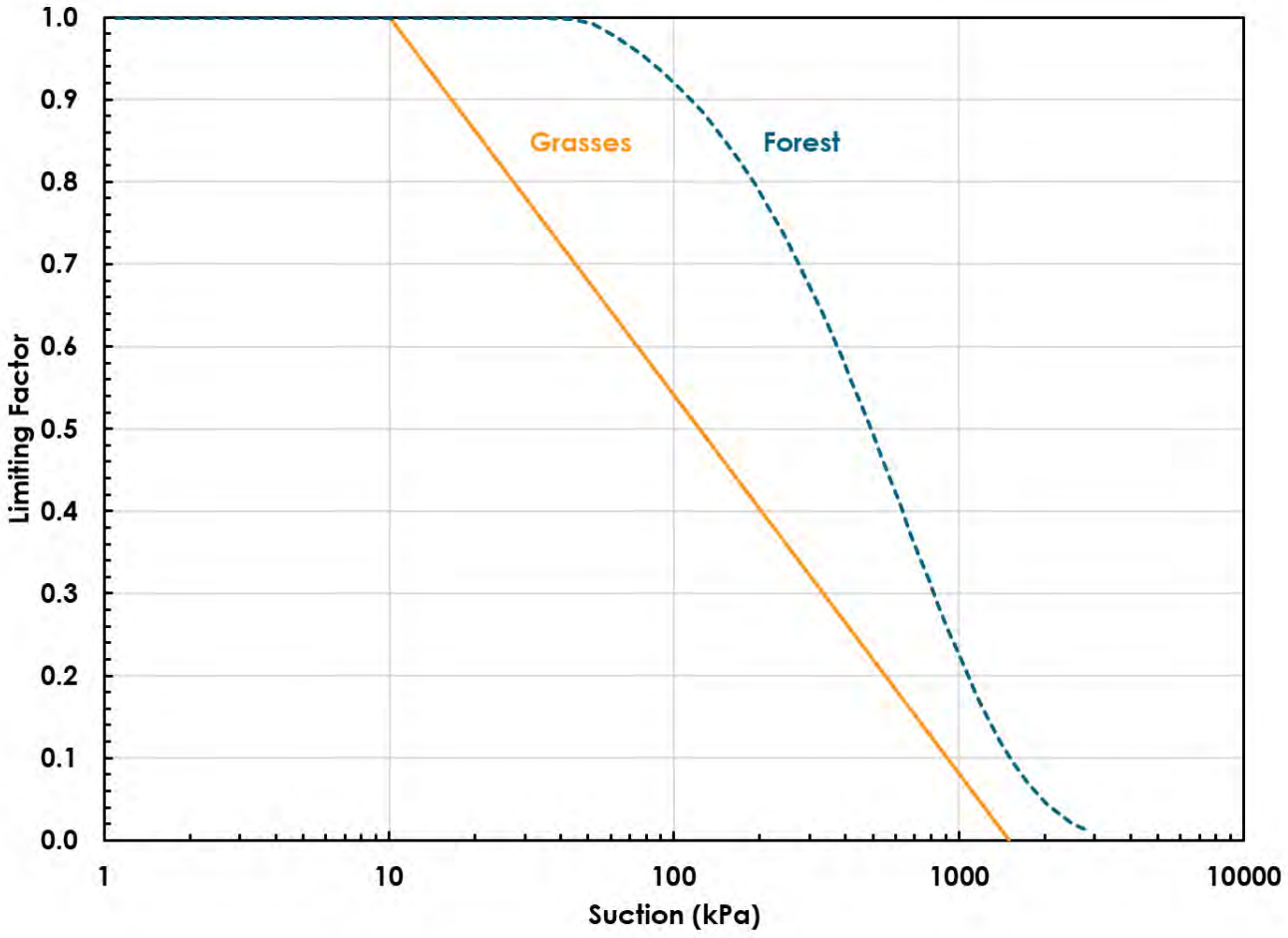

Figure 3.9: PWLFs estimated to simulate grasses and forest growth.

3.5.4.4 Growing Season

To define the growing season, the following assumptions were made:

- The growing season starts once the snowpack is completely melted and mean daily air temperature is above 5°C.
- The growing season ends once the minimum temperature after September 1 drops below 0°C.

3.5.5 Lower Boundary Conditions

The lower boundary condition was assumed to be a unit hydraulic gradient for the 1D simulations. This boundary condition assumes that the movement of water at the depth of the lower boundary is no longer influenced by atmospheric forces and is moving downwards only due to gravity.

3.5.5.1 Initial Conditions

The initial conditions for the 1D SPA model were obtained by running the models twice, using the final conditions of the first simulation as the initial conditions of the second simulation. This is done to remove the subjectivity of the ascribed initial conditions from the model results. The initial conditions of the 2D and 3D models were based on the results of the 1D SPA model.

3.5.6 Geochemical Model

Source terms for the NAG pit backfill were developed using a geochemical model based on the facility specific conceptual model. Source terms were modelled using both mechanistic reactive transport models and geochemical scale-up models. Source terms were developed for three scenarios; two cover system scenarios, a poorly graded till and sandstone mine rock scenario and a well graded till and blended mine rock (60% siltstone, 35% mudstone and 5% sandstone) with internal layers scenario and a third well graded till and blended mine rock (60% siltstone, 35% mudstone and 5% sandstone) without internal layers scenario. Source terms for the NAG pit backfill can be found in Appendix A.

3.5.6.1 Geochemical Model Methodology

Reactive transport models utilized the geochemical code PHREEQC to apply mineralogical kinetics that applicable to NAG mine rock from the Project. The purpose of the reactive transport model was to incorporate mineral kinetics, water flow, and oxygen availability to simulate the evolution of sulfide oxidation rates, metal leaching, and carbonate dissolution simultaneously over a long-term timeframe. Reaction kinetics were calibrated to NAG mine rock barrel tests that are ongoing at the Tenas site (SRK, 2022b). The geochemical scale-up model utilized NAG barrel tests from the Tenas project to calculate loading rates of parameters that are not strongly influenced by sulfide oxidation and carbonate dissolution. Source terms of these parameters were scaled up to conditions representative of the NAG backfill.

Parameters that were modelled via the reactive transport model included pH, alkalinity, SO_4, Al, Ag, As, Ca, Co, Cr, Cd, Cu, Fe, Hg, Mg, Mn, Na, Ni, Pb, Si, Sr, Sn, U, V, Zn, NO_3, NH_3, and NO_2. The mechanistic reactive transport model was developed in two phases:

- *Phase 1* – The reactive transport model was developed and calibrated using mineralogical data and barrel test leachate data for representative NAG mine rock.

- *Phase 2* – The calibrated reactive transport model for the barrel test was scaled to field conditions by adjusting for the differences in hydrology, temperature, and mass of the reactive particle size fraction (< 6.35 mm in the barrel tests) between the barrel tests and full-scale conditions.

Parameters not incorporated into the reactive transport model were estimated using a geochemical scale-up model. This model was developed by scaling up barrel test production rates by using facility- and site-specific adjustment factors to obtain representative weathering rates. Parameters incorporated in this model included Ba, B, Be, Li, K, P, Si, Sr, Ti, and Zr. Adjustment to full scale conditions was completed by applying scaling factors for reactive particle size, and water contact.

3.5.6.2 Model Development

Reactive transport models were developed for the B1 and B2 barrel tests combined and for the B7 barrel test. The B1 and B2 were combined as these barrels were constructed using the same NAG mine rock samples while the B7 barrel test used different NAG mine rock samples.

Mineralogical analyses for several samples used in the barrel tests reported a single mass for the dolomite-ankerite phase while other samples reported a unique mass for both dolomite and ankerite. Therefore, for modelling purposes it was assumed that if dolomite-ankerite was reported, 50% of this mass was dolomite and the other 50% was ankerite. The reactive mineralogy modelled in the NAG barrel tests is summarized in Table 3.5.

Table 3.5: Summary of reactive minerology in NAG mine rock barrel tests (from SRK, 2022b).

Mineral Name	Unit	B1 and B2	B7	Median NAG Mine Rock
Calcite	wt.%	2.3	0.5	1.4
Siderite	wt.%	7.3	7.8	2.0
Dolomite	wt.%	8.9	8.0	6.9
Ankerite	wt.%	7.9	3.4	0.4
Pyrite	wt.%	4.6	2.0	0.8

Metal leaching was assumed to be predominantly associated with pyrite oxidation. Therefore, metal(loid)s were added to the pyrite mineral phase in PHREEQC based on the molar ratio of respective metals to SO_4 in barrel test leachates (Table 3.6). Divalent cationic metals were assumed to substitute for Fe, while anionic metals were assumed to substitute for S in the pyrite structure. This enabled the release of metals commonly associated with pyrite to be closely coupled to the kinetics of pyrite dissolution in the model.

Table 3.6: Molar composition of pyrite phase used in the reactive transport model.

Parameter	Molar Composition
Fe	0.9999384
Ni	0.0000177
Co	0.0000051
Cu	0.0000044
Pb	0.0000014
Mn	0.000022
Zn	0.0000097
Se	0.000045
As	0.0000013
S	1.99995

Kinetic rate equations were added to the reactive transport model based on published rate law equations and reaction rate coefficients for both the oxidation of sulfide minerals and the dissolution of carbonate phases (Table 3.7). Due to limited kinetic and thermodynamic data associated with ankerite in literature it was assumed that ankerite had the same thermodynamic and kinetic properties as dolomite in the model.

The hydraulic regime of the reactive transport model of the barrel test followed leachate collection events when leachate volumes were measured. Material properties for the reactive particle size fraction (< 6.35 mm) from the water balance modelling were used and assumed a porosity of 0.35 and degree of saturation of 50%, corresponding to a volumetric water content of 0.175 m^3/m^3 in the barrels.

Table 3.7: Kinetic rate equations for minerals included in the reactive transport model.

Mineral	Rate Equation	Rate Constant, k (mol m^{-2} s^{-1})	Effective Rate Constant, k_{eff} (mol m^{-3} s^{-1})	Reference
Pyrite	$Pyrite\ Rate = k\ x \left(\frac{A}{V}\right)\ x\ [H^+]^{-0.11}\ x\ [O_2]^{0.5}\ x\ \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	1.1 x 10^{-10}	-	Williamson and Rimstidt, 1994 Xu et al., 1998
Calcite	$Calcite\ Rate = (k_1\ x\ [H^+] + k_2\ x\ [H_2CO_3])\ x \left(\frac{A}{V}\right)\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	$k_1 = 10^{-0.05}$ $k_2 = 10^{-0.05}$	-	Chou et al., 1989
Dolomite	$Dolomite\ Rate = k\ x \left(\frac{A}{V}\right)\ x\ [H^+]^{0.5}\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	$10^{-2.59}$	-	Chou et al., 1989
Ankerite	$Ankerite\ Rate = k\ x \left(\frac{A}{V}\right)\ x\ [H^+]^{0.5}\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	$10^{-2.59}$	-	*
Siderite	$Siderite\ Rate = k_{eff}\ x \left(\frac{m}{m_0}\right)^{\frac{2}{3}}$	-	$10^{-9.52}$	Dresel, 1989

*Ankerite kinetic characteristics were assumed to be similar to dolomite.

3.5.6.3 Calibration

The reactive transport model was calibrated by adjusting mineral-specific surface areas or effective rate coefficients (Table 3.8) such that modelled barrel test results were comparable to the median leachate concentration of the barrel tests. A separate model was calibrated for the B1 and B2 barrel tests together and another model was calibrated to the B7 barrel test.

Substantial cation exchange between Na, Ca, and Mg was observed in the barrel tests. Carbonate dissolution releases Ca^{2+} and Mg^{2+} that subsequently exchange for Na^{+} from surface sites of the host rock (likely associated with clay minerals). The resulting leachate from the barrel tests is enriched in Na concentrations. In order to calibrate the reaction rate for carbonate dissolution, Ca and Mg concentrations needed to be back calculated from the Na concentrations in the leachate. It was assumed that all Na was sourced from cation exchange with Ca and Mg. The ratio of Ca/Na exchanged compared to Mg/Na exchanged was calculated based on the ratio of ion exchange coefficients of Ca-Na and Mg-Na exchange pairs (Bruggenwert and Kamphorst, 1982).

Table 3.8: Calibrated values of kinetic rate equation parameters.

Mineral	Calibrated Surface Area/Volume (dm^{-1})		Calibrated Effective Rate Coefficient (mol m^{-3} s^{-1})	
	B1 and B2	B7	B1 and B2	B7
Pyrite	-	-	$10^{-8.585}$	$10^{-8.72}$
Calcite	0.01	0.009	-	-
Dolomite	0.02	0.007	-	-
Ankerite	0.01	0.007	-	-
Siderite	-	-	$10^{-9.523}$	$10^{-9.523}$

Following the calibration of the barrel test scale reactive transport model, there was good agreement between modelled parameter concentrations and measured leachate chemistry from the mine rock barrel tests (Figure 3.10). The average of the calibrated factors for the B1/B2 and B7 models were used in the full-scale reactive transport model.

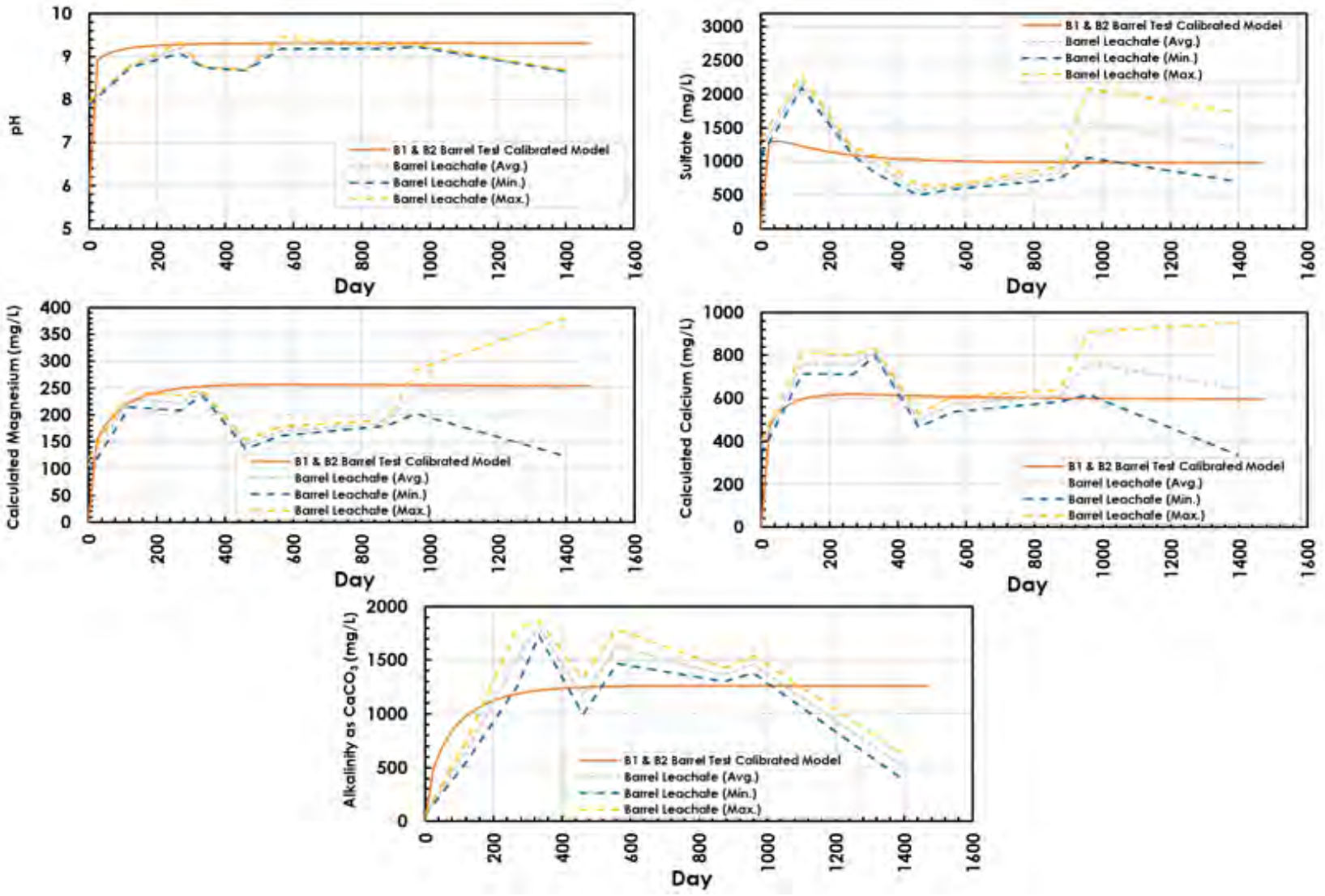

Figure 3.10: Parameter concentrations for the calibrated model versus minimum, maximum, and average B1 and B2 leachate concentrations.

3.5.6.4 Model Scale-Up

Once the geochemical model was calibrated to the field barrel tests, the reactive transport model was scaled up using the nominal height of respective strips (Table 3.1) within the NAG backfill with the final output being stockpile drainage chemistry. GeoStudio oxidation modelling provided stockpile temperature and thickness of both oxic reactive and suboxic non-reactive material. Hydraulic information such as the timing and amount of seepage for the full-scale model was provided by the GoldSim hydrological and seepage models for bare surface and covered conditions.

Temperature Adjustments

The effects of temperature on the literature values for the rate constant of each mineral modelled in the NAG backfill was adjusted using the Arrhenius equation (Equation 4; Gautelier et al., 1999). The temperature adjustment was performed on barrel tests that used an average annual air temperature of 4.9°C. The average internal NAG backfill temperature was estimated to be approximately 3°C based on the GeoStudio oxidation model, and this temperature was used to scale the reaction rates.

$$k_T = k_{25°C}\, x\, A^{\left(\frac{-Ea}{R\Delta T}\right)} \quad (5)$$

Where:

- k_T is the rate constant at temperature, T;
- $k_{25°C}$ is the rate constant at 25°C;
- A is the pre-exponential factor (2.718 s^{-1});
- E_a is the activation energy (kJ);
- R is the molar gas constant (8.314 J K^{-1} mol^{-1}); and
- ΔT is the temperature difference $\left(\frac{1}{T\ (K)} - \frac{1}{298.15\ K}\right)$

The activation energies used for the temperature correction of mineral reaction rates are summarized in Table 3.9. Only pyrite, calcite, and dolomite were adjusted for temperature, while reactivity of siderite was maintained under standard conditions due to a lack of information.

Table 3.9: Activation energies for minerals included in the reactive transport model.

Mineral	Activation Energy (kJ)	Reference
Pyrite	70	Lowson, 1982
Calcite	20.9	Sajwan and Evangelou, 1991
Dolomite	36.1	Herman and White, 1985
Siderite	-	-

3.5.6.5 Reactive Transport Model of the NAG Backfill

Infiltrating Water Chemistry

The chemical signature of the infiltrating water (or net percolation) was assumed to be equal to the water chemistry of a site-specific overburden barrel test because of the use of overburden in the cover system (Table 3.10). Initial NAG backfill porewater was assumed to be similar to the initial water chemistry sampled from the NAG barrel tests. An average from the B1/B2 and B7 tests was used in the full-scale model.

Table 3.10: Reactive transport model infiltrating water and initial NAG backfill porewater composition.

Parameter	Unit	Infiltrating Water Composition	Initial Porewater Composition
pH	-	8.2	7.9
Sulfate (Dissolved)	mg/L	118	1,205
Alkalinity (Total as $CaCO_3$)	mg/L	0.1	106
Chloride (Dissolved)	mg/L	0.25	3.83
Fluoride (Dissolved)	mg/L	0.13	-
Arsenic (Dissolved)	mg/L	0.00078	0.00012
Calcium (Dissolved)	mg/L	45.0	372
Cobalt (Dissolved)	mg/L	0.00016	0.0057
Copper (Dissolved)	mg/L	0.011	0.001
Iron (Dissolved)	mg/L	0.005	0.01
Lead (Dissolved)	mg/L	0.00014	0.0001
Magnesium (Dissolved)	mg/L	26.0	107
Manganese (Dissolved)	mg/L	0.00052	0.034
Nickel (Dissolved)	mg/L	0.00025	0.0074
Potassium (Dissolved)	mg/L	1.6	3.23
Selenium (Dissolved)	mg/L	0.00058	0.11
Sodium (Dissolved)	mg/L	19	512
Zinc (Dissolved)	mg/L	0.0005	0.0043

Parameter	Unit	Infiltrating Water Composition	Initial Porewater Composition
Nitrate (as N)	mg/L	0.44	56.8
Ammonia (Total)	mg/L	0.0088	7.18
Nitrite (as N)	mg/L	0.0039	1.31

Blasting residues from placed mine rock will leach inorganic nitrogen. Initial source terms of N species (NO_3, NO_2, and NH_4) were determined based on the powder factor (0.5 kg/m^3) and proportion of inorganic N produced based on emulsion and ammonium nitrate fuel oil (ANFO) composition (SRK, 2022a). To calculate the mass of residual N in the NAG backfill, the method by Ferguson and Leask (1988) was used and assumed the following:

- 0.9% of N from ANFO and 5.1% of N from the emulsion as available for leaching (Ferguson and Leask, 1988);
- ANFO is 75% ammonium-nitrate and emulsion comprise the remaining 25%; and
- Leachable inorganic N load from explosives will result in:
    - 87% as NO_3-N;
    - 11% as NH_4-N; and
    - 2% as NO_2-N.

Nitrogen species leaching was incorporated into the reactive transport model by using an assumed volumetric water content, the total volume of material placed, and the mass of residual N to calculate an N concentration leaching from the backfill. This methodology was used so that the hydraulic transport time simulated in the reactive transport model could also be applied to N leaching. Nitrogen species concentrations used in the model are shown in Table 3.10.

Mineralogy

The NAG backfill reactive transport models included both reactive primary minerals and secondary minerals. Reactive primary minerals were limited to pyrite, calcite, dolomite, ankerite, and siderite. Additional minerals (e.g., primary silicates) were identified in the geochemical characterization program (SRK, 2022b); however, these minerals were assumed to be kinetically insignificant during the modelled time scale due to the neutral pH of the NAG backfill.

Elevated concentrations of dissolved metals under neutral pH conditions can result in the precipitation of secondary minerals. Secondary mineral precipitation was incorporated into the final reactive transport and geochemical scale-up model results by completing equilibrium modelling on the source terms. Minerals applied in the equilibrium modelling step were generally consistent with those used in the

SRK (2022a) (Table 3.11). Surface adsorption reactions were not included in the model because it was assumed that adsorption was accounted for in the barrel test leachate chemistry, therefore, the pyrite stoichiometric composition used in the model.

Table 3.11: Model equilibrium phases.

Phase	Empirical Formula	Phase	Empirical Formula
Aluminum Hydroxysulfate	$Al_4(OH)_{10}SO_4$	Ferrihydrite	$Fe(OH)_3$
Amorphous Aluminum Hydroxide	$Al(OH)_3$	Goslarite	$ZnSO_4 \cdot 7H_2O$
Azurite	$Cu_3(CO_3)_2(OH)_2$	Gypsum	$CaSO_4 \cdot 2H_2O$
Barite	$BaSO_4$	Lead Molybdenum Oxide	$PbMoO_4$
Birnessite	$MnO_2 \cdot nH_2O$	Malachite	$Cu_2(CO_3)(OH)_2$
Brochantite	$Cu_4SO_4(OH)_6$	Manganite	$MnO(OH)$
Calcium Molybdenum Oxide	$CaMoO_4$	Melanterite	$FeSO_4 \cdot 7H_2O$
Calcite	$CaCO_3$	Nickel Hydroxide	$Ni(OH)_2$
Chalcanthite	$CuSO_4 \cdot 5H_2O$	Otavite	$CdCO_3$
Carbon Dioxide	$CO_{2(g)}$	Zinc Hydroxide	$Zn(OH)_2$
Copper Hydroxide	$Cu(OH)_2$		

Note: Phases in BOLD not included in SRK (2022a).

Flow Transport

Hydrology is an important component of the NAG reactive transport models. The NAG backfill hydrology used results from the GoldSim hydrological and seepage models (Section 3.3). The NAG backfill reactive transport models were split into 23 cells (Figure 3.3), each having different geometries and mine rock storage capacities (Table 3.1).

Material properties of the bulk mine rock in the NAG backfill were included in the full-scale geochemical model but were adjusted to account for only the reactive fraction of the mine rock (assumed to be the -6.35 mm fraction as used in the barrel tests). Flow of water was assumed to be primarily matrix-dominated. Flow calculations for the model assumed the following material properties for the finer fraction:

- Porosity – The porosity of the finer fraction of the NAG backfill was assumed to be 0.4;
- Degree of saturation – The degree of saturation of the finer fraction in NAG backfill at steady-state was 0.61 based on GoldSim modelling; and
- Proportion of reactive mine rock – The -6.35 mm size fraction typically controls the reactivity of mine rock. The NAG backfill was assumed to composed of 20% -6.35 mm particles based on existing material properties.

The adjusted reactive volumetric water content of the facility was calculated to be 0.049 based on these values and was used to determine cell-specific pore volumes in the reactive transport model.

The volume of water entering of the NAG backfill will change once the mine rock is covered. Additionally, this volume will be different based on the cover system scenario modelled. Three hydrological periods were defined in NAG backfill reactive transport models for each of the modelled scenarios, respectively:

1) *Bare Surface* – This period represented conditions prior to cover system placement on the cell. During this phase, mine rock is exposed to the atmosphere and infiltration rates are 273 mm/year for the poorly graded till and sandstone scenario (Scenario #1) and 143 mm/year for both the well graded till and mixed mine rock scenario (Scenario #2) and the no internal layers scenario (Scenario #3). The duration of the bare surface period is cell-specific and is dependent on the construction and reclamation schedule.

2) Covered Grass NP – This phase represented construction of the closure cover on a cell and occurred for a period of five years as re-vegetation occurs. Once the cover system is placed, both oxygen ingress and NP decrease. Once covered, NP decreases to 197 mm/year in the poorly graded till and sandstone scenario (Scenario #1). Due to differences in runoff between the bare surface and the grass covered surface in the well graded till and mixed mine rock scenarios (Scenarios #2 and #3) NP increased to 148 mm/year.

3) Covered Forest NP – This phase represents maturing of vegetation on the constructed cover system and occurred for the remaining model time following the covered grass NP period. As vegetation matures and shifts to forest dominated NP decreases. Covered forest NP was 124 mm/year for the poorly graded till and sandstone scenario (Scenario #1) and 72 mm/year for the well graded till and mixed mine rock scenarios (Scenarios #2 and #3).

Effects of Suboxic Zones

Potential establishment of suboxia within the NAG backfill is a function of limiting re-supply of oxygen from the atmosphere, either laterally across angle of repose slopes of the backfilled mine rock, or vertically across the horizontal surface of the backfilled mine rock. Limiting airflow capacity across the horizontal surfaces can also limit lateral advective gas transport, in the absence of a limitation of the presence of a limitation on airflow capacity on the sloping backfilled surface, depending on the lift height of the backfilled mine rock. Initially, oxygen concentration in the pore-space of the backfilled NAG material will be atmospheric (nominally 20.9% by volume). Sulfide material within the NAG material will consume this oxygen; however, if re-supply of oxygen is limited as discussed previously, then the availability of further sulfide oxidation will be limited, thus creating suboxic conditions within each encapsulated cell. As oxygen decreases, and the geochemical conditions shift from oxic to suboxic, additional biological reactions that are favourable in the absence of oxygen may occur; however, to provide a conservative prediction of the effect of suboxic conditions, these biological reactions were

not included in any modelling. This is a substantively conservative approach given that in suboxic conditions, and provided there is opportunity and hydraulic residence time for denitrification, it is reasonable to postulate that bio-reduction of selenium will also occur (see MEND, 2015). Once suboxic conditions are established, the reactive transport model assumes that pyrite oxidation only occurs in the oxic zone nearer to the surface, while carbonate minerals can still react throughout the entire depth of the cell as their reactivity is not dependent on oxygen availability in the NAG backfill.

Given the geometry of the NAG backfill, and the different cell volumes and placement timing, zones of suboxia will vary based on the location of the cell in the NAG backfill. Cell-specific reactive and suboxic zone thicknesses for all cells were determined from the GeoStudio Oxygen Ingress Model results (Section 4.2). The development of suboxic conditions occurred at depths of roughly 13 m below the cover system in the poorly graded till and sandstone scenario and occurred within the 3.3 m cover system in both the well graded till and mixed mine rock scenarios. In order to remain conservative and capture sulfide oxidation and subsequent reactions occurring in the mine rock mix cover system, a depth to suboxic conditions of 3 m was used in the well graded cover system scenarios. Cell-specific reactive and suboxic zone thicknesses are summarized below in Table 3.12.

Table 3.12: Cell-specific reactive and suboxic zone thicknesses.

Cell	Total Cell Height (m)*	Reactive Zone Thickness (m)		Suboxic Zone Thickness (m)	
		Poorly Graded	Well Graded	Poorly Graded Scenario	Well Graded Scenarios
1	28	13	3	15	25
2	44	13	3	31	41
3	44	13	3	31	41
4	51	13	3	38	48
5	64	13	3	51	61
6	51	13	3	38	48
7	33	13	3	20	30
8	24	13	3	11	21
9	28	13	3	15	25
10	13	13	3	-	10
11	6	6	3	-	3
12	7	7	3	-	4
13	6	6	3	-	3
14	6	6	3	-	3
15	5	5	3	-	2
16	5	5	3	-	2
17	5	5	3	-	2

Cell	Total Cell Height (m)*	Reactive Zone Thickness (m)		Suboxic Zone Thickness (m)	
		Poorly Graded	Well Graded	Poorly Graded Scenario	Well Graded Scenarios
18	7	7	3	-	4
19	6	6	3	-	3
20	10	10	3	-	7
21	8	8	3	-	5
22	4	4	3	-	1
23	3	3	3	-	-

*Not including cover system

Construction Schedule

The construction schedules of the NAG backfill will influence timing of seepage quality. Placement of the cover system will limit oxygen ingress and NP into the NAG backfill as well as the maturing of the cover system vegetation. The construction schedule of both the backfill and cover system was simplified to allow for implementation into the reactive transport model. These simplifications and assumptions were:

- All cells are built instantaneously, and the complete height of the cell was available for reaction once it was placed in the model.
- Cover system placement for the backfill is indicated by the construction schedule provided by Telkwa and detailed in Section 3.5.1.
- Once covered, there will be an instantaneous decrease in NP.
- Once forest vegetation is developed (assumed to be five years after cover construction) there will be an instantaneous decrease in NP.
- Once covered, there will be an approximately 15-year period for suboxic conditions to develop. It was assumed there will be an instantaneous shift to suboxic conditions 15 years after cover construction.

Additional NAG Backfill Reactive Transport Model Assumptions

- Mineralogy was homogeneous throughout the NAG backfill and is defined based on the NAG mine rock barrel tests compositions;
- Mine rock placement in the NAG backfill will include mine rock characterized as the average composition from the mine rock barrel tests;

- Cell-specific annual loads (mg/year) were calculated based on the reactive transport concentration outputs and total annual flow volumes for each cell respectively;
- The timing of seepage from each cell of the reactive transport model was based on wetting-up timing from the GoldSim model. A cell was assumed to be wetted-up when total annual seepage from the GoldSim model was greater or equal to 50% of the steady state total annual seepage for that cell. Prior to a cell being wetted-up, parameter concentrations were set to equal the concentration from Year 0 of the reactive transport model. Seepage rates are negligible during the time the cell is wetting up, and therefore load from the cell is also negligible;
- After an initial wetting-up phase, final concentrations for the NAG backfill were calculated using the total annual loads (mg/year) from each cell divided by the total annual seepage rate (L/year);
- Seasonality was not included in the model. A constant NP based on bare surface, covered grass surface, or covered forest surface was assumed for all cells;
- Cell-specific seepage volumes and concentrations were mixed at the base of the NAG backfill based on the modelled seepage rates from the GoldSim model;
- The performance of the cover system remains constant;
- Parameter concentrations below detection limit were assigned values of the detection limit used in the barrel test leachate chemistry reporting;
- During the bare surface period, seepage and porewater is in equilibrium with the atmosphere ($\log(pO_2) = -0.7$ and $\log(pCO_2) = -3.5$); and
- During the cover period, pore water residing in the suboxic zone is in equilibrium with O_2 concentrations of 0.1% ($\log(pO_2) = -3.0$).

3.5.6.6 Geochemical Scale-Up Model

Parameters that were not included in the reactive transport model were modelled using a geochemical scale-up model. The geochemical scale-up model functioned by:

- Developing average loading rates for parameters not included in the reactive transport models using the leachate data from the B1, B2 and B7 barrel tests; and
- Scaling-up the production rates based on material placement, hydraulic properties, and material properties.

Soluble salts can accumulate before kinetic experiments are initiated and result in rapid flushing of constituents. Potentially due to the age of the weathering experiments or variations in collected water volumes it was not entirely apparent if the B2 and B7 barrel tests had fully flushed stored soluble salts; however, loading rates from the last three samples collected were used.

Similar to the reactive transport model, loading rates derived using the barrel leachate data were scaled up based on differences between the barrel test scale and the full backfill scale. The scale up included two scaling factors: particle size and mine rock contact. Temperature scaling factors were not applied as it was assumed that the average temperature in the barrels will be comparable to the full-scale NAG backfill.

Particle Size Factor

The reactive particle sizes of the NAG backfill were assumed to be limited to the < 6.35 mm portion and assumed to be 20% of the bulk mine rock; therefore, the scaling factor for particle size was set to 0.2. This particle size scaling factor was previously used by SRK (2022a) to scale HCT loading rates to field scale.

Contact Factor

The reactivity of the mine rock will be limited to the < 6.35 mm portion; however, only a portion of the seepage will react with this portion given the likely presence of preferential flow paths. A contact factor of 0.5 was used in previous source term development (SRK, 2022a) and was deemed reasonable for the current model.

Geochemical Scale-Up Model Assumptions

The following assumptions were included in the geochemical scale-up model:

- Cell-specific annual loads (mg/year) were calculated based on the annual mass of mine rock for the cell in the given year and the loading rate of the parameter (mg/kg/year). After an initial wetting-up phase, final concentrations for the NAG backfill were calculated using the total annual loads (mg/year) for all cells divided by the total annual seepage rate (L/year);
- The wetting up period for the backfill was estimated as the period of time prior to total annual seepage volumes equalling roughly 50% of steady state annual seepage volumes (roughly 17 years). Seepage concentrations prior to wetting up were set to concentrations calculated for the first year after wetting up;
- Once a cell was fully constructed and wetted-up, the annual loads were assumed to remain constant and estimated parameter concentrations were only influenced by changes in annual seepage rates;
- The seepage of all cells mixed at the base of the NAG backfill;

- Loading rates remained constant and were not affected by changes in mineralogy or kinetic rates over time; and
- Solubility controls were applied by including the geochemical scale-up modelled parameters in the equilibrium modelling discussed in Section 3.5.6.5.

3.5.7 Nitrogen Sensitivity Scenarios

Two additional model sensitivity scenarios were simulated to assess nitrogen source terms under different blasting loss conditions. A high nitrogen source term scenario was run to simulate a scenario where nitrogen losses from blasting are greater than expected. A low nitrogen source term scenario was run to simulate decreased nitrogen losses from blasting resulting from blast hole liners used as a source mitigation.

Nitrogen source term scenarios were modelled by either increasing or decreasing the residual nitrogen available for leaching as calculated by Ferguson & Leask (1988). This in turn increased or decreased the initial pore-water concentration of nitrogen species applied in PHREEQC for the respective nitrogen scenarios (Table 3.13). All other reactive transport model inputs remained the same as in the Well-Graded with No Internal Layers models. The high nitrogen source term scenario represents an increase of 56.25% residual nitrogen. Blasthole liners are assumed to decrease nitrogen losses by 37.5% in the low nitrogen source term scenario (D. Farmer, personal communication, July 15, 2024).

Table 3.13: Initial nitrogen species concentrations in NAG backfill porewater for nitrogen source term scenarios.

Parameter	Unit	Initial Porewater Composition		
		Well-Graded No Internal Layers Scenario	High Nitrogen Scenario	Low Nitrogen Scenario
Nitrate (as N)	mg/L	65	102	41
Ammonia (Total)	mg/L	8.3	13	5.2
Nitrite (as N)	mg/L	1.5	2.4	0.94

4 MODELLING RESULTS AND DISCUSSION

4.1 Water Balance Results

A landform water balance was completed to develop simplified boundary conditions for the 2D GeoStudio oxidation modelling and the 3D GoldSim modelling. A summary of the 1D water balance for the two material combination scenarios is provided in Table 4.1. The well-graded till and mine rock mix material properties and results were also used for the no internal layers scenario.

Table 4.1: Summary of water balance results for the two material combination scenarios.

Scenario	Total Precipitation (mm)	Rainfall (% of PPT)	Snow (% of PPT)	Actual Evapotranspiration (% of PPT)	Runoff (% of PPT)	Sublimation (% of PPT)	Net Percolation (% of PPT)
PG Till and Sandstone (Bare)	649	61%	39%	32%	2%	24%	42%
PG Till and Sandstone (Grass – 5 years)	616	52%	48%	49%	0%	19%	32%
PG Till and Sandstone (Forest – 73 years)	655	61%	39%	57%	3%	21%	19%
WG Till and Mine Rock Mix (Bare)	649	61%	39%	42%	12%	24%	22%
WG Till and Mine Rock Mix (Grass – 5 years)	616	52%	48%	54%	3%	19%	24%
WG Till and Mine Rock Mix (Forest – 73 years)	655	61%	39%	59%	9%	21%	11%
Mine Rock Mix (Bare)	649	61%	39%	28%	28%	21%	22%*

PG Till – Poorly Graded Till; WG Till – Well Graded Till; PPT – Precipitation

* - Surface net infiltration into the bare Mine Rock Mix

An average year of daily net percolation rates for each time period (bare, grass, and forest) were used as inputs in the 2D GeoStudio models and stochastically in the 3D GoldSim model.

4.2 2D GeoStudio Oxidation Model Results

The predicted development of the suboxic zone within the NAG backfill mine rock within the Open Pit with time for the poorly graded till and sandstone mine rock scenario is shown in Figure 4.1. The suboxic zone development for the well graded till and mine rock mix scenario is shown in Figure 4.2, while the suboxic zone development for the scenario with no internal overburden layers is shown in Figure 4.3. The models indicate that the long-term depths to suboxia are, on average, 13 m for the poorly graded till with sandstone mine rock scenario and 3.3 m for the well graded till with the mine rock mix scenario, as well as the no internal overburden layers scenario. The suboxic zone takes approximately 15 years to form in each strip in the poorly graded till with sandstone mine rock scenario. In both the well graded till with the mine rock mix scenario and the no internal layers scenario (using well graded till and mine rock mx material properties), it took approximately 13 years for the suboxic zone to form in each strip. These results were used to estimate the development of the suboxic zone within the 3D GoldSim model.

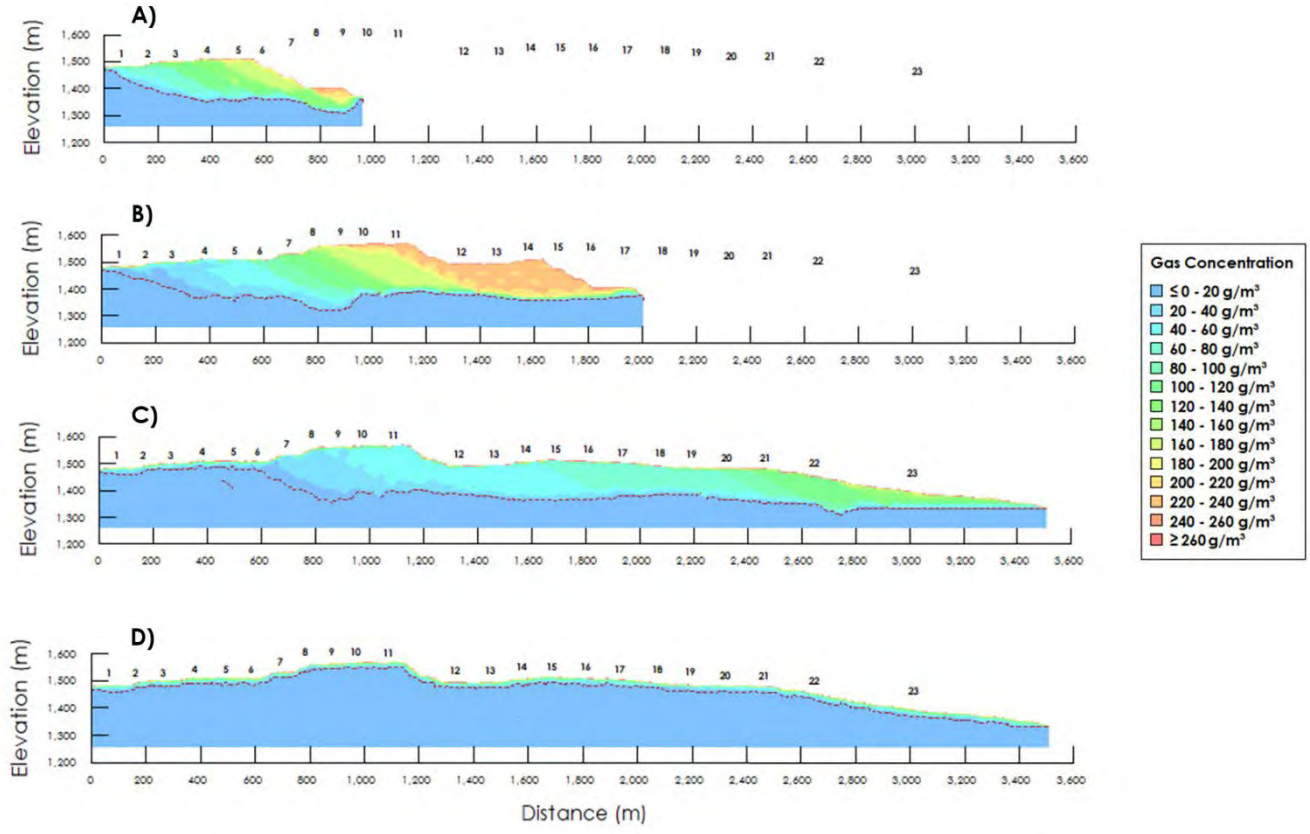

Figure 4.1: Development of suboxic zone for the poorly graded till and sandstone mine rock scenario (outlined by red dashed line in figures, which represents the zone at, or below, an O_2 concentration of 13 g/m³ or 1 vol.%) for the poorly graded till and sandstone mine rock scenario at A) Year 12; B) Year 17; C) Year 23; and d) Year 36/Long Term.

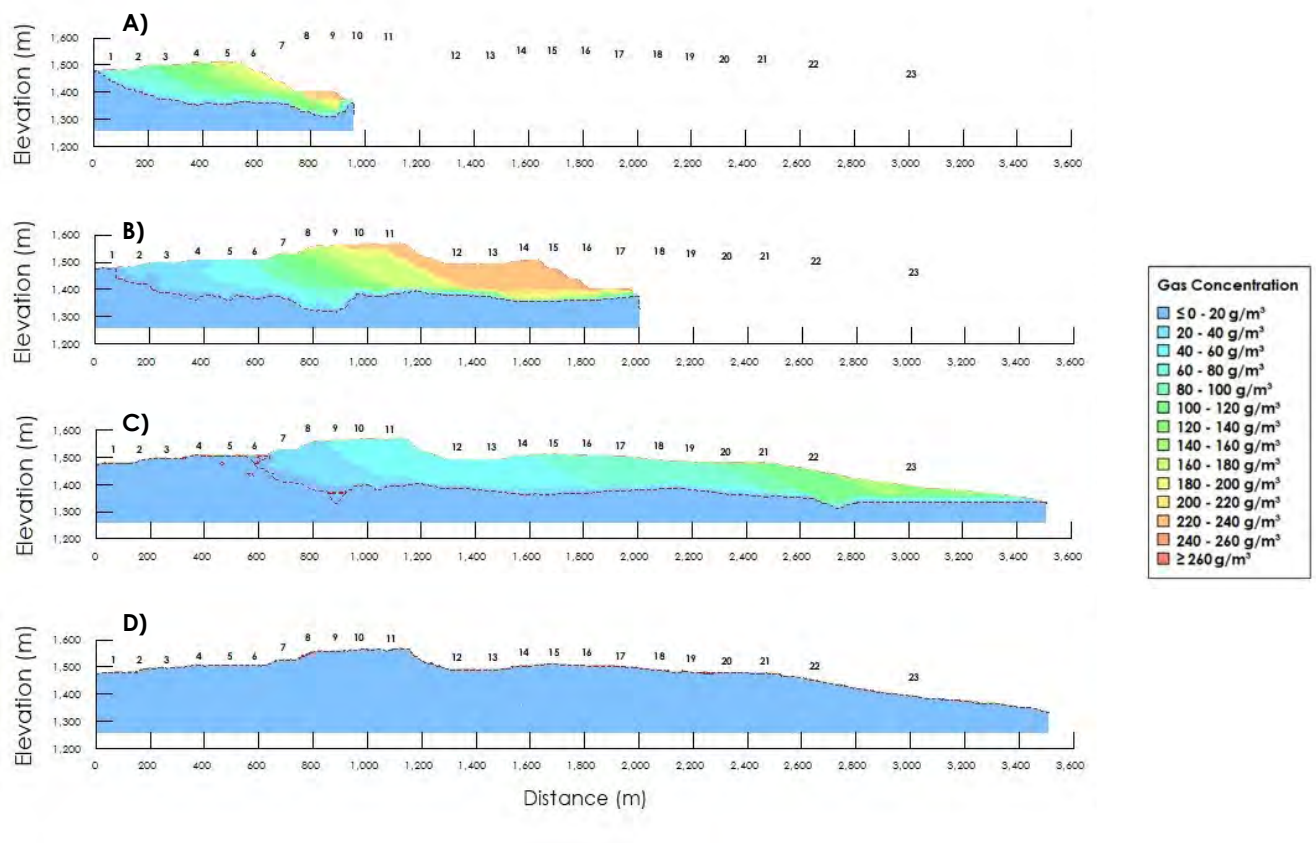

Figure 4.2: Development of suboxic zone (outlined by red dashed line in figures, which represents the zone at, or below, an O_2 concentration of 13 g/m³ or 1 vol.%) for the well graded till and mine rock mix scenario at A) Year 12; B) Year 17; C) Year 23; and d) Year 36/Long Term.

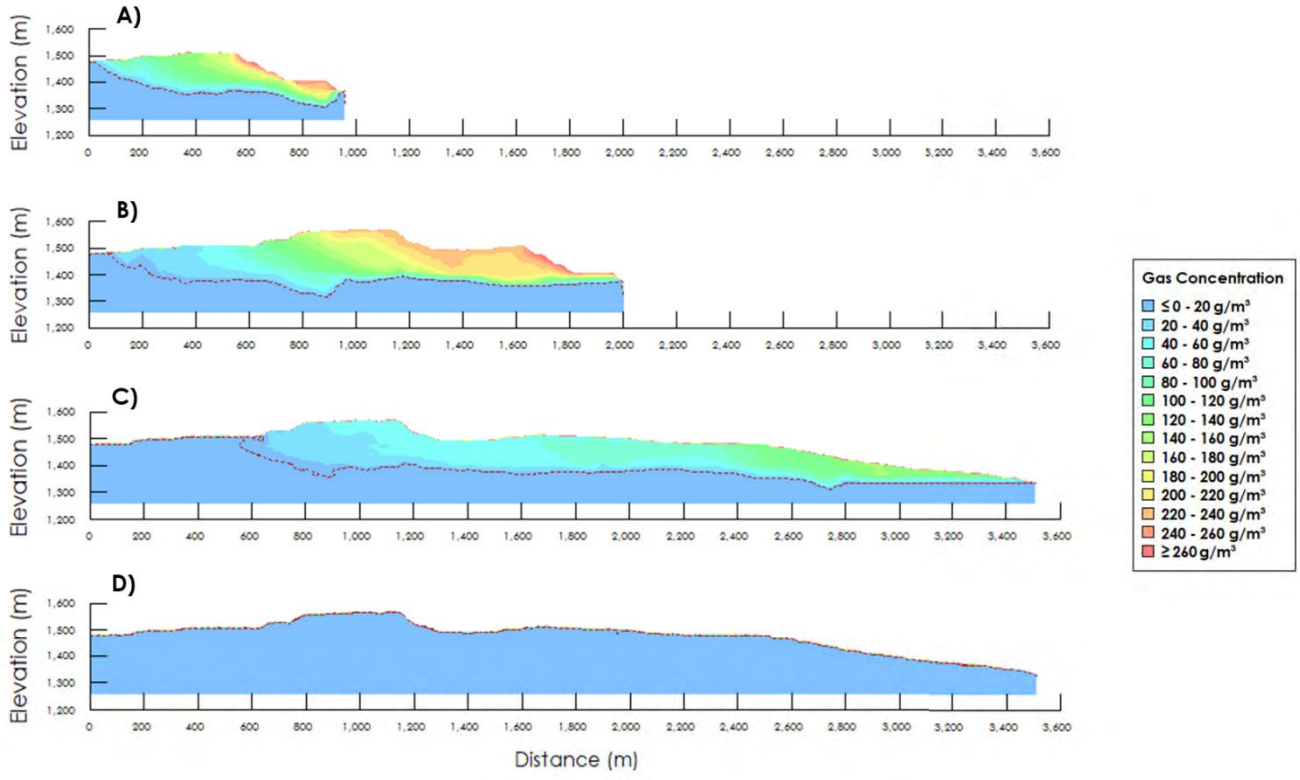

Figure 4.3: Development of suboxic zone (outlined by red dashed line in figures, which represents the zone at, or below, an O_2 concentration of 13 g/m³ or 1 vol.%) for the no internal layers scenario at A) Year 12; B) Year 17; C) Year 23; and d) Year 36/Long Term.

4.3 3D GoldSim Model Results

The 3D GoldSim model was run on calendar time with 2023 representing the first year of placement, or Year 6. The results are therefore presented in calendar time out to 2150, which represents Year 133.

4.3.1 Total Seepage

The total seepage rate of the backfilled NAG mine rock in the Open Pit was simulated in GoldSim for 100 realizations. The mean value, along with the 5th and 95th percentiles of the model results, are plotted in Figure 4.4 for all modelled scenarios. The models predicted long-term stabilized seepage rates from the covered and vegetated backfilled NAG mine rock that were between 31,000 m³/month and 36,000 m³/month for the poorly graded till and sandstone mine rock scenario, and between 14,500 m³/month and 16,000 m³/month for both the well graded till with mine rock mix scenario and the no internal layers scenario. The poorly graded till and sandstone mine rock scenario showed greater variability in monthly seepage rates due to the coarser texture of the material. Prior to cover system placement, the well graded till with mine rock mix scenario differs from the no internal layers scenario

due to the lack of overburden layers, but once the cover system is placed, the two scenarios show almost identical results.

The model results indicate that the backfilled NAG mine rock in the Open Pit will be wetted up, as indicated by the stabilization of the seepage rates, approximately 40 years following completion of construction for the poorly graded till and sandstone mine rock scenario. The finer texture of the material in both the well graded till with mine rock mix scenario and the no internal layers scenario resulted in a longer wetting up period, reaching stabilization approximately 80 years following the completion of construction.

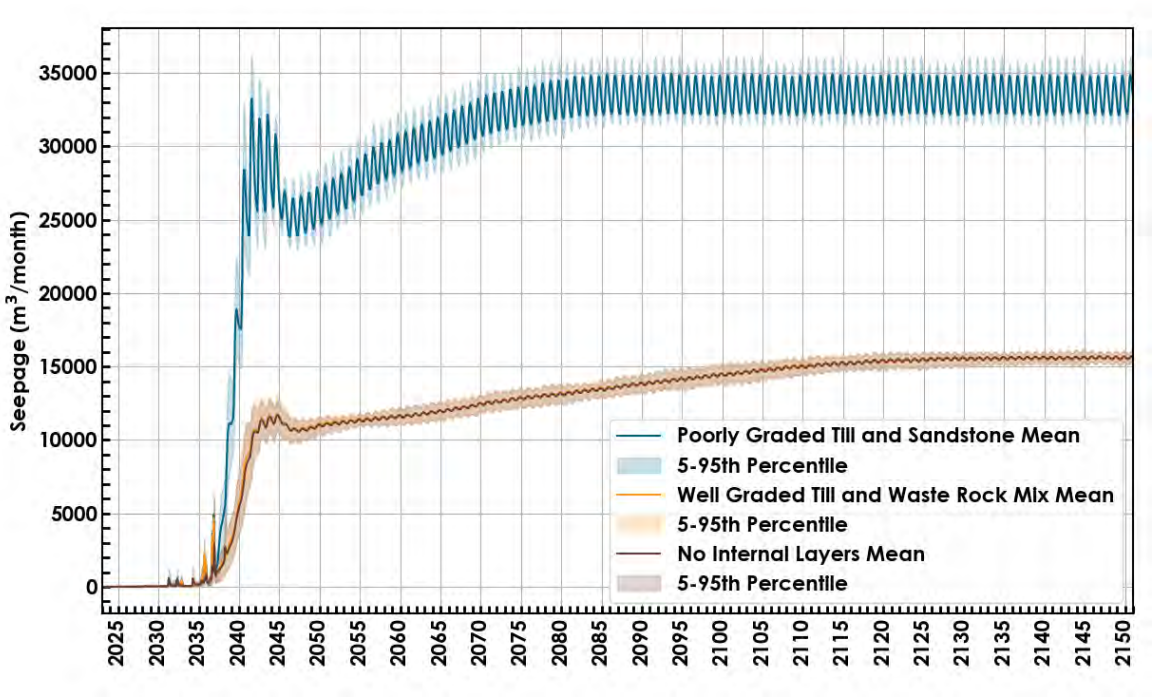

Figure 4.4: Range of seepage rates simulated by the GoldSim model for the backfilled NAG mine rock in the Open Pit for all the scenarios.

4.3.2 Total Storage

The estimated total stored water volume within the backfilled NAG mine rock for the modelled scenarios are shown in Figure 4.5. The modelled water volume increases with mine rock placement during construction before starting to stabilize once construction is complete and the cover system is placed. Similar to the seepage results, the water volume within the backfilled NAG mine rock is estimated to stabilize after approximately 40 years for the poorly graded till and sandstone mine rock scenario and approximately 70-80 years for both the well graded till with mine rock mix scenario and the no internal layers scenario. Once the stored water volume stabilized, very small variations in water volume were predicted, due to the variation in seasonal NP inputs.

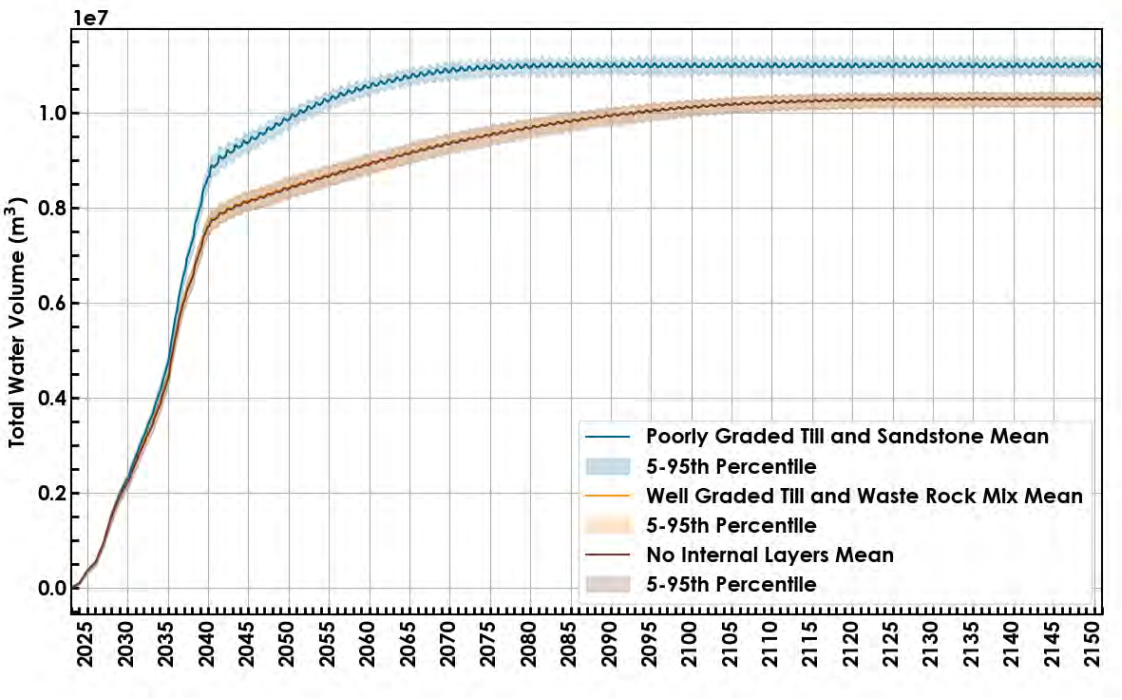

Figure 4.5: Range of total water volume within the backfilled NAG mine rock in the Open Pit simulated by the GoldSim model.

4.3.3 Oxygen Ingress

The range of oxygen ingress from the 3D GoldSim model for all modelled scenarios is presented in Figure 4.6. The well graded till with mine rock mix scenario and the no internal layers scenario both showed a higher long term average oxygen ingress despite having a shallower depth to suboxia. Due to the limitations of the GoldSim model representing each strip as a 1D column, convection is limited to density driven convection (free convection) and oxygen ingress is dominated by diffusion. In this case, with a shallower depth to suboxia, the concentration gradient across the cover system is greater, resulting in a higher diffusive oxygen ingress rate. In the poorly graded till and sandstone mine rock scenario, the depth to suboxia is greater, reducing the concentration gradient across the cover system and lowering the overall diffusive flux. When forced convection (advection) is accounted for, it is likely that the oxygen ingress rate for the poorly graded till and sandstone mine rock scenario would show higher oxygen ingress rates.

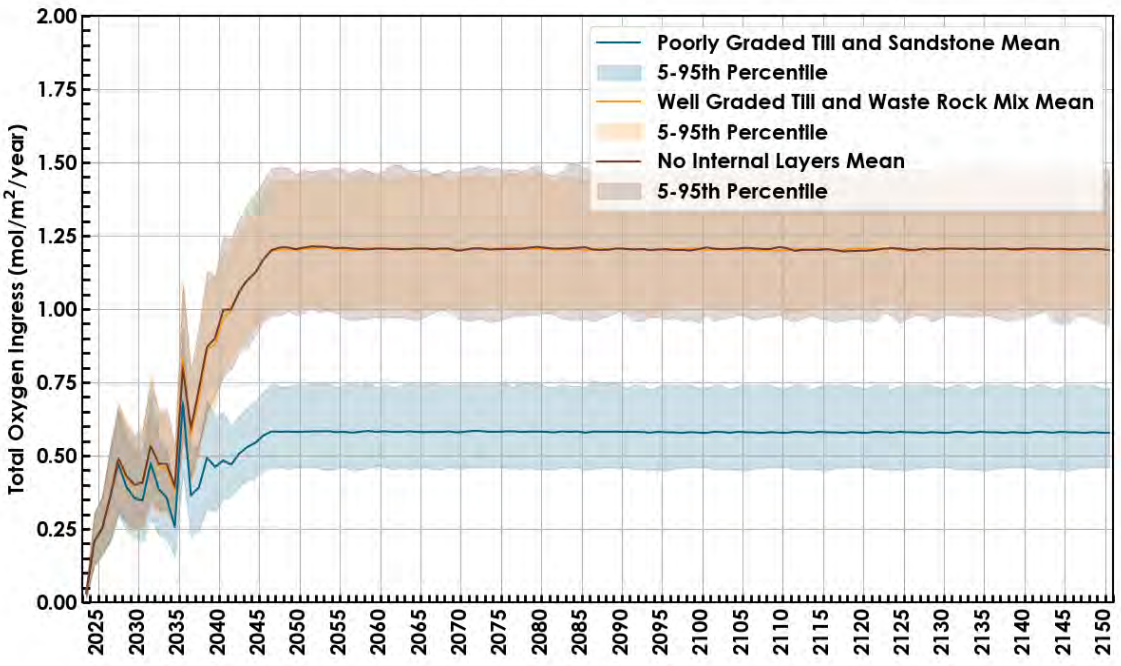

Figure 4.6: Range of oxygen ingress rates simulated by GoldSim for the backfilled NAG mine rock in the Open Pit for all modelled scenarios.

4.4 Geochemical Modelling Results

This section summarizes the results of the geochemical models of the NAG backfill cover scenarios and present a time-series of source terms for the NAG backfill during the bare surface, covered grass surface, and covered forest surface timeframes. Model results of select parameters are presented in Figure 4.7 to Figure 4.11. Tables of source terms and annual loads from the three scenarios of the NAG backfill are provided in Appendix A.

In the three modelled scenarios, the cover system construction decreases NP and limits oxygen ingress into the mine rock within the NAG backfill. Suboxic zones were established in almost half of the cells in the poorly graded till and sandstone mine rock scenario and in all but one cell in the well graded till and mine rock mix scenarios (Section 4.3.3). Sulfide oxidation only occurred in the reactive oxic zones, as a result, loading rates of oxidation products are partly controlled by the amount of suboxic mine rock in the backfill.

In general, concentrations for most modelled parameters were similar between the poorly graded till and sandstone and well graded till and mine rock mix scenarios. While the amount of suboxia increased substantially for the well graded till and mine rock mix scenarios, the volume of water infiltrating the surface of the NAG backfill decreased, resulting is less water available to dilute oxidation products from the limited reactive zone. Despite concentrations remaining similar between the three scenarios, the

annual load exiting the NAG backfill as seepage in both the well graded till and mine rock mix scenarios is roughly half the annual load exiting in the poorly graded till and sandstone scenario.

The onset of seepage from the NAG backfill occurs as cells from the model become fully wetted-up, which begins in approximately 2036. Areas of the backfill that contain smaller thicknesses of mine rock wet up faster than areas with greater thicknesses; therefore, the effects of seepage from thinner cells are observed in the model results faster than the effects from thicker cells. Thicker cells will generally produce poorer water quality than thinner cells because there is a longer pathway for water to accumulate oxidation products (ignoring the effects of suboxic zones).

After the initial wetting-up period and prior to the development of suboxic zones within the models, concentrations of parameters associated with pyrite oxidation (e.g., SO_4, Se, Cu, etc.) generally have an increasing trend. Concentrations stabilize and tend to decrease once suboxic conditions are established. After the onset of seepage, Se concentrations range between 0.03 to 0.07 mg/L, with the onset of lower concentration occurring near the end of the modelled timeframe. Concentrations of Se are trending lower near the end of the modelled timeframe for the well graded till and mine rock mix scenario. Concentrations of SO_4 and Cu are approximately 1,500 mg/L and 0.015 mg/L, respectively, near the end of the modelled timeframes for all three scenarios. Annual loads of parameters related to pyrite oxidation in the well graded till and sandstone scenarios are approximately half of the poorly graded till and mine rock mix scenario. Annual loads are generally similar between the two well graded till and waste rock mix scenarios with the largest differences observed in the last ~20 years of the modelled timeframe.

Nitrate concentrations and loads peak in the initial years that seepage occurs and are controlled by flushing of blast residues that are on the surface of the mine rock. The release of NO_3 (and subsequently NO_2 and NH_4) is spread out over many decades as the transport time is variable in different areas of the backfill depending on the cell thickness.

A slight variation in pH was observed between the modelled scenarios with the well graded till and sandstone scenarios having a slightly higher value. This is likely a result of the longer residence time of water in the suboxic zone of the carbonate-rich mine rock in the well-graded model scenario.

The NAG backfill source terms from the three modelled scenarios are summarized in Table 4.2 and represent the concentrations of parameters at the end of the modelled timeframe (year 2150). The source terms are also compared to source terms developed by SRK (2024). It should be noted that source terms developed by both SRK and Okane utilized NAG field bin data to derive source terms. Differences in source terms are attributed to the implementation of reactive transport modelling and the consideration of changes in net percolation and oxygen ingress into the NAG backfill as a result of the modelled cover systems. In general, the source terms from the current modelling work are lower than the initial SRK source terms. Due to the incorporation of wetting up in the current model, the largest differences in loading rates between both sets of models are observed in the initial 20 years of the model

time frame. Once the modelled loading rates stabilize, mass loads of constituents such as SO_4 and Se range from approximately 50 to 75% lower than the initial SRK loads (Figure 4.12).

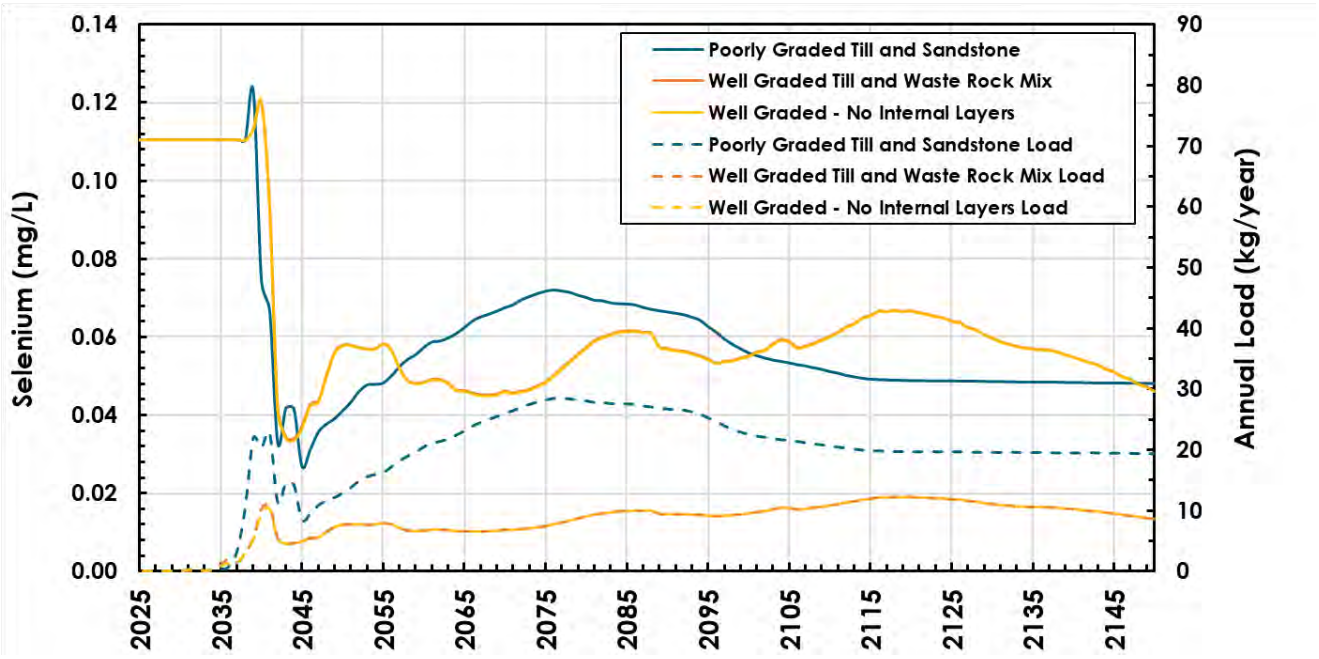

Figure 4.7: Evolution of Se concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

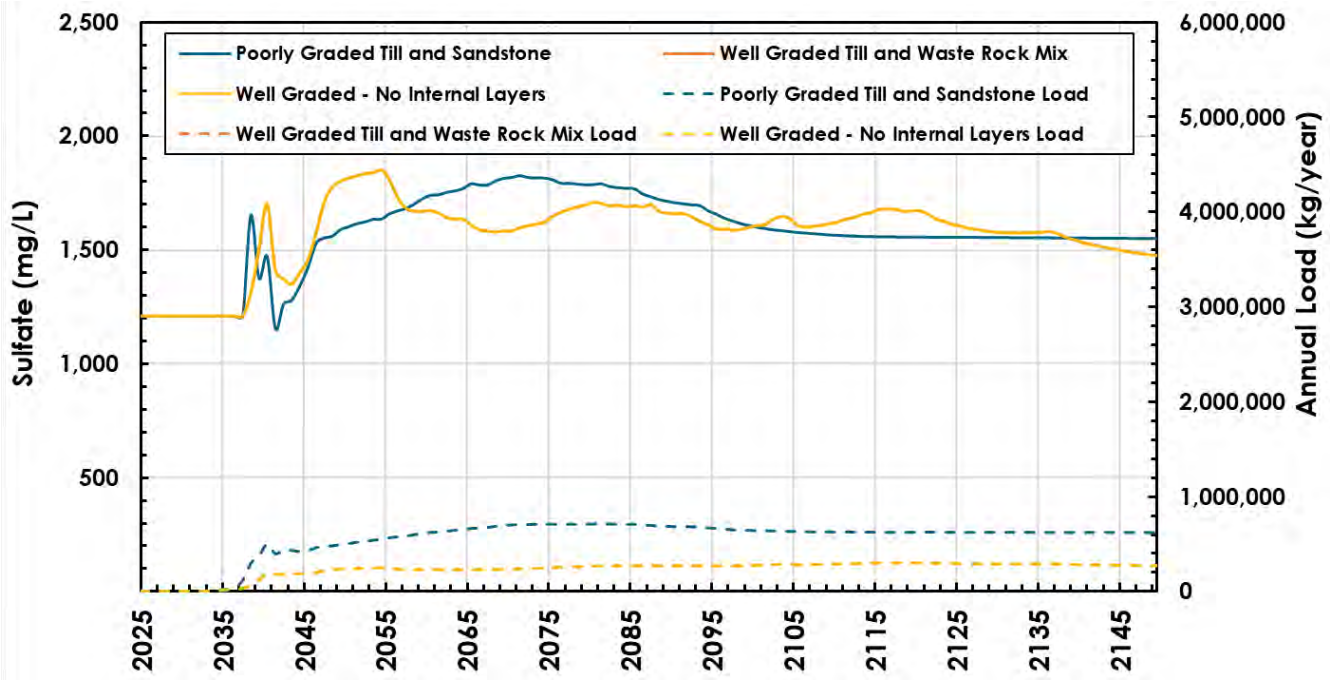

Figure 4.8: Evolution of SO_4 concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

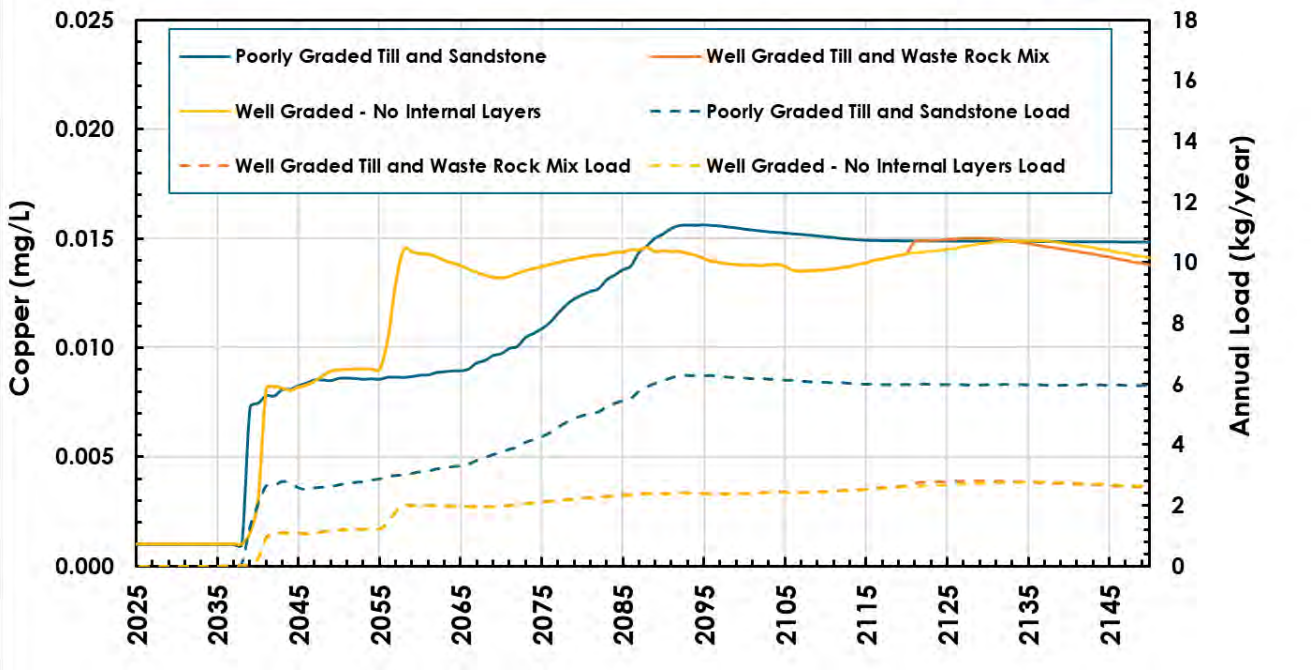

Figure 4.9: Evolution of Cu concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

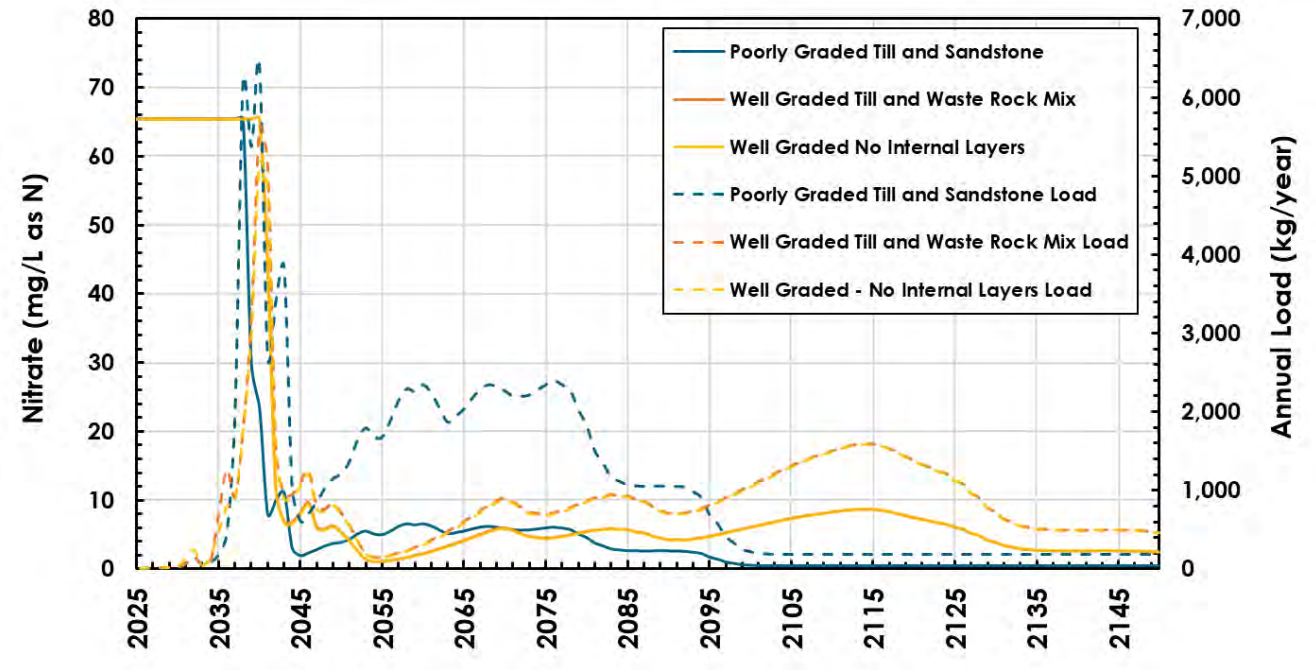

Figure 4.10: Evolution of NO_3 concentrations and annual loads from NAG backfill seepage in the three cover system and mine rock scenarios.

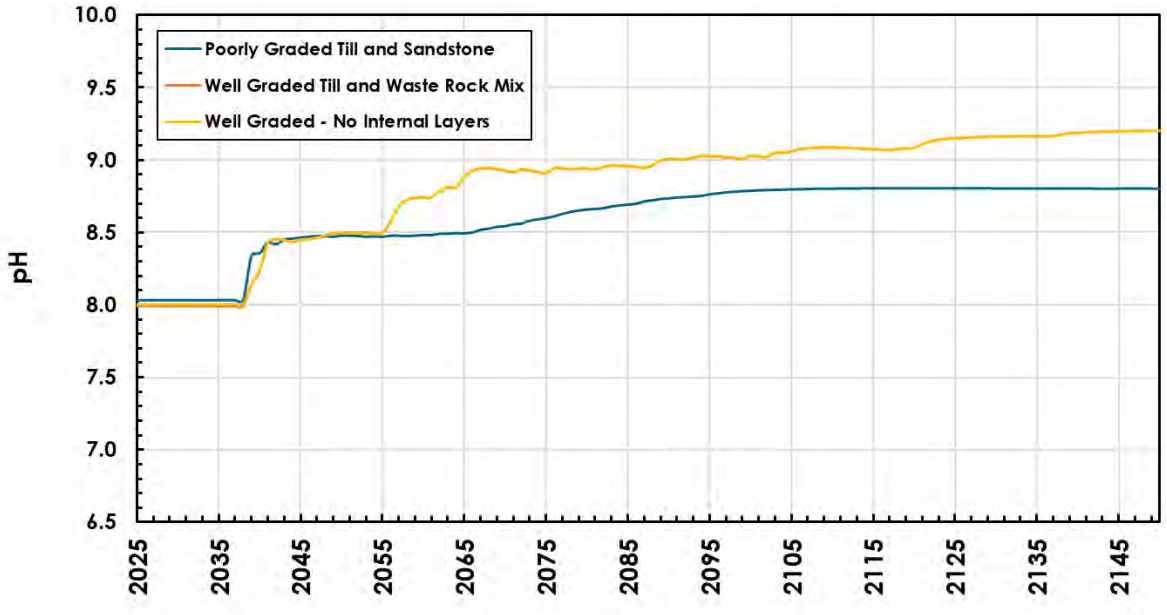

Figure 4.11: Evolution of pH from NAG backfill seepage in the three cover system and mine rock scenarios.

Table 4.2: Comparison of source terms of the NAG backfill from various model scenarios.

Parameter	Well Graded Model Source Term[1]	Well Graded with No Internal Layers Source Term[1]	Poorly Graded Model Source Term[1]	NAG Backfill – 2021-2029		NAG Backfill – 2030-2100	
				NAG Typical[2]	NAG High[2]	NAG Typical[2]	NAG High[2]
pH	9.2	9.2	8.8	8.2	8.4	8.3	8.5
Alkalinity (mg/L as $CaCO_3$)	3,445	3,445	1,947	1,904	3,398	2953	4468
Ca (mg/L)	0.85	0.85	2.6	53	95	79	119
Mg (mg/L)	84	84	54	32	57	48	72
K (mg/L)	24	24	11	13	23	20	31
Na (mg/L)	1,335	1,335	1,083	1,614	2,881	2505	3790
Cl (mg/L)	17	17	7.9	24	43	37	56
SO4 (mg/L)	1,476	1,476	1,550	1,803	3,218	2772	4193
Al (mg/L)	0.27	0.27	0.075	0.0045	0.0072	0.0064	0.0089
Sb (mg/L)	0.0026	0.0026	0.0027	0.0029	0.0052	0.0045	0.0069
As (mg/L)	0.0019	0.0019	0.002	0.0043	0.0078	0.0067	0.01
Ba (mg/L)	0.0034	0.0034	0.0026	0.045	0.08	0.069	0.1
B (mg/L)	0.78	0.78	0.36	0.45	0.8	0.7	1.1
Cd (mg/L)	0.00004	0.00005	0.00004	0.000095	0.00017	0.00014	0.00021
Cr (mg/L)	0.0005	0.0005	0.0005	0.0018	0.0033	0.0029	0.0043
Co (mg/L)	0.0039	0.0039	0.0042	0.015	0.026	0.02	0.03

Parameter	Well Graded Model Source Term[1]	Well Graded with No Internal Layers Source Term[1]	Poorly Graded Model Source Term[1]	NAG Backfill – 2021-2029		NAG Backfill – 2030-2100	
				NAG Typical[2]	NAG High[2]	NAG Typical[2]	NAG High[2]
Cu (mg/L)	0.014	0.014	0.015	0.016	0.029	0.025	0.037
Fe (mg/L)	0.05	0.05	0.05	0.00012	0.0001	0.00011	0.0001
Pb (mg/L)	0.0036	0.0036	0.004	0.0048	0.0085	0.0074	0.011
Li (mg/L)	0.43	0.43	0.2	0.14	0.24	0.21	0.32
Mn (mg/L)	0.016	0.016	0.017	0.11	0.19	0.12	0.18
Hg (mg/L)	0.000005	0.000005	0.000005	0.00001	0.000018	0.000016	0.000023
P (mg/L)	0.27	0.27	0.13	0.026	0.046	0.04	0.06
Mo (mg/L)	0.05	0.05	0.052	0.17	0.3	0.26	0.39
Ni (mg/L)	0.013	0.013	0.014	0.029	0.051	0.04	0.061
Se (mg/L)	0.046	0.046	0.048	0.089	0.16	0.14	0.21
Si (mg/L)	2.8	2.8	1.3	4.6	8.3	7.1	11
Ag (mg/L)	0.000035	0.000035	0.000037	0.000074	0.00013	0.00011	0.00017
Sr (mg/L)	1.4	1.4	0.64	0.83	1.5	1.3	1.9
Sn (mg/L)	0.0005	0.0005	0.0005	0.00078	0.0014	0.0012	0.0018
Tl (mg/L)	0.000036	0.000036	0.000037	0.000078	0.00014	0.00012	0.00018
U (mg/L)	0.016	0.016	0.017	0.019	0.034	0.029	0.044
V (mg/L)	0.005	0.005	0.005	0.004	0.0072	0.0062	0.0095
Zn (mg/L)	0.01	0.01	0.01	0.032	0.058	0.046	0.07

[1] Source term represents the parameter value at the end of the modelled timeframe (year 2150).

[2] Source term from SRK (2024).

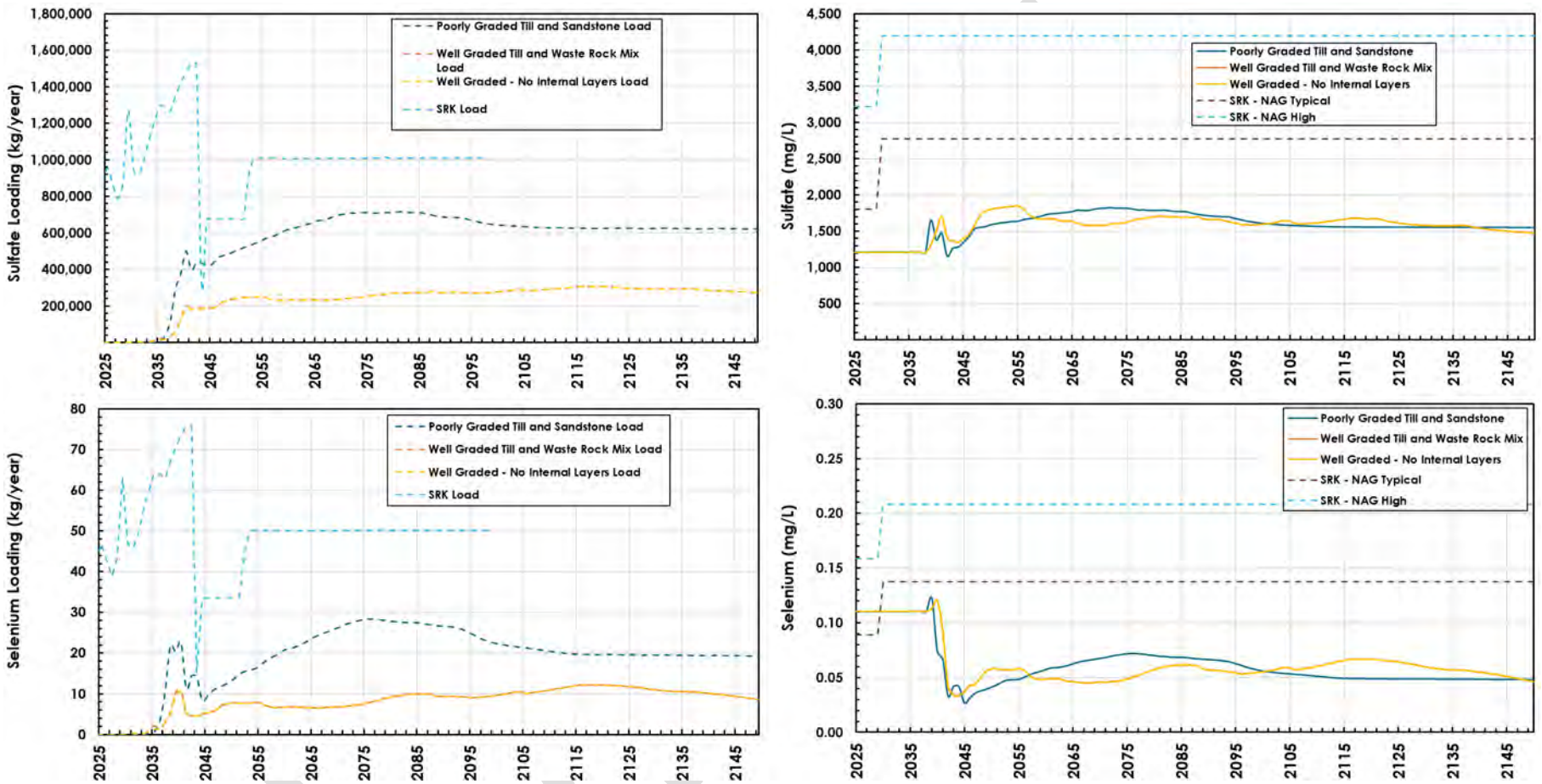

Figure 4.12: Summary of sulfate and selenium NAG backfill source terms and loading rates.

4.4.1 Nitrogen Source Term Scenarios

Nitrogen source terms decreased by 37.5% in the low nitrogen scenario and increased by 56.25% in the high nitrogen scenario throughout the first 15 years of the modelled timeframe as the initial porewater from each cell flushed out (Figure 4.13). Once individual cells began to be fully flushed, there were small variations in the percent change in nitrogen concentrations across sensitivities caused by dilution from cells that had been fully flushed of nitrogen. Overall, the differences in nitrogen source terms were similar to the 37.5% decrease or 56.25% increased applied in the respective sensitivity.

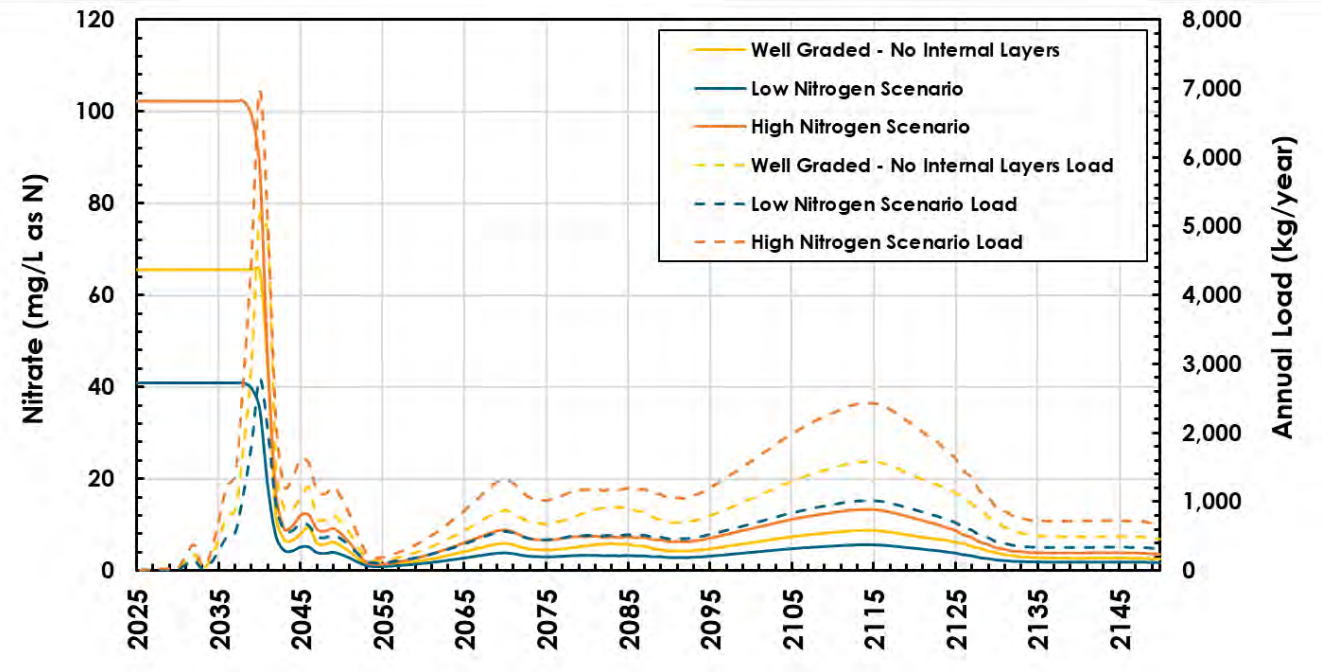

Figure 4.13: Summary of nitrate source terms and loading rates in the well graded – no internal layers scenario and two nitrogen source term scenarios.

5 CONCLUSIONS

The scope of this work was to provide Telkwa support in the development of source terms for three scenarios of backfilled NAG mine rock in lifts using bottom-up construction methodology with overburden covers. The objective of the backfilled design is to limit oxygen and water ingress to minimize the release of potential contaminants of concern such as selenium and sulfate to the receiving environment. Based on the modelling that was completed for this work, the following conclusions are made:

- GoldSim modelling indicates that the backfilled NAG mine rock in the Open Pit will be wetted up approximately 40 years following completion of construction for the poorly graded till and sandstone mine rock scenario. The well graded till with mine rock mix scenario and the no internal layers scenario will be wetted up approximately 80 years following the completion of construction due to the finer texture of material.

- Two-dimensional oxygen models indicate that the long-term depths to suboxia are, on average, 13 m for the poorly graded till and sandstone mine rock scenario and 3.3 m for the well graded till with mine rock mix scenario and the no internal layers scenario. The suboxic zone takes approximately 15 years to form in each strip modelled of the poorly graded till and sandstone mine rock once the cover system has been placed. In both the well graded till with mine rock mix scenario and the no internal layers scenario, the suboxic zone takes approximately 13 years to develop following cover system placement.

- It is likely that the oxygen ingress rate for the poorly graded till and sandstone mine rock scenario would be greater than the well graded till and mine rock mix scenarios.

- In general, concentrations in NAG backfill seepage for most modelled parameters will be similar between the three modelled scenarios.

- The decrease in oxygen ingress and infiltrating water into the NAG backfill for the well graded till and mine rock mix scenarios results in an annual chemical load (mass released per year) decrease of approximately half compared to the poorly graded till and sandstone mine rock scenario.

- As a result, mass loads of dissolved constituents such as selenium and sulfate from the NAG backfill are expected to decrease relative to initial source term and load balance models under the conditions modelled herein.

The NAG backfill source terms from this modelling work will be integrated into the site wide load balance model to quantify the effects of the backfill on water quality around the Tenas project.

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7 CLOSURE

We trust information provided is satisfactory for your requirements. Please do not hesitate to contact the undersigned for further information or questions.

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Appendix A

NAG Backfill Source Terms

Table A1. Source terms of the NAG backfill for the poorly graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	16
2024	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	33
2025	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	57
2026	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	87
2027	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	116
2028	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	195
2029	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	221
2030	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	266
2031	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	961
2032	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,273
2033	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	710
2034	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	1,289
2035	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,755
2036	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	6,758
2037	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	30,026
2038	8.0	1,210	94	12	0.012	0.0021	0.0012	0.0023	0.53	0.00005	28	0.0005	0.0057	0.001	0.05	0.0001	0.29	20	0.034	0.000005	0.041	0.0074	0.19	17	0.11	1.9	0.000029	530	0.93	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	94,634
2039	8.3	1,652	609	12	0.022	0.0029	0.0015	0.0021	0.53	0.00005	21	0.0005	0.0068	0.002	0.05	0.0011	0.29	31	0.038	0.000005	0.056	0.011	0.19	17	0.12	1.9	0.00004	846	0.93	0.00004	0.0005	0.018	0.005	0.01	30	3.8	0.69	178,458
2040	8.4	1,376	625	12	0.023	0.0024	0.0014	0.0023	0.53	0.00005	18	0.0005	0.0044	0.0068	0.05	0.0013	0.29	27	0.023	0.000005	0.046	0.0085	0.19	17	0.074	1.9	0.000033	730	0.93	0.000033	0.0005	0.015	0.005	0.01	23	3.0	0.54	272,969
2041	8.4	1,472	753	9.4	0.028	0.0026	0.0015	0.0023	0.43	0.00005	13	0.0005	0.0041	0.008	0.05	0.0016	0.23	29	0.021	0.000005	0.05	0.0087	0.15	13	0.067	1.6	0.000035	806	0.75	0.000035	0.0005	0.016	0.005	0.01	8.0	1.0	0.18	338,914
2042	8.4	1,156	717	9.2	0.028	0.002	0.0013	0.0026	0.42	0.00005	13	0.0005	0.0024	0.0078	0.05	0.0015	0.23	24	0.011	0.000005	0.039	0.0061	0.15	13	0.033	1.5	0.000028	658	0.74	0.000028	0.0005	0.012	0.005	0.01	9.9	1.3	0.23	343,355
2043	8.5	1,262	782	9.2	0.03	0.0022	0.0014	0.0025	0.42	0.00005	11	0.0005	0.0029	0.0081	0.05	0.0016	0.23	26	0.014	0.000005	0.042	0.0072	0.15	13	0.042	1.5	0.00003	721	0.74	0.00003	0.0005	0.013	0.005	0.01	11	1.4	0.26	345,155
2044	8.5	1,280	797	9.3	0.03	0.0023	0.0014	0.0025	0.43	0.00005	11	0.0005	0.003	0.0082	0.05	0.0019	0.23	26	0.014	0.000005	0.043	0.0078	0.15	13	0.042	1.6	0.000031	733	0.75	0.000031	0.0005	0.014	0.005	0.01	3.0	0.38	0.07	339,203
2045	8.5	1,343	812	10	0.03	0.0024	0.0014	0.0024	0.46	0.00005	11	0.0005	0.0023	0.0083	0.05	0.0021	0.25	27	0.0094	0.000005	0.045	0.0074	0.16	15	0.027	1.7	0.000032	764	0.82	0.000032	0.0005	0.014	0.005	0.01	1.9	0.25	0.045	312,231
2046	8.5	1,424	827	11	0.031	0.0025	0.0015	0.0024	0.48	0.00005	11	0.0005	0.0026	0.0084	0.05	0.0024	0.26	29	0.011	0.000005	0.048	0.0085	0.17	15	0.031	1.8	0.000034	804	0.85	0.000034	0.0005	0.015	0.005	0.01	2.3	0.29	0.054	301,366
2047	8.5	1,529	845	10	0.031	0.0027	0.0017	0.0023	0.48	0.00005	11	0.0005	0.003	0.0085	0.05	0.0027	0.26	31	0.012	0.000005	0.051	0.0096	0.17	15	0.036	1.7	0.000037	855	0.84	0.000037	0.0005	0.016	0.005	0.01	2.8	0.36	0.065	302,616
2048	8.5	1,553	841	10	0.03	0.0027	0.0017	0.0023	0.47	0.00005	11	0.0005	0.0031	0.0085	0.05	0.0028	0.26	31	0.013	0.000005	0.052	0.01	0.17	15	0.038	1.7	0.000037	864	0.83	0.000037	0.0005	0.017	0.005	0.01	3.3	0.42	0.077	305,970
2049	8.5	1,561	834	10	0.03	0.0028	0.0017	0.0023	0.47	0.00005	11	0.0005	0.0032	0.0085	0.05	0.0028	0.26	31	0.013	0.000005	0.053	0.01	0.16	15	0.039	1.7	0.000037	866	0.83	0.000038	0.0005	0.017	0.005	0.01	3.7	0.47	0.086	308,547
2050	8.5	1,590	853	10	0.031	0.0028	0.0018	0.0022	0.46	0.00005	11	0.0005	0.0034	0.0086	0.05	0.003	0.25	32	0.014	0.000005	0.054	0.011	0.16	15	0.041	1.7	0.000038	884	0.82	0.000038	0.0005	0.017	0.005	0.01	3.9	0.49	0.089	311,965
2051	8.5	1,602	853	10	0.031	0.0028	0.0018	0.0022	0.46	0.00005	11	0.0005	0.0036	0.0086	0.05	0.0031	0.25	32	0.015	0.000005	0.054	0.011	0.16	14	0.043	1.7	0.000038	889	0.81	0.000039	0.0005	0.017	0.005	0.01	4.3	0.55	0.099	316,216
2052	8.5	1,616	848	9.9	0.03	0.0028	0.0018	0.0022	0.45	0.00005	11	0.0005	0.0038	0.0086	0.05	0.0032	0.25	32	0.016	0.000005	0.054	0.012	0.16	14	0.046	1.6	0.000039	894	0.79	0.000039	0.0005	0.017	0.005	0.01	5.1	0.65	0.12	321,547
2053	8.5	1,623	839	9.8	0.03	0.0029	0.0019	0.0022	0.45	0.00005	11	0.0005	0.0039	0.0085	0.05	0.0033	0.24	32	0.016	0.000005	0.055	0.012	0.16	14	0.048	1.6	0.000039	895	0.78	0.000039	0.0005	0.017	0.005	0.01	5.5	0.7	0.13	324,989
2054	8.5	1,635	843	9.6	0.03	0.0029	0.0019	0.0022	0.44	0.00005	11	0.0005	0.0039	0.0086	0.05	0.0034	0.24	32	0.016	0.000005	0.055	0.012	0.15	14	0.048	1.6	0.000039	901	0.77	0.000039	0.0005	0.017	0.005	0.01	5.1	0.64	0.12	331,093
2055	8.5	1,636	838	9.4	0.03	0.0029	0.0019	0.0022	0.43	0.00005	11	0.0005	0.0039	0.0085	0.05	0.0034	0.24	32	0.016	0.000005	0.055	0.012	0.15	14	0.048	1.6	0.000039	900	0.76	0.000039	0.0005	0.017	0.005	0.011	5.0	0.63	0.11	335,909
2056	8.5	1,659	855	9.3	0.03	0.0029	0.0019	0.0022	0.42	0.00005	11	0.0005	0.0041	0.0086	0.05	0.0035	0.23	33	0.017	0.000005	0.056	0.013	0.15	13	0.05	1.5	0.00004	915	0.75	0.00004	0.0005	0.018	0.005	0.01	5.5	0.7	0.13	342,067
2057	8.5	1,672	854	9.2	0.03	0.0029	0.002	0.0022	0.42	0.00005	11	0.0005	0.0042	0.0086	0.05	0.0036	0.23	33	0.018	0.000005	0.056	0.013	0.15	13	0.052	1.5	0.00004	920	0.74	0.00004	0.0005	0.018	0.005	0.01	6.2	0.78	0.14	345,301
2058	8.5	1,682	851	9.1	0.03	0.003	0.002	0.0022	0.42	0.00005	11	0.00051	0.0044	0.0086	0.05	0.0037	0.23	33	0.019	0.000005	0.057	0.014	0.15	13	0.054	1.5	0.00004	924	0.73	0.00004	0.0005	0.018	0.005	0.01	6.6	0.83	0.15	348,168
2059	8.5	1,701	857	9.0	0.03	0.003	0.002	0.0022	0.41	0.00005	11	0.00051	0.0045	0.0087	0.05	0.0038	0.23	34	0.019	0.000005	0.057	0.014	0.14	13	0.056	1.5	0.000041	934	0.72	0.000041	0.0005	0.018	0.005	0.01	6.4	0.81	0.15	352,107
2060	8.5	1,724	867	8.9	0.031	0.003	0.0021	0.0021	0.41	0.00005	11	0.00052	0.0046	0.0087	0.05	0.0039	0.22	34	0.02	0.000005	0.058	0.015	0.14	13	0.057	1.5	0.000041	947	0.72	0.000041	0.0005	0.018	0.005	0.01	6.6	0.83	0.15	356,256
2061	8.5	1,741	868	8.9	0.031	0.0031	0.0021	0.0021	0.41	0.00005	11	0.00052	0.0048	0.0088	0.05	0.0041	0.22	34	0.02	0.000005	0.059	0.015	0.14	13	0.059	1.5	0.000042	954	0.71	0.000042	0.0005	0.019	0.005	0.01	6.3	0.79	0.14	358,049
2062	8.5	1,742	886	8.8	0.031	0.0031	0.0022	0.0021	0.4	0.00005	11	0.00052	0.0048	0.0089	0.05	0.0042	0.22	35	0.02	0.000005	0.059	0.015	0.14	13	0.059	1.5	0.000042	959	0.71	0.000042	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	361,103
2063	8.5	1,753	891	8.7	0.031	0.0031	0.0022	0.0021	0.4	0.00005	11	0.00053	0.0049	0.0089	0.05	0.0043	0.22	35	0.02	0.000005	0.059	0.016	0.14	12	0.06	1.5	0.000042	965	0.7	0.000042	0.0005	0.019	0.005	0.01	5.1	0.65	0.12	363,501
2064	8.5	1,759	896	8.6	0.031	0.0031	0.0022	0.0021	0.4	0.00005	11	0.00053	0.005	0.0089	0.05	0.0044	0.22	35	0.021	0.000005	0.059	0.016	0.14	12	0.061	1.4	0.000042	969	0.69	0.000042	0.0005	0.019	0.005	0.01	5.3	0.67	0.12	367,099
2065	8.5	1,770	895	8.6	0.031	0.0031	0.0023	0.0021	0.39	0.00005	11	0.00053	0.0051	0.0089	0.05	0.0045	0.22	35	0.021	0.000005	0.06	0.016	0.14	12	0.062	1.4	0.000042	973	0.69	0.000043	0.0005	0.019	0.005	0.01	5.5	0.7	0.13	369,105
2066	8.5	1,790	909	8.5	0.032	0.0032	0.0023	0.0021	0.39	0.00005	10	0.00054	0.0052	0.009	0.05	0.0046	0.21	36	0.022	0.000005	0.06	0.017	0.14	12	0.064	1.4	0.000043	985	0.69	0.000043	0.0005	0.019	0.005	0.01	5.8	0.74	0.13	371,946
2067	8.5	1,785	952	8.5	0.033	0.0031	0.0023	0.0021	0.39	0.00005	9.5	0.00054	0.0053	0.0093	0.05	0.0047	0.21	36	0.022	0.000005	0.06	0.017	0.14	12	0.065	1.4	0.000043	993	0.68	0.000043	0.0005	0.019	0.005	0.01	6.1	0.77	0.14	374,952
2068	8.5	1,786	969	8.4	0.034	0.0031	0.0023	0.0021	0.38	0.00005	9.2	0.00054	0.0054	0.0094	0.05	0.0047	0.21	37	0.022	0.000005	0.06	0.017	0.13	12	0.066	1.4	0.000043	996	0.67	0.000043	0.0005	0.019	0.005	0.01	6.2	0.78	0.14	378,901
2069	8.5	1,803	1,003	8.3	0.035	0.0032	0.0024	0.0021	0.38	0.00005	8.7	0.00054	0.0055	0.0096	0.05	0.0048	0.21	38	0.023	0.000005	0.061	0.017	0.13	12	0.067	1.4	0.000043	1,012	0.67	0.000043	0.0005	0.019	0.005	0.01	6.1	0.77	0.14	381,313
2070	8.5	1,815	1,013	8.3	0.036	0.0032	0.0024	0.0021	0.38	0.00005	8.6	0.00055	0.0055	0.0097	0.05	0.0049	0.21	38	0.023	0.000005	0.061	0.018	0.13	12	0.068	1.4	0.000043	1,019	0.66	0.000044	0.0005	0.019	0.005	0.01	5.9	0.74	0.14	384,374
2071	8.6	1,818	1,048	8.2	0.037	0.0032	0.0024	0.0021	0.38	0.00005	8.1	0.00055	0.0056	0.01	0.05	0.005	0.21	38	0.023	0.000005	0.061	0.018	0.13	12	0.068	1.4	0.000044	1,028	0.66	0.000044	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	386,328
2072	8.6	1,826	1,060	8.2	0.037	0.0032	0.0025	0.0021	0.37	0.00005	7.9	0.00055	0.0057	0.01	0.05	0.0051	0.2	39	0.024	0.000005	0.061	0.019	0.13	12	0.07	1.4	0.000044	1,034	0.66	0.000044	0.0005	0.019	0.005	0.01	5.6	0.71	0.13	388,982
2073	8.6	1,817	1,116	8.2	0.039	0.0032	0.0025	0.0022	0.37	0.00005	7.2	0.00055	0.0058	0.01	0.05	0.0051	0.2	39	0.024	0.000005	0.061	0.019	0.13	12	0.07	1.4	0.000044	1,043	0.66	0.000044	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	389,390
2074	8.6	1,817	1,139	8.1	0.04	0.0032	0.0025	0.0022	0.37	0.00005	7.0	0.00055	0.0059	0.011	0.05	0.0052	0.2	40	0.024	0.000005	0.061	0.019	0.13	12	0.071	1.4	0.000044	1,047	0.65	0.000044	0.0005	0.019	0.005	0.01	5.8	0.74	0.13	391,164
2075	8.6	1,816	1,167	8.1	0.041	0.0032	0.0025	0.0022	0.37	0.00005	6.7	0.00055	0.0059	0.011	0.05	0.0052	0.2	40	0.024	0.000005	0.061	0.019	0.13	12	0.072	1.4	0.000043	1,052	0.65	0.000044	0.0005	0.019	0.005	0.01	6.0	0.76	0.14	391,961
2076	8.6	1,808	1,202	8.1	0.043	0.0032	0.0025	0.0022	0.37	0.00005	6.3	0.00054	0.0059	0.011	0.05	0.0052	0.2	41	0.025	0.000005	0.061	0.019	0.13	12	0.072	1.3	0.000043	1,056	0.65	0.000043	0.0005	0.019	0.005	0.01	6.1	0.77	0.14	394,086
2077	8.6	1,793	1,254	8.0	0.045	0.0032	0.0025	0.0022	0.37	0.00005	5.9	0.00054	0.0059	0.012	0.05	0.0052	0.2	42	0.025	0.000005	0.06	0.019	0.13	12	0.072	1.3	0.000043	1,060	0.65	0.000043	0.0005	0.019	0.005	0.01	5.9	0.75	0.14	394,666
2078	8.6	1,793	1,299	8.0	0.046	0.0032	0.0025	0.0022	0.37	0.00005	5.5	0.00054	0.0059	0.012	0.05	0.0052	0.2	42	0.024	0.000005	0.06	0.019	0.13	11	0.071	1.3	0.000043	1,070	0.64	0.000043	0.0005	0.019	0.005	0.01	5.7	0.72	0.13	396,324
2079	8.7	1,789	1,333	8.0	0.048	0.0032	0.0025	0.0022	0.37	0.00005	5.3	0.00054	0.0058	0.012	0.05	0.0052	0.2	43	0.024	0.000005	0.06	0.019	0.13	11	0.071	1.3	0.000043	1,074	0.64	0.000043	0.0005	0.019	0.005	0.01	5.1	0.64	0.12	397,336
2080	8.7	1,786	1,355	8.0	0.049	0.0031	0.0025	0.0022	0.36	0.00005	5.1	0.00054	0.0058	0.012	0.05	0.0053	0.2	43	0.024	0.000005	0.06	0.019	0.13	11	0.07	1.3	0.000043	1,077	0.64	0.000043	0.0005	0.019	0.005	0.01	4.6	0.58	0.11	398,998
2081	8.7	1,787	1,371	7.9	0.049	0.0032	0.0025	0.0023	0.36	0.00005	5.0	0.00054	0.0058	0.013	0.05	0.0053	0.2	44	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000043	1,081	0.64	0.000043	0.0005	0.019	0.005	0.01	3.8	0.48	0.086	399,482
2082	8.7	1,790	1,384	7.9	0.05	0.0032	0.0025	0.0023	0.36	0.00005	4.9	0.00054	0.0058	0.013	0.05	0.0054	0.2	44	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000043	1,085	0.64	0.000043	0.0005	0.019	0.005	0.01	3.4	0.43	0.077	400,065
2083	8.7	1,778	1,429	7.9	0.052	0.0031	0.0025	0.0023	0.36	0.00005	4.7	0.00053	0.0058	0.013	0.05	0.0054	0.2	45	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000043	1,089	0.64	0.000043	0.0005	0.019	0.005	0.01	2.9	0.37	0.067	400,547
2084	8.7	1,773	1,453	7.9	0.053	0.0031	0.0025	0.0023	0.36	0.00005	4.5	0.00053	0.0058	0.013	0.05	0.0054	0.2	45	0.024	0.000005	0.06	0.019	0.13	11	0.069	1.3	0.000042	1,091	0.64	0.000043	0.0005	0.019	0.005	0.01	2.8	0.35	0.064	401,921
2085	8.7	1,770	1,479	7.9	0.054	0.0031	0.0025	0.0023	0.36	0.00005	4.4	0.00053	0.0058	0.014	0.05	0.0054	0.2	46	0.024	0.000005	0.06	0.019	0.13	11	0.068	1.3	0.000042	1,095	0.64	0.000043	0.0005	0.019	0.005	0.01	2.7	0.34	0.061	401,543
2086	8.7	1,769	1,496	7.9	0.054	0.0031	0.0025	0.0023	0.36	0.00005	4.3	0.00053	0.0058	0.014	0.05	0.0054	0.2	46	0.023	0.000005	0.06	0.019	0.13	11	0.068	1.3	0.000042	1,097	0.64	0.000043	0.0005	0.019	0.005	0.01	2.6	0.33	0.06	401,553
2087	8.7	1,746	1,561	7.9	0.057	0.0031	0.0025	0.0023	0.36	0.00005	4.0	0.00052	0.0057	0.014	0.05	0.0053	0.2	47	0.023	0.000005	0.059	0.019	0.13	11	0.068	1.3	0.000042	1,100	0.64	0.000042	0.0005	0.019	0.005	0.01	2.6	0.33	0.06	401,267
2088	8.7	1,734	1,593	7.9	0.059	0.0031	0.0025	0.0024	0.36	0.00005	3.8	0.00052	0.0057	0.015	0.05	0.0053	0.2	47	0.023	0.000005	0.058	0.019	0.13	11	0.067	1.3	0.000042	1,101	0.63	0.000042	0.0005	0.019	0.005	0.01	2.6	0.33	0.06	402,320
2089	8.7	1,721	1,628	7.9	0.06	0.003	0.0025	0.0024	0.36	0.00005	3.7	0.00052	0.0056	0.015	0.05	0.0053	0.2	48	0.023	0.000005	0.058	0.019	0.13	11	0.067	1.3	0.000041	1,102	0.64	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.06	401,001
2090	8.7	1,714	1,647	7.9	0.061	0.003	0.0025	0.0024	0.36	0.00005	3.6	0.00052	0.0056	0.015	0.05	0.0052	0.2	48	0.023	0.000005	0.058	0.019	0.13	11	0.066	1.3	0.000041	1,103	0.64	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.06	401,227
2091	8.7	1,707	1,672	7.9	0.062	0.003	0.0025	0.0024	0.36	0.00005	3.5	0.00051	0.0056	0.015	0.05	0.0052	0.2	49	0.023	0.000005	0.057	0.019	0.13	11	0.066	1.3	0.000041	1,104	0.64	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.06	401,098
2092	8.7	1,703	1,685	7.9	0.063	0.003	0.0025	0.0024	0.36	0.00005	3.5	0.00051	0.0056	0.016	0.05	0.0052	0.2	49	0.023	0.000005	0.057	0.019	0.13	11	0.066	1.3	0.000041	1,105	0.63	0.000041	0.0005	0.018	0.005	0.01	2.6	0.33	0.059	402,800
2093	8.7	1,698	1,703	7.9	0.063	0.003	0.0025	0.0024	0.36	0.00005	3.4	0.00051	0.0055	0.016	0.05	0.0051	0.2	49	0.022	0.000005	0.057	0.018	0.13	11	0.065	1.3	0.000041	1,106	0.63	0.000041	0.0005	0.018	0.005	0.01	2.4	0.31	0.056	402,142
2094	8.8	1,695	1,717	7.9	0.064	0.003	0.0025	0.0024	0.36	0.00005	3.4	0.00051	0.0055	0.016	0.05	0.0051	0.2	50	0.022	0.000005	0.057	0.018	0.13	11	0.064	1.3	0.000041	1,107	0.64	0.000041	0.0005	0.018	0.005	0.01	2.3	0.29	0.052	401,911
2095	8.8	1,672	1,770	7.9	0.066	0.0029	0.0024	0.0025	0.36	0.00005	3.2	0.0005	0.0054	0.016	0.05	0.005	0.2	50	0.022	0.000005	0.056	0.018	0.13	11	0.063	1.3	0.00004	1,108	0.64	0.00004	0.0005	0.018	0.005	0.01	1.7	0.22	0.04	401,364
2096	8.8	1,658	1,797	7.9	0.068	0.0029	0.0024	0.0025	0.36	0.00005	3.1	0.0005	0.0052	0.016	0.05	0.005	0.2	51	0.021	0.000005	0.056	0.018	0.13	11	0.061	1.3	0.00004	1,106	0.63	0.00004	0.0005	0.018	0.005	0.01	1.4	0.18	0.033	402,265
2097	8.8	1,640	1,828	7.9	0.069	0.0029	0.0024	0.0025	0.36	0.00005	3.0	0.0005	0.0051	0.016	0.05	0.0049	0.2	51	0.021	0.000005	0.055	0.017	0.13	11	0.06	1.3	0.000039	1,104	0.64	0.000039	0.0005	0.018	0.005	0.01	1.0	0.13	0.024	401,193
2098	8.8	1,628	1,850	7.9	0.07	0.0029	0.0023	0.0025	0.36	0.00005	2.9	0.0005	0.005	0.016	0.05	0.0048	0.2	51	0.02	0.000005	0.055	0.017	0.13	11	0.058	1.3	0.000039	1,103	0.64	0.000039	0.0005	0.017	0.005	0.01	0.82	0.1	0.019	400,659
2099	8.8	1,616	1,868	7.9	0.071	0.0028	0.0023	0.0025	0.36	0.00005	2.9	0.0005	0.0049	0.015	0.05	0.0047	0.2	52	0.02	0.000005	0.054	0.017	0.13	11	0.057	1.3	0.000039	1,101	0.64	0.000039	0.0005	0.017	0.005	0.01	0.62	0.078	0.014	400,865
2100	8.8	1,608	1,880	7.9	0.072	0.0028	0.0023	0.0026	0.36	0.00005	2.8	0.0005	0.0048	0.015	0.05	0.0047	0.2	52	0.019	0.000005	0.054	0.016	0.13	11	0.056	1.3	0.000038	1,099	0.64	0.000039	0.0005	0.017	0.005	0.01	0.54	0.069	0.012	401,623
2101	8.8	1,600	1,895	7.9	0.072	0.0028	0.0023	0.0026	0.36	0.00005	2.8	0.0005	0.0048	0.015	0.05	0.0046	0.2	52	0.019	0.000005	0.054	0.016	0.13	11	0.055	1.3	0.000038	1,098	0.64	0.000038	0.0005	0.017	0.005	0.01	0.49	0.061	0.011	401,098
2102	8.8	1,594	1,902	7.9	0.073	0.0028	0.0022	0.0026	0.36	0.00005	2.8	0.0005	0.0047	0.015	0.05	0.0046	0.2	52	0.019	0.000005	0.054	0.016	0.13	11	0.055	1.3	0.000038	1,097	0.63	0.000038	0.0005	0.017	0.005	0.01	0.47	0.059	0.011	402,800
2103	8.8	1,588	1,911	7.9	0.073	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0047	0.015	0.05	0.0045	0.2	53	0.019	0.000005	0.053	0.016	0.13	11	0.054	1.3	0.000038	1,096	0.64	0.000038	0.0005	0.017	0.005	0.01	0.46	0.058	0.011	402,142
2104	8.8	1,585	1,917	7.9	0.074	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0047	0.015	0.05	0.0045	0.2	53	0.019	0.000005	0.053	0.016	0.13	11	0.054	1.3	0.000038	1,095	0.64	0.000038	0.0005	0.017	0.005	0.01	0.46	0.058	0.01	401,911
2105	8.8	1,581	1,927	7.9	0.074	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0046	0.015	0.05	0.0045	0.2	53	0.018	0.000005	0.053	0.016	0.13	11	0.053	1.3	0.000038	1,095	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2106	8.8	1,577	1,935	7.9	0.074	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0046	0.015	0.05	0.0044	0.2	53	0.018	0.000005	0.053	0.016	0.13	11	0.053	1.3	0.000038	1,095	0.63	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2107	8.8	1,574	1,939	7.9	0.075	0.0028	0.0022	0.0026	0.36	0.00005	2.7	0.0005	0.0046	0.015	0.05	0.0044	0.2	53	0.018	0.000005	0.053	0.015	0.13	11	0.053	1.3	0.000038	1,094	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2108	8.8	1,571	1,946	7.9	0.075	0.0028	0.0022	0.0026	0.36	0.00005	2.6	0.0005	0.0045	0.015	0.05	0.0044	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.052	1.3	0.000038	1,094	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2109	8.8	1,569	1,948	7.9	0.075	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0045	0.015	0.05	0.0043	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.052	1.3	0.000038	1,093	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2110	8.8	1,566	1,951	7.9	0.075	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0044	0.015	0.05	0.0043	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.051	1.3	0.000037	1,092	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623
2111	8.8	1,564	1,955	7.9	0.075	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0044	0.015	0.05	0.0042	0.2	54	0.018	0.000005	0.053	0.015	0.13	11	0.051	1.3	0.000037	1,092	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,098
2112	8.8	1,562	1,957	7.9	0.076	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0044	0.015	0.05	0.0042	0.2	54	0.017	0.000005	0.053	0.015	0.13	11	0.05	1.3	0.000037	1,091	0.63	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,800
2113	8.8	1,561	1,958	7.9	0.076	0.0028	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0042	0.2	54	0.017	0.000005	0.053	0.015	0.13	11	0.05	1.3	0.000037	1,091	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,142
2114	8.8	1,560	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.015	0.13	11	0.05	1.3	0.000037	1,091	0.64	0.000038	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,911
2115	8.8	1,559	1,964	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,091	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2116	8.8	1,558	1,965	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,091	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2117	8.8	1,558	1,965	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,090	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2118	8.8	1,557	1,966	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,091	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	400,659
2119	8.8	1,557	1,965	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0043	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,090	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	400,865
2120	8.8	1,557	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,623
2121	8.8	1,557	1,963	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,090	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,098
2122	8.8	1,556	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.63	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	402,800
2123	8.8	1,556	1,958	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	402,142
2124	8.8	1,556	1,959	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,911
2125	8.8	1,556	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.64	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	401,364
2126	8.8	1,556	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.63	0.000037	0.0005	0.017	0.005	0.011	0.45	0.057	0.01	402,265
2127	8.8	1,555	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2128	8.8	1,555	1,961	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,089	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2129	8.8	1,555	1,960	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2130	8.8	1,555	1,956	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623
2131	8.8	1,554	1,958	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,088	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,098
2132	8.8	1,554	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,800
2133	8.8	1,554	1,953	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,142
2134	8.8	1,554	1,954	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,911

Table A1. Source terms of the NAG backfill for the poorly graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	8.8	1,554	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2136	8.8	1,553	1,956	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.049	1.3	0.000037	1,087	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2137	8.8	1,553	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2138	8.8	1,553	1,956	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.0041	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,087	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2139	8.8	1,553	1,955	7.9	0.076	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2140	8.8	1,552	1,951	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623
2141	8.8	1,552	1,953	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,086	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,098
2142	8.8	1,552	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,800
2143	8.8	1,552	1,948	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,142
2144	8.8	1,552	1,949	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,911
2145	8.8	1,552	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,364
2146	8.8	1,551	1,951	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.63	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	402,265
2147	8.8	1,551	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,193
2148	8.8	1,551	1,951	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,085	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,659
2149	8.8	1,550	1,950	7.9	0.075	0.0027	0.0021	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,084	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	400,865
2150	8.8	1,550	1,947	7.9	0.075	0.0027	0.002	0.0026	0.36	0.00005	2.6	0.0005	0.0042	0.015	0.05	0.004	0.2	54	0.017	0.000005	0.052	0.014	0.13	11	0.048	1.3	0.000037	1,083	0.64	0.000037	0.0005	0.017	0.005	0.01	0.45	0.057	0.01	401,623

Table A2. Annual loads of the NAG backfill for the poorly graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	20	1.5	0.19	0.0002	0.000034	0.000019	0.000037	0.0086	0.00000065	0.45	0.0000081	0.000092	0.000016	0.00081	0.0000016	0.0047	0.33	0.00054	0.00	0.00066	0.00012	0.003	0.27	0.0018	0.031	0.00000047	8.5	0.015	0.00000047	0.0000081	0.00021	0.000028	0.00007	1.1	0.13	0.024	16
2024	40	3.1	0.38	0.0004	0.00007	0.00004	0.000076	0.017	0.0000013	0.92	0.000017	0.00019	0.000033	0.0016	0.0000033	0.0096	0.67	0.0011	0.00000016	0.0013	0.00025	0.0061	0.55	0.0036	0.064	0.00000096	17	0.031	0.00000096	0.000016	0.00043	0.000058	0.00014	2.2	0.27	0.05	33
2025	69	5.4	0.67	0.0007	0.00012	0.000069	0.00013	0.03	0.0000023	1.6	0.000029	0.00033	0.000058	0.0029	0.0000058	0.017	1.2	0.0019	0.00000029	0.0023	0.00043	0.011	0.95	0.0063	0.11	0.0000017	30	0.054	0.0000017	0.000029	0.00074	0.0001	0.00025	3.8	0.48	0.086	57
2026	106	8.2	1.0	0.0011	0.00019	0.00011	0.0002	0.046	0.0000035	2.4	0.000044	0.0005	0.000088	0.0044	0.0000088	0.025	1.8	0.0029	0.00000044	0.0036	0.00065	0.016	1.5	0.0097	0.17	0.0000025	46	0.082	0.0000025	0.000044	0.0011	0.00015	0.00038	5.7	0.72	0.13	87
2027	141	11	1.3	0.0014	0.00025	0.00014	0.00027	0.062	0.0000047	3.2	0.000058	0.00067	0.00012	0.0058	0.000012	0.034	2.3	0.0039	0.00000058	0.0047	0.00086	0.022	1.9	0.013	0.22	0.0000034	62	0.11	0.0000034	0.000058	0.0015	0.0002	0.0005	7.6	0.96	0.17	116
2028	236	18	2.3	0.0024	0.00042	0.00024	0.00045	0.1	0.0000078	5.4	0.000098	0.0011	0.0002	0.0098	0.00002	0.057	3.9	0.0066	0.00000098	0.008	0.0015	0.036	3.2	0.022	0.38	0.0000057	103	0.18	0.0000057	0.000098	0.0025	0.00034	0.00084	13	1.6	0.29	195
2029	267	21	2.6	0.0027	0.00047	0.00027	0.00051	0.12	0.0000089	6.1	0.00011	0.0013	0.00022	0.011	0.000022	0.064	4.5	0.0074	0.0000011	0.009	0.0016	0.041	3.7	0.024	0.43	0.0000064	117	0.21	0.0000064	0.00011	0.0029	0.00039	0.00095	14	1.8	0.33	221
2030	321	25	3.1	0.0032	0.00057	0.00032	0.00061	0.14	0.000011	7.4	0.00013	0.0015	0.00027	0.013	0.000027	0.077	5.4	0.0089	0.0000013	0.011	0.002	0.049	4.4	0.029	0.51	0.0000077	141	0.25	0.0000077	0.00013	0.0034	0.00046	0.0011	17	2.2	0.4	266
2031	1,162	91	11	0.012	0.002	0.0012	0.0022	0.51	0.000039	27	0.00048	0.0055	0.00096	0.048	0.000096	0.28	19	0.032	0.0000048	0.039	0.0071	0.18	16	0.11	1.9	0.000028	509	0.9	0.000028	0.00048	0.012	0.0017	0.0041	63	8.0	1.4	961
2032	2,750	214	26	0.028	0.0048	0.0027	0.0052	1.2	0.000091	63	0.0011	0.013	0.0023	0.11	0.00023	0.66	46	0.076	0.000011	0.093	0.017	0.42	38	0.25	4.4	0.000066	1,204	2.1	0.000066	0.0011	0.029	0.004	0.0098	149	19	3.4	2,273
2033	859	67	8.2	0.0086	0.0015	0.00086	0.0016	0.38	0.000028	20	0.00036	0.0041	0.00071	0.036	0.000071	0.21	14	0.024	0.0000036	0.029	0.0053	0.13	12	0.078	1.4	0.000021	376	0.66	0.000021	0.00036	0.0092	0.0012	0.0031	46	5.9	1.1	710
2034	1,559	121	15	0.016	0.0027	0.0016	0.003	0.68	0.000052	36	0.00065	0.0074	0.0013	0.064	0.00013	0.37	26	0.043	0.0000064	0.052	0.0096	0.24	21	0.14	2.5	0.000037	682	1.2	0.000037	0.00064	0.017	0.0023	0.0056	84	11	1.9	1,289
2035	3,332	260	32	0.033	0.0059	0.0033	0.0063	1.5	0.00011	77	0.0014	0.016	0.0028	0.14	0.00028	0.8	56	0.093	0.000014	0.11	0.02	0.51	46	0.3	5.3	0.00008	1,459	2.6	0.00008	0.0014	0.036	0.0048	0.012	180	23	4.1	2,755
2036	8,174	637	78	0.082	0.014	0.0081	0.016	3.6	0.00027	188	0.0034	0.039	0.0068	0.34	0.00068	2.0	137	0.23	0.000034	0.28	0.05	1.3	112	0.75	13	0.0002	3,579	6.3	0.0002	0.0034	0.087	0.012	0.029	442	56	10	6,758
2037	36,319	2,829	349	0.36	0.064	0.036	0.069	16	0.0012	835	0.015	0.17	0.03	1.5	0.003	8.7	607	1.0	0.00015	1.2	0.22	5.6	499	3.3	58	0.00087	15,900	28	0.00087	0.015	0.39	0.053	0.13	1,966	249	45	30,026
2038	114,469	8,916	1,099	1.1	0.2	0.11	0.22	50	0.0038	2,631	0.047	0.54	0.095	4.7	0.0095	28	1,914	3.2	0.00047	3.9	0.7	18	1,572	10	183	0.0027	50,111	88	0.0028	0.047	1.2	0.17	0.41	6,195	783	142	94,634
2039	294,759	108,602	2,074	3.9	0.52	0.27	0.38	95	0.0072	3,692	0.09	1.2	0.35	8.9	0.19	52	5,595	6.7	0.00089	9.9	2.0	33	2,968	22	346	0.0071	151,047	167	0.0071	0.089	3.1	0.43	1.2	5,376	680	124	178,458
2040	375,606	170,679	3,171	6.4	0.66	0.39	0.64	145	0.011	4,853	0.14	1.2	1.9	14	0.37	79	7,282	6.4	0.0014	13	2.3	51	4,538	20	529	0.009	199,379	255	0.009	0.14	4.0	0.54	1.4	6,406	810	147	272,969
2041	498,712	255,334	3,172	9.3	0.88	0.5	0.78	145	0.014	4,424	0.17	1.4	2.7	17	0.54	79	9,903	7.2	0.0017	17	2.9	51	4,539	23	529	0.012	273,283	255	0.012	0.17	5.3	0.72	1.8	2,699	341	62	338,914
2042	396,987	246,288	3,170	9.5	0.7	0.44	0.89	145	0.014	4,317	0.17	0.81	2.7	17	0.51	79	8,082	3.8	0.0017	13	2.1	51	4,537	11	529	0.0095	226,085	255	0.0095	0.17	4.2	0.57	1.4	3,408	431	78	343,355
2043	435,552	270,005	3,171	10	0.77	0.48	0.86	145	0.014	3,874	0.17	0.99	2.8	17	0.57	79	8,919	4.7	0.0017	15	2.5	51	4,538	14	529	0.01	248,909	255	0.01	0.17	4.7	0.63	1.6	3,841	486	88	345,155
2044	434,078	270,470	3,171	10	0.77	0.49	0.84	145	0.014	3,704	0.17	1.0	2.8	17	0.63	79	8,909	4.7	0.0017	15	2.6	51	4,538	14	529	0.01	248,527	255	0.01	0.17	4.6	0.63	1.7	1,031	130	24	339,203
2045	419,201	253,400	3,171	9.5	0.74	0.45	0.76	145	0.013	3,387	0.16	0.72	2.6	16	0.65	79	8,520	2.9	0.0016	14	2.3	51	4,539	8.4	529	0.01	238,585	255	0.01	0.16	4.5	0.61	1.5	607	77	14	312,231
2046	429,085	249,341	3,172	9.2	0.76	0.47	0.71	145	0.012	3,257	0.15	0.8	2.5	15	0.72	79	8,673	3.3	0.0015	14	2.6	51	4,539	9.4	529	0.01	242,238	255	0.01	0.15	4.6	0.62	1.7	703	89	16	301,366
2047	462,700	255,572	3,172	9.3	0.82	0.5	0.69	145	0.012	3,275	0.15	0.91	2.6	15	0.81	79	9,280	3.7	0.0015	16	2.9	51	4,540	11	529	0.011	258,595	255	0.011	0.15	4.9	0.67	1.9	851	108	20	302,616
2048	475,079	257,244	3,172	9.3	0.84	0.52	0.69	145	0.012	3,367	0.15	0.96	2.6	15	0.85	80	9,496	4.0	0.0015	16	3.1	51	4,540	12	529	0.011	264,392	255	0.011	0.15	5.1	0.69	2.0	1,024	129	24	305,970
2049	481,735	257,436	3,172	9.3	0.85	0.53	0.69	145	0.012	3,453	0.15	1.	2.6	15	0.87	80	9,605	4.1	0.0015	16	3.2	51	4,541	12	529	0.012	267,313	255	0.012	0.15	5.1	0.7	2.0	1,149	145	26	308,547
2050	495,931	266,156	3,173	9.6	0.87	0.55	0.7	145	0.013	3,386	0.16	1.1	2.7	16	0.93	80	9,905	4.4	0.0016	17	3.4	51	4,541	13	529	0.012	275,624	255	0.012	0.16	5.3	0.72	2.2	1,211	153	28	311,965
2051	506,546	269,609	3,173	9.7	0.89	0.57	0.7	145	0.013	3,451	0.16	1.1	2.7	16	0.98	80	10,108	4.7	0.0016	17	3.6	51	4,541	14	529	0.012	281,043	255	0.012	0.16	5.4	0.73	2.3	1,365	173	31	316,216
2052	519,492	272,711	3,173	9.8	0.92	0.59	0.71	145	0.013	3,560	0.16	1.2	2.8	16	1.0	80	10,331	5.1	0.0016	17	3.8	51	4,541	15	529	0.012	287,399	255	0.012	0.16	5.5	0.75	2.4	1,641	208	38	321,547
2053	527,425	272,692	3,173	9.8	0.93	0.61	0.72	145	0.013	3,677	0.16	1.3	2.8	16	1.1	80	10,460	5.3	0.0016	18	4.0	51	4,541	16	529	0.013	290,813	255	0.013	0.16	5.6	0.76	2.5	1,793	227	41	324,989
2054	541,271	279,264	3,173	10.0	0.95	0.62	0.73	145	0.013	3,726	0.17	1.3	2.8	17	1.1	80	10,735	5.4	0.0017	18	4.1	51	4,541	16	529	0.013	298,374	255	0.013	0.17	5.8	0.78	2.6	1,681	212	39	331,093
2055	549,412	281,438	3,173	10	0.97	0.64	0.74	145	0.013	3,827	0.17	1.3	2.9	17	1.1	80	10,886	5.5	0.0017	18	4.2	51	4,541	16	529	0.013	302,375	255	0.013	0.17	5.9	0.79	2.7	1,677	212	39	335,909
2056	567,386	292,614	3,173	10	1.0	0.66	0.75	145	0.014	3,782	0.17	1.4	3.0	17	1.2	80	11,257	5.8	0.0017	19	4.4	51	4,541	17	529	0.014	312,895	255	0.014	0.17	6.1	0.82	2.8	1,883	238	43	342,067
2057	577,274	295,022	3,173	10	1.0	0.68	0.75	145	0.014	3,843	0.17	1.5	3.0	17	1.2	80	11,440	6.2	0.0017	19	4.6	51	4,541	18	529	0.014	317,753	255	0.014	0.17	6.2	0.83	2.9	2,140	271	49	345,301
2058	585,688	296,388	3,173	11	1.0	0.7	0.76	145	0.014	3,914	0.18	1.5	3.0	17	1.3	80	11,577	6.4	0.0017	20	4.8	51	4,541	19	529	0.014	321,759	255	0.014	0.17	6.3	0.85	3.0	2,290	289	53	348,168
2059	599,004	301,717	3,173	11	1.1	0.72	0.76	145	0.014	3,937	0.18	1.6	3.1	18	1.3	80	11,834	6.7	0.0018	20	5.0	51	4,541	20	529	0.014	328,850	255	0.014	0.18	6.4	0.87	3.1	2,259	286	52	352,107
2060	614,185	309,045	3,173	11	1.1	0.74	0.76	145	0.014	3,924	0.18	1.7	3.1	18	1.4	80	12,138	7.0	0.0018	21	5.2	51	4,542	20	529	0.015	337,224	255	0.015	0.18	6.6	0.89	3.3	2,342	296	54	356,256
2061	623,220	310,786	3,173	11	1.1	0.77	0.76	145	0.014	3,961	0.19	1.7	3.1	18	1.5	80	12,296	7.2	0.0018	21	5.4	51	4,542	21	529	0.015	341,621	255	0.015	0.18	6.7	0.9	3.4	2,238	283	51	358,049
2062	629,113	320,078	3,174	11	1.1	0.78	0.77	145	0.014	3,848	0.19	1.7	3.2	18	1.5	80	12,494	7.3	0.0018	21	5.6	51	4,542	21	529	0.015	346,334	255	0.015	0.18	6.7	0.91	3.5	2,049	259	47	361,103
2063	637,217	323,857	3,174	11	1.1	0.8	0.78	145	0.015	3,851	0.19	1.8	3.2	18	1.6	80	12,682	7.4	0.0018	21	5.8	51	4,542	22	529	0.015	350,709	255	0.015	0.18	6.8	0.92	3.6	1,868	236	43	363,501
2064	645,763	328,913	3,174	12	1.1	0.82	0.78	145	0.015	3,857	0.19	1.8	3.3	18	1.6	80	12,901	7.6	0.0018	22	5.9	51	4,542	22	529	0.015	355,546	255	0.016	0.18	6.9	0.93	3.7	1,941	245	45	367,099
2065	653,279	330,460	3,174	12	1.2	0.84	0.78	145	0.015	3,897	0.2	1.9	3.3	18	1.7	80	13,064	7.9	0.0018	22	6.1	51	4,542	23	529	0.016	359,150	255	0.016	0.18	7.0	0.94	3.8	2,035	257	47	369,105
2066	665,895	338,047	3,174	12	1.2	0.86	0.79	145	0.015	3,846	0.2	2.0	3.4	19	1.7	80	13,365	8.1	0.0019	22	6.3	51	4,543	24	529	0.016	366,415	255	0.016	0.19	7.1	0.96	3.9	2,170	274	50	371,946
2067	669,364	357,055	3,174	13	1.2	0.87	0.8	145	0.015	3,559	0.2	2.0	3.5	19	1.7	80	13,668	8.3	0.0019	23	6.4	51	4,543	24	529	0.016	372,203	255	0.016	0.19	7.1	0.97	4.0	2,287	289	53	374,952
2068	676,528	366,985	3,174	13	1.2	0.89	0.81	145	0.015	3,489	0.2	2.0	3.6	19	1.8	80	13,925	8.5	0.0019	23	6.5	51	4,543	25	529	0.016	377,499	255	0.016	0.19	7.2	0.98	4.1	2,343	296	54	378,901
2069	687,621	382,571	3,174	13	1.2	0.9	0.81	145	0.015	3,316	0.21	2.1	3.7	19	1.8	80	14,316	8.7	0.0019	23	6.7	51	4,543	25	529	0.016	385,850	255	0.017	0.19	7.3	0.99	4.2	2,318	293	53	381,313
2070	697,446	389,524	3,174	14	1.2	0.92	0.82	145	0.015	3,294	0.21	2.1	3.7	19	1.9	80	14,580	8.9	0.0019	23	6.8	51	4,543	26	529	0.017	391,677	255	0.017	0.19	7.4	1.0	4.3	2,264	286	52	384,374
2071	702,460	404,872	3,174	14	1.2	0.94	0.83	145	0.016	3,122	0.21	2.2	3.9	19	1.9	80	14,860	9.0	0.0019	24	7.0	51	4,543	26	529	0.017	397,261	255	0.017	0.19	7.5	1.0	4.4	2,197	278	51	386,328
2072	710,321	412,321	3,175	14	1.3	0.96	0.83	145	0.016	3,088	0.21	2.2	3.9	19	2.0	80	15,089	9.2	0.0019	24	7.2	51	4,543	27	529	0.017	402,363	255	0.017	0.19	7.6	1.0	4.5	2,195	278	50	388,982
2073	707,678	434,637	3,175	15	1.2	0.97	0.84	145	0.016	2,815	0.21	2.3	4.1	19	2.0	80	15,360	9.4	0.0019	24	7.3	51	4,544	27	529	0.017	405,978	255	0.017	0.19	7.6	1.0	4.6	2,213	280	51	389,390
2074	710,667	445,575	3,175	16	1.3	0.98	0.85	145	0.016	2,728	0.21	2.3	4.2	20	2.0	80	15,593	9.5	0.002	24	7.4	51	4,544	28	530	0.017	409,588	255	0.017	0.2	7.6	1.0	4.6	2,280	288	52	391,164
2075	711,723	457,301	3,175	16	1.3	0.98	0.85	145	0.016	2,620	0.21	2.3	4.3	20	2.0	80	15,849	9.6	0.002	24	7.5	51	4,544	28	530	0.017	412,422	255	0.017	0.2	7.6	1.0	4.7	2,342	296	54	391,961
2076	712,311	473,534	3,175	17	1.3	0.99	0.86	145	0.016	2,496	0.21	2.3	4.4	20	2.1	80	16,115	9.7	0.002	24	7.5	51	4,544	28	530	0.017	416,076	255	0.017	0.2	7.6	1.0	4.7	2,398	303	55	394,086
2077	707,438	494,792	3,175	18	1.2	0.99	0.87	145	0.016	2,312	0.21	2.3	4.6	20	2.1	80	16,390	9.7	0.002	24	7.5	51	4,544	28	530	0.017	418,346	255	0.017	0.2	7.6	1.0	4.7	2,343	296	54	394,666
2078	710,609	514,944	3,175	18	1.3	1.	0.88	145	0.016	2,183	0.21	2.3	4.7	20	2.1	80	16,746	9.7	0.002	24	7.5	51	4,545	28	530	0.017	423,948	255	0.017	0.2	7.6	1.0	4.7	2,271	287	52	396,324
2079	710,676	529,490	3,175	19	1.3	1.	0.89	145	0.016	2,093	0.21	2.3	4.9	20	2.1	80	17,035	9.6	0.002	24	7.6	51	4,545	28	530	0.017	426,858	255	0.017	0.2	7.6	1.0	4.7	2,020	255	46	397,336
2080	712,491	540,563	3,175	19	1.3	1.0	0.9	145	0.016	2,041	0.21	2.3	5.0	20	2.1	80	17,272	9.6	0.002	24	7.6	51	4,545	28	530	0.017	429,881	255	0.017	0.2	7.6	1.0	4.8	1,826	231	42	398,998
2081	713,835	547,810	3,176	20	1.3	1.0	0.9	145	0.016	2,003	0.21	2.3	5.0	20	2.1	80	17,466	9.5	0.002	24	7.7	51	4,545	28	530	0.017	431,880	255	0.017	0.2	7.6	1.0	4.8	1,502	190	35	399,482
2082	716,077	553,651	3,176	20	1.3	1.0	0.9	145	0.016	1,977	0.22	2.3	5.1	20	2.1	80	17,644	9.5	0.002	24	7.7	51	4,545	28	530	0.017	433,991	255	0.017	0.2	7.6	1.0	4.8	1,347	170	31	400,065
2083	712,212	572,301	3,176	21	1.3	1.0	0.91	145	0.016	1,868	0.21	2.3	5.2	20	2.2	80	17,882	9.5	0.002	24	7.7	51	4,545	28	530	0.017	436,075	255	0.017	0.2	7.6	1.0	4.8	1,166	147	27	400,547
2084	712,767	584,072	3,176	21	1.3	1.0	0.92	145	0.016	1,819	0.21	2.3	5.4	20	2.2	80	18,123	9.5	0.002	24	7.7	51	4,545	28	530	0.017	438,657	255	0.017	0.2	7.6	1.0	4.9	1,115	141	26	401,921
2085	710,811	593,882	3,176	22	1.3	1.0	0.92	145	0.016	1,763	0.21	2.3	5.5	20	2.2	80	18,323	9.4	0.002	24	7.8	51	4,545	27	530	0.017	439,649	255	0.017	0.2	7.6	1.0	4.9	1,067	135	25	401,543
2086	710,147	600,804	3,176	22	1.3	1.0	0.92	145	0.016	1,728	0.21	2.3	5.5	20	2.2	80	18,494	9.4	0.002	24	7.7	51	4,546	27	530	0.017	440,624	255	0.017	0.2	7.6	1.0	4.9	1,057	134	24	401,553
2087	700,533	626,419	3,176	23	1.2	1.0	0.94	145	0.016	1,598	0.21	2.3	5.8	20	2.1	80	18,766	9.3	0.002	24	7.7	51	4,546	27	530	0.017	441,555	255	0.017	0.2	7.5	1.0	4.8	1,051	133	24	401,267
2088	697,502	640,694	3,176	24	1.2	1.0	0.95	145	0.016	1,545	0.21	2.3	5.9	20	2.1	80	18,989	9.3	0.002	23	7.6	51	4,546	27	530	0.017	443,035	255	0.017	0.2	7.4	1.0	4.8	1,055	133	24	402,320
2089	690,123	652,790	3,176	24	1.2	1.0	0.95	145	0.016	1,479	0.21	2.3	6.0	20	2.1	80	19,138	9.2	0.002	23	7.5	51	4,546	27	530	0.017	442,064	255	0.017	0.2	7.4	1.	4.7	1,054	133	24	401,001
2090	687,743	660,781	3,176	24	1.2	1.0	0.96	145	0.016	1,449	0.21	2.3	6.1	20	2.1	80	19,281	9.2	0.002	23	7.5	51	4,546	27	530	0.016	442,513	255	0.017	0.2	7.3	0.99	4.7	1,054	133	24	401,227
2091	684,634	670,516	3,176	25	1.2	1.	0.96	145	0.016	1,411	0.21	2.2	6.2	20	2.1	80	19,472	9.1	0.002	23	7.5	51	4,546	27	530	0.016	442,973	255	0.016	0.2	7.3	0.99	4.7	1,048	133	24	401,098
2092	685,888	678,557	3,176	25	1.2	1.	0.97	145	0.016	1,397	0.21	2.2	6.3	20	2.1	80	19,672	9.1	0.002	23	7.5	51	4,546	26	530	0.016	445,054	255	0.016	0.2	7.3	0.99	4.7	1,038	131	24	402,800
2093	682,917	684,848	3,176	25	1.2	0.99	0.97	145	0.016	1,369	0.21	2.2	6.3	20	2.1	80	19,826	9.0	0.002	23	7.4	51	4,546	26	530	0.016	444,809	255	0.016	0.2	7.3	0.99	4.6	980	124	23	402,142
2094	681,159	690,162	3,177	26	1.2	0.99	0.98	145	0.016	1,348	0.2	2.2	6.3	20	2.1	80	19,971	8.9	0.002	23	7.3	51	4,546	26	530	0.016	444,956	255	0.016	0.2	7.3	0.98	4.6	909	115	21	401,911
2095	671,241	710,213	3,177	27	1.2	0.97	0.99	145	0.016	1,274	0.2	2.1	6.3	20	2.0	80	20,167	8.7	0.002	23	7.2	51	4,546	25	530	0.016	444,510	255	0.016	0.2	7.2	0.97	4.5	696	88	16	401,364
2096	666,795	723,032	3,177	27	1.2	0.97	1.0	145	0.016	1,240	0.2	2.1	6.3	20	2.0	80	20,371	8.5	0.002	22	7.1	51	4,546	25	530	0.016	444,986	255	0.016	0.2	7.1	0.96	4.5	576	73	13	402,265
2097	657,837	733,381	3,177	28	1.2	0.95	1.0	145	0.016	1,197	0.2	2.1	6.2	20	2.0	80	20,489	8.3	0.002	22	6.9	51	4,546	24	530	0.016	442,877	255	0.016	0.2	7.0	0.95	4.4	411	52	9.5	401,193
2098	652,273	741,179	3,177	28	1.2	0.94	1.0	145	0.016	1,169	0.2	2.0	6.2	20	1.9	80	20,624	8.1	0.002	22	6.8	51	4,547	23	530	0.016	441,807	255	0.016	0.2	7.0	0.94	4.3	329	42	7.6	400,659
2099	647,798	748,976	3,177	29	1.1	0.92	1.0	145	0.016	1,147	0.2	2.0	6.2	20	1.9	80	20,750	7.9	0.002	22	6.7	51	4,547	23	530	0.016	441,232	255	0.016	0.2	6.9	0.94	4.2	248	31	5.7	400,865
2100	645,730	755,011	3,177	29	1.1	0.91	1.0	145	0.016	1,135	0.2	1.9	6.2	20	1.9	80	20,887	7.8	0.002	22	6.6	51	4,547	22	530	0.015	441,384	255	0.016	0.2	6.9	0.93	4.2	218	28	5.0	401,623
2101	641,637	760,241	3,177	29	1.1	0.9	1.0	145	0.016	1,116	0.2	1.9	6.2	20	1.8	80	20,974	7.7	0.002	22	6.5	51	4,547	22	530	0.015	440,486	255	0.015	0.2	6.9	0.93	4.1	195	25	4.5	401,098
2102	642,144	766,206	3,177	29	1.1	0.9	1.0	145	0.016	1,112	0.2	1.9	6.2	20	1.8	80	21,122	7.6	0.002	22	6.5	51	4,547	22	530	0.015	441,791	255	0.015	0.2	6.9	0.93	4.1	189	24	4.3	402,800
2103	638,762	768,332	3,177	29	1.1	0.89	1.0	145	0.016	1,101	0.2	1.9	6.2	20	1.8	80	21,156	7.5	0.002	21	6.4	51	4,547	22	530	0.015	440,627	255	0.015	0.2	6.8	0.92	4.0	184	23	4.2	402,142
2104	637,029	770,544	3,177	30	1.1	0.89	1.0	145	0.016	1,093	0.2	1.9	6.1	20	1.8	80	21,202	7.5	0.002	21	6.4	51	4,547	22	530	0.015	440,213	255	0.015	0.2	6.8	0.92	4.0	183	23	4.2	401,911
2105	634,436	773,348	3,177	30	1.1	0.88	1.0	145	0.016	1,082	0.2	1.9	6.1	20	1.8	80	21,261	7.4	0.002	21	6.3	51	4,547	21	530	0.015	439,533	255	0.015	0.2	6.8	0.92	4.0	183	23	4.2	401,364
2106	634,252	778,182	3,177	30	1.1	0.88	1.1	145	0.016	1,076	0.2	1.8	6.1	20	1.8	80	21,388	7.4	0.002	21	6.3	51	4,547	21	530	0.015	440,320	255	0.015	0.2	6.8	0.92	4.0	183	23	4.2	402,265
2107	631,558	777,713	3,177	30	1.1	0.87	1.0	145	0.016	1,069	0.2	1.8	6.1	20	1.8	80	21,379	7.3	0.002	21	6.2	51	4,547	21	530	0.015	438,946	255	0.015	0.2	6.7	0.91	3.9	182	23	4.2	401,193
2108	629,475	779,602	3,177	30	1.1	0.87	1.1	145	0.016	1,060	0.2	1.8	6.1	20	1.7	80	21,435	7.2	0.002	21	6.1	51	4,547	21	530	0.015	438,281	255	0.015	0.2	6.7	0.91	3.9	182	23	4.2	400,659
2109	628,837	780,965	3,177	30	1.1	0.86	1.1	145	0.016	1,058	0.2	1.8	6.1	20	1.7	80	21,484	7.2	0.002	21	6.1	51	4,547	21	530	0.015	438,226	255	0.015	0.2	6.7	0.91	3.9	182	23	4.2	400,865
2110	628,942	783,406	3,177	30	1.1	0.86	1.1	145	0.016	1,057	0.2	1.8	6.1	20	1.7	80	21,576	7.1	0.002	21	6.0	51	4,547	21	530	0.015	438,653	255	0.015	0.2	6.7	0.91	3.8	182	23	4.2	401,623
2111	627,438	784,267	3,177	30	1.1	0.85	1.1	145	0.016	1,051	0.2	1.8	6.0	20	1.7	80	21,607	7.1	0.002	21	6.0	51	4,547	20	530	0.015	438,079	255	0.015	0.2	6.7	0.91	3.8	182	23	4.2	401,098
2112	629,133	788,360	3,177	30	1.1	0.85	1.1	145	0.016	1,053	0.2	1.8	6.0	20	1.7	80	21,747	7.0	0.002	21	5.9	51	4,547	20	530	0.015	439,576	255	0.015	0.2	6.7	0.91	3.8	183	23	4.2	402,800
2113	627,623	787,273	3,177	30	1.1	0.84	1.1	145	0.016	1,051	0.2	1.7	6.0	20	1.7	80	21,735	7.0	0.002	21	5.9	51	4,547	20	530	0.015	438,616	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	402,142
2114	626,780	788,067	3,177	30	1.1	0.84	1.1	145	0.016	1,047	0.2	1.7	6.0	20	1.7	80	21,771	6.9	0.002	21	5.8	51	4,547	20	530	0.015	438,324	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	401,911
2115	625,566	788,198	3,177	30	1.1	0.83	1.1	145	0.016	1,043	0.2	1.7	6.0	20	1.7	80	21,780	6.9	0.002	21	5.8	51	4,547	20	530	0.015	437,767	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,364
2116	626,770	790,411	3,177	31	1.1	0.84	1.1	145	0.016	1,044	0.2	1.7	6.0	20	1.7	80	21,843	6.9	0.002	21	5.8	51	4,547	20	530	0.015	438,711	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	402,265
2117	624,858	788,305	3,177	30	1.1	0.83	1.1	145	0.016	1,041	0.2	1.7	6.0	20	1.6	80	21,788	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,421	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,193
2118	623,986	787,695	3,177	30	1.1	0.83	1.1	145	0.016	1,039	0.2	1.7	6.0	20	1.6	80	21,770	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,918	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	400,659
2119	624,107	787,540	3,177	30	1.1	0.83	1.1	145	0.016	1,041	0.2	1.7	6.0	20	1.6	80	21,769	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,943	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	400,865
2120	625,207	787,703	3,177	30	1.1	0.83	1.1	145	0.016	1,045	0.2	1.7	6.0	20	1.6	80	21,784	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,448	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,623
2121	624,349	787,235	3,177	30	1.1	0.83	1.1	145	0.016	1,043	0.2	1.7	6.0	20	1.6	80	21,766	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,996	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,098
2122	626,837	789,528	3,177	31	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,836	6.8	0.002	21	5.8	51	4,547	20	530	0.015	438,569	255	0.015	0.2	6.7	0.91	3.7	183	23	4.2	402,800
2123	625,773	787,515	3,177	30	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,784	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,691	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	402,142
2124	625,374	787,183	3,177	30	1.1	0.83	1.1	145	0.016	1,048	0.2	1.7	6.0	20	1.6	80	21,773	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,440	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	401,911
2125	624,482	786,753	3,177	30	1.1	0.83	1.1	145	0.016	1,045	0.2	1.7	6.0	20	1.6	80	21,754	6.8	0.002	21	5.8	51	4,547	20	530	0.015	436,965	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,364
2126	625,764	788,681	3,177	30	1.1	0.83	1.1	145	0.016	1,047	0.2	1.7	6.0	20	1.6	80	21,804	6.8	0.002	21	5.8	51	4,547	20	530	0.015	437,906	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	402,265
2127	623,976	786,379	3,177	30	1.1	0.83	1.1	145	0.016	1,045	0.2	1.7	6.0	20	1.6	80	21,742	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,659	255	0.015	0.2	6.7	0.9	3.7	182	23	4.2	401,193
2128	623,065	785,732	3,177	30	1.1	0.83	1.1	145	0.016	1,042	0.2	1.7	6.0	20	1.6	80	21,721	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,117	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	400,659
2129	623,185	785,535	3,177	30	1.1	0.83	1.1	145	0.016	1,044	0.2	1.7	6.0	20	1.6	80	21,717	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,141	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	400,865
2130	624,323	785,735	3,177	30	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,732	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,685	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,623
2131	623,467	785,230	3,177	30	1.1	0.83	1.1	145	0.016	1,046	0.2	1.7	6.0	20	1.6	80	21,713	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,194	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,098
2132	625,992	787,555	3,177	30	1.1	0.83	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,783	6.8	0.002	21	5.7	51	4,547	20	530	0.015	437,803	255	0.015	0.2	6.7	0.9	3.7	183	23	4.2	402,800
2133	624,888	785,504	3,177	30	1.1	0.83	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,731	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,887	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,142
2134	624,530	785,214	3,177	30	1.1	0.83	1.1	145	0.016	1,051	0.2	1.7	6.0	20	1.6	80	21,720	6.8	0.002	21	5.7	51	4,547	20	530	0.015	436,676	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	401,911

Table A2. Annual loads of the NAG backfill for the poorly graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	623,599	784,746	3,177	30	1.1	0.83	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,701	6.8	0.002	21	5.7	51	4,547	19	530	0.015	436,162	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,364
2136	624,879	786,710	3,177	30	1.1	0.83	1.1	145	0.016	1,050	0.2	1.7	6.0	20	1.6	80	21,751	6.8	0.002	21	5.7	51	4,547	20	530	0.015	437,142	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,265
2137	623,093	784,413	3,177	30	1.1	0.83	1.1	145	0.016	1,048	0.2	1.7	6.0	20	1.6	80	21,688	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,856	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,193
2138	622,223	783,769	3,177	30	1.1	0.82	1.1	145	0.016	1,046	0.2	1.7	6.0	20	1.6	80	21,667	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,356	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,659
2139	622,343	783,571	3,177	30	1.1	0.82	1.1	145	0.016	1,047	0.2	1.7	6.0	20	1.6	80	21,664	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,380	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,865
2140	623,439	783,727	3,177	30	1.1	0.83	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,678	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,922	255	0.015	0.2	6.7	0.9	3.6	182	23	4.2	401,623
2141	622,625	783,264	3,177	30	1.1	0.82	1.1	145	0.016	1,049	0.2	1.7	6.0	20	1.6	80	21,660	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,432	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,098
2142	625,105	785,541	3,177	30	1.1	0.83	1.1	145	0.016	1,056	0.2	1.7	6.0	20	1.6	80	21,729	6.8	0.002	21	5.7	51	4,547	19	530	0.015	436,998	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,800
2143	624,044	783,533	3,177	30	1.1	0.83	1.1	145	0.016	1,056	0.2	1.7	6.0	20	1.6	80	21,677	6.7	0.002	21	5.7	51	4,547	19	530	0.015	436,123	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,142
2144	623,645	783,204	3,177	30	1.1	0.83	1.1	145	0.016	1,055	0.2	1.7	6.0	20	1.6	80	21,666	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,873	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	401,911
2145	622,716	782,740	3,177	30	1.1	0.82	1.1	145	0.016	1,052	0.2	1.7	6.0	20	1.6	80	21,647	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,399	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,364
2146	623,994	784,699	3,177	30	1.1	0.83	1.1	145	0.016	1,054	0.2	1.7	6.0	20	1.6	80	21,697	6.7	0.002	21	5.7	51	4,547	19	530	0.015	436,337	255	0.015	0.2	6.7	0.9	3.6	183	23	4.2	402,265
2147	622,211	782,407	3,177	30	1.1	0.82	1.1	145	0.016	1,051	0.2	1.7	6.0	20	1.6	80	21,635	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,094	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,193
2148	621,342	781,766	3,177	30	1.1	0.82	1.1	145	0.016	1,049	0.2	1.7	5.9	20	1.6	80	21,614	6.7	0.002	21	5.7	51	4,547	19	530	0.015	434,555	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,659
2149	621,461	781,567	3,177	30	1.1	0.82	1.1	145	0.016	1,051	0.2	1.7	5.9	20	1.6	80	21,611	6.7	0.002	21	5.7	51	4,547	19	530	0.015	434,578	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	400,865
2150	622,596	781,759	3,177	30	1.1	0.82	1.1	145	0.016	1,055	0.2	1.7	6.0	20	1.6	80	21,625	6.7	0.002	21	5.7	51	4,547	19	530	0.015	435,118	255	0.015	0.2	6.6	0.9	3.6	182	23	4.2	401,623

Table A3. Source terms of the NAG backfill for the well graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2023	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2024	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2025	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2026	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2027	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2028	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2029	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2030	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2031	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2032	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2033	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2034	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2035	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2036	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2037	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2038	8.0	1,210	94	27	0.012	0.0021	0.0012	0.0023	1.2	0.00005	28	0.0005
2039	8.1	1,311	237	27	0.015	0.0023	0.0013	0.0023	1.2	0.00005	31	0.0005
2040	8.2	1,499	470	27	0.018	0.0026	0.0015	0.0022	1.2	0.00005	32	0.0005
2041	8.4	1,703	762	27	0.027	0.003	0.0016	0.0021	1.2	0.00005	14	0.00051
2042	8.5	1,409	792	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005
2043	8.4	1,372	778	23	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.0005
2044	8.4	1,350	755	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	12	0.0005
2045	8.5	1,400	788	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005
2046	8.5	1,458	800	24	0.029	0.0026	0.0016	0.0023	1.1	0.00005	12	0.0005
2047	8.5	1,576	822	25	0.03	0.0028	0.0017	0.0022	1.1	0.00005	12	0.0005
2048	8.5	1,713	861	24	0.03	0.003	0.0019	0.0022	1.1	0.00005	11	0.00051
2049	8.5	1,776	893	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.00053
2050	8.5	1,804	902	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00054
2051	8.5	1,817	903	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00055
2052	8.5	1,827	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055
2053	8.5	1,837	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055
2054	8.5	1,840	903	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055
2055	8.5	1,851	902	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.00056
2056	8.6	1,807	1,101	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.00054
2057	8.7	1,730	1,420	23	0.052	0.003	0.0022	0.0023	1.1	0.00005	4.7	0.00052
2058	8.7	1,684	1,602	23	0.059	0.003	0.0021	0.0024	1.0	0.00005	3.8	0.00051
2059	8.7	1,671	1,663	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005
2060	8.7	1,670	1,675	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005
2061	8.7	1,673	1,672	23	0.062	0.003	0.002	0.0024	1.0	0.00005	3.5	0.0005
2062	8.8	1,663	1,742	23	0.07	0.0029	0.002	0.0025	1.0	0.00005	3.1	0.0005
2063	8.8	1,642	1,814	22	0.077	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005
2064	8.8	1,636	1,828	22	0.076	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005
2065	8.9	1,636	1,899	22	0.094	0.0029	0.0019	0.0026	1.0	0.00005	2.4	0.0005
2066	8.9	1,609	1,986	22	0.11	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.0005
2067	8.9	1,589	2,043	22	0.11	0.0028	0.0019	0.0027	0.99	0.00005	2.0	0.0005
2068	8.9	1,583	2,073	22	0.11	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.0005
2069	8.9	1,580	2,092	21	0.11	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.0005
2070	8.9	1,584	2,093	21	0.11	0.0028	0.0019	0.0027	0.97	0.00005	2.0	0.0005
2071	8.9	1,584	2,095	21	0.1	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.0005
2072	8.9	1,600	2,101	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.0005
2073	8.9	1,607	2,096	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.0005
2074	8.9	1,614	2,086	21	0.11	0.0028	0.0019	0.0026	0.95	0.00005	2.0	0.0005
2075	8.9	1,623	2,076	21	0.1	0.0029	0.0019	0.0026	0.94	0.00005	2.1	0.0005
2076	8.9	1,650	2,086	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	2.0	0.0005
2077	8.9	1,666	2,081	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.0005
2078	8.9	1,680	2,074	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.00051
2079	8.9	1,691	2,082	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051
2080	8.9	1,698	2,093	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051
2081	8.9	1,711	2,092	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.00051
2082	9.0	1,705	2,128	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.00051
2083	9.0	1,694	2,167	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.00051
2084	9.0	1,698	2,182	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.00051
2085	9.0	1,691	2,202	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.00051
2086	9.0	1,695	2,209	19	0.12	0.003	0.0023	0.0026	0.89	0.00005	1.9	0.00051
2087	8.9	1,689	2,222	19	0.11	0.003	0.0022	0.0026	0.89	0.00005	1.9	0.00051
2088	9.0	1,701	2,235	19	0.12	0.003	0.0023	0.0026	0.88	0.00005	1.8	0.00051
2089	9.0	1,669	2,282	19	0.13	0.0029	0.0022	0.0027	0.88	0.00005	1.7	0.0005
2090	9.0	1,663	2,315	19	0.14	0.0029	0.0022	0.0027	0.88	0.00005	1.6	0.0005
2091	9.0	1,660	2,331	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005
2092	9.0	1,661	2,347	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005
2093	9.0	1,647	2,387	19	0.14	0.0029	0.0021	0.0027	0.86	0.00005	1.5	0.0005
2094	9.0	1,626	2,437	19	0.15	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.0005
2095	9.0	1,612	2,454	19	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.0005
2096	9.0	1,592	2,483	19	0.15	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005
2097	9.0	1,592	2,489	19	0.14	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005
2098	9.0	1,587	2,506	18	0.14	0.0028	0.002	0.0028	0.84	0.00005	1.5	0.0005
2099	9.0	1,590	2,507	18	0.14	0.0028	0.002	0.0028	0.84	0.00005	1.5	0.0005
2100	9.0	1,600	2,529	18	0.15	0.0028	0.002	0.0028	0.84	0.00005	1.4	0.0005
2101	9.0	1,608	2,531	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.0005
2102	9.0	1,611	2,539	18	0.14	0.0028	0.0021	0.0028	0.83	0.00005	1.5	0.0005
2103	9.1	1,636	2,555	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.0005
2104	9.1	1,648	2,563	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005
2105	9.1	1,639	2,581	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005
2106	9.1	1,608	2,628	18	0.17	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.0005
2107	9.1	1,602	2,658	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.0005
2108	9.1	1,606	2,681	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005
2109	9.1	1,609	2,699	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005
2110	9.1	1,618	2,714	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005
2111	9.1	1,624	2,726	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005
2112	9.1	1,638	2,736	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005
2113	9.1	1,644	2,743	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005
2114	9.1	1,659	2,749	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005
2115	9.1	1,665	2,755	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005
2116	9.1	1,679	2,756	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005
2117	9.1	1,681	2,759	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.00051
2118	9.1	1,680	2,784	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005
2119	9.1	1,670	2,817	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005
2120	9.1	1,673	2,830	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005
2121	9.1	1,673	2,864	17	0.19	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005
2122	9.1	1,658	2,906	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.0005
2123	9.1	1,635	2,962	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.0005
2124	9.1	1,627	2,985	17	0.22	0.0029	0.0023	0.003	0.78	0.00005	1.1	0.0005
2125	9.2	1,611	3,022	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005
2126	9.2	1,606	3,037	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005
2127	9.2	1,594	3,068	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005
2128	9.2	1,591	3,085	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005
2129	9.2	1,583	3,109	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005
2130	9.2	1,580	3,121	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005
2131	9.2	1,577	3,142	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.0005
2132	9.2	1,576	3,151	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.98	0.0005
2133	9.2	1,575	3,168	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005
2134	9.2	1,576	3,174	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005

Model Year	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2023	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2024	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2025	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2026	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2027	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2028	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2029	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2030	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2031	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2032	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2033	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2034	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2035	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2036	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2037	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2038	0.0057	0.001	0.05	0.0001	0.68	20	0.034	0.000005	0.041	0.0074	0.44	39	0.11	4.6	0.000029
2039	0.006	0.0012	0.05	0.00032	0.68	23	0.035	0.000005	0.044	0.0082	0.44	39	0.11	4.6	0.000031
2040	0.0065	0.0017	0.05	0.00084	0.68	28	0.037	0.000005	0.05	0.01	0.44	39	0.12	4.6	0.000036
2041	0.0055	0.0058	0.05	0.0017	0.69	33	0.029	0.000005	0.057	0.011	0.44	39	0.094	4.6	0.000041
2042	0.003	0.0082	0.05	0.002	0.6	28	0.014	0.000005	0.047	0.008	0.39	34	0.042	4.0	0.000034
2043	0.0027	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.37	33	0.034	3.9	0.000033
2044	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.034	3.8	0.000032
2045	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	3.9	0.000034
2046	0.0032	0.0083	0.05	0.0023	0.61	29	0.014	0.000005	0.049	0.009	0.39	35	0.043	4.1	0.000035
2047	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.39	35	0.044	4.1	0.000038
2048	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041
2049	0.0045	0.0089	0.05	0.0038	0.6	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043
2050	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043
2051	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	3.9	0.000044
2052	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.062	0.016	0.37	34	0.057	3.9	0.000044
2053	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.37	34	0.057	3.9	0.000044
2054	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044
2055	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044
2056	0.0049	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043
2057	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041
2058	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004
2059	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004
2060	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004
2061	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	32	0.049	3.8	0.00004
2062	0.0041	0.014	0.05	0.0037	0.56	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004
2063	0.004	0.014	0.05	0.0036	0.56	45	0.017	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039
2064	0.004	0.014	0.05	0.0036	0.56	45	0.017	0.000005	0.055	0.013	0.35	32	0.046	3.7	0.000039
2065	0.004	0.014	0.05	0.0035	0.55	46	0.016	0.000005	0.055	0.013	0.35	32	0.046	3.7	0.000039
2066	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.046	3.7	0.000039
2067	0.0039	0.013	0.05	0.0033	0.54	47	0.016	0.000005	0.053	0.012	0.35	31	0.045	3.6	0.000038
2068	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038
2069	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038
2070	0.0039	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.046	3.5	0.000038
2071	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.046	3.5	0.000038
2072	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.046	3.5	0.000038
2073	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038
2074	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.013	0.33	30	0.047	3.5	0.000039
2075	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	29	0.048	3.4	0.000039
2076	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.056	0.013	0.33	29	0.05	3.4	0.000039
2077	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004
2078	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.057	0.014	0.32	29	0.054	3.4	0.00004
2079	0.0046	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.056	3.4	0.00004
2080	0.0047	0.014	0.05	0.0041	0.5	50	0.02	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.000041
2081	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.058	0.015	0.32	29	0.059	3.3	0.000041
2082	0.0049	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.06	3.3	0.000041
2083	0.0049	0.014	0.05	0.0043	0.5	52	0.021	0.000005	0.057	0.016	0.32	28	0.061	3.3	0.000041
2084	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.000041
2085	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.00004
2086	0.0051	0.014	0.05	0.0045	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.062	3.3	0.000041
2087	0.005	0.014	0.05	0.0044	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.00004
2088	0.005	0.015	0.05	0.0045	0.48	54	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.000041
2089	0.0047	0.014	0.05	0.0042	0.48	54	0.02	0.000005	0.056	0.015	0.31	28	0.057	3.2	0.00004
2090	0.0047	0.014	0.05	0.0042	0.48	54	0.02	0.000005	0.056	0.015	0.31	27	0.057	3.2	0.00004
2091	0.0047	0.014	0.05	0.0042	0.48	55	0.019	0.000005	0.056	0.015	0.3	27	0.057	3.2	0.00004
2092	0.0047	0.014	0.05	0.0042	0.47	55	0.019	0.000005	0.056	0.015	0.3	27	0.056	3.2	0.00004
2093	0.0046	0.014	0.05	0.0041	0.47	56	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.1	0.000039
2094	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.055	3.1	0.000039
2095	0.0045	0.014	0.05	0.0039	0.47	57	0.019	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000039
2096	0.0044	0.014	0.05	0.0038	0.47	57	0.018	0.000005	0.054	0.014	0.3	27	0.053	3.1	0.000038
2097	0.0044	0.014	0.05	0.0038	0.46	58	0.018	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000038
2098	0.0044	0.014	0.05	0.0038	0.46	58	0.018	0.000005	0.053	0.014	0.29	26	0.054	3.1	0.000038
2099	0.0044	0.014	0.05	0.0038	0.46	58	0.019	0.000005	0.054	0.014	0.29	26	0.055	3.1	0.000038
2100	0.0045	0.014	0.05	0.0038	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.055	3.1	0.000038
2101	0.0045	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.0	0.000038
2102	0.0046	0.014	0.05	0.0039	0.45	60	0.019	0.000005	0.054	0.014	0.29	26	0.057	3.0	0.000039
2103	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.058	3.0	0.000039
2104	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039
2105	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039
2106	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.057	3.0	0.000038
2107	0.0046	0.014	0.05	0.0038	0.44	62	0.02	0.000005	0.054	0.014	0.28	25	0.058	3.0	0.000038
2108	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.058	2.9	0.000038
2109	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.059	2.9	0.000038
2110	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000039
2111	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.061	2.9	0.000039
2112	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.063	2.9	0.000039
2113	0.005	0.014	0.05	0.0042	0.44	66	0.022	0.000005	0.055	0.016	0.28	25	0.063	2.9	0.000039
2114	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004
2115	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004
2116	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004
2117	0.0053	0.014	0.05	0.0045	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.066	2.9	0.00004
2118	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004
2119	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004
2120	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004
2121	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004
2122	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.056	0.017	0.27	25	0.066	2.9	0.00004
2123	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039
2124	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039
2125	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000039
2126	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	24	0.064	2.9	0.000038
2127	0.0052	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.9	0.000038
2128	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.8	0.000038
2129	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.9	0.000038
2130	0.005	0.015	0.05	0.0045	0.43	75	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038
2131	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038
2132	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.8	0.000038
2133	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038
2134	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038

Model Year	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	16
2024	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	33
2025	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	57
2026	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	87
2027	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	116
2028	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	195
2029	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	221
2030	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	266
2031	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	961
2032	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,273
2033	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	710
2034	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	1,284
2035	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	10,477
2036	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	19,356
2037	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	14,018
2038	528	2.2	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	27,168
2039	601	2.2	0.000032	0.0005	0.014	0.005	0.01	65	3.8	0.69	48,784
2040	735	2.2	0.000036	0.0005	0.016	0.005	0.01	65	3.0	0.54	85,906
2041	909	2.2	0.000041	0.0005	0.018	0.005	0.01	44	1.0	0.18	116,049
2042	788	1.9	0.000034	0.0005	0.015	0.005	0.01	12	1.3	0.23	131,728
2043	768	1.9	0.000033	0.0005	0.015	0.005	0.01	6.9	1.4	0.26	135,614
2044	752	1.8	0.000032	0.0005	0.014	0.005	0.01	6.9	0.38	0.07	137,918
2045	783	1.9	0.000034	0.0005	0.015	0.005	0.01	8.2	0.25	0.045	134,843
2046	811	2.0	0.000035	0.0005	0.016	0.005	0.01	9.7	0.29	0.054	129,640
2047	869	2.0	0.000038	0.0005	0.017	0.005	0.01	6.2	0.36	0.065	128,811
2048	939	2.0	0.000041	0.0005	0.018	0.005	0.01	5.8	0.42	0.077	130,391
2049	975	1.9	0.000043	0.0005	0.019	0.005	0.01	6.3	0.47	0.086	131,655
2050	989	1.9	0.000043	0.0005	0.019	0.005	0.01	5.3	0.49	0.089	133,193
2051	995	1.9	0.000044	0.0005	0.019	0.005	0.01	4.1	0.55	0.099	134,254
2052	1,000	1.9	0.000044	0.0005	0.02	0.005	0.01	2.6	0.65	0.12	135,292
2053	1,004	1.9	0.000044	0.0005	0.02	0.005	0.01	1.4	0.7	0.13	135,311
2054	1,006	1.9	0.000044	0.0005	0.02	0.005	0.01	1.1	0.64	0.12	135,939
2055	1,010	1.9	0.000045	0.0005	0.02	0.005	0.011	1.1	0.63	0.11	136,744
2056	1,036	1.9	0.000043	0.0005	0.019	0.005	0.01	1.3	0.7	0.13	137,789
2057	1,070	1.8	0.000042	0.0005	0.018	0.005	0.01	1.5	0.78	0.14	138,099
2058	1,088	1.8	0.00004	0.0005	0.018	0.005	0.01	1.7	0.83	0.15	138,393
2059	1,094	1.8	0.00004	0.0005	0.018	0.005	0.01	2.0	0.81	0.15	138,657
2060	1,096	1.8	0.00004	0.0005	0.018	0.005	0.01	2.3	0.83	0.15	139,741
2061	1,097	1.8	0.00004	0.0005	0.018	0.005	0.01	2.6	0.79	0.14	140,084
2062	1,107	1.8	0.00004	0.0005	0.018	0.005	0.01	3.0	0.72	0.13	140,942
2063	1,113	1.8	0.000039	0.0005	0.018	0.005	0.01	3.3	0.65	0.12	141,850
2064	1,113	1.8	0.000039	0.0005	0.017	0.005	0.01	3.8	0.67	0.12	143,090
2065	1,128	1.8	0.000039	0.0005	0.017	0.005	0.01	4.2	0.7	0.13	143,729
2066	1,134	1.8	0.000039	0.0005	0.017	0.005	0.01	4.6	0.74	0.13	144,914
2067	1,137	1.7	0.000038	0.0005	0.017	0.005	0.01	5.1	0.77	0.14	146,084
2068	1,140	1.7	0.000038	0.0005	0.017	0.005	0.01	5.5	0.78	0.14	147,667
2069	1,141	1.7	0.000038	0.0005	0.017	0.005	0.01	5.9	0.77	0.14	148,435
2070	1,143	1.7	0.000038	0.0005	0.017	0.005	0.01	6.0	0.74	0.14	149,714
2071	1,143	1.7	0.000038	0.0005	0.017	0.005	0.01	5.7	0.72	0.13	150,869
2072	1,151	1.7	0.000038	0.0005	0.017	0.005	0.01	5.1	0.71	0.13	152,259
2073	1,154	1.7	0.000039	0.0005	0.017	0.005	0.01	4.7	0.72	0.13	152,620
2074	1,155	1.7	0.000039	0.0005	0.017	0.005	0.01	4.6	0.74	0.13	153,555
2075	1,157	1.7	0.000039	0.0005	0.017	0.005	0.01	4.5	0.76	0.14	154,302
2076	1,171	1.6	0.00004	0.0005	0.018	0.005	0.01	4.6	0.77	0.14	155,300
2077	1,177	1.6	0.00004	0.0005	0.018	0.005	0.01	4.8	0.75	0.14	155,642
2078	1,182	1.6	0.00004	0.0005	0.018	0.005	0.01	5.0	0.72	0.13	156,520
2079	1,188	1.6	0.000041	0.0005	0.018	0.005	0.01	5.2	0.64	0.12	157,526
2080	1,194	1.6	0.000041	0.0005	0.018	0.005	0.01	5.5	0.58	0.11	158,727
2081	1,199	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.48	0.086	159,076
2082	1,204	1.6	0.000041	0.0005	0.018	0.005	0.01	5.8	0.43	0.077	160,041
2083	1,207	1.6	0.000041	0.0005	0.018	0.005	0.01	5.9	0.37	0.067	160,609
2084	1,212	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.35	0.064	161,869
2085	1,212	1.6	0.000041	0.0005	0.018	0.005	0.01	5.8	0.34	0.061	162,127
2086	1,215	1.6	0.000041	0.0005	0.018	0.005	0.01	5.4	0.33	0.06	163,022
2087	1,215	1.6	0.000041	0.0005	0.018	0.005	0.01	5.3	0.33	0.06	163,716
2088	1,222	1.6	0.000041	0.0005	0.018	0.005	0.01	4.8	0.33	0.06	164,817
2089	1,217	1.5	0.00004	0.0005	0.018	0.005	0.01	4.5	0.33	0.06	165,016
2090	1,221	1.5	0.00004	0.0005	0.018	0.005	0.01	4.3	0.33	0.06	165,702
2091	1,223	1.5	0.00004	0.0005	0.018	0.005	0.01	4.3	0.33	0.06	166,524
2092	1,226	1.5	0.00004	0.0005	0.018	0.005	0.01	4.2	0.33	0.059	167,829
2093	1,227	1.5	0.00004	0.0005	0.018	0.005	0.01	4.4	0.31	0.056	168,420
2094	1,228	1.5	0.000039	0.0005	0.017	0.005	0.01	4.5	0.29	0.052	169,379
2095	1,224	1.5	0.000039	0.0005	0.017	0.005	0.01	4.8	0.22	0.04	170,071
2096	1,221	1.5	0.000038	0.0005	0.017	0.005	0.01	5.0	0.18	0.033	171,166
2097	1,221	1.5	0.000038	0.0005	0.017	0.005	0.01	5.3	0.13	0.024	171,387
2098	1,222	1.5	0.000038	0.0005	0.017	0.005	0.01	5.6	0.1	0.019	172,099
2099	1,223	1.5	0.000038	0.0005	0.017	0.005	0.01	5.8	0.078	0.014	172,718
2100	1,232	1.5	0.000038	0.0005	0.017	0.005	0.01	6.1	0.069	0.012	173,742
2101	1,235	1.5	0.000039	0.0005	0.017	0.005	0.01	6.3	0.061	0.011	174,656
2102	1,238	1.5	0.000039	0.0005	0.017	0.005	0.01	6.6	0.059	0.011	175,434
2103	1,252	1.5	0.000039	0.0005	0.017	0.005	0.01	6.9	0.058	0.011	176,132
2104	1,259	1.4	0.00004	0.0005	0.018	0.005	0.01	7.1	0.058	0.01	177,487
2105	1,258	1.4	0.000039	0.0005	0.018	0.005	0.01	7.4	0.057	0.01	177,786
2106	1,253	1.4	0.000039	0.0005	0.017	0.005	0.01	7.6	0.057	0.01	178,442
2107	1,256	1.4	0.000039	0.0005	0.017	0.005	0.01	7.8	0.057	0.01	179,251
2108	1,262	1.4	0.000039	0.0005	0.017	0.005	0.01	8.0	0.057	0.01	180,376
2109	1,267	1.4	0.000039	0.0005	0.017	0.005	0.01	8.1	0.057	0.01	180,436
2110	1,273	1.4	0.000039	0.0005	0.017	0.005	0.01	8.3	0.057	0.01	181,010
2111	1,278	1.4	0.000039	0.0005	0.017	0.005	0.01	8.5	0.057	0.01	181,411
2112	1,286	1.4	0.000039	0.0005	0.017	0.005	0.01	8.6	0.057	0.01	182,128
2113	1,290	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	0.057	0.01	182,005
2114	1,297	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	0.057	0.01	182,253
2115	1,300	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	0.057	0.01	182,451
2116	1,307	1.4	0.00004	0.0005	0.018	0.005	0.01	8.6	0.057	0.01	183,471
2117	1,308	1.4	0.00004	0.0005	0.018	0.005	0.01	8.3	0.057	0.01	183,498
2118	1,312	1.4	0.00004	0.0005	0.018	0.005	0.011	8.1	0.057	0.01	183,749
2119	1,314	1.4	0.00004	0.0005	0.018	0.005	0.011	7.8	0.057	0.01	183,758
2120	1,317	1.4	0.00004	0.0005	0.018	0.005	0.011	7.5	0.057	0.01	184,333
2121	1,324	1.4	0.00004	0.0005	0.018	0.005	0.011	7.2	0.057	0.01	184,127
2122	1,326	1.4	0.00004	0.0005	0.018	0.005	0.011	7.0	0.057	0.01	184,511
2123	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.7	0.057	0.01	184,738
2124	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	6.5	0.057	0.01	185,454
2125	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.1	0.057	0.01	185,444
2126	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	5.8	0.057	0.01	185,945
2127	1,327	1.4	0.000038	0.0005	0.017	0.005	0.01	5.2	0.057	0.01	186,004
2128	1,328	1.4	0.000038	0.0005	0.017	0.005	0.01	4.8	0.057	0.01	186,369
2129	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	4.2	0.057	0.01	185,968
2130	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	3.9	0.057	0.01	186,144
2131	1,331	1.4	0.000038	0.0005	0.017	0.005	0.01	3.4	0.057	0.01	186,102
2132	1,332	1.4	0.000038	0.0005	0.017	0.005	0.01	3.2	0.057	0.01	186,692
2133	1,334	1.4	0.000038	0.0005	0.017	0.005	0.01	2.9	0.057	0.01	186,155
2134	1,335	1.4	0.000038	0.0005	0.017	0.005	0.01	2.8	0.057	0.01	186,362

Table A3. Source terms of the NAG backfill for the well graded cover system scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
-	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,577	3,187	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,338	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.057	0.01	186,587
2136	9.2	1,578	3,192	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,339	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.057	0.01	187,193
2137	9.2	1,581	3,204	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.057	0.01	186,724
2138	9.2	1,570	3,233	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.0005	0.0048	0.015	0.05	0.0044	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.057	0.01	186,796
2139	9.2	1,553	3,271	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.0005	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.052	0.016	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.017	0.005	0.01	2.6	0.057	0.01	187,060
2140	9.2	1,545	3,291	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.0005	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,517
2141	9.2	1,532	3,320	17	0.25	0.0027	0.0022	0.0033	0.78	0.00005	0.9	0.0005	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	186,898
2142	9.2	1,525	3,335	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.0005	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	186,889
2143	9.2	1,516	3,353	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,340	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,035
2144	9.2	1,509	3,369	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,551
2145	9.2	1,502	3,386	17	0.26	0.0026	0.0021	0.0033	0.78	0.00005	0.87	0.0005	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,020
2146	9.2	1,496	3,399	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.87	0.0005	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,082
2147	9.2	1,490	3,412	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,212
2148	9.2	1,485	3,424	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0041	0.014	0.05	0.0037	0.42	84	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.057	0.01	187,667
2149	9.2	1,480	3,436	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.0005	0.004	0.014	0.05	0.0037	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.047	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.5	0.057	0.01	187,030
2150	9.2	1,476	3,445	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.0005	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000036	0.0005	0.016	0.005	0.01	2.4	0.057	0.01	186,985

Table A4. Annual loads of the NAG backfill for the well graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year
2023	20	1.5	0.44	0.00019	0.000034	0.000019	0.000037	0.02	0.00000065	0.45	0.0000081	0.000092
2024	40	3.1	0.9	0.00038	0.00007	0.00004	0.000076	0.041	0.0000013	0.92	0.000017	0.00019
2025	69	5.4	1.6	0.00067	0.00012	0.000069	0.00013	0.072	0.0000023	1.6	0.000029	0.00033
2026	106	8.2	2.4	0.001	0.00019	0.00011	0.0002	0.11	0.0000035	2.4	0.000044	0.0005
2027	141	11	3.2	0.0013	0.00025	0.00014	0.00027	0.15	0.0000047	3.2	0.000058	0.00067
2028	236	18	5.3	0.0023	0.00042	0.00024	0.00045	0.24	0.0000078	5.4	0.000098	0.0011
2029	267	21	6.0	0.0026	0.00047	0.00027	0.00051	0.28	0.0000089	6.1	0.00011	0.0013
2030	321	25	7.3	0.0031	0.00057	0.00032	0.00062	0.33	0.000011	7.4	0.00013	0.0015
2031	1,162	91	26	0.011	0.002	0.0012	0.0022	1.2	0.000039	27	0.00048	0.0055
2032	2,750	214	62	0.026	0.0048	0.0027	0.0053	2.8	0.000091	63	0.0011	0.013
2033	858	67	19	0.0082	0.0015	0.00086	0.0016	0.89	0.000028	20	0.00036	0.0041
2034	1,554	121	35	0.015	0.0027	0.0015	0.003	1.6	0.000051	36	0.00064	0.0074
2035	12,672	987	286	0.12	0.022	0.013	0.024	13	0.00042	291	0.0052	0.06
2036	23,413	1,824	529	0.22	0.041	0.023	0.045	24	0.00078	538	0.0097	0.11
2037	16,957	1,321	383	0.16	0.03	0.017	0.033	17	0.00056	390	0.007	0.08
2038	32,863	2,560	742	0.32	0.058	0.033	0.063	34	0.0011	755	0.014	0.16
2039	63,961	11,571	1,332	0.72	0.11	0.062	0.11	61	0.002	1,527	0.024	0.29
2040	128,782	40,409	2,348	1.5	0.23	0.13	0.19	107	0.0034	2,749	0.043	0.56
2041	197,654	88,386	3,173	3.1	0.35	0.19	0.25	145	0.0047	1,619	0.059	0.64
2042	185,591	104,355	3,172	3.9	0.33	0.19	0.31	145	0.0053	1,539	0.066	0.4
2043	186,076	105,488	3,171	3.9	0.33	0.2	0.33	145	0.0054	1,615	0.068	0.36
2044	186,190	104,188	3,171	3.9	0.33	0.2	0.33	145	0.0055	1,717	0.069	0.36
2045	188,820	106,262	3,172	3.9	0.33	0.2	0.32	145	0.0054	1,585	0.068	0.38
2046	188,964	103,720	3,172	3.8	0.33	0.2	0.3	145	0.0052	1,515	0.065	0.41
2047	203,032	105,866	3,173	3.8	0.36	0.22	0.29	145	0.0052	1,496	0.065	0.45
2048	223,360	112,202	3,173	4.0	0.39	0.25	0.28	145	0.0052	1,458	0.067	0.53
2049	233,846	117,629	3,174	4.1	0.41	0.27	0.28	145	0.0053	1,404	0.07	0.59
2050	240,268	120,082	3,174	4.2	0.42	0.29	0.28	145	0.0053	1,409	0.072	0.63
2051	243,939	121,288	3,174	4.2	0.43	0.3	0.28	145	0.0054	1,421	0.073	0.65
2052	247,218	122,306	3,174	4.3	0.44	0.31	0.28	145	0.0054	1,435	0.074	0.66
2053	248,540	122,377	3,174	4.3	0.44	0.31	0.28	145	0.0054	1,438	0.075	0.66
2054	250,169	122,780	3,174	4.3	0.44	0.31	0.29	145	0.0055	1,450	0.075	0.67
2055	253,168	123,343	3,174	4.3	0.45	0.32	0.29	145	0.0055	1,467	0.076	0.68
2056	249,012	151,733	3,175	5.3	0.44	0.32	0.3	145	0.0055	1,021	0.075	0.67
2057	238,870	196,129	3,175	7.1	0.42	0.3	0.32	145	0.0055	643	0.072	0.61
2058	233,012	221,733	3,176	8.2	0.41	0.28	0.33	145	0.0056	520	0.07	0.58
2059	231,696	230,559	3,176	8.6	0.41	0.28	0.34	145	0.0056	488	0.07	0.57
2060	233,410	234,067	3,176	8.7	0.41	0.28	0.34	145	0.0056	486	0.07	0.57
2061	234,402	234,276	3,176	8.7	0.41	0.28	0.34	145	0.0056	489	0.07	0.58
2062	234,343	245,464	3,176	9.9	0.41	0.28	0.35	145	0.0057	436	0.071	0.58
2063	232,890	257,359	3,176	11	0.41	0.28	0.36	145	0.0057	398	0.071	0.57
2064	234,081	261,497	3,176	11	0.41	0.28	0.36	145	0.0057	402	0.072	0.57
2065	235,155	272,984	3,176	14	0.41	0.28	0.37	145	0.0058	339	0.072	0.57
2066	233,224	287,755	3,177	16	0.41	0.28	0.38	145	0.0058	303	0.073	0.57
2067	232,156	298,507	3,177	17	0.41	0.28	0.39	145	0.0059	288	0.073	0.56
2068	233,756	306,039	3,177	17	0.41	0.28	0.4	145	0.0059	287	0.074	0.57
2069	234,467	310,511	3,177	17	0.41	0.28	0.4	145	0.006	288	0.075	0.57
2070	237,133	313,382	3,177	16	0.42	0.28	0.4	145	0.006	297	0.075	0.58
2071	238,917	316,056	3,177	16	0.42	0.28	0.4	145	0.0061	305	0.076	0.58
2072	243,538	319,835	3,177	17	0.43	0.28	0.41	145	0.0061	297	0.076	0.58
2073	245,306	319,891	3,177	17	0.43	0.29	0.41	145	0.0061	303	0.077	0.59
2074	247,823	320,362	3,177	16	0.44	0.29	0.41	145	0.0062	312	0.077	0.6
2075	250,494	320,300	3,177	16	0.44	0.3	0.41	145	0.0062	322	0.078	0.62
2076	256,213	323,939	3,177	18	0.45	0.31	0.41	145	0.0062	304	0.078	0.64
2077	259,315	323,891	3,177	18	0.46	0.31	0.4	145	0.0063	308	0.078	0.67
2078	262,984	324,669	3,177	17	0.46	0.32	0.4	145	0.0063	314	0.079	0.69
2079	266,345	327,890	3,177	18	0.47	0.33	0.41	145	0.0063	314	0.08	0.72
2080	269,535	332,232	3,177	18	0.48	0.34	0.41	145	0.0064	315	0.081	0.75
2081	272,116	332,708	3,177	18	0.48	0.35	0.41	145	0.0064	320	0.082	0.77
2082	272,869	340,630	3,177	19	0.48	0.35	0.41	145	0.0064	308	0.082	0.78
2083	272,120	348,104	3,177	19	0.48	0.35	0.42	145	0.0065	299	0.082	0.79
2084	274,821	353,230	3,178	19	0.48	0.36	0.42	145	0.0065	301	0.083	0.81
2085	274,109	357,053	3,178	19	0.48	0.36	0.42	145	0.0065	299	0.082	0.81
2086	276,257	360,164	3,178	19	0.49	0.37	0.43	145	0.0066	304	0.083	0.82
2087	276,500	363,696	3,178	19	0.49	0.37	0.43	145	0.0066	306	0.083	0.82
2088	280,271	368,398	3,178	20	0.49	0.37	0.43	145	0.0066	299	0.084	0.83
2089	275,396	376,485	3,178	22	0.49	0.36	0.44	145	0.0066	274	0.083	0.78
2090	275,529	383,534	3,178	23	0.49	0.36	0.45	145	0.0067	268	0.083	0.78
2091	276,362	388,183	3,178	23	0.49	0.36	0.45	145	0.0067	268	0.084	0.78
2092	278,748	393,879	3,178	23	0.49	0.36	0.45	145	0.0067	270	0.084	0.79
2093	277,320	402,001	3,178	24	0.49	0.36	0.46	145	0.0068	260	0.085	0.78
2094	275,444	412,709	3,178	25	0.49	0.36	0.47	145	0.0068	252	0.085	0.77
2095	274,222	417,353	3,178	25	0.48	0.35	0.47	145	0.0068	251	0.085	0.76
2096	272,497	424,921	3,178	25	0.48	0.35	0.48	145	0.0069	249	0.086	0.75
2097	272,865	426,547	3,178	25	0.48	0.35	0.48	145	0.0069	252	0.086	0.75
2098	273,173	431,194	3,178	25	0.48	0.35	0.49	145	0.0069	253	0.086	0.76
2099	274,674	432,953	3,179	24	0.48	0.35	0.49	145	0.0069	257	0.087	0.77
2100	278,005	439,464	3,179	26	0.49	0.36	0.49	145	0.007	248	0.087	0.78
2101	280,794	442,036	3,179	26	0.5	0.36	0.49	145	0.007	252	0.088	0.79
2102	282,642	445,462	3,179	25	0.5	0.36	0.5	145	0.0071	255	0.088	0.8
2103	288,151	450,051	3,179	28	0.51	0.37	0.49	145	0.0071	243	0.089	0.83
2104	292,516	454,953	3,179	28	0.52	0.38	0.5	145	0.0071	245	0.089	0.85
2105	291,427	458,777	3,179	29	0.51	0.37	0.5	145	0.0071	241	0.089	0.84
2106	286,935	468,857	3,179	31	0.51	0.37	0.51	145	0.0072	230	0.09	0.82
2107	287,106	476,395	3,179	32	0.51	0.37	0.52	145	0.0072	226	0.09	0.83
2108	289,593	483,606	3,179	32	0.51	0.37	0.52	145	0.0073	225	0.091	0.84
2109	290,357	486,978	3,179	32	0.51	0.38	0.52	145	0.0073	224	0.091	0.85
2110	292,783	491,206	3,180	32	0.52	0.38	0.52	145	0.0073	224	0.091	0.87
2111	294,684	494,473	3,180	32	0.52	0.39	0.52	145	0.0073	225	0.091	0.88
2112	298,326	498,249	3,180	32	0.53	0.39	0.52	145	0.0073	226	0.092	0.91
2113	299,198	499,295	3,180	32	0.53	0.4	0.52	145	0.0073	227	0.092	0.92
2114	302,322	500,942	3,180	32	0.53	0.4	0.52	145	0.0073	229	0.092	0.94
2115	303,689	502,579	3,180	31	0.54	0.41	0.52	145	0.0073	230	0.092	0.95
2116	308,102	505,590	3,180	31	0.54	0.42	0.52	145	0.0074	234	0.093	0.98
2117	308,423	506,215	3,180	31	0.54	0.42	0.52	145	0.0074	235	0.093	0.98
2118	308,662	511,484	3,180	32	0.54	0.42	0.52	145	0.0074	231	0.093	0.99
2119	306,858	517,555	3,180	32	0.54	0.42	0.53	145	0.0074	226	0.092	0.98
2120	308,297	521,571	3,180	32	0.54	0.43	0.53	145	0.0074	226	0.093	0.99
2121	308,008	527,340	3,181	36	0.54	0.43	0.53	145	0.0074	213	0.093	0.99
2122	305,993	536,189	3,181	37	0.54	0.43	0.54	145	0.0074	206	0.093	0.98
2123	301,991	547,268	3,181	39	0.53	0.43	0.55	145	0.0074	198	0.093	0.98
2124	301,714	553,653	3,181	40	0.53	0.43	0.56	145	0.0075	196	0.093	0.98
2125	298,732	560,394	3,181	41	0.53	0.43	0.56	145	0.0075	192	0.093	0.97
2126	298,628	564,660	3,181	41	0.53	0.43	0.57	145	0.0075	191	0.094	0.97
2127	296,453	570,679	3,181	42	0.52	0.43	0.57	145	0.0075	188	0.094	0.96
2128	296,420	574,930	3,181	42	0.52	0.43	0.57	145	0.0075	187	0.094	0.95
2129	294,443	578,211	3,181	43	0.52	0.42	0.58	145	0.0075	185	0.094	0.94
2130	294,182	580,975	3,181	43	0.52	0.42	0.58	145	0.0075	184	0.094	0.93
2131	293,409	584,696	3,181	43	0.52	0.42	0.58	145	0.0075	182	0.094	0.92
2132	294,171	588,305	3,182	43	0.52	0.42	0.58	145	0.0075	183	0.094	0.91
2133	293,194	589,740	3,182	43	0.52	0.42	0.58	145	0.0075	181	0.094	0.9
2134	293,631	591,512	3,182	43	0.52	0.42	0.58	145	0.0075	181	0.094	0.9

Model Year	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag
	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year
2023	0.000016	0.00081	0.0000016	0.011	0.33	0.00054	0.00	0.00066	0.00012	0.007	0.63	0.0018	0.073	0.00000047
2024	0.000033	0.0016	0.0000033	0.023	0.67	0.0011	0.00000016	0.0013	0.00025	0.014	1.3	0.0036	0.15	0.00000096
2025	0.000058	0.0029	0.0000058	0.039	1.2	0.0019	0.00000029	0.0023	0.00043	0.025	2.2	0.0063	0.26	0.0000017
2026	0.000088	0.0044	0.0000088	0.06	1.8	0.0029	0.00000044	0.0036	0.00065	0.038	3.4	0.0097	0.4	0.0000025
2027	0.00012	0.0058	0.000012	0.08	2.3	0.0039	0.00000058	0.0047	0.00086	0.051	4.5	0.013	0.53	0.0000034
2028	0.0002	0.0098	0.00002	0.13	4.0	0.0066	0.00000098	0.008	0.0015	0.085	7.6	0.022	0.89	0.0000057
2029	0.00022	0.011	0.000022	0.15	4.5	0.0074	0.0000011	0.009	0.0016	0.097	8.6	0.024	1.0	0.0000064
2030	0.00027	0.013	0.000027	0.18	5.4	0.0089	0.0000013	0.011	0.002	0.12	10	0.029	1.2	0.0000077
2031	0.00097	0.048	0.000096	0.66	19	0.032	0.0000048	0.039	0.0071	0.42	38	0.11	4.4	0.000028
2032	0.0023	0.11	0.00023	1.6	46	0.076	0.000011	0.093	0.017	0.99	89	0.25	10	0.000066
2033	0.00071	0.035	0.000071	0.49	14	0.024	0.0000035	0.029	0.0053	0.31	28	0.078	3.2	0.000021
2034	0.0013	0.064	0.00013	0.88	26	0.043	0.0000064	0.052	0.0095	0.56	50	0.14	5.8	0.000037
2035	0.011	0.52	0.0011	7.2	212	0.35	0.000052	0.43	0.078	4.6	409	1.2	48	0.0003
2036	0.019	0.97	0.0019	13	391	0.65	0.000097	0.79	0.14	8.5	756	2.1	88	0.00056
2037	0.014	0.7	0.0014	9.6	283	0.47	0.00007	0.57	0.1	6.1	548	1.5	64	0.00041
2038	0.027	1.4	0.0027	19	549	0.91	0.00014	1.1	0.2	12	1,062	3.0	124	0.00079
2039	0.059	2.4	0.015	33	1,111	1.7	0.00024	2.2	0.4	21	1,907	5.5	222	0.0015
2040	0.15	4.3	0.073	59	2,362	3.2	0.00043	4.3	0.87	38	3,360	10	392	0.0031
2041	0.67	5.8	0.2	80	3,854	3.4	0.00058	6.7	1.2	51	4,542	11	529	0.0047
2042	1.1	6.6	0.26	79	3,722	1.8	0.00066	6.2	1.1	51	4,539	5.5	529	0.0045
2043	1.1	6.8	0.27	79	3,734	1.6	0.00068	6.3	1.0	51	4,539	4.7	529	0.0045
2044	1.1	6.9	0.27	79	3,726	1.6	0.00069	6.3	1.0	51	4,539	4.7	529	0.0045
2045	1.1	6.7	0.28	79	3,791	1.7	0.00067	6.4	1.1	51	4,539	5.0	529	0.0045
2046	1.1	6.5	0.3	79	3,787	1.8	0.00065	6.4	1.2	51	4,540	5.5	529	0.0045
2047	1.1	6.4	0.37	80	4,033	1.9	0.00064	6.8	1.4	51	4,541	5.6	529	0.0049
2048	1.1	6.5	0.45	80	4,420	2.2	0.00065	7.5	1.7	51	4,542	6.5	529	0.0054
2049	1.2	6.6	0.51	80	4,637	2.5	0.00066	7.9	1.9	51	4,543	7.4	529	0.0056
2050	1.2	6.7	0.55	80	4,757	2.6	0.00067	8.1	2.0	51	4,543	7.7	529	0.0058
2051	1.2	6.7	0.58	80	4,821	2.7	0.00067	8.2	2.1	51	4,543	7.8	529	0.0058
2052	1.2	6.8	0.61	80	4,882	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059
2053	1.2	6.8	0.62	80	4,905	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006
2054	1.2	6.8	0.63	80	4,934	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006
2055	1.2	6.8	0.65	80	4,987	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061
2056	1.4	6.9	0.63	80	5,237	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006
2057	1.8	6.9	0.58	80	5,612	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057
2058	2.0	6.9	0.54	80	5,863	2.3	0.00069	7.8	1.9	51	4,545	6.8	530	0.0056
2059	2.0	6.9	0.53	80	5,977	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0055
2060	2.0	7.0	0.53	80	6,061	2.3	0.0007	7.9	1.9	51	4,545	6.8	530	0.0056
2061	2.0	7.0	0.53	80	6,088	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056
2062	2.0	7.0	0.53	80	6,206	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056
2063	2.0	7.1	0.51	80	6,350	2.3	0.00071	7.8	1.9	51	4,546	6.8	530	0.0056
2064	2.0	7.2	0.51	80	6,432	2.4	0.00072	7.9	1.8	51	4,546	6.6	530	0.0056
2065	2.0	7.2	0.51	80	6,587	2.4	0.00072	7.9	1.8	51	4,546	6.6	530	0.0056
2066	2.0	7.2	0.49	80	6,742	2.4	0.00072	7.8	1.8	51	4,546	6.6	530	0.0056
2067	2.0	7.3	0.49	80	6,877	2.4	0.00073	7.8	1.8	51	4,546	6.6	530	0.0056
2068	2.0	7.4	0.48	80	7,031	2.4	0.00074	7.9	1.8	51	4,546	6.7	530	0.0056
2069	2.0	7.4	0.48	80	7,136	2.4	0.00074	7.9	1.7	51	4,547	6.7	530	0.0056
2070	2.0	7.5	0.49	80	7,238	2.4	0.00075	8.0	1.8	51	4,547	6.9	530	0.0057
2071	2.0	7.5	0.49	80	7,328	2.4	0.00075	8.0	1.8	51	4,547	6.9	530	0.0057
2072	2.0	7.6	0.5	80	7,448	2.4	0.00076	8.2	1.8	51	4,547	7.0	530	0.0058
2073	2.1	7.6	0.51	80	7,488	2.5	0.00076	8.3	1.9	51	4,547	7.1	530	0.0059
2074	2.1	7.7	0.53	80	7,532	2.5	0.00077	8.3	1.9	51	4,547	7.3	530	0.0059
2075	2.1	7.7	0.54	80	7,577	2.6	0.00077	8.4	2.0	51	4,547	7.5	530	0.006
2076	2.1	7.8	0.56	80	7,698	2.7	0.00078	8.6	2.1	51	4,547	7.8	530	0.0061
2077	2.2	7.8	0.58	80	7,746	2.8	0.00078	8.7	2.1	51	4,547	8.1	530	0.0062
2078	2.2	7.8	0.61	80	7,807	2.9	0.00078	8.9	2.2	51	4,547	8.4	530	0.0063
2079	2.2	7.9	0.63	80	7,896	3.0	0.00079	9.0	2.3	51	4,547	8.8	530	0.0064
2080	2.2	7.9	0.65	80	8,005	3.1	0.00079	9.1	2.4	51	4,547	9.1	530	0.0065
2081	2.3	8.0	0.67	80	8,059	3.2	0.0008	9.2	2.5	51	4,548	9.4	530	0.0065
2082	2.3	8.0	0.68	80	8,173	3.3	0.0008	9.2	2.5	51	4,548	9.6	530	0.0065
2083	2.3	8.0	0.69	80	8,273	3.3	0.0008	9.2	2.5	51	4,548	9.7	530	0.0065
2084	2.3	8.1	0.71	80	8,405	3.4	0.00081	9.2	2.6	51	4,548	9.9	530	0.0066
2085	2.3	8.1	0.71	80	8,478	3.4	0.00081	9.2	2.6	51	4,548	10.0	530	0.0066
2086	2.4	8.2	0.73	80	8,584	3.4	0.00082	9.3	2.6	51	4,548	10	530	0.0066
2087	2.4	8.2	0.72	80	8,675	3.4	0.00082	9.3	2.6	51	4,548	10	530	0.0066
2088	2.4	8.2	0.74	80	8,822	3.4	0.00082	9.4	2.7	51	4,548	10	530	0.0067
2089	2.4	8.3	0.7	80	8,871	3.2	0.00083	9.3	2.5	51	4,548	9.5	530	0.0066
2090	2.4	8.3	0.7	80	9,001	3.2	0.00083	9.3	2.5	51	4,549	9.4	530	0.0066
2091	2.4	8.3	0.7	80	9,122	3.2	0.00083	9.3	2.5	51	4,549	9.4	530	0.0066
2092	2.4	8.4	0.7	80	9,285	3.2	0.00084	9.4	2.5	51	4,549	9.5	530	0.0067
2093	2.4	8.4	0.69	80	9,409	3.2	0.00084	9.3	2.5	51	4,549	9.4	530	0.0066
2094	2.4	8.5	0.69	80	9,573	3.2	0.00085	9.3	2.5	51	4,549	9.3	530	0.0066
2095	2.4	8.5	0.67	80	9,662	3.2	0.00085	9.2	2.4	51	4,549	9.2	530	0.0066
2096	2.4	8.6	0.66	80	9,796	3.1	0.00086	9.2	2.4	51	4,549	9.1	530	0.0065
2097	2.4	8.6	0.66	80	9,863	3.1	0.00086	9.2	2.4	51	4,549	9.2	530	0.0065
2098	2.4	8.6	0.65	80	9,992	3.2	0.00086	9.2	2.4	51	4,549	9.3	530	0.0065
2099	2.4	8.6	0.66	80	10,074	3.2	0.00086	9.2	2.4	51	4,549	9.4	530	0.0066
2100	2.4	8.7	0.66	80	10,262	3.3	0.00087	9.4	2.4	51	4,549	9.6	530	0.0067
2101	2.4	8.7	0.68	80	10,370	3.3	0.00087	9.5	2.5	51	4,549	9.8	530	0.0067
2102	2.4	8.8	0.68	80	10,504	3.4	0.00088	9.5	2.5	51	4,550	9.9	530	0.0068
2103	2.4	8.8	0.7	80	10,666	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069
2104	2.5	8.9	0.72	80	10,855	3.6	0.00089	9.8	2.7	51	4,550	11	530	0.007
2105	2.4	8.9	0.71	80	10,899	3.6	0.00089	9.8	2.6	51	4,550	10	530	0.007
2106	2.4	8.9	0.68	80	10,998	3.5	0.00089	9.7	2.5	51	4,550	10	530	0.0069
2107	2.4	9.0	0.69	80	11,130	3.5	0.0009	9.7	2.6	51	4,550	10	530	0.0069
2108	2.4	9.0	0.7	80	11,329	3.6	0.0009	9.7	2.6	51	4,550	11	530	0.0069
2109	2.4	9.0	0.71	80	11,430	3.6	0.0009	9.8	2.6	51	4,551	11	530	0.0069
2110	2.5	9.1	0.72	80	11,588	3.7	0.00091	9.9	2.7	51	4,551	11	530	0.007
2111	2.5	9.1	0.73	80	11,708	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007
2112	2.5	9.1	0.75	80	11,875	3.9	0.00091	10	2.8	51	4,551	11	530	0.0071
2113	2.5	9.1	0.76	80	11,944	3.9	0.00091	10	2.8	51	4,551	12	530	0.0072
2114	2.5	9.1	0.78	80	12,058	4.0	0.00091	10	2.9	51	4,551	12	530	0.0072
2115	2.5	9.1	0.79	80	12,147	4.1	0.00091	10	3.0	51	4,551	12	530	0.0073
2116	2.6	9.2	0.82	80	12,297	4.2	0.00092	10	3.0	51	4,552	12	530	0.0074
2117	2.6	9.2	0.82	80	12,347	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074
2118	2.6	9.2	0.83	80	12,450	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074
2119	2.6	9.2	0.83	80	12,546	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073
2120	2.6	9.2	0.85	80	12,669	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074
2121	2.6	9.2	0.85	80	12,779	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074
2122	2.7	9.2	0.85	80	12,896	4.1	0.00092	10	3.1	51	4,552	12	531	0.0073
2123	2.7	9.2	0.85	80	13,042	4.1	0.00092	10	3.1	51	4,553	12	531	0.0072
2124	2.7	9.3	0.85	80	13,181	4.1	0.00093	10	3.1	51	4,553	12	531	0.0072
2125	2.7	9.3	0.85	80	13,306	4.1	0.00093	10	3.1	51	4,553	12	531	0.0071
2126	2.7	9.3	0.85	80	13,410	4.0	0.00093	10	3.1	51	4,553	12	531	0.0071
2127	2.7	9.3	0.85	80	13,548	4.0	0.00093	10.0	3.1	51	4,553	12	531	0.0071
2128	2.7	9.3	0.85	80	13,678	3.9	0.00093	10.0	3.1	51	4,553	12	531	0.0071
2129	2.7	9.3	0.85	80	13,781	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.007
2130	2.8	9.3	0.84	80	13,879	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007
2131	2.8	9.3	0.84	80	14,009	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007
2132	2.8	9.3	0.84	80	14,131	3.7	0.00093	9.9	3.0	51	4,553	11	531	0.007
2133	2.8	9.3	0.83	80	14,216	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007
2134	2.8	9.3	0.83	80	14,294	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007

Model Year	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	8.5	0.035	0.00000047	0.0000081	0.00021	0.000028	0.00007	1.1	0.13	0.024	16
2024	17	0.072	0.00000096	0.000016	0.00043	0.000058	0.00014	2.2	0.27	0.05	33
2025	30	0.13	0.0000017	0.000029	0.00074	0.0001	0.00025	3.8	0.48	0.086	57
2026	46	0.19	0.0000025	0.000044	0.0011	0.00015	0.00038	5.7	0.72	0.13	87
2027	61	0.26	0.0000034	0.000058	0.0015	0.0002	0.0005	7.6	0.96	0.17	116
2028	103	0.43	0.0000057	0.000098	0.0025	0.00034	0.00084	13	1.6	0.29	195
2029	117	0.49	0.0000064	0.00011	0.0029	0.00039	0.00095	14	1.8	0.33	221
2030	140	0.58	0.0000077	0.00013	0.0034	0.00046	0.0011	17	2.2	0.4	266
2031	508	2.1	0.000028	0.00048	0.012	0.0017	0.0041	63	8.0	1.4	961
2032	1,201	5.0	0.000066	0.0011	0.029	0.004	0.0098	149	19	3.4	2,273
2033	375	1.6	0.000021	0.00035	0.0092	0.0012	0.0031	46	5.9	1.1	710
2034	679	2.8	0.000037	0.00064	0.017	0.0022	0.0055	84	11	1.9	1,284
2035	5,534	23	0.0003	0.0052	0.14	0.018	0.045	686	87	16	10,477
2036	10,225	42	0.00056	0.0097	0.25	0.034	0.084	1,267	160	29	19,356
2037	7,405	31	0.00041	0.007	0.18	0.025	0.061	918	116	21	14,018
2038	14,352	60	0.00079	0.014	0.35	0.048	0.12	1,778	225	41	27,168
2039	29,310	107	0.0015	0.024	0.68	0.092	0.23	3,194	186	34	48,784
2040	63,111	189	0.0031	0.043	1.4	0.19	0.51	5,626	255	46	85,906
2041	105,502	255	0.0048	0.058	2.1	0.29	0.76	5,144	117	21	116,049
2042	103,736	255	0.0045	0.066	2.0	0.27	0.68	1,545	165	30	131,728
2043	104,118	255	0.0045	0.068	2.0	0.27	0.68	942	191	35	135,614
2044	103,774	255	0.0045	0.069	2.0	0.27	0.68	947	53	9.6	137,918
2045	105,535	255	0.0045	0.067	2.0	0.27	0.69	1,107	33	6.0	134,843
2046	105,107	255	0.0045	0.065	2.0	0.27	0.75	1,252	38	6.9	129,640
2047	111,892	255	0.0049	0.064	2.2	0.29	0.88	792	46	8.3	128,811
2048	122,389	255	0.0054	0.065	2.4	0.32	1.0	762	55	10	130,391
2049	128,307	255	0.0056	0.066	2.5	0.34	1.2	833	62	11	131,655
2050	131,710	255	0.0058	0.067	2.6	0.35	1.3	710	65	12	133,193
2051	133,609	255	0.0059	0.067	2.6	0.35	1.3	552	73	13	134,254
2052	135,278	255	0.0059	0.068	2.6	0.36	1.4	353	87	16	135,292
2053	135,880	255	0.006	0.068	2.7	0.36	1.4	193	94	17	135,311
2054	136,687	255	0.006	0.068	2.7	0.36	1.4	145	87	16	135,939
2055	138,125	255	0.0061	0.068	2.7	0.37	1.5	151	86	16	136,744
2056	142,694	255	0.006	0.069	2.7	0.36	1.4	174	96	17	137,789
2057	147,766	255	0.0057	0.069	2.6	0.35	1.3	202	108	20	138,099
2058	150,502	255	0.0056	0.069	2.5	0.34	1.2	234	115	21	138,393
2059	151,719	255	0.0056	0.069	2.5	0.33	1.2	271	112	20	138,657
2060	153,184	255	0.0056	0.07	2.5	0.34	1.2	316	116	21	139,741
2061	153,658	255	0.0056	0.07	2.5	0.34	1.2	364	111	20	140,084
2062	156,036	255	0.0056	0.07	2.5	0.34	1.2	417	101	18	140,942
2063	157,837	255	0.0056	0.071	2.5	0.34	1.2	474	92	17	141,850
2064	159,202	255	0.0056	0.072	2.5	0.34	1.2	537	96	17	143,090
2065	162,126	255	0.0057	0.072	2.5	0.34	1.2	600	100	18	143,729
2066	164,332	255	0.0056	0.072	2.5	0.34	1.1	669	107	19	144,914
2067	166,053	255	0.0056	0.073	2.5	0.34	1.1	741	113	20	146,084
2068	168,266	255	0.0056	0.074	2.5	0.34	1.1	813	115	21	147,667
2069	169,423	255	0.0056	0.074	2.5	0.34	1.1	871	114	21	148,435
2070	171,153	255	0.0057	0.075	2.5	0.34	1.1	897	112	20	149,714
2071	172,459	255	0.0057	0.075	2.6	0.35	1.1	857	108	20	150,869
2072	175,311	255	0.0059	0.076	2.6	0.35	1.2	780	109	20	152,259
2073	176,093	255	0.0059	0.076	2.6	0.35	1.2	721	110	20	152,620
2074	177,310	255	0.006	0.077	2.6	0.36	1.2	707	113	21	153,555
2075	178,481	255	0.006	0.077	2.7	0.36	1.3	694	117	21	154,302
2076	181,840	255	0.0062	0.078	2.7	0.37	1.3	716	119	22	155,300
2077	183,222	255	0.0062	0.078	2.8	0.37	1.3	741	117	21	155,642
2078	185,022	255	0.0063	0.078	2.8	0.38	1.4	781	113	21	156,520
2079	187,204	255	0.0064	0.079	2.8	0.39	1.5	824	101	18	157,526
2080	189,520	255	0.0065	0.079	2.9	0.39	1.5	867	92	17	158,727
2081	190,764	255	0.0065	0.08	2.9	0.39	1.5	903	76	14	159,076
2082	192,737	255	0.0066	0.08	2.9	0.39	1.6	921	68	12	160,041
2083	193,919	255	0.0066	0.08	2.9	0.39	1.6	944	59	11	160,609
2084	196,136	255	0.0066	0.081	2.9	0.4	1.6	930	57	10	161,869
2085	196,531	255	0.0066	0.081	2.9	0.4	1.6	934	54	9.9	162,127
2086	198,072	255	0.0067	0.082	2.9	0.4	1.7	880	54	9.9	163,022
2087	198,833	255	0.0066	0.082	3.0	0.4	1.7	869	54	9.9	163,716
2088	201,439	255	0.0067	0.082	3.0	0.41	1.7	795	55	9.9	164,817
2089	200,891	255	0.0066	0.083	2.9	0.4	1.6	749	55	10.0	165,016
2090	202,339	255	0.0066	0.083	2.9	0.4	1.6	707	55	10	165,702
2091	203,575	255	0.0066	0.083	3.0	0.4	1.6	718	55	10	166,524
2092	205,708	255	0.0067	0.084	3.0	0.4	1.6	711	55	9.9	167,829
2093	206,668	255	0.0067	0.084	3.0	0.4	1.6	740	52	9.4	168,420
2094	207,930	256	0.0066	0.085	2.9	0.4	1.6	767	48	8.8	169,379
2095	208,234	255	0.0066	0.085	2.9	0.4	1.5	812	37	6.8	170,071
2096	208,909	256	0.0066	0.086	2.9	0.39	1.5	859	31	5.6	171,166
2097	209,332	256	0.0066	0.086	2.9	0.39	1.5	907	22	4.0	171,387
2098	210,288	256	0.0066	0.086	2.9	0.39	1.5	956	18	3.2	172,099
2099	211,252	256	0.0066	0.086	2.9	0.4	1.5	1,007	14	2.5	172,718
2100	213,999	256	0.0067	0.087	3.0	0.4	1.5	1,058	12	2.2	173,742
2101	215,717	256	0.0068	0.087	3.0	0.41	1.6	1,109	11	2.0	174,656
2102	217,135	256	0.0068	0.088	3.0	0.41	1.6	1,160	10	1.9	175,434
2103	220,517	256	0.0069	0.088	3.1	0.42	1.6	1,212	10	1.9	176,132
2104	223,385	256	0.007	0.089	3.1	0.42	1.7	1,267	10	1.9	177,487
2105	223,655	256	0.007	0.089	3.1	0.42	1.7	1,312	10	1.9	177,786
2106	223,642	256	0.0069	0.089	3.1	0.41	1.6	1,355	10	1.9	178,442
2107	225,211	256	0.0069	0.09	3.1	0.42	1.6	1,395	10	1.9	179,251
2108	227,670	256	0.007	0.09	3.1	0.42	1.6	1,436	10	1.9	180,376
2109	228,630	256	0.007	0.09	3.1	0.42	1.7	1,467	10	1.9	180,436
2110	230,462	256	0.007	0.091	3.1	0.42	1.7	1,501	10	1.9	181,010
2111	231,880	256	0.0071	0.091	3.1	0.43	1.7	1,533	10	1.9	181,411
2112	234,181	256	0.0072	0.091	3.2	0.43	1.8	1,565	10	1.9	182,128
2113	234,714	256	0.0072	0.091	3.2	0.43	1.8	1,582	10	1.9	182,005
2114	236,364	256	0.0073	0.091	3.2	0.44	1.8	1,590	10	1.9	182,253
2115	237,222	256	0.0073	0.091	3.2	0.44	1.9	1,587	10	1.9	182,451
2116	239,741	256	0.0074	0.092	3.3	0.45	1.9	1,571	11	1.9	183,471
2117	239,941	256	0.0074	0.092	3.3	0.45	1.9	1,531	11	1.9	183,498
2118	241,079	256	0.0074	0.092	3.3	0.45	1.9	1,485	11	1.9	183,749
2119	241,440	256	0.0074	0.092	3.3	0.44	1.9	1,428	11	1.9	183,758
2120	242,804	256	0.0074	0.092	3.3	0.45	2.0	1,379	11	1.9	184,333
2121	243,803	256	0.0074	0.092	3.3	0.45	2.0	1,327	11	1.9	184,127
2122	244,643	256	0.0074	0.092	3.3	0.44	2.0	1,292	11	1.9	184,511
2123	245,018	256	0.0073	0.092	3.2	0.44	2.0	1,239	11	1.9	184,738
2124	246,078	256	0.0073	0.093	3.2	0.44	2.0	1,210	11	1.9	185,454
2125	245,973	256	0.0072	0.093	3.2	0.43	2.0	1,126	11	1.9	185,444
2126	246,694	256	0.0072	0.093	3.2	0.43	2.0	1,080	11	1.9	185,945
2127	246,772	256	0.0071	0.093	3.2	0.43	1.9	963	11	1.9	186,004
2128	247,498	256	0.0071	0.093	3.2	0.43	1.9	904	11	1.9	186,369
2129	247,096	256	0.0071	0.093	3.1	0.43	1.9	777	11	1.9	185,968
2130	247,423	256	0.0071	0.093	3.1	0.43	1.9	725	11	1.9	186,144
2131	247,684	256	0.0071	0.093	3.1	0.42	1.9	631	11	1.9	186,102
2132	248,637	256	0.0071	0.093	3.1	0.43	1.9	600	11	1.9	186,692
2133	248,350	256	0.007	0.093	3.1	0.42	1.9	544	11	1.9	186,155
2134	248,793	256	0.0071	0.093	3.1	0.42	1.9	529	11	1.9	186,362

Table A4. Annual loads of the NAG backfill for the well graded cover system scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	294,248	594,560	3,182	43	0.52	0.42	0.59	145	0.0075	181	0.094	0.9	2.8	9.3	0.83	80	14,424	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	249,560	256	0.0071	0.093	3.1	0.43	1.9	506	11	1.9	186,587
2136	295,465	597,538	3,182	43	0.52	0.42	0.59	145	0.0075	181	0.094	0.9	2.8	9.4	0.83	80	14,530	3.7	0.00094	9.9	3.0	51	4,554	11	531	0.0071	250,632	256	0.0071	0.094	3.2	0.43	1.9	503	11	2.0	187,193
2137	295,267	598,264	3,182	43	0.52	0.42	0.59	145	0.0075	180	0.094	0.89	2.8	9.3	0.83	80	14,607	3.6	0.00093	9.9	3.0	51	4,554	11	531	0.0071	250,546	256	0.0071	0.093	3.2	0.43	1.9	494	11	1.9	186,724
2138	293,288	603,873	3,182	45	0.52	0.41	0.59	145	0.0075	176	0.094	0.89	2.8	9.3	0.82	80	14,678	3.6	0.00093	9.9	2.9	51	4,554	10	531	0.007	250,755	256	0.007	0.093	3.1	0.42	1.9	493	11	2.0	186,796
2139	290,505	611,856	3,182	46	0.51	0.41	0.6	145	0.0075	172	0.094	0.88	2.8	9.4	0.81	80	14,802	3.6	0.00094	9.8	2.9	51	4,554	10	531	0.0069	251,035	256	0.007	0.094	3.1	0.42	1.8	492	11	2.0	187,060
2140	289,638	617,098	3,182	47	0.51	0.41	0.61	145	0.0075	171	0.094	0.87	2.8	9.4	0.8	80	14,924	3.5	0.00094	9.7	2.9	51	4,554	10	531	0.0069	251,572	256	0.007	0.094	3.1	0.42	1.8	492	11	2.0	187,517
2141	286,309	620,463	3,182	48	0.5	0.4	0.61	145	0.0075	167	0.094	0.86	2.8	9.3	0.79	80	14,989	3.5	0.00093	9.6	2.8	51	4,555	10	531	0.0068	250,649	256	0.0069	0.093	3.1	0.41	1.8	492	11	2.0	186,898
2142	285,025	623,257	3,182	48	0.5	0.4	0.61	145	0.0075	166	0.094	0.84	2.7	9.3	0.78	80	15,070	3.4	0.00093	9.6	2.8	51	4,554	10.0	531	0.0068	250,525	256	0.0068	0.093	3.0	0.41	1.8	492	11	2.0	186,889
2143	283,564	627,204	3,182	48	0.5	0.4	0.62	145	0.0075	165	0.094	0.84	2.7	9.4	0.77	80	15,161	3.4	0.00094	9.5	2.8	51	4,554	9.9	531	0.0068	250,553	256	0.0068	0.094	3.0	0.41	1.7	493	11	2.0	187,035
2144	283,034	631,917	3,182	49	0.5	0.39	0.62	145	0.0075	164	0.094	0.82	2.7	9.4	0.75	80	15,311	3.3	0.00094	9.5	2.7	51	4,555	9.7	531	0.0068	251,094	256	0.0068	0.094	3.0	0.41	1.7	495	11	2.0	187,551
2145	280,847	633,211	3,183	49	0.5	0.39	0.62	145	0.0075	163	0.094	0.81	2.7	9.4	0.74	80	15,352	3.3	0.00094	9.5	2.7	51	4,555	9.6	531	0.0067	250,270	256	0.0068	0.094	3.0	0.41	1.7	493	11	2.0	187,020
2146	279,837	635,834	3,182	49	0.49	0.38	0.63	145	0.0075	162	0.094	0.79	2.7	9.4	0.72	80	15,458	3.2	0.00094	9.4	2.6	51	4,555	9.3	531	0.0067	250,203	256	0.0067	0.094	3.0	0.4	1.6	492	11	2.0	187,082
2147	278,890	638,693	3,183	49	0.49	0.38	0.63	145	0.0075	161	0.094	0.78	2.7	9.4	0.72	80	15,545	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,228	256	0.0067	0.094	3.0	0.4	1.6	488	11	2.0	187,212
2148	278,629	642,477	3,183	50	0.49	0.37	0.64	145	0.0076	161	0.094	0.76	2.7	9.4	0.7	80	15,681	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,723	256	0.0067	0.094	3.0	0.4	1.6	485	11	2.0	187,667
2149	276,730	642,673	3,183	50	0.49	0.37	0.64	145	0.0075	159	0.094	0.75	2.7	9.4	0.69	80	15,708	3.0	0.00094	9.3	2.5	51	4,555	8.8	531	0.0066	249,798	256	0.0067	0.094	3.0	0.4	1.6	469	11	2.0	187,030
2150	275,915	644,201	3,183	50	0.49	0.36	0.64	145	0.0075	159	0.094	0.73	2.6	9.3	0.67	80	15,786	3.0	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,606	256	0.0066	0.093	2.9	0.4	1.5	458	11	2.0	186,985

Table A5. Source terms of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	24
2024	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	44
2025	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	80
2026	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	125
2027	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	158
2028	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	289
2029	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	270
2030	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	348
2031	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,236
2032	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	3,634
2033	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	620
2034	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	2,492
2035	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	7,085
2036	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	12,083
2037	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	13,464
2038	8.0	1,210	94	29	0.012	0.0021	0.0012	0.0023	1.3	0.00005	28	0.0005	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	528	2.3	0.000029	0.0005	0.013	0.005	0.01	65	8.3	1.5	26,952
2039	8.1	1,310	236	29	0.015	0.0023	0.0013	0.0023	1.3	0.00005	31	0.0005	0.0059	0.004	0.05	0.00032	0.72	23	0.035	0.000005	0.044	0.0082	0.46	41	0.11	4.8	0.000031	600	2.3	0.000031	0.0005	0.014	0.005	0.01	65	8.3	1.5	45,912
2040	8.2	1,513	481	29	0.018	0.0027	0.0015	0.0022	1.3	0.00005	31	0.0005	0.0065	0.004	0.05	0.00088	0.72	28	0.037	0.000005	0.051	0.01	0.46	41	0.12	4.8	0.000035	744	2.3	0.000036	0.0005	0.016	0.005	0.01	65	8.3	1.5	79,056
2041	8.4	1,702	763	29	0.027	0.003	0.0016	0.0022	1.3	0.00005	14	0.00051	0.0055	0.0059	0.05	0.0017	0.72	33	0.029	0.000005	0.057	0.011	0.46	41	0.093	4.8	0.000036	909	2.3	0.000041	0.0005	0.018	0.005	0.01	44	5.5	1.0	110,907
2042	8.5	1,410	794	25	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005	0.003	0.0082	0.05	0.002	0.62	28	0.014	0.000005	0.047	0.008	0.39	35	0.041	4.1	0.000034	788	2.0	0.000034	0.0005	0.015	0.005	0.01	12	1.5	0.26	128,839
2043	8.4	1,372	781	24	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.0005	0.0026	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.38	34	0.034	4.0	0.000033	768	1.9	0.000033	0.0005	0.015	0.005	0.01	6.7	0.84	0.15	133,866
2044	8.4	1,350	759	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	12	0.0005	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.033	3.9	0.000032	753	1.9	0.000032	0.0005	0.014	0.005	0.01	6.5	0.83	0.15	136,575
2045	8.5	1,399	790	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.0005	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	4.0	0.000034	783	1.9	0.000034	0.0005	0.015	0.005	0.01	7.9	1.	0.18	133,758
2046	8.5	1,457	802	25	0.029	0.0026	0.0016	0.0023	1.1	0.00005	12	0.0005	0.0032	0.0083	0.05	0.0023	0.62	29	0.014	0.000005	0.049	0.009	0.39	35	0.042	4.1	0.000035	811	2.0	0.000035	0.0005	0.016	0.005	0.01	9.4	1.2	0.21	128,763
2047	8.5	1,577	824	25	0.03	0.0028	0.0017	0.0022	1.1	0.00005	12	0.0005	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.4	35	0.043	4.1	0.000038	870	2.0	0.000038	0.0005	0.017	0.005	0.01	5.9	0.75	0.14	128,089
2048	8.5	1,714	862	24	0.03	0.003	0.0019	0.0022	1.1	0.00005	11	0.00051	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041	939	2.0	0.000041	0.0005	0.018	0.005	0.01	5.6	0.71	0.13	129,793
2049	8.5	1,776	894	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.00053	0.0045	0.0089	0.05	0.0038	0.61	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043	975	1.9	0.000043	0.0005	0.019	0.005	0.01	6.2	0.78	0.14	131,172
2050	8.5	1,804	902	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00054	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043	989	1.9	0.000043	0.0005	0.019	0.005	0.01	5.2	0.66	0.12	132,811
2051	8.5	1,817	904	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.00055	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	4.0	0.000044	995	1.9	0.000044	0.0005	0.019	0.005	0.01	4.0	0.51	0.093	133,964
2052	8.5	1,827	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044	1,000	1.9	0.000044	0.0005	0.02	0.005	0.01	2.6	0.33	0.059	135,076
2053	8.5	1,837	905	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044	1,004	1.9	0.000044	0.0005	0.02	0.005	0.01	1.4	0.18	0.032	135,145
2054	8.5	1,841	904	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.00055	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044	1,006	1.9	0.000044	0.0005	0.02	0.005	0.01	1.0	0.13	0.024	135,795
2055	8.5	1,852	903	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.00056	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044	1,011	1.9	0.000045	0.0005	0.02	0.005	0.011	1.1	0.13	0.024	136,601
2056	8.6	1,808	1,102	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.00054	0.0048	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043	1,036	1.9	0.000043	0.0005	0.019	0.005	0.01	1.2	0.15	0.028	137,639
2057	8.7	1,730	1,422	23	0.052	0.0031	0.0022	0.0023	1.1	0.00005	4.6	0.00052	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041	1,071	1.9	0.000042	0.0005	0.018	0.005	0.01	1.4	0.18	0.032	137,940
2058	8.7	1,684	1,604	23	0.059	0.003	0.0021	0.0024	1.1	0.00005	3.7	0.00051	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004	1,088	1.8	0.00004	0.0005	0.018	0.005	0.01	1.6	0.2	0.037	138,218
2059	8.7	1,672	1,665	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004	1,095	1.8	0.00004	0.0005	0.018	0.005	0.01	1.9	0.24	0.043	138,460
2060	8.7	1,671	1,678	23	0.063	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004	1,097	1.8	0.00004	0.0005	0.018	0.005	0.01	2.2	0.27	0.05	139,518
2061	8.7	1,674	1,676	23	0.062	0.003	0.002	0.0024	1.0	0.00005	3.5	0.0005	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.014	0.36	33	0.049	3.8	0.00004	1,098	1.8	0.00004	0.0005	0.018	0.005	0.01	2.5	0.31	0.057	139,838
2062	8.8	1,663	1,745	23	0.071	0.0029	0.002	0.0025	1.0	0.00005	3.1	0.0005	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004	1,108	1.8	0.00004	0.0005	0.018	0.005	0.01	2.8	0.36	0.065	140,676
2063	8.8	1,642	1,818	22	0.078	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,114	1.8	0.000039	0.0005	0.018	0.005	0.01	3.2	0.41	0.074	141,568
2064	8.8	1,637	1,831	22	0.077	0.0029	0.002	0.0025	1.0	0.00005	2.8	0.0005	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.046	3.7	0.000039	1,114	1.8	0.000039	0.0005	0.017	0.005	0.01	3.6	0.46	0.083	142,789
2065	8.9	1,636	1,903	22	0.095	0.0029	0.0019	0.0026	1.0	0.00005	2.3	0.0005	0.004	0.014	0.05	0.0035	0.56	46	0.016	0.000005	0.055	0.013	0.35	32	0.046	3.7	0.000039	1,129	1.8	0.000039	0.0005	0.017	0.005	0.01	4.0	0.51	0.093	143,409
2066	8.9	1,609	1,989	22	0.11	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.0005	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.045	3.7	0.000039	1,135	1.8	0.000039	0.0005	0.017	0.005	0.01	4.5	0.57	0.1	144,573
2067	8.9	1,589	2,048	22	0.11	0.0028	0.0019	0.0027	1.	0.00005	2.0	0.0005	0.0039	0.013	0.05	0.0033	0.55	47	0.016	0.000005	0.053	0.012	0.35	31	0.045	3.6	0.000038	1,138	1.8	0.000038	0.0005	0.017	0.005	0.01	4.9	0.62	0.11	145,722
2068	8.9	1,583	2,077	22	0.11	0.0028	0.0019	0.0027	0.99	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038	1,140	1.7	0.000038	0.0005	0.017	0.005	0.01	5.3	0.68	0.12	147,284
2069	8.9	1,580	2,097	21	0.11	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.045	3.6	0.000038	1,142	1.7	0.000038	0.0005	0.017	0.005	0.01	5.7	0.72	0.13	148,041
2070	8.9	1,584	2,098	21	0.11	0.0028	0.0019	0.0027	0.97	0.00005	2.0	0.0005	0.0038	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.046	3.5	0.000038	1,144	1.7	0.000038	0.0005	0.017	0.005	0.01	5.8	0.74	0.13	149,328
2071	8.9	1,584	2,100	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.0005	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.045	3.5	0.000038	1,144	1.7	0.000038	0.0005	0.017	0.005	0.01	5.5	0.7	0.13	150,505
2072	8.9	1,599	2,104	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	1.9	0.0005	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.046	3.5	0.000038	1,152	1.7	0.000038	0.0005	0.017	0.005	0.01	5.0	0.63	0.12	151,916
2073	8.9	1,607	2,100	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.0005	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.046	3.5	0.000038	1,154	1.7	0.000039	0.0005	0.017	0.005	0.01	4.6	0.58	0.11	152,292
2074	8.9	1,614	2,090	21	0.11	0.0028	0.0019	0.0026	0.95	0.00005	2.0	0.0005	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000039	1,155	1.7	0.000039	0.0005	0.017	0.005	0.01	4.5	0.57	0.1	153,237
2075	8.9	1,623	2,079	21	0.1	0.0029	0.0019	0.0026	0.94	0.00005	2.1	0.0005	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	30	0.048	3.4	0.000039	1,157	1.7	0.000039	0.0005	0.017	0.005	0.01	4.4	0.55	0.1	153,995
2076	8.9	1,649	2,089	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	2.0	0.0005	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.056	0.013	0.33	29	0.05	3.4	0.000039	1,171	1.6	0.00004	0.0005	0.018	0.005	0.01	4.5	0.57	0.1	155,005
2077	8.9	1,665	2,084	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.0005	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004	1,177	1.6	0.00004	0.0005	0.018	0.005	0.01	4.6	0.59	0.11	155,356
2078	8.9	1,680	2,077	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.00051	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.057	0.014	0.32	29	0.054	3.4	0.00004	1,182	1.6	0.00004	0.0005	0.018	0.005	0.01	4.9	0.62	0.11	156,236
2079	8.9	1,690	2,084	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051	0.0046	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.055	3.4	0.00004	1,189	1.6	0.000041	0.0005	0.018	0.005	0.01	5.1	0.65	0.12	157,251
2080	8.9	1,698	2,096	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.00051	0.0047	0.014	0.05	0.0041	0.5	50	0.02	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.000041	1,194	1.6	0.000041	0.0005	0.018	0.005	0.01	5.4	0.68	0.12	158,470
2081	8.9	1,710	2,094	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.00051	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.058	0.015	0.32	29	0.059	3.3	0.000041	1,200	1.6	0.000041	0.0005	0.018	0.005	0.01	5.6	0.71	0.13	158,838
2082	9.0	1,705	2,131	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.00051	0.0049	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.06	3.3	0.000041	1,205	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.72	0.13	159,814
2083	9.0	1,694	2,170	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.00051	0.0049	0.014	0.05	0.0043	0.5	52	0.021	0.000005	0.057	0.016	0.32	28	0.06	3.3	0.000041	1,208	1.6	0.000041	0.0005	0.018	0.005	0.01	5.8	0.73	0.13	160,383
2084	9.0	1,698	2,185	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.00051	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.000041	1,212	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.72	0.13	161,637
2085	9.0	1,691	2,205	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.00051	0.005	0.014	0.05	0.0044	0.49	52	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.00004	1,213	1.6	0.000041	0.0005	0.018	0.005	0.01	5.7	0.72	0.13	161,890
2086	9.0	1,695	2,213	20	0.12	0.003	0.0023	0.0026	0.89	0.00005	1.9	0.00051	0.0051	0.015	0.05	0.0045	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.3	0.000041	1,216	1.6	0.000041	0.0005	0.018	0.005	0.01	5.3	0.67	0.12	162,778
2087	8.9	1,689	2,225	19	0.12	0.003	0.0022	0.0026	0.89	0.00005	1.9	0.00051	0.005	0.014	0.05	0.0044	0.49	53	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.00004	1,215	1.6	0.000041	0.0005	0.018	0.005	0.01	5.2	0.66	0.12	163,470
2088	9.0	1,701	2,239	19	0.12	0.003	0.0023	0.0026	0.88	0.00005	1.8	0.00051	0.005	0.015	0.05	0.0045	0.48	54	0.021	0.000005	0.057	0.016	0.31	28	0.061	3.2	0.000041	1,223	1.6	0.000041	0.0005	0.018	0.005	0.01	4.7	0.6	0.11	164,570
2089	9.0	1,669	2,284	19	0.13	0.0029	0.0022	0.0027	0.88	0.00005	1.7	0.0005	0.0047	0.014	0.05	0.0042	0.48	54	0.02	0.000005	0.056	0.015	0.31	28	0.057	3.2	0.00004	1,218	1.6	0.00004	0.0005	0.018	0.005	0.01	4.4	0.56	0.1	164,772
2090	9.0	1,663	2,317	19	0.14	0.0029	0.0022	0.0027	0.88	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	54	0.019	0.000005	0.056	0.015	0.31	27	0.057	3.2	0.00004	1,222	1.5	0.00004	0.0005	0.018	0.005	0.01	4.2	0.53	0.096	165,462
2091	9.0	1,660	2,334	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	55	0.019	0.000005	0.056	0.015	0.31	27	0.056	3.2	0.00004	1,223	1.5	0.00004	0.0005	0.018	0.005	0.01	4.2	0.53	0.097	166,285
2092	9.0	1,661	2,350	19	0.14	0.0029	0.0022	0.0027	0.87	0.00005	1.6	0.0005	0.0047	0.014	0.05	0.0042	0.48	55	0.019	0.000005	0.056	0.015	0.3	27	0.056	3.2	0.00004	1,226	1.5	0.00004	0.0005	0.018	0.005	0.01	4.1	0.52	0.095	167,587
2093	9.0	1,647	2,390	19	0.14	0.0029	0.0021	0.0027	0.86	0.00005	1.5	0.0005	0.0046	0.014	0.05	0.0041	0.47	56	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.2	0.000039	1,228	1.5	0.00004	0.0005	0.018	0.005	0.01	4.3	0.54	0.099	168,175
2094	9.0	1,626	2,440	19	0.15	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.0005	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.055	3.1	0.000039	1,228	1.5	0.000039	0.0005	0.017	0.005	0.01	4.4	0.56	0.1	169,130
2095	9.0	1,612	2,458	19	0.15	0.0028	0.0021	0.0028	0.86	0.00005	1.5	0.0005	0.0045	0.014	0.05	0.0039	0.47	57	0.019	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000039	1,225	1.5	0.000039	0.0005	0.017	0.005	0.01	4.7	0.59	0.11	169,816
2096	9.0	1,592	2,486	19	0.15	0.0028	0.002	0.0028	0.85	0.00005	1.4	0.0005	0.0044	0.014	0.05	0.0038	0.47	57	0.018	0.000005	0.054	0.014	0.3	27	0.053	3.1	0.000038	1,221	1.5	0.000038	0.0005	0.017	0.005	0.01	4.9	0.62	0.11	170,905
2097	9.0	1,592	2,493	19	0.15	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.47	58	0.018	0.000005	0.054	0.014	0.3	27	0.054	3.1	0.000038	1,222	1.5	0.000038	0.0005	0.017	0.005	0.01	5.2	0.66	0.12	171,124
2098	9.0	1,588	2,509	18	0.14	0.0028	0.002	0.0028	0.85	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.46	58	0.018	0.000005	0.053	0.014	0.3	26	0.054	3.1	0.000038	1,223	1.5	0.000038	0.0005	0.017	0.005	0.01	5.5	0.69	0.13	171,837
2099	9.0	1,591	2,511	18	0.14	0.0028	0.002	0.0028	0.84	0.00005	1.5	0.0005	0.0044	0.014	0.05	0.0038	0.46	58	0.019	0.000005	0.054	0.014	0.29	26	0.054	3.1	0.000038	1,224	1.5	0.000038	0.0005	0.017	0.005	0.01	5.7	0.73	0.13	172,453
2100	9.0	1,600	2,533	18	0.15	0.0028	0.002	0.0028	0.84	0.00005	1.4	0.0005	0.0045	0.014	0.05	0.0038	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.055	3.1	0.000038	1,233	1.5	0.000038	0.0005	0.017	0.005	0.01	6.0	0.76	0.14	173,472
2101	9.0	1,608	2,535	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0045	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.0	0.000038	1,236	1.5	0.000039	0.0005	0.017	0.005	0.01	6.3	0.79	0.14	174,383
2102	9.0	1,611	2,543	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0046	0.014	0.05	0.0039	0.45	60	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.0	0.000039	1,238	1.5	0.000039	0.0005	0.017	0.005	0.01	6.5	0.82	0.15	175,164
2103	9.1	1,636	2,558	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.0005	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.058	3.0	0.000039	1,252	1.5	0.000039	0.0005	0.017	0.005	0.01	6.8	0.86	0.16	175,863
2104	9.1	1,648	2,566	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,259	1.4	0.00004	0.0005	0.018	0.005	0.01	7.1	0.89	0.16	177,220
2105	9.1	1,638	2,583	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.0005	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,258	1.4	0.000039	0.0005	0.017	0.005	0.01	7.3	0.92	0.17	177,533
2106	9.1	1,607	2,630	18	0.17	0.0028	0.0021	0.0029	0.82	0.00005	1.3	0.0005	0.0046	0.014	0.05	0.0038	0.45	62	0.019	0.000005	0.054	0.014	0.28	26	0.057	3.0	0.000038	1,254	1.4	0.000039	0.0005	0.017	0.005	0.01	7.5	0.95	0.17	178,211
2107	9.1	1,601	2,660	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.0005	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.057	3.0	0.000038	1,257	1.4	0.000039	0.0005	0.017	0.005	0.01	7.7	0.98	0.18	179,040
2108	9.1	1,605	2,683	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.058	2.9	0.000038	1,262	1.4	0.000039	0.0005	0.017	0.005	0.01	7.9	1.	0.18	180,178
2109	9.1	1,608	2,701	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.0005	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.059	2.9	0.000038	1,267	1.4	0.000039	0.0005	0.017	0.005	0.01	8.1	1.0	0.19	180,248
2110	9.1	1,617	2,716	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000039	1,273	1.4	0.000039	0.0005	0.017	0.005	0.01	8.2	1.0	0.19	180,830
2111	9.1	1,624	2,728	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.0005	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.061	2.9	0.000039	1,278	1.4	0.000039	0.0005	0.017	0.005	0.01	8.4	1.1	0.19	181,243
2112	9.1	1,637	2,738	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.062	2.9	0.000039	1,286	1.4	0.000039	0.0005	0.017	0.005	0.01	8.5	1.1	0.2	181,975
2113	9.1	1,643	2,745	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.0005	0.005	0.014	0.05	0.0042	0.44	66	0.022	0.000005	0.055	0.016	0.28	25	0.063	2.9	0.000039	1,290	1.4	0.00004	0.0005	0.018	0.005	0.01	8.6	1.1	0.2	181,870
2114	9.1	1,659	2,750	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,297	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	1.1	0.2	182,135
2115	9.1	1,664	2,756	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.0005	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,301	1.4	0.00004	0.0005	0.018	0.005	0.01	8.7	1.1	0.2	182,344
2116	9.1	1,679	2,757	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004	1,307	1.4	0.00004	0.0005	0.018	0.005	0.01	8.5	1.1	0.2	183,370
2117	9.1	1,681	2,760	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.00051	0.0053	0.014	0.05	0.0045	0.43	67	0.023	0.000005	0.057	0.017	0.28	25	0.066	2.9	0.00004	1,308	1.4	0.00004	0.0005	0.018	0.005	0.01	8.3	1.1	0.19	183,400
2118	9.1	1,680	2,785	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.0005	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.057	0.017	0.28	25	0.067	2.9	0.00004	1,312	1.4	0.00004	0.0005	0.018	0.005	0.011	8.1	1.0	0.19	183,657
2119	9.1	1,670	2,818	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004	1,314	1.4	0.00004	0.0005	0.018	0.005	0.011	7.7	0.98	0.18	183,671
2120	9.1	1,673	2,831	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,318	1.4	0.00004	0.0005	0.018	0.005	0.011	7.5	0.94	0.17	184,250
2121	9.1	1,673	2,865	17	0.19	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.0005	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004	1,324	1.4	0.00004	0.0005	0.018	0.005	0.011	7.2	0.91	0.17	184,044
2122	9.1	1,658	2,907	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.056	0.017	0.28	25	0.066	2.9	0.00004	1,326	1.4	0.00004	0.0005	0.018	0.005	0.011	7.0	0.88	0.16	184,430
2123	9.1	1,635	2,964	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.7	0.85	0.15	184,660
2124	9.1	1,627	2,986	17	0.22	0.0029	0.0023	0.003	0.78	0.00005	1.1	0.0005	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	6.5	0.82	0.15	185,381
2125	9.2	1,611	3,023	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000039	1,326	1.4	0.000039	0.0005	0.017	0.005	0.011	6.1	0.77	0.14	185,380
2126	9.2	1,606	3,038	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	24	0.064	2.9	0.000038	1,327	1.4	0.000039	0.0005	0.017	0.005	0.011	5.8	0.73	0.13	185,890
2127	9.2	1,594	3,069	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005	0.0052	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.9	0.000038	1,327	1.4	0.000038	0.0005	0.017	0.005	0.01	5.2	0.65	0.12	185,957
2128	9.2	1,590	3,086	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.0	0.0005	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.054	0.017	0.27	24	0.062	2.8	0.000038	1,328	1.4	0.000038	0.0005	0.017	0.005	0.01	4.8	0.61	0.11	186,328
2129	9.2	1,583	3,110	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.9	0.000038	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	4.2	0.53	0.096	185,930
2130	9.2	1,580	3,122	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.0005	0.005	0.015	0.05	0.0045	0.43	75	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038	1,329	1.4	0.000038	0.0005	0.017	0.005	0.01	3.9	0.49	0.089	186,107
2131	9.2	1,576	3,143	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.0005	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038	1,331	1.4	0.000038	0.0005	0.017	0.005	0.01	3.4	0.43	0.078	186,064
2132	9.2	1,575	3,152	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.98	0.0005	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.8	0.000038	1,332	1.4	0.000038	0.0005	0.017	0.005	0.01	3.2	0.4	0.074	186,657
2133	9.2	1,575	3,169	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038	1,334	1.4	0.000038	0.0005	0.017	0.005	0.01	2.9	0.37	0.067	186,125
2134	9.2	1,575	3,175	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,335	1.4	0.000038	0.0005	0.017	0.005	0.01	2.8	0.36	0.065	186,338

Table A5. Source terms of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,577	3,187	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,338	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.34	0.062	186,569
2136	9.2	1,578	3,193	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,339	1.4	0.000038	0.0005	0.017	0.005	0.01	2.7	0.34	0.062	187,180
2137	9.2	1,581	3,204	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.0005	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.33	0.061	186,716
2138	9.2	1,570	3,233	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.0005	0.0047	0.015	0.05	0.0044	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.0005	0.017	0.005	0.01	2.6	0.33	0.061	186,790
2139	9.2	1,553	3,271	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.0005	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.052	0.016	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.017	0.005	0.01	2.6	0.33	0.06	187,056
2140	9.2	1,545	3,291	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.0005	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,342	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	187,514
2141	9.2	1,532	3,320	17	0.25	0.0027	0.0022	0.0033	0.78	0.00005	0.9	0.0005	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	186,895
2142	9.2	1,525	3,335	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.0005	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,341	1.4	0.000037	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	186,886
2143	9.2	1,516	3,354	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,340	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	187,034
2144	9.2	1,509	3,370	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.0005	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	187,551
2145	9.2	1,502	3,386	17	0.26	0.0026	0.0021	0.0033	0.78	0.00005	0.87	0.0005	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.061	187,019
2146	9.2	1,496	3,399	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.87	0.0005	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	187,081
2147	9.2	1,490	3,412	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.06	187,212
2148	9.2	1,485	3,424	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.0005	0.0041	0.014	0.05	0.0037	0.42	84	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.6	0.33	0.059	187,667
2149	9.2	1,480	3,436	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.0005	0.004	0.014	0.05	0.0037	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.047	2.8	0.000035	1,336	1.4	0.000036	0.0005	0.016	0.005	0.01	2.5	0.32	0.058	187,030
2150	9.2	1,476	3,445	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.0005	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000036	0.0005	0.016	0.005	0.01	2.4	0.31	0.056	186,985

Table A6. Annual loads of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	29	2.3	0.69	0.00029	0.000052	0.000029	0.000056	0.032	0.0000012	0.67	0.000024	0.00014	0.000097	0.0012	0.0000024	0.017	0.49	0.00081	0.00000012	0.00098	0.00018	0.011	0.99	0.0027	0.12	0.0000007	13	0.056	0.0000007	0.000007	0.00031	0.00012	0.00024	1.6	0.2	0.036	24
2024	53	4.1	1.3	0.00052	0.000094	0.000053	0.0001	0.057	0.0000022	1.2	0.000044	0.00025	0.00018	0.0022	0.0000044	0.031	0.89	0.0015	0.00000022	0.0018	0.00033	0.02	1.8	0.0048	0.21	0.0000013	23	0.1	0.0000013	0.000013	0.00057	0.00022	0.00044	2.9	0.36	0.066	44
2025	97	7.6	2.3	0.00096	0.00017	0.000097	0.00019	0.11	0.000004	2.2	0.00008	0.00046	0.00032	0.004	0.0000081	0.058	1.6	0.0027	0.0000004	0.0033	0.0006	0.037	3.3	0.0089	0.38	0.0000023	42	0.18	0.0000023	0.000023	0.001	0.0004	0.0008	5.3	0.67	0.12	80
2026	152	12	3.6	0.0015	0.00027	0.00015	0.00029	0.16	0.0000063	3.5	0.00013	0.00072	0.0005	0.0063	0.000013	0.09	2.5	0.0042	0.00000063	0.0051	0.00093	0.057	5.1	0.014	0.6	0.0000036	66	0.29	0.0000036	0.000036	0.0016	0.00063	0.0013	8.2	1.0	0.19	125
2027	191	15	4.5	0.0019	0.00034	0.00019	0.00037	0.21	0.0000079	4.4	0.00016	0.0009	0.00063	0.0079	0.000016	0.11	3.2	0.0053	0.00000079	0.0064	0.0012	0.072	6.5	0.017	0.75	0.0000046	83	0.36	0.0000046	0.000046	0.002	0.00079	0.0016	10	1.3	0.24	158
2028	349	27	8.2	0.0034	0.00062	0.00035	0.00067	0.38	0.000014	8.0	0.00029	0.0017	0.0012	0.014	0.000029	0.21	5.8	0.0097	0.0000014	0.012	0.0021	0.13	12	0.032	1.4	0.0000084	152	0.66	0.0000084	0.000084	0.0037	0.0014	0.0029	19	2.4	0.43	289
2029	326	25	7.7	0.0032	0.00057	0.00032	0.00063	0.35	0.000013	7.5	0.00027	0.0015	0.0011	0.013	0.000027	0.19	5.5	0.0091	0.0000013	0.011	0.002	0.12	11	0.03	1.3	0.0000078	142	0.62	0.0000078	0.000078	0.0035	0.0013	0.0027	18	2.2	0.41	270
2030	421	33	9.9	0.0041	0.00074	0.00042	0.00081	0.45	0.000017	9.7	0.00035	0.002	0.0014	0.017	0.000035	0.25	7.0	0.012	0.0000017	0.014	0.0026	0.16	14	0.038	1.7	0.00001	184	0.8	0.00001	0.0001	0.0045	0.0017	0.0035	23	2.9	0.52	348
2031	2,705	211	64	0.027	0.0048	0.0027	0.0052	2.9	0.00011	62	0.0022	0.013	0.0089	0.11	0.00022	1.6	45	0.075	0.000011	0.091	0.017	1.0	91	0.25	11	0.000065	1,181	5.1	0.000065	0.00065	0.029	0.011	0.022	146	19	3.4	2,236
2032	4,396	343	104	0.043	0.0078	0.0044	0.0084	4.7	0.00018	101	0.0036	0.021	0.015	0.18	0.00036	2.6	73	0.12	0.000018	0.15	0.027	1.7	149	0.4	17	0.00011	1,919	8.3	0.00011	0.0011	0.047	0.018	0.036	238	30	5.5	3,634
2033	750	58	18	0.0074	0.0013	0.00075	0.0014	0.81	0.000031	17	0.00062	0.0035	0.0025	0.031	0.000062	0.44	13	0.021	0.0000031	0.025	0.0046	0.28	25	0.068	3.0	0.000018	327	1.4	0.000018	0.00018	0.008	0.0031	0.0062	41	5.1	0.93	620
2034	3,014	235	71	0.03	0.0053	0.003	0.0058	3.3	0.00012	69	0.0025	0.014	0.01	0.12	0.00025	1.8	50	0.084	0.000012	0.1	0.019	1.1	102	0.28	12	0.000072	1,316	5.7	0.000072	0.00072	0.032	0.012	0.025	163	21	3.8	2,492
2035	8,570	669	202	0.084	0.015	0.0085	0.016	9.3	0.00035	197	0.0071	0.041	0.028	0.35	0.00071	5.1	143	0.24	0.000035	0.29	0.053	3.2	290	0.78	34	0.00021	3,742	16	0.00021	0.0021	0.092	0.035	0.071	464	59	11	7,085
2036	14,615	1,141	345	0.14	0.026	0.015	0.028	16	0.0006	336	0.012	0.069	0.048	0.6	0.0012	8.7	244	0.41	0.00006	0.49	0.09	5.5	494	1.3	58	0.00035	6,382	28	0.00035	0.0035	0.16	0.06	0.12	791	100	18	12,083
2037	16,286	1,271	385	0.16	0.029	0.016	0.031	18	0.00067	374	0.013	0.077	0.054	0.67	0.0014	9.6	272	0.45	0.000067	0.55	0.1	6.2	551	1.5	64	0.00039	7,112	31	0.00039	0.0039	0.17	0.067	0.13	881	111	20	13,464
2038	32,601	2,544	770	0.32	0.057	0.032	0.063	35	0.0013	749	0.027	0.15	0.11	1.3	0.0027	19	545	0.91	0.00013	1.1	0.2	12	1,102	3.0	128	0.00078	14,236	62	0.00078	0.0078	0.35	0.13	0.27	1,764	223	41	26,952
2039	60,149	10,833	1,312	0.69	0.11	0.059	0.11	60	0.0023	1,436	0.046	0.27	0.18	2.3	0.014	33	1,044	1.6	0.00023	2.0	0.38	21	1,878	5.2	219	0.0014	27,549	105	0.0014	0.014	0.64	0.23	0.46	3,006	380	69	45,912
2040	119,581	38,041	2,261	1.4	0.21	0.12	0.17	103	0.004	2,436	0.079	0.52	0.32	4.0	0.07	57	2,201	2.9	0.0004	4.0	0.81	36	3,235	9.5	377	0.0028	58,833	182	0.0029	0.029	1.3	0.4	0.79	5,177	655	119	79,056
2041	188,787	84,647	3,173	3.0	0.33	0.18	0.24	145	0.0055	1,541	0.11	0.61	0.65	5.5	0.19	80	3,682	3.2	0.00055	6.4	1.2	51	4,542	10	529	0.004	100,813	255	0.0045	0.045	2.0	0.55	1.1	4,861	615	112	110,907
2042	181,599	102,301	3,172	3.8	0.32	0.19	0.31	145	0.0064	1,499	0.13	0.39	1.1	6.4	0.25	79	3,643	1.8	0.00064	6.1	1.0	51	4,539	5.3	529	0.0044	101,547	255	0.0044	0.044	1.9	0.64	1.3	1,485	188	34	128,839
2043	183,623	104,498	3,172	3.9	0.32	0.19	0.32	145	0.0067	1,583	0.13	0.35	1.1	6.7	0.27	79	3,687	1.5	0.00067	6.2	1.0	51	4,539	4.5	529	0.0044	102,842	255	0.0044	0.044	2.0	0.67	1.3	894	113	21	133,866
2044	184,376	103,656	3,171	3.9	0.33	0.2	0.33	145	0.0068	1,686	0.14	0.35	1.1	6.8	0.27	79	3,693	1.5	0.00068	6.2	1.0	51	4,539	4.6	529	0.0044	102,878	255	0.0044	0.044	2.0	0.68	1.4	893	113	21	136,575
2045	187,168	105,697	3,172	3.9	0.33	0.2	0.32	145	0.0067	1,564	0.13	0.37	1.1	6.7	0.27	79	3,760	1.6	0.00067	6.3	1.1	51	4,539	4.9	529	0.0045	104,694	255	0.0045	0.045	2.0	0.67	1.3	1,055	133	24	133,758
2046	187,633	103,314	3,172	3.8	0.33	0.2	0.3	145	0.0064	1,497	0.13	0.41	1.1	6.4	0.3	79	3,762	1.8	0.00064	6.3	1.2	51	4,540	5.4	529	0.0045	104,445	255	0.0045	0.045	2.0	0.64	1.3	1,204	152	28	128,763
2047	202,021	105,599	3,173	3.8	0.36	0.22	0.29	145	0.0064	1,480	0.13	0.44	1.1	6.4	0.37	80	4,014	1.9	0.00064	6.8	1.4	51	4,541	5.5	529	0.0048	111,397	255	0.0049	0.049	2.2	0.64	1.3	760	96	17	128,089
2048	222,427	111,893	3,173	4.0	0.39	0.25	0.28	145	0.0065	1,447	0.13	0.52	1.1	6.5	0.45	80	4,403	2.2	0.00065	7.5	1.6	51	4,542	6.5	529	0.0053	121,916	255	0.0054	0.053	2.4	0.65	1.3	733	93	17	129,793
2049	232,948	117,236	3,174	4.1	0.41	0.27	0.28	145	0.0066	1,398	0.13	0.59	1.2	6.6	0.5	80	4,619	2.5	0.00066	7.8	1.9	51	4,542	7.3	529	0.0056	127,828	255	0.0056	0.056	2.5	0.66	1.3	808	102	19	131,172
2050	239,538	119,755	3,174	4.2	0.42	0.29	0.28	145	0.0066	1,405	0.13	0.63	1.2	6.6	0.55	80	4,743	2.6	0.00066	8.1	2.0	51	4,543	7.7	529	0.0057	131,320	255	0.0058	0.058	2.6	0.66	1.3	693	88	16	132,811
2051	243,385	121,046	3,174	4.2	0.43	0.3	0.28	145	0.0067	1,417	0.13	0.65	1.2	6.7	0.58	80	4,810	2.7	0.00067	8.2	2.1	51	4,543	7.7	529	0.0058	133,315	255	0.0058	0.059	2.6	0.67	1.3	542	68	12	133,964
2052	246,811	122,148	3,174	4.3	0.44	0.3	0.28	145	0.0068	1,432	0.14	0.65	1.2	6.8	0.61	80	4,874	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059	135,071	255	0.0059	0.059	2.6	0.68	1.4	348	44	8.0	135,076
2053	248,249	122,284	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,435	0.14	0.66	1.2	6.8	0.62	80	4,899	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.0059	135,740	255	0.006	0.06	2.7	0.68	1.4	190	24	4.4	135,145
2054	249,944	122,730	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,447	0.14	0.66	1.2	6.8	0.63	80	4,930	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006	136,583	255	0.006	0.06	2.7	0.68	1.4	140	18	3.2	135,795
2055	252,972	123,320	3,174	4.3	0.45	0.32	0.29	145	0.0068	1,463	0.14	0.68	1.2	6.8	0.65	80	4,984	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061	138,036	255	0.0061	0.061	2.7	0.68	1.5	145	18	3.3	136,601
2056	248,809	151,733	3,175	5.3	0.44	0.31	0.3	145	0.0069	1,018	0.14	0.67	1.4	6.9	0.63	80	5,234	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006	142,607	255	0.006	0.06	2.7	0.69	1.4	166	21	3.8	137,639
2057	238,664	196,137	3,175	7.1	0.42	0.3	0.32	145	0.0069	641	0.14	0.61	1.8	6.9	0.58	80	5,609	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057	147,678	255	0.0057	0.057	2.5	0.69	1.4	192	24	4.4	137,940
2058	232,800	221,757	3,176	8.2	0.41	0.28	0.33	145	0.0069	518	0.14	0.58	2.0	6.9	0.54	80	5,859	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0056	150,409	255	0.0056	0.056	2.5	0.69	1.4	223	28	5.1	138,218
2059	231,450	230,578	3,176	8.6	0.41	0.28	0.34	145	0.0069	486	0.14	0.57	2.0	6.9	0.53	80	5,973	2.3	0.00069	7.8	1.9	51	4,545	6.6	530	0.0055	151,614	255	0.0056	0.056	2.5	0.69	1.4	259	33	5.9	138,460
2060	233,135	234,084	3,176	8.7	0.41	0.28	0.34	145	0.007	484	0.14	0.57	2.0	7.0	0.53	80	6,057	2.3	0.0007	7.8	1.9	51	4,545	6.7	530	0.0056	153,080	255	0.0056	0.056	2.5	0.7	1.4	301	38	6.9	139,518
2061	234,102	234,298	3,176	8.7	0.41	0.28	0.34	145	0.007	487	0.14	0.58	2.0	7.0	0.53	80	6,083	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056	153,528	255	0.0056	0.056	2.5	0.7	1.4	348	44	8.0	139,838
2062	233,972	245,423	3,176	10.0	0.41	0.28	0.35	145	0.007	432	0.14	0.58	2.0	7.0	0.53	80	6,199	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056	155,869	255	0.0056	0.056	2.5	0.7	1.4	400	51	9.2	140,676
2063	232,497	257,328	3,176	11	0.41	0.28	0.36	145	0.0071	394	0.14	0.57	2.0	7.1	0.51	80	6,343	2.3	0.00071	7.8	1.8	51	4,546	6.8	530	0.0056	157,664	255	0.0056	0.056	2.5	0.71	1.4	456	58	10	141,568
2064	233,675	261,461	3,176	11	0.41	0.28	0.36	145	0.0071	397	0.14	0.57	2.0	7.1	0.51	80	6,425	2.4	0.00071	7.9	1.8	51	4,546	6.6	530	0.0056	159,010	255	0.0056	0.056	2.5	0.71	1.4	517	65	12	142,789
2065	234,617	272,850	3,176	14	0.41	0.28	0.37	145	0.0072	336	0.14	0.57	2.0	7.2	0.5	80	6,577	2.4	0.00072	7.9	1.8	51	4,546	6.6	530	0.0056	161,866	255	0.0056	0.056	2.5	0.72	1.4	580	73	13	143,409
2066	232,662	287,614	3,176	16	0.41	0.28	0.38	145	0.0072	300	0.14	0.56	2.0	7.2	0.49	80	6,732	2.3	0.00072	7.8	1.8	51	4,546	6.6	530	0.0056	164,062	255	0.0056	0.056	2.5	0.72	1.4	647	82	15	144,573
2067	231,552	298,380	3,177	17	0.41	0.27	0.39	145	0.0073	285	0.15	0.56	2.0	7.3	0.49	80	6,866	2.3	0.00073	7.8	1.8	51	4,546	6.5	530	0.0055	165,759	255	0.0056	0.056	2.5	0.73	1.5	717	91	16	145,722
2068	233,135	305,923	3,177	17	0.41	0.28	0.39	145	0.0074	284	0.15	0.56	2.0	7.4	0.48	80	7,020	2.4	0.00074	7.8	1.7	51	4,546	6.6	530	0.0056	167,962	255	0.0056	0.056	2.5	0.74	1.5	788	100	18	147,284
2069	233,831	310,413	3,177	17	0.41	0.27	0.4	145	0.0074	285	0.15	0.56	2.0	7.4	0.48	80	7,125	2.4	0.00074	7.9	1.7	51	4,546	6.7	530	0.0056	169,122	255	0.0056	0.056	2.5	0.74	1.5	846	107	19	148,041
2070	236,506	313,306	3,177	16	0.42	0.28	0.4	145	0.0075	293	0.15	0.57	2.0	7.5	0.48	80	7,227	2.4	0.00075	8.0	1.8	51	4,547	6.8	530	0.0057	170,877	255	0.0057	0.057	2.5	0.75	1.5	872	110	20	149,328
2071	238,355	316,001	3,177	16	0.42	0.28	0.4	145	0.0075	301	0.15	0.57	2.0	7.5	0.49	80	7,318	2.4	0.00075	8.0	1.8	51	4,547	6.8	530	0.0057	172,193	255	0.0057	0.057	2.5	0.75	1.5	835	106	19	150,505
2072	242,928	319,691	3,177	17	0.43	0.28	0.41	145	0.0076	295	0.15	0.58	2.0	7.6	0.5	80	7,437	2.4	0.00076	8.2	1.8	51	4,547	7.0	530	0.0058	175,007	255	0.0058	0.058	2.6	0.76	1.5	760	96	17	151,916
2073	244,733	319,752	3,177	17	0.43	0.29	0.41	145	0.0076	301	0.15	0.59	2.1	7.6	0.51	80	7,478	2.5	0.00076	8.2	1.9	51	4,547	7.1	530	0.0059	175,806	255	0.0059	0.059	2.6	0.76	1.5	702	89	16	152,292
2074	247,278	320,249	3,177	16	0.44	0.29	0.41	145	0.0077	310	0.15	0.6	2.1	7.7	0.53	80	7,522	2.5	0.00077	8.3	1.9	51	4,547	7.2	530	0.0059	177,050	255	0.0059	0.059	2.6	0.77	1.5	688	87	16	153,237
2075	249,980	320,217	3,177	16	0.44	0.3	0.41	145	0.0077	319	0.15	0.62	2.1	7.7	0.54	80	7,568	2.6	0.00077	8.4	2.0	51	4,547	7.4	530	0.006	178,234	255	0.006	0.06	2.7	0.77	1.5	675	85	16	153,995
2076	255,619	323,744	3,177	18	0.45	0.31	0.41	145	0.0078	302	0.16	0.64	2.1	7.8	0.56	80	7,687	2.7	0.00078	8.6	2.0	51	4,547	7.7	530	0.0061	181,527	255	0.0062	0.061	2.7	0.78	1.6	698	88	16	155,005
2077	258,731	323,701	3,177	18	0.46	0.31	0.4	145	0.0078	306	0.16	0.66	2.2	7.8	0.58	80	7,735	2.8	0.00078	8.7	2.1	51	4,547	8.0	530	0.0062	182,917	255	0.0062	0.062	2.8	0.78	1.6	722	91	17	155,356
2078	262,398	324,502	3,177	17	0.46	0.32	0.4	145	0.0078	312	0.16	0.69	2.2	7.8	0.61	80	7,796	2.9	0.00078	8.8	2.2	51	4,547	8.4	530	0.0063	184,733	255	0.0063	0.063	2.8	0.78	1.6	763	96	18	156,236
2079	265,770	327,742	3,177	18	0.47	0.33	0.41	145	0.0079	312	0.16	0.72	2.2	7.9	0.63	80	7,886	3.0	0.00079	8.9	2.3	51	4,547	8.7	530	0.0064	186,924	255	0.0064	0.064	2.8	0.79	1.6	806	102	19	157,251
2080	269,002	332,121	3,177	18	0.47	0.34	0.41	145	0.0079	313	0.16	0.74	2.2	7.9	0.65	80	7,995	3.1	0.00079	9.1	2.4	51	4,547	9.0	530	0.0064	189,260	255	0.0065	0.065	2.9	0.79	1.6	850	108	20	158,470
2081	271,645	332,624	3,177	18	0.48	0.34	0.41	145	0.0079	318	0.16	0.77	2.3	7.9	0.67	80	8,050	3.2	0.00079	9.1	2.4	51	4,548	9.3	530	0.0065	190,543	255	0.0065	0.065	2.9	0.79	1.6	888	112	20	158,838
2082	272,418	340,563	3,177	19	0.48	0.35	0.41	145	0.008	307	0.16	0.78	2.3	8.0	0.68	80	8,165	3.3	0.0008	9.2	2.5	51	4,548	9.6	530	0.0065	192,527	255	0.0066	0.066	2.9	0.8	1.6	907	115	21	159,814
2083	271,705	348,063	3,178	19	0.48	0.35	0.42	145	0.008	297	0.16	0.79	2.3	8.0	0.69	80	8,265	3.3	0.0008	9.1	2.5	51	4,548	9.7	530	0.0065	193,727	255	0.0065	0.065	2.9	0.8	1.6	930	118	21	160,383
2084	274,395	353,193	3,178	19	0.48	0.36	0.42	145	0.0081	299	0.16	0.81	2.3	8.1	0.71	80	8,398	3.4	0.00081	9.2	2.6	51	4,548	9.9	530	0.0066	195,937	255	0.0066	0.066	2.9	0.81	1.6	915	116	21	161,637
2085	273,707	357,031	3,178	19	0.48	0.36	0.42	145	0.0081	297	0.16	0.81	2.3	8.1	0.71	80	8,471	3.4	0.00081	9.2	2.6	51	4,548	9.9	530	0.0066	196,356	255	0.0066	0.066	2.9	0.81	1.6	918	116	21	161,890
2086	275,893	360,180	3,178	19	0.49	0.37	0.43	145	0.0081	302	0.16	0.82	2.4	8.1	0.73	80	8,578	3.4	0.00081	9.3	2.6	51	4,548	10	530	0.0066	197,906	255	0.0066	0.066	2.9	0.81	1.7	864	109	20	162,778
2087	276,149	363,720	3,178	19	0.49	0.37	0.43	145	0.0082	304	0.16	0.82	2.4	8.2	0.72	80	8,669	3.4	0.00082	9.3	2.6	51	4,548	10.0	530	0.0066	198,681	255	0.0066	0.066	2.9	0.82	1.7	853	108	20	163,470
2088	279,900	368,389	3,178	20	0.49	0.37	0.43	145	0.0082	297	0.16	0.83	2.4	8.2	0.74	80	8,815	3.4	0.00082	9.4	2.7	51	4,548	10	530	0.0067	201,269	255	0.0067	0.067	3.0	0.82	1.7	779	98	18	164,570
2089	274,989	376,389	3,178	22	0.48	0.36	0.44	145	0.0082	273	0.16	0.78	2.4	8.2	0.7	80	8,863	3.2	0.00082	9.3	2.5	51	4,548	9.5	530	0.0066	200,693	255	0.0066	0.066	2.9	0.82	1.6	733	93	17	164,772
2090	275,131	383,442	3,178	23	0.49	0.36	0.44	145	0.0083	267	0.17	0.78	2.4	8.3	0.7	80	8,993	3.2	0.00083	9.3	2.5	51	4,548	9.4	530	0.0066	202,145	255	0.0066	0.066	2.9	0.83	1.7	692	87	16	165,462
2091	275,967	388,093	3,178	23	0.49	0.36	0.45	145	0.0083	267	0.17	0.78	2.4	8.3	0.7	80	9,115	3.2	0.00083	9.3	2.5	51	4,549	9.4	530	0.0066	203,383	255	0.0066	0.066	2.9	0.83	1.7	702	89	16	166,285
2092	278,346	393,814	3,178	23	0.49	0.36	0.45	145	0.0084	268	0.17	0.78	2.4	8.4	0.7	80	9,278	3.2	0.00084	9.4	2.5	51	4,549	9.4	530	0.0067	205,512	255	0.0067	0.067	3.0	0.84	1.7	695	88	16	167,587
2093	276,900	401,954	3,178	24	0.49	0.36	0.46	145	0.0084	259	0.17	0.78	2.4	8.4	0.69	80	9,401	3.2	0.00084	9.3	2.5	51	4,549	9.4	530	0.0066	206,468	255	0.0067	0.067	3.0	0.84	1.7	724	92	17	168,175
2094	275,023	412,661	3,178	25	0.48	0.36	0.47	145	0.0085	250	0.17	0.77	2.4	8.5	0.69	80	9,565	3.2	0.00085	9.3	2.5	51	4,549	9.3	530	0.0066	207,726	256	0.0066	0.066	2.9	0.85	1.7	750	95	17	169,130
2095	273,812	417,324	3,178	25	0.48	0.35	0.47	145	0.0085	250	0.17	0.76	2.4	8.5	0.67	80	9,655	3.2	0.00085	9.2	2.4	51	4,549	9.2	530	0.0066	208,059	256	0.0066	0.066	2.9	0.85	1.7	795	101	18	169,816
2096	272,115	424,905	3,178	25	0.48	0.35	0.48	145	0.0085	248	0.17	0.75	2.4	8.5	0.65	80	9,789	3.1	0.00085	9.2	2.4	51	4,549	9.1	530	0.0065	208,727	256	0.0065	0.065	2.9	0.85	1.7	841	106	19	170,905
2097	272,498	426,544	3,178	25	0.48	0.35	0.48	145	0.0086	250	0.17	0.75	2.4	8.6	0.66	80	9,856	3.1	0.00086	9.2	2.4	51	4,549	9.2	530	0.0065	209,165	256	0.0066	0.066	2.9	0.86	1.7	890	112	20	171,124
2098	272,808	431,208	3,178	25	0.48	0.35	0.49	145	0.0086	251	0.17	0.76	2.4	8.6	0.65	80	9,986	3.2	0.00086	9.2	2.4	51	4,549	9.2	530	0.0065	210,139	256	0.0066	0.066	2.9	0.86	1.7	939	119	22	171,837
2099	274,304	432,960	3,179	24	0.48	0.35	0.49	145	0.0086	255	0.17	0.77	2.4	8.6	0.66	80	10,068	3.2	0.00086	9.2	2.4	51	4,549	9.4	530	0.0066	211,100	256	0.0066	0.066	2.9	0.86	1.7	990	125	23	172,453
2100	277,589	439,421	3,179	26	0.49	0.36	0.49	145	0.0087	247	0.17	0.77	2.4	8.7	0.66	80	10,254	3.3	0.00087	9.3	2.4	51	4,549	9.5	530	0.0066	213,804	256	0.0067	0.067	3.0	0.87	1.7	1,040	131	24	173,472
2101	280,374	441,975	3,179	26	0.49	0.36	0.49	145	0.0087	250	0.17	0.79	2.4	8.7	0.68	80	10,363	3.3	0.00087	9.4	2.5	51	4,549	9.8	530	0.0067	215,520	256	0.0067	0.067	3.0	0.87	1.7	1,091	138	25	174,383
2102	282,224	445,407	3,179	26	0.5	0.36	0.49	145	0.0088	253	0.18	0.8	2.4	8.8	0.68	80	10,497	3.4	0.00088	9.5	2.5	51	4,550	9.9	530	0.0068	216,923	256	0.0068	0.068	3.0	0.88	1.8	1,143	144	26	175,164
2103	287,623	449,892	3,179	28	0.51	0.37	0.49	145	0.0088	242	0.18	0.82	2.4	8.8	0.7	80	10,656	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069	220,250	256	0.0069	0.069	3.1	0.88	1.8	1,194	151	27	175,863
2104	291,969	454,781	3,179	28	0.51	0.38	0.5	145	0.0089	244	0.18	0.84	2.5	8.9	0.71	80	10,844	3.6	0.00089	9.8	2.6	51	4,550	10	530	0.007	223,102	256	0.007	0.07	3.1	0.89	1.8	1,249	158	29	177,220
2105	290,870	458,603	3,179	29	0.51	0.37	0.5	145	0.0089	240	0.18	0.84	2.4	8.9	0.71	80	10,888	3.6	0.00089	9.8	2.6	51	4,550	10	530	0.007	223,372	256	0.007	0.07	3.1	0.89	1.8	1,295	164	30	177,533
2106	286,439	468,714	3,179	31	0.5	0.37	0.51	145	0.0089	229	0.18	0.82	2.4	8.9	0.68	80	10,989	3.5	0.00089	9.6	2.5	51	4,550	10	530	0.0069	223,388	256	0.0069	0.069	3.1	0.89	1.8	1,340	169	31	178,211
2107	286,625	476,247	3,179	32	0.51	0.37	0.52	145	0.009	225	0.18	0.82	2.4	9.0	0.68	80	11,121	3.5	0.0009	9.6	2.6	51	4,550	10	530	0.0069	224,964	256	0.0069	0.069	3.1	0.9	1.8	1,381	175	32	179,040
2108	289,132	483,491	3,179	32	0.51	0.37	0.52	145	0.009	225	0.18	0.84	2.4	9.0	0.69	80	11,321	3.6	0.0009	9.7	2.6	51	4,550	10	530	0.0069	227,439	256	0.007	0.07	3.1	0.9	1.8	1,423	180	33	180,178
2109	289,892	486,885	3,180	32	0.51	0.38	0.52	145	0.009	223	0.18	0.85	2.4	9.0	0.7	80	11,421	3.6	0.0009	9.8	2.6	51	4,551	11	530	0.0069	228,392	256	0.007	0.07	3.1	0.9	1.8	1,455	184	33	180,248
2110	292,330	491,134	3,180	32	0.52	0.38	0.52	145	0.009	224	0.18	0.87	2.5	9.0	0.71	80	11,579	3.7	0.0009	9.8	2.7	51	4,551	11	530	0.007	230,233	256	0.007	0.07	3.1	0.9	1.8	1,490	188	34	180,830
2111	294,267	494,413	3,180	32	0.52	0.39	0.52	145	0.0091	224	0.18	0.88	2.5	9.1	0.73	80	11,700	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007	231,683	256	0.0071	0.071	3.1	0.91	1.8	1,522	192	35	181,243
2112	297,967	498,213	3,180	32	0.53	0.39	0.52	145	0.0091	226	0.18	0.91	2.5	9.1	0.75	80	11,869	3.9	0.00091	10	2.8	51	4,551	11	530	0.0071	234,020	256	0.0072	0.072	3.2	0.91	1.8	1,555	197	36	181,975
2113	298,885	499,270	3,180	32	0.53	0.4	0.52	145	0.0091	226	0.18	0.92	2.5	9.1	0.76	80	11,939	3.9	0.00091	10	2.8	51	4,551	12	530	0.0071	234,576	256	0.0072	0.072	3.2	0.91	1.8	1,573	199	36	181,870
2114	302,071	500,944	3,180	32	0.53	0.4	0.52	145	0.0091	228	0.18	0.94	2.5	9.1	0.78	80	12,054	4.0	0.00091	10	2.9	51	4,551	12	530	0.0072	236,266	256	0.0073	0.073	3.2	0.91	1.8	1,583	200	36	182,135
2115	303,494	502,577	3,180	31	0.54	0.41	0.52	145	0.0091	229	0.18	0.95	2.5	9.1	0.79	80	12,144	4.0	0.00091	10	3.0	51	4,551	12	530	0.0073	237,139	256	0.0073	0.073	3.2	0.91	1.9	1,580	200	36	182,344
2116	307,951	505,605	3,180	31	0.54	0.42	0.52	145	0.0092	233	0.18	0.98	2.6	9.2	0.82	80	12,295	4.1	0.00092	10	3.0	51	4,552	12	530	0.0074	239,683	256	0.0074	0.074	3.3	0.92	1.9	1,564	198	36	183,370
2117	308,296	506,240	3,180	31	0.54	0.42	0.52	145	0.0092	234	0.18	0.98	2.6	9.2	0.82	80	12,345	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	239,888	256	0.0074	0.074	3.3	0.92	1.9	1,525	193	35	183,400
2118	308,543	511,520	3,180	32	0.54	0.42	0.52	145	0.0092	230	0.18	0.98	2.6	9.2	0.83	80	12,448	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	241,031	256	0.0074	0.074	3.3	0.92	1.9	1,479	187	34	183,657
2119	306,750	517,586	3,180	32	0.54	0.42	0.53	145	0.0092	225	0.18	0.98	2.6	9.2	0.83	80	12,544	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073	241,399	256	0.0074	0.074	3.3	0.92	1.9	1,422	180	33	183,671
2120	308,195	521,611	3,181	32	0.54	0.43	0.53	145	0.0092	225	0.18	0.99	2.6	9.2	0.85	80	12,667	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	242,768	256	0.0074	0.074	3.3	0.92	2.0	1,374	174	32	184,250
2121	307,851	527,324	3,181	36	0.54	0.43	0.53	145	0.0092	213	0.18	0.99	2.6	9.2	0.85	80	12,776	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	243,730	256	0.0074	0.074	3.3	0.92	2.0	1,321	167	30	184,044
2122	305,840	536,155	3,181	37	0.54	0.43	0.54	145	0.0092	206	0.18	0.98	2.7	9.2	0.85	80	12,893	4.1	0.00092	10	3.1	51	4,552	12	530	0.0073	244,572	256	0.0073	0.074	3.3	0.92	2.0	1,286	163	30	184,430
2123	301,845	547,239	3,181	39	0.53	0.43	0.55	145	0.0092	197	0.18	0.98	2.7	9.2	0.85	80	13,039	4.1	0.00092	10	3.1	51	4,552	12	531	0.0072	244,932	256	0.0073	0.073	3.2	0.92	2.0	1,234	156	28	184,660
2124	301,559	553,620	3,181	40	0.53	0.43	0.56	145	0.0093	196	0.19	0.98	2.7	9.3	0.85	80	13,178	4.1	0.00093	10	3.1	51	4,553	12	531	0.0072	246,000	256	0.0073	0.073	3.2	0.93	2.0	1,206	152	28	185,381
2125	298,592	560,386	3,181	41	0.53	0.43	0.56	145	0.0093	192	0.19	0.97	2.7	9.3	0.85	80	13,303	4.1	0.00093	10	3.1	51	4,553	12	531	0.0071	245,888	256	0.0072	0.072	3.2	0.93	2.0	1,122	142	26	185,380
2126	298,503	564,642	3,181	41	0.53	0.43	0.57	145	0.0093	191	0.19	0.97	2.7	9.3	0.85	80	13,407	4.0	0.00093	10	3.1	51	4,553	12	531	0.0071	246,639	256	0.0072	0.072	3.2	0.93	2.0	1,077	136	25	185,890
2127	296,322	570,664	3,181	42	0.52	0.43	0.57	145	0.0093	188	0.19	0.96	2.7	9.3	0.85	80	13,546	4.0	0.00093	10.0	3.1	51	4,553	12	531	0.0071	246,709	256	0.0071	0.071	3.2	0.93	1.9	959	121	22	185,957
2128	296,317	574,933	3,181	42	0.52	0.43	0.57	145	0.0093	187	0.19	0.95	2.7	9.3	0.85	80	13,676	3.9	0.00093	10.0	3.1	51	4,553	12	531	0.0071	247,443	256	0.0071	0.071	3.2	0.93	1.9	901	114	21	186,328
2129	294,327	578,205	3,181	43	0.52	0.42	0.58	145	0.0093	184	0.19	0.94	2.7	9.3	0.84	80	13,779	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.007	247,045	256	0.0071	0.071	3.1	0.93	1.9	775	98	18	185,930
2130	294,049	580,970	3,181	43	0.52	0.42	0.58	145	0.0093	184	0.19	0.93	2.8	9.3	0.84	80	13,877	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007	247,374	256	0.0071	0.071	3.1	0.93	1.9	723	91	17	186,107
2131	293,274	584,707	3,182	43	0.52	0.42	0.58	145	0.0093	182	0.19	0.92	2.8	9.3	0.84	80	14,007	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007	247,614	256	0.0071	0.071	3.1	0.93	1.9	628	79	14	186,064
2132	294,059	588,305	3,182	43	0.52	0.42	0.58	145	0.0093	183	0.19	0.91	2.8	9.3	0.84	80	14,129	3.7	0.00093	9.9	3.0	51	4,553	11	531	0.007	248,590	256	0.0071	0.071	3.1	0.93	1.9	597	76	14	186,657
2133	293,090	589,755	3,182	43	0.52	0.42	0.58	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,215	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	248,290	256	0.007	0.07	3.1	0.93	1.9	542	69	12	186,125
2134	293,519	591,529	3,182	43	0.52	0.42	0.58	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,293	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	248,761	256	0.0071	0.071	3.1	0.93	1.9	528	67	12	186,338

Table A6. Annual loads of the NAG backfill for the well graded cover system and no internal layer scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	294,182	594,578	3,182	43	0.52	0.42	0.59	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,422	3.7	0.00093	9.9	3.0	51	4,554	11	531	0.007	249,536	256	0.0071	0.071	3.1	0.93	1.9	505	64	12	186,569
2136	295,407	597,572	3,182	43	0.52	0.42	0.59	145	0.0094	181	0.19	0.9	2.8	9.4	0.83	80	14,529	3.7	0.00094	9.9	3.0	51	4,554	11	531	0.0071	250,615	256	0.0071	0.071	3.2	0.94	1.9	502	63	12	187,180
2137	295,235	598,275	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.83	80	14,606	3.6	0.00093	9.9	3.0	51	4,554	11	531	0.0071	250,535	256	0.0071	0.071	3.2	0.93	1.9	493	62	11	186,716
2138	293,260	603,891	3,182	45	0.52	0.41	0.59	145	0.0093	176	0.19	0.89	2.8	9.3	0.82	80	14,678	3.6	0.00093	9.9	2.9	51	4,554	10	531	0.007	250,747	256	0.007	0.071	3.1	0.93	1.9	492	62	11	186,790
2139	290,498	611,880	3,182	46	0.51	0.41	0.6	145	0.0094	172	0.19	0.88	2.8	9.4	0.81	80	14,802	3.6	0.00094	9.8	2.9	51	4,554	10	531	0.0069	251,030	256	0.007	0.07	3.1	0.94	1.9	491	62	11	187,056
2140	289,615	617,108	3,182	47	0.51	0.41	0.61	145	0.0094	171	0.19	0.87	2.8	9.4	0.8	80	14,924	3.5	0.00094	9.7	2.9	51	4,554	10	531	0.0069	251,587	256	0.007	0.07	3.1	0.94	1.9	492	62	11	187,514
2141	286,304	620,491	3,182	48	0.5	0.4	0.61	145	0.0093	167	0.19	0.86	2.8	9.3	0.79	80	14,988	3.5	0.00093	9.6	2.8	51	4,554	10	531	0.0068	250,645	256	0.0069	0.069	3.1	0.93	1.9	491	62	11	186,895
2142	285,021	623,285	3,182	48	0.5	0.4	0.61	145	0.0093	166	0.19	0.84	2.7	9.3	0.78	80	15,070	3.4	0.00093	9.6	2.8	51	4,554	10.0	531	0.0068	250,521	256	0.0068	0.069	3.0	0.93	1.9	492	62	11	186,886
2143	283,562	627,217	3,182	48	0.5	0.4	0.62	145	0.0094	165	0.19	0.84	2.7	9.4	0.77	80	15,161	3.4	0.00094	9.5	2.8	51	4,555	9.9	531	0.0068	250,550	256	0.0068	0.068	3.0	0.94	1.9	493	62	11	187,034
2144	283,033	631,952	3,182	49	0.5	0.39	0.62	145	0.0094	164	0.19	0.82	2.7	9.4	0.75	80	15,311	3.3	0.00094	9.5	2.7	51	4,555	9.7	531	0.0068	251,111	256	0.0068	0.068	3.0	0.94	1.9	494	63	11	187,551
2145	280,846	633,246	3,183	49	0.5	0.39	0.62	145	0.0094	163	0.19	0.81	2.7	9.4	0.74	80	15,352	3.3	0.00094	9.5	2.7	51	4,555	9.6	531	0.0067	250,287	256	0.0068	0.068	3.0	0.94	1.9	493	62	11	187,019
2146	279,836	635,870	3,182	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.79	2.7	9.4	0.72	80	15,458	3.2	0.00094	9.4	2.6	51	4,555	9.3	531	0.0067	250,202	256	0.0067	0.067	3.0	0.94	1.9	492	62	11	187,081
2147	278,890	638,712	3,183	49	0.49	0.38	0.63	145	0.0094	161	0.19	0.78	2.7	9.4	0.72	80	15,545	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,228	256	0.0067	0.067	3.0	0.94	1.9	488	62	11	187,212
2148	278,629	642,514	3,183	50	0.49	0.37	0.64	145	0.0094	161	0.19	0.76	2.7	9.4	0.7	80	15,681	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,723	256	0.0067	0.067	3.0	0.94	1.9	485	61	11	187,667
2149	276,730	642,692	3,183	50	0.49	0.37	0.64	145	0.0094	160	0.19	0.75	2.7	9.4	0.69	80	15,708	3.0	0.00094	9.3	2.5	51	4,555	8.8	531	0.0066	249,797	256	0.0067	0.067	3.0	0.94	1.9	469	59	11	187,030
2150	275,915	644,238	3,183	50	0.49	0.36	0.64	145	0.0093	159	0.19	0.73	2.6	9.3	0.67	80	15,786	3.0	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,625	256	0.0066	0.066	2.9	0.93	1.9	458	58	11	186,985

Table A7. Source terms of the NAG backfill for the low nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	24
2024	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	44
2025	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	80
2026	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	125
2027	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	158
2028	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	289
2029	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	270
2030	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	348
2031	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	2,236
2032	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	3,634
2033	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	620
2034	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	2,492
2035	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	7,085
2036	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	12,083
2037	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	13,464
2038	8.2	1,210	73	29	0.017	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029	540	2.3	0.000029	0.00029	0.013	0.005	0.01	41	5.2	0.94	26,952
2039	8.3	1,301	139	29	0.021	0.0023	0.0013	0.0023	1.3	0.00005	31	0.001	0.0058	0.004	0.05	0.00032	0.72	23	0.034	0.000005	0.044	0.008	0.46	41	0.11	4.8	0.000031	606	2.3	0.000031	0.00031	0.014	0.005	0.01	40	5.0	0.91	45,912
2040	8.3	1,464	246	29	0.018	0.0026	0.0014	0.0022	1.3	0.00005	29	0.001	0.0057	0.004	0.05	0.00082	0.72	27	0.032	0.000005	0.049	0.009	0.46	41	0.1	4.8	0.000035	728	2.3	0.000035	0.00035	0.016	0.005	0.01	35	4.5	0.81	79,056
2041	8.4	1,507	382	29	0.028	0.0027	0.0015	0.0023	1.3	0.00005	13	0.001	0.0042	0.0081	0.05	0.0017	0.72	30	0.021	0.000005	0.051	0.0089	0.46	41	0.067	4.8	0.000036	823	2.3	0.000036	0.00036	0.016	0.005	0.01	18	2.3	0.42	110,907
2042	8.5	1,408	398	25	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001	0.003	0.0082	0.05	0.002	0.62	28	0.014	0.000005	0.047	0.008	0.39	35	0.042	4.1	0.000034	788	2.0	0.000034	0.00034	0.015	0.005	0.01	7.3	0.93	0.17	128,839
2043	8.4	1,371	392	24	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.001	0.0026	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.38	34	0.034	4.0	0.000033	769	1.9	0.000033	0.00033	0.015	0.005	0.01	4.3	0.55	0.099	133,866
2044	8.4	1,350	381	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	12	0.001	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.033	3.9	0.000032	754	1.9	0.000032	0.00032	0.014	0.005	0.01	4.2	0.54	0.098	136,575
2045	8.5	1,399	396	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	4.0	0.000034	783	1.9	0.000034	0.00034	0.015	0.005	0.01	5.1	0.64	0.12	133,758
2046	8.5	1,450	402	25	0.03	0.0026	0.0016	0.0023	1.1	0.00005	12	0.001	0.003	0.0083	0.05	0.0023	0.62	29	0.013	0.000005	0.049	0.0089	0.39	35	0.04	4.1	0.000035	809	2.0	0.000035	0.00035	0.015	0.005	0.01	5.1	0.64	0.12	128,763
2047	8.5	1,577	414	25	0.03	0.0028	0.0017	0.0023	1.1	0.00005	11	0.001	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.4	35	0.043	4.1	0.000038	870	2.0	0.000038	0.00038	0.017	0.005	0.01	3.9	0.49	0.089	128,089
2048	8.5	1,714	432	24	0.031	0.003	0.0019	0.0022	1.1	0.00005	11	0.001	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041	940	2.0	0.000041	0.00041	0.018	0.005	0.01	3.7	0.47	0.085	129,793
2049	8.5	1,775	447	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.001	0.0045	0.0089	0.05	0.0038	0.61	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043	974	1.9	0.000043	0.00043	0.019	0.005	0.01	3.9	0.5	0.09	131,172
2050	8.5	1,803	451	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043	989	1.9	0.000043	0.00043	0.019	0.005	0.01	3.4	0.43	0.079	132,811
2051	8.5	1,816	452	24	0.032	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	4.0	0.000044	995	1.9	0.000044	0.00044	0.019	0.005	0.01	2.7	0.34	0.062	133,964
2052	8.5	1,827	452	23	0.032	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.057	3.9	0.000044	1,000	1.9	0.000044	0.00044	0.02	0.005	0.01	1.8	0.22	0.041	135,076
2053	8.5	1,837	453	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044	1,004	1.9	0.000044	0.00044	0.02	0.005	0.01	1.0	0.13	0.024	135,145
2054	8.5	1,841	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044	1,006	1.9	0.000044	0.00044	0.02	0.005	0.01	0.81	0.1	0.02	135,795
2055	8.5	1,852	452	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.001	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044	1,011	1.9	0.000045	0.00045	0.02	0.005	0.011	0.83	0.1	0.02	136,601
2056	8.6	1,808	551	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.001	0.0048	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043	1,036	1.9	0.000043	0.00043	0.019	0.005	0.01	0.92	0.12	0.021	137,639
2057	8.7	1,730	711	23	0.052	0.0031	0.0022	0.0023	1.1	0.00005	4.6	0.001	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041	1,071	1.9	0.000042	0.00042	0.018	0.005	0.01	1.0	0.13	0.024	137,940
2058	8.7	1,684	803	23	0.059	0.003	0.0021	0.0024	1.1	0.00005	3.7	0.001	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004	1,088	1.8	0.00004	0.00041	0.018	0.005	0.01	1.2	0.15	0.027	138,218
2059	8.7	1,672	833	23	0.063	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004	1,095	1.8	0.00004	0.0004	0.018	0.005	0.01	1.3	0.17	0.031	138,460
2060	8.7	1,671	840	23	0.063	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004	1,098	1.8	0.00004	0.0004	0.018	0.005	0.01	1.5	0.19	0.035	139,518
2061	8.7	1,674	839	23	0.063	0.003	0.002	0.0024	1.0	0.00005	3.5	0.001	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.014	0.36	33	0.049	3.8	0.00004	1,098	1.8	0.00004	0.0004	0.018	0.005	0.01	1.7	0.22	0.04	139,838
2062	8.8	1,663	873	23	0.073	0.0029	0.002	0.0025	1.0	0.00005	3.0	0.001	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004	1,108	1.8	0.00004	0.0004	0.018	0.005	0.01	1.9	0.25	0.045	140,676
2063	8.8	1,642	909	22	0.08	0.0029	0.002	0.0025	1.0	0.00005	2.7	0.001	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,114	1.8	0.000039	0.00039	0.018	0.005	0.01	2.2	0.28	0.05	141,568
2064	8.8	1,636	916	22	0.079	0.0029	0.002	0.0025	1.0	0.00005	2.7	0.001	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039	1,114	1.8	0.000039	0.00039	0.017	0.005	0.01	2.4	0.31	0.056	142,789
2065	8.9	1,636	951	22	0.096	0.0029	0.0019	0.0026	1.0	0.00005	2.3	0.001	0.004	0.014	0.05	0.0035	0.56	46	0.016	0.000005	0.055	0.013	0.35	32	0.048	3.7	0.000039	1,129	1.8	0.000039	0.00039	0.017	0.005	0.01	2.7	0.34	0.062	143,409
2066	8.9	1,609	995	22	0.11	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.001	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.048	3.7	0.000039	1,135	1.8	0.000039	0.00039	0.017	0.005	0.01	3.0	0.37	0.068	144,573
2067	8.9	1,588	1,024	22	0.12	0.0028	0.0019	0.0027	1.	0.00005	1.9	0.001	0.0039	0.013	0.05	0.0033	0.55	47	0.016	0.000005	0.053	0.012	0.35	31	0.047	3.6	0.000038	1,137	1.8	0.000038	0.00038	0.017	0.005	0.01	3.2	0.41	0.074	145,722
2068	9.0	1,582	1,039	22	0.12	0.0028	0.0019	0.0027	0.99	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038	1,140	1.7	0.000038	0.00038	0.017	0.005	0.01	3.5	0.44	0.08	147,284
2069	8.9	1,579	1,049	21	0.12	0.0028	0.0019	0.0027	0.98	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038	1,142	1.7	0.000038	0.00038	0.017	0.005	0.01	3.7	0.47	0.086	148,041
2070	8.9	1,583	1,050	21	0.11	0.0028	0.0019	0.0027	0.97	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.048	3.5	0.000038	1,144	1.7	0.000038	0.00038	0.017	0.005	0.01	3.8	0.48	0.088	149,328
2071	8.9	1,583	1,051	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.001	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.047	3.5	0.000038	1,144	1.7	0.000038	0.00038	0.017	0.005	0.01	3.6	0.46	0.083	150,505
2072	8.9	1,599	1,053	21	0.11	0.0028	0.0019	0.0027	0.96	0.00005	1.9	0.001	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038	1,152	1.7	0.000038	0.00038	0.017	0.005	0.01	3.3	0.42	0.076	151,916
2073	8.9	1,607	1,050	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.001	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038	1,155	1.7	0.000039	0.00039	0.017	0.005	0.01	3.0	0.38	0.07	152,292
2074	8.9	1,613	1,046	21	0.11	0.0028	0.0019	0.0027	0.95	0.00005	2.0	0.001	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.013	0.33	30	0.048	3.5	0.000039	1,155	1.7	0.000039	0.00039	0.017	0.005	0.01	3.0	0.37	0.068	153,237
2075	8.9	1,623	1,040	21	0.11	0.0029	0.0019	0.0026	0.94	0.00005	2.0	0.001	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	30	0.049	3.4	0.000039	1,158	1.7	0.000039	0.00039	0.017	0.005	0.01	2.9	0.37	0.067	153,995
2076	8.9	1,649	1,044	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	1.9	0.001	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.055	0.013	0.33	29	0.05	3.4	0.000039	1,171	1.6	0.00004	0.0004	0.018	0.005	0.01	3.0	0.38	0.068	155,005
2077	8.9	1,665	1,042	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.001	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004	1,177	1.6	0.00004	0.0004	0.018	0.005	0.01	3.1	0.39	0.07	155,356
2078	8.9	1,678	1,039	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.001	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.056	0.014	0.32	29	0.054	3.4	0.00004	1,182	1.6	0.00004	0.0004	0.018	0.005	0.01	3.2	0.4	0.073	156,236
2079	8.9	1,688	1,042	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001	0.0045	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.055	3.4	0.00004	1,188	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.41	0.074	157,251
2080	8.9	1,694	1,048	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001	0.0046	0.014	0.05	0.0041	0.5	50	0.019	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.000041	1,193	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.41	0.074	158,470
2081	8.9	1,705	1,047	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.001	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.057	0.015	0.32	29	0.058	3.3	0.000041	1,198	1.6	0.000041	0.00041	0.018	0.005	0.01	3.3	0.41	0.075	158,838
2082	9.0	1,698	1,066	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.001	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.015	0.32	28	0.058	3.3	0.000041	1,202	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.4	0.073	159,814
2083	9.0	1,686	1,086	20	0.12	0.003	0.0022	0.0026	0.91	0.00005	1.8	0.001	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.059	3.3	0.000041	1,205	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.41	0.074	160,383
2084	9.0	1,688	1,093	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.001	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.000041	1,208	1.6	0.000041	0.00041	0.018	0.005	0.01	3.2	0.4	0.072	161,637
2085	9.0	1,681	1,104	20	0.12	0.003	0.0022	0.0026	0.9	0.00005	1.8	0.001	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004	1,209	1.6	0.00004	0.0004	0.018	0.005	0.01	3.2	0.41	0.074	161,890
2086	9.0	1,685	1,107	20	0.12	0.003	0.0022	0.0026	0.89	0.00005	1.8	0.001	0.005	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.000041	1,212	1.6	0.00004	0.00041	0.018	0.005	0.01	3.1	0.4	0.072	162,778
2087	9.0	1,679	1,114	19	0.12	0.003	0.0022	0.0026	0.89	0.00005	1.8	0.001	0.0049	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.2	0.00004	1,211	1.6	0.00004	0.0004	0.018	0.005	0.01	3.1	0.4	0.072	163,470
2088	9.0	1,691	1,120	19	0.12	0.003	0.0023	0.0026	0.88	0.00005	1.8	0.001	0.0049	0.015	0.05	0.0044	0.48	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.2	0.000041	1,219	1.6	0.000041	0.00041	0.018	0.005	0.01	3.0	0.37	0.068	164,570
2089	9.0	1,688	1,142	19	0.13	0.003	0.0022	0.0027	0.88	0.00005	1.7	0.001	0.0049	0.015	0.05	0.0044	0.48	54	0.02	0.000005	0.057	0.016	0.31	28	0.059	3.2	0.00004	1,226	1.6	0.000041	0.00041	0.018	0.005	0.01	3.0	0.37	0.068	164,772
2090	9.0	1,679	1,158	19	0.14	0.003	0.0022	0.0027	0.88	0.00005	1.6	0.001	0.0049	0.015	0.05	0.0044	0.48	55	0.02	0.000005	0.057	0.016	0.31	27	0.059	3.2	0.00004	1,229	1.5	0.00004	0.0004	0.018	0.005	0.01	2.8	0.35	0.064	165,462
2091	9.0	1,674	1,167	19	0.14	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001	0.0048	0.015	0.05	0.0043	0.48	55	0.02	0.000005	0.056	0.016	0.31	27	0.058	3.2	0.00004	1,230	1.5	0.00004	0.0004	0.018	0.005	0.01	2.8	0.35	0.064	166,285
2092	9.0	1,674	1,175	19	0.14	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001	0.0048	0.015	0.05	0.0043	0.48	56	0.02	0.000005	0.056	0.016	0.3	27	0.058	3.2	0.00004	1,232	1.5	0.00004	0.0004	0.018	0.005	0.01	2.8	0.35	0.063	167,587
2093	9.0	1,659	1,195	19	0.14	0.0029	0.0022	0.0027	0.86	0.00005	1.5	0.001	0.0048	0.014	0.05	0.0043	0.47	56	0.02	0.000005	0.056	0.015	0.3	27	0.058	3.2	0.000039	1,233	1.5	0.00004	0.0004	0.018	0.005	0.01	2.9	0.36	0.066	168,175
2094	9.0	1,636	1,221	19	0.15	0.0029	0.0022	0.0028	0.86	0.00005	1.5	0.001	0.0047	0.014	0.05	0.0042	0.47	57	0.02	0.000005	0.055	0.015	0.3	27	0.057	3.1	0.000039	1,233	1.5	0.000039	0.00039	0.017	0.005	0.01	2.9	0.37	0.067	169,130
2095	9.0	1,622	1,230	19	0.15	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.001	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.1	0.000039	1,230	1.5	0.000039	0.00039	0.017	0.005	0.01	3.1	0.39	0.071	169,816
2096	9.0	1,600	1,244	19	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.4	0.001	0.0045	0.014	0.05	0.004	0.47	57	0.019	0.000005	0.054	0.015	0.3	27	0.055	3.1	0.000038	1,225	1.5	0.000038	0.00038	0.017	0.005	0.01	3.2	0.41	0.074	170,905
2097	9.0	1,599	1,248	19	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.4	0.001	0.0045	0.014	0.05	0.004	0.47	58	0.019	0.000005	0.054	0.015	0.3	27	0.056	3.1	0.000038	1,226	1.5	0.000038	0.00038	0.017	0.005	0.01	3.4	0.43	0.078	171,124
2098	9.0	1,593	1,256	18	0.15	0.0028	0.0021	0.0028	0.85	0.00005	1.4	0.001	0.0045	0.014	0.05	0.0039	0.46	58	0.019	0.000005	0.054	0.014	0.3	26	0.056	3.1	0.000038	1,226	1.5	0.000038	0.00038	0.017	0.005	0.01	3.6	0.45	0.082	171,837
2099	9.0	1,595	1,257	18	0.14	0.0028	0.0021	0.0028	0.84	0.00005	1.5	0.001	0.0046	0.014	0.05	0.004	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.1	0.000038	1,227	1.5	0.000038	0.00038	0.017	0.005	0.01	3.7	0.47	0.086	172,453
2100	9.0	1,603	1,268	18	0.15	0.0028	0.0021	0.0028	0.84	0.00005	1.4	0.001	0.0046	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.057	3.1	0.000038	1,234	1.5	0.000039	0.00039	0.017	0.005	0.01	3.9	0.49	0.09	173,472
2101	9.0	1,610	1,269	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.001	0.0046	0.014	0.05	0.004	0.46	60	0.019	0.000005	0.054	0.015	0.29	26	0.057	3.0	0.000038	1,238	1.5	0.000039	0.00039	0.017	0.005	0.01	4.1	0.51	0.093	174,383
2102	9.0	1,612	1,273	18	0.15	0.0028	0.0021	0.0028	0.83	0.00005	1.4	0.001	0.0046	0.014	0.05	0.004	0.45	60	0.02	0.000005	0.054	0.015	0.29	26	0.058	3.0	0.000039	1,240	1.5	0.000039	0.00039	0.017	0.005	0.01	4.2	0.54	0.097	175,164
2103	9.1	1,636	1,280	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.001	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039	1,253	1.5	0.000039	0.00039	0.017	0.005	0.01	4.4	0.56	0.101	175,863
2104	9.1	1,648	1,284	18	0.16	0.0029	0.0022	0.0028	0.82	0.00005	1.4	0.001	0.0048	0.014	0.05	0.0041	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039	1,259	1.4	0.00004	0.0004	0.018	0.005	0.01	4.6	0.58	0.105	177,220
2105	9.1	1,638	1,292	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.3	0.001	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039	1,258	1.4	0.000039	0.00039	0.017	0.005	0.01	4.7	0.6	0.108	177,533
2106	9.1	1,606	1,315	18	0.17	0.0028	0.0021	0.0029	0.82	0.00005	1.3	0.001	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	26	0.058	3.0	0.000038	1,253	1.4	0.000039	0.00039	0.017	0.005	0.01	4.9	0.61	0.112	178,211
2107	9.1	1,600	1,330	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.001	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.058	3.0	0.000038	1,256	1.4	0.000039	0.00038	0.017	0.005	0.01	5.0	0.63	0.114	179,040
2108	9.1	1,603	1,342	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.001	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.059	2.9	0.000038	1,262	1.4	0.000039	0.00039	0.017	0.005	0.01	5.1	0.64	0.117	180,178
2109	9.1	1,607	1,351	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.001	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000038	1,266	1.4	0.000039	0.00039	0.017	0.005	0.01	5.2	0.66	0.119	180,248
2110	9.1	1,615	1,358	18	0.18	0.0028	0.0021	0.0029	0.8	0.00005	1.2	0.001	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.061	2.9	0.000039	1,272	1.4	0.000039	0.00039	0.017	0.005	0.01	5.3	0.67	0.122	180,830
2111	9.1	1,622	1,364	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.001	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.062	2.9	0.000039	1,278	1.4	0.000039	0.00039	0.017	0.005	0.01	5.4	0.68	0.124	181,243
2112	9.1	1,636	1,369	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.001	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.063	2.9	0.000039	1,285	1.4	0.000039	0.00039	0.017	0.005	0.01	5.5	0.69	0.13	181,975
2113	9.1	1,642	1,373	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.001	0.005	0.014	0.05	0.0042	0.44	66	0.022	0.000005	0.055	0.016	0.28	25	0.064	2.9	0.000039	1,289	1.4	0.00004	0.00039	0.018	0.005	0.01	5.6	0.7	0.13	181,870
2114	9.1	1,657	1,375	17	0.18	0.0029	0.0022	0.0029	0.8	0.00005	1.2	0.001	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.00004	1,296	1.4	0.00004	0.0004	0.018	0.005	0.01	5.6	0.71	0.13	182,135
2115	9.1	1,663	1,378	17	0.17	0.0029	0.0023	0.0029	0.8	0.00005	1.3	0.001	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.066	2.9	0.00004	1,300	1.4	0.00004	0.0004	0.018	0.005	0.01	5.6	0.7	0.13	182,344
2116	9.1	1,678	1,379	17	0.17	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.001	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,306	1.4	0.00004	0.0004	0.018	0.005	0.01	5.5	0.69	0.13	183,370
2117	9.1	1,671	1,392	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0053	0.014	0.05	0.0045	0.43	67	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,308	1.4	0.00004	0.0004	0.018	0.005	0.01	5.3	0.68	0.12	183,400
2118	9.1	1,667	1,407	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,312	1.4	0.00004	0.0004	0.018	0.005	0.011	5.2	0.66	0.12	183,657
2119	9.1	1,664	1,415	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,314	1.4	0.00004	0.0004	0.018	0.005	0.011	5.0	0.63	0.11	183,671
2120	9.1	1,663	1,425	17	0.18	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,317	1.4	0.00004	0.0004	0.018	0.005	0.011	4.8	0.61	0.11	184,250
2121	9.1	1,656	1,451	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.001	0.0054	0.014	0.05	0.0046	0.43	70	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004	1,325	1.4	0.00004	0.0004	0.018	0.005	0.011	4.6	0.58	0.106	184,044
2122	9.1	1,633	1,480	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.055	0.017	0.28	25	0.066	2.9	0.00004	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	4.4	0.56	0.101	184,430
2123	9.1	1,623	1,492	17	0.22	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	4.2	0.54	0.098	184,660
2124	9.2	1,607	1,511	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.001	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.065	2.9	0.000039	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	4.0	0.5	0.091	185,381
2125	9.2	1,601	1,519	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.001	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000039	1,325	1.4	0.000039	0.00038	0.017	0.005	0.011	3.8	0.48	0.087	185,380
2126	9.2	1,589	1,533	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.01	0.001	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.063	2.9	0.000038	1,324	1.4	0.000038	0.00038	0.017	0.005	0.01	3.4	0.43	0.077	185,890
2127	9.2	1,585	1,541	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.	0.001	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.062	2.9	0.000038	1,325	1.4	0.000038	0.00038	0.017	0.005	0.01	3.2	0.4	0.073	185,957
2128	9.2	1,576	1,555	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.8	0.000038	1,326	1.4	0.000038	0.00038	0.017	0.005	0.01	2.7	0.35	0.063	186,328
2129	9.2	1,576	1,560	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	2.6	0.32	0.059	185,930
2130	9.2	1,568	1,571	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	2.2	0.28	0.052	186,107
2131	9.2	1,571	1,576	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	2.1	0.27	0.049	186,064
2132	9.2	1,566	1,585	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	2.0	0.25	0.045	186,657
2133	9.2	1,570	1,589	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.9	0.000038	1,333	1.4	0.000038	0.00038	0.017	0.005	0.01	1.9	0.24	0.044	186,125
2134	9.2	1,568	1,595	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0048	0.015	0.05	0.0044	0.43	77	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,334	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.042	186,338

Table A7. Source terms of the NAG backfill for the low nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,573	1,597	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,337	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.042	186,569
2136	9.2	1,572	1,603	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0047	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,338	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.041	187,180
2137	9.2	1,578	1,606	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.96	0.001	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,341	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.041	186,716
2138	9.2	1,565	1,622	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.001	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.00038	0.017	0.005	0.01	1.8	0.23	0.041	186,790
2139	9.2	1,549	1,640	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.001	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.017	0.005	0.01	1.8	0.23	0.041	187,056
2140	9.2	1,541	1,650	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.001	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.016	0.005	0.01	1.8	0.23	0.041	187,514
2141	9.2	1,529	1,664	17	0.26	0.0027	0.0022	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.016	0.005	0.01	1.8	0.23	0.042	186,895
2142	9.2	1,523	1,670	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000036	1,340	1.4	0.000037	0.00037	0.016	0.005	0.01	1.8	0.23	0.042	186,886
2143	9.2	1,512	1,682	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.001	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,034
2144	9.2	1,507	1,687	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.87	0.001	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,551
2145	9.2	1,498	1,697	17	0.26	0.0026	0.0021	0.0034	0.78	0.00005	0.87	0.001	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,338	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,019
2146	9.2	1,494	1,702	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.042	187,081
2147	9.2	1,487	1,710	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0041	0.014	0.05	0.0037	0.43	83	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000036	1,336	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.041	187,212
2148	9.2	1,483	1,714	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.004	0.014	0.05	0.0037	0.42	84	0.016	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000035	1,336	1.4	0.000036	0.00036	0.016	0.005	0.01	1.8	0.23	0.041	187,667
2149	9.2	1,477	1,721	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000036	0.00036	0.016	0.005	0.01	1.7	0.22	0.04	187,030
2150	9.2	1,474	1,724	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0035	0.43	85	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000035	0.00035	0.016	0.005	0.01	1.7	0.21	0.039	186,985

Table A8. Annual loads of the NAG backfill for the low nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	29	1.8	0.69	0.00041	0.000052	0.000029	0.000057	0.032	0.0000012	0.67	0.000024	0.00014	0.000097	0.0012	0.0000024	0.017	0.49	0.00081	0.00000012	0.00098	0.00018	0.011	0.99	0.0027	0.12	0.0000007	13	0.056	0.0000007	0.000007	0.00031	0.00012	0.00024	0.99	0.13	0.023	24
2024	53	3.2	1.3	0.00074	0.000094	0.000053	0.0001	0.057	0.0000022	1.2	0.000044	0.00025	0.00018	0.0022	0.0000044	0.031	0.89	0.0015	0.00000022	0.0018	0.00033	0.02	1.8	0.0048	0.21	0.0000013	24	0.1	0.0000013	0.000013	0.00057	0.00022	0.00044	1.8	0.23	0.041	44
2025	97	5.9	2.3	0.0014	0.00017	0.000097	0.00019	0.11	0.000004	2.2	0.00008	0.00046	0.00032	0.004	0.0000081	0.058	1.6	0.0027	0.0000004	0.0033	0.0006	0.037	3.3	0.0089	0.38	0.0000023	43	0.18	0.0000023	0.000023	0.001	0.0004	0.0008	3.3	0.42	0.076	80
2026	152	9.1	3.6	0.0021	0.00027	0.00015	0.00029	0.16	0.0000063	3.5	0.00013	0.00072	0.0005	0.0063	0.000013	0.09	2.5	0.0042	0.00000063	0.0051	0.00093	0.057	5.1	0.014	0.6	0.0000036	68	0.29	0.0000036	0.000036	0.0016	0.00063	0.0013	5.1	0.65	0.12	125
2027	191	11	4.5	0.0027	0.00034	0.00019	0.00037	0.21	0.0000079	4.4	0.00016	0.0009	0.00063	0.0079	0.000016	0.11	3.2	0.0053	0.00000079	0.0064	0.0012	0.072	6.5	0.017	0.75	0.0000046	85	0.36	0.0000046	0.000046	0.002	0.00079	0.0016	6.5	0.82	0.15	158
2028	349	21	8.2	0.0048	0.00062	0.00035	0.00068	0.38	0.000014	8.0	0.00029	0.0017	0.0012	0.014	0.000029	0.21	5.8	0.0097	0.0000014	0.012	0.0021	0.13	12	0.032	1.4	0.0000084	156	0.66	0.0000084	0.000084	0.0037	0.0014	0.0029	12	1.5	0.27	289
2029	326	20	7.7	0.0045	0.00057	0.00032	0.00063	0.35	0.000013	7.5	0.00027	0.0015	0.0011	0.013	0.000027	0.19	5.5	0.0091	0.0000013	0.011	0.002	0.12	11	0.03	1.3	0.0000078	146	0.62	0.0000078	0.000078	0.0035	0.0013	0.0027	11	1.4	0.25	270
2030	421	25	9.9	0.0058	0.00074	0.00042	0.00081	0.45	0.000017	9.7	0.00035	0.002	0.0014	0.017	0.000035	0.25	7.0	0.012	0.0000017	0.014	0.0026	0.16	14	0.038	1.7	0.00001	188	0.8	0.00001	0.0001	0.0045	0.0017	0.0035	14	1.8	0.33	348
2031	2,705	163	64	0.038	0.0048	0.0027	0.0052	2.9	0.00011	62	0.0022	0.013	0.0089	0.11	0.00022	1.6	45	0.075	0.000011	0.091	0.017	1.0	91	0.25	11	0.000065	1,208	5.1	0.000065	0.00065	0.029	0.011	0.022	92	12	2.1	2,236
2032	4,396	264	104	0.061	0.0078	0.0044	0.0085	4.7	0.00018	101	0.0036	0.021	0.015	0.18	0.00036	2.6	73	0.12	0.000018	0.15	0.027	1.7	149	0.4	17	0.00011	1,962	8.3	0.00011	0.0011	0.047	0.018	0.036	149	19	3.4	3,634
2033	750	45	18	0.01	0.0013	0.00075	0.0015	0.81	0.000031	17	0.00062	0.0035	0.0025	0.031	0.000062	0.44	13	0.021	0.0000031	0.025	0.0046	0.28	25	0.068	3.0	0.000018	335	1.4	0.000018	0.00018	0.008	0.0031	0.0062	25	3.2	0.58	620
2034	3,015	181	71	0.042	0.0053	0.003	0.0058	3.3	0.00012	69	0.0025	0.014	0.01	0.12	0.00025	1.8	50	0.084	0.000012	0.1	0.019	1.1	102	0.28	12	0.000072	1,346	5.7	0.000072	0.00072	0.032	0.012	0.025	102	13	2.3	2,492
2035	8,570	516	202	0.12	0.015	0.0085	0.017	9.3	0.00035	197	0.0071	0.041	0.028	0.35	0.00071	5.1	143	0.24	0.000035	0.29	0.053	3.2	290	0.78	34	0.00021	3,825	16	0.00021	0.0021	0.092	0.035	0.071	290	37	6.7	7,085
2036	14,616	879	345	0.2	0.026	0.015	0.028	16	0.0006	336	0.012	0.069	0.048	0.6	0.0012	8.7	244	0.41	0.00006	0.49	0.09	5.5	494	1.3	58	0.00035	6,524	28	0.00035	0.0035	0.16	0.06	0.12	494	63	11	12,083
2037	16,287	980	385	0.23	0.029	0.016	0.032	18	0.00067	374	0.013	0.077	0.054	0.67	0.0014	9.6	272	0.45	0.000067	0.55	0.1	6.2	551	1.5	64	0.00039	7,270	31	0.00039	0.0039	0.17	0.067	0.13	551	70	13	13,464
2038	32,604	1,961	770	0.45	0.057	0.032	0.063	35	0.0013	749	0.027	0.15	0.11	1.3	0.0027	19	545	0.91	0.00013	1.1	0.2	12	1,102	3.0	128	0.00078	14,553	62	0.00078	0.0078	0.35	0.13	0.27	1,103	139	25	26,952
2039	59,745	6,372	1,312	0.94	0.11	0.058	0.11	60	0.0023	1,423	0.046	0.27	0.18	2.3	0.015	33	1,035	1.5	0.00023	2.0	0.37	21	1,878	5.0	219	0.0014	27,828	105	0.0014	0.014	0.64	0.23	0.46	1,824	231	42	45,912
2040	115,715	19,463	2,260	1.5	0.2	0.11	0.18	103	0.004	2,290	0.079	0.45	0.32	4.0	0.065	57	2,115	2.5	0.0004	3.9	0.71	36	3,235	8.2	377	0.0028	57,514	182	0.0028	0.028	1.2	0.4	0.79	2,790	353	64	79,056
2041	167,182	42,337	3,172	3.1	0.29	0.16	0.25	145	0.0055	1,440	0.11	0.46	0.9	5.5	0.18	79	3,299	2.4	0.00055	5.6	0.98	51	4,540	7.5	529	0.004	91,316	255	0.004	0.04	1.8	0.55	1.1	2,013	255	46	110,907
2042	181,431	51,233	3,172	3.8	0.32	0.19	0.31	145	0.0064	1,494	0.13	0.39	1.1	6.4	0.25	79	3,643	1.8	0.00064	6.1	1.0	51	4,539	5.4	529	0.0044	101,510	255	0.0044	0.044	1.9	0.64	1.3	946	120	22	128,839
2043	183,557	52,414	3,172	3.9	0.32	0.19	0.32	145	0.0067	1,574	0.13	0.35	1.1	6.7	0.27	79	3,688	1.5	0.00067	6.2	1.0	51	4,539	4.6	529	0.0044	102,890	255	0.0044	0.044	2.0	0.67	1.3	579	73	13	133,866
2044	184,376	52,092	3,171	3.9	0.33	0.2	0.33	145	0.0068	1,671	0.14	0.35	1.1	6.8	0.27	79	3,693	1.5	0.00068	6.2	1.0	51	4,539	4.6	529	0.0044	103,017	255	0.0044	0.044	2.0	0.68	1.4	579	73	13	136,575
2045	187,155	52,976	3,172	3.9	0.33	0.2	0.32	145	0.0067	1,557	0.13	0.37	1.1	6.7	0.27	79	3,757	1.6	0.00067	6.3	1.1	51	4,539	4.9	529	0.0045	104,762	255	0.0045	0.045	2.0	0.67	1.3	679	86	16	133,758
2046	186,745	51,799	3,172	3.8	0.33	0.2	0.3	145	0.0064	1,486	0.13	0.39	1.1	6.4	0.3	79	3,742	1.7	0.00064	6.3	1.1	51	4,540	5.1	529	0.0045	104,136	255	0.0045	0.045	2.0	0.64	1.3	655	83	15	128,763
2047	201,983	52,985	3,173	3.8	0.36	0.22	0.29	145	0.0064	1,470	0.13	0.44	1.1	6.4	0.37	80	4,015	1.9	0.00064	6.8	1.4	51	4,541	5.6	529	0.0048	111,476	255	0.0049	0.049	2.2	0.64	1.3	495	63	11	128,089
2048	222,414	56,058	3,173	4.0	0.39	0.25	0.28	145	0.0065	1,442	0.13	0.52	1.1	6.5	0.45	80	4,401	2.2	0.00065	7.5	1.6	51	4,542	6.5	529	0.0053	121,971	255	0.0054	0.053	2.4	0.65	1.3	479	61	11	129,793
2049	232,882	58,638	3,174	4.1	0.41	0.27	0.28	145	0.0066	1,397	0.13	0.59	1.2	6.6	0.5	80	4,615	2.5	0.00066	7.8	1.9	51	4,542	7.3	529	0.0056	127,814	255	0.0056	0.056	2.5	0.66	1.3	516	65	12	131,172
2050	239,485	59,886	3,174	4.2	0.42	0.29	0.28	145	0.0066	1,404	0.13	0.63	1.2	6.6	0.55	80	4,741	2.6	0.00066	8.1	2.0	51	4,543	7.7	529	0.0057	131,300	255	0.0058	0.058	2.6	0.66	1.3	454	57	10	132,811
2051	243,278	60,526	3,174	4.2	0.43	0.3	0.28	145	0.0067	1,417	0.13	0.65	1.2	6.7	0.58	80	4,811	2.7	0.00067	8.2	2.1	51	4,543	7.8	529	0.0058	133,263	255	0.0058	0.059	2.6	0.67	1.3	360	46	8.3	133,964
2052	246,757	61,084	3,174	4.3	0.44	0.3	0.28	145	0.0068	1,431	0.14	0.65	1.2	6.8	0.61	80	4,875	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059	135,046	255	0.0059	0.059	2.6	0.68	1.4	239	30	5.5	135,076
2053	248,235	61,157	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,435	0.14	0.66	1.2	6.8	0.62	80	4,900	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.0059	135,740	255	0.006	0.06	2.7	0.68	1.4	141	18	3.2	135,145
2054	249,944	61,387	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,446	0.14	0.66	1.2	6.8	0.63	80	4,930	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006	136,596	255	0.006	0.06	2.7	0.68	1.4	111	14	2.7	135,795
2055	252,972	61,688	3,174	4.3	0.45	0.32	0.29	145	0.0068	1,462	0.14	0.68	1.2	6.8	0.65	80	4,984	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061	138,049	255	0.0061	0.061	2.7	0.68	1.5	113	14	2.7	136,601
2056	248,809	75,905	3,175	5.4	0.44	0.31	0.3	145	0.0069	1,017	0.14	0.67	1.4	6.9	0.63	80	5,234	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006	142,635	255	0.006	0.06	2.7	0.69	1.4	127	16	2.9	137,639
2057	238,664	98,121	3,175	7.1	0.42	0.3	0.32	145	0.0069	641	0.14	0.61	1.8	6.9	0.58	80	5,609	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057	147,692	255	0.0057	0.057	2.5	0.69	1.4	143	18	3.3	137,940
2058	232,800	110,938	3,176	8.2	0.41	0.28	0.33	145	0.0069	518	0.14	0.58	2.0	6.9	0.54	80	5,859	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0056	150,436	255	0.0056	0.056	2.5	0.69	1.4	162	21	3.7	138,218
2059	231,450	115,350	3,176	8.7	0.41	0.28	0.34	145	0.0069	480	0.14	0.57	2.0	6.9	0.53	80	5,973	2.3	0.00069	7.8	1.9	51	4,545	6.6	530	0.0055	151,656	255	0.0056	0.056	2.5	0.69	1.4	185	23	4.2	138,460
2060	233,135	117,134	3,176	8.8	0.41	0.28	0.34	145	0.007	483	0.14	0.57	2.0	7.0	0.53	80	6,057	2.3	0.0007	7.8	1.9	51	4,545	6.7	530	0.0056	153,122	255	0.0056	0.056	2.5	0.7	1.4	212	27	4.9	139,518
2061	234,102	117,262	3,176	8.7	0.41	0.28	0.34	145	0.007	486	0.14	0.58	2.0	7.0	0.53	80	6,083	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056	153,584	255	0.0056	0.056	2.5	0.7	1.4	240	30	5.5	139,838
2062	233,972	122,782	3,176	10	0.41	0.28	0.35	145	0.007	425	0.14	0.58	2.0	7.0	0.53	80	6,199	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056	155,911	255	0.0056	0.056	2.5	0.7	1.4	273	35	6.3	140,676
2063	232,497	128,745	3,176	11	0.41	0.28	0.36	145	0.0071	387	0.14	0.57	2.0	7.1	0.51	80	6,343	2.3	0.00071	7.8	1.8	51	4,546	6.8	530	0.0056	157,707	255	0.0056	0.056	2.5	0.71	1.4	308	39	7.1	141,568
2064	233,632	130,824	3,176	11	0.41	0.28	0.36	145	0.0071	389	0.14	0.57	2.0	7.1	0.51	80	6,425	2.4	0.00071	7.9	1.8	51	4,546	6.9	530	0.0056	159,053	255	0.0056	0.056	2.5	0.71	1.4	346	44	8.0	142,789
2065	234,574	136,451	3,176	14	0.41	0.28	0.37	145	0.0072	335	0.14	0.57	2.0	7.2	0.5	80	6,576	2.4	0.00072	7.9	1.8	51	4,546	6.9	530	0.0056	161,851	255	0.0056	0.056	2.5	0.72	1.4	385	49	8.9	143,409
2066	232,619	143,839	3,176	16	0.41	0.28	0.38	145	0.0072	299	0.14	0.56	2.0	7.2	0.49	80	6,730	2.3	0.00072	7.8	1.8	51	4,546	6.9	530	0.0056	164,047	255	0.0056	0.056	2.5	0.72	1.4	427	54	9.8	144,573
2067	231,421	149,219	3,177	17	0.41	0.27	0.39	145	0.0073	283	0.15	0.56	2.0	7.3	0.49	80	6,867	2.3	0.00073	7.8	1.8	51	4,546	6.9	530	0.0055	165,715	255	0.0056	0.056	2.5	0.73	1.5	471	60	11	145,722
2068	232,988	153,013	3,177	17	0.41	0.28	0.4	145	0.0074	281	0.15	0.56	2.0	7.4	0.48	80	7,020	2.4	0.00074	7.8	1.8	51	4,546	7.0	530	0.0056	167,918	255	0.0056	0.056	2.5	0.74	1.5	516	65	12	147,284
2069	233,683	155,281	3,177	17	0.41	0.28	0.4	145	0.0074	282	0.15	0.56	2.0	7.4	0.48	80	7,126	2.4	0.00074	7.9	1.8	51	4,546	7.0	530	0.0056	169,093	255	0.0056	0.056	2.5	0.74	1.5	552	70	13	148,041
2070	236,372	156,735	3,177	17	0.42	0.28	0.4	145	0.0075	289	0.15	0.57	2.0	7.5	0.48	80	7,228	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057	170,847	255	0.0057	0.057	2.5	0.75	1.5	569	72	13	149,328
2071	238,235	158,106	3,177	16	0.42	0.28	0.4	145	0.0075	296	0.15	0.57	2.0	7.5	0.49	80	7,319	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057	172,193	255	0.0057	0.057	2.5	0.75	1.5	545	69	13	150,505
2072	242,837	159,906	3,177	17	0.43	0.29	0.41	145	0.0076	292	0.15	0.58	2.0	7.6	0.5	80	7,437	2.4	0.00076	8.2	1.8	51	4,547	7.1	530	0.0058	174,992	255	0.0058	0.058	2.6	0.76	1.5	499	63	11	151,916
2073	244,688	159,952	3,177	17	0.43	0.29	0.41	145	0.0076	297	0.15	0.59	2.1	7.6	0.51	80	7,477	2.5	0.00076	8.2	1.9	51	4,547	7.2	530	0.0059	175,821	255	0.0059	0.059	2.6	0.76	1.5	463	59	11	152,292
2074	247,186	160,209	3,177	17	0.44	0.29	0.41	145	0.0077	305	0.15	0.6	2.1	7.7	0.53	80	7,523	2.5	0.00077	8.3	1.9	51	4,547	7.3	530	0.0059	177,034	255	0.0059	0.059	2.6	0.77	1.5	454	57	10	153,237
2075	249,903	160,201	3,177	16	0.44	0.3	0.41	145	0.0077	314	0.15	0.62	2.1	7.7	0.54	80	7,568	2.6	0.00077	8.4	2.0	51	4,547	7.5	530	0.006	178,249	255	0.006	0.06	2.7	0.77	1.5	447	56	10	153,995
2076	255,542	161,888	3,177	18	0.45	0.31	0.41	145	0.0078	302	0.16	0.64	2.1	7.8	0.56	80	7,686	2.7	0.00078	8.6	2.0	51	4,547	7.8	530	0.0061	181,511	255	0.0062	0.061	2.7	0.78	1.6	461	58	11	155,005
2077	258,668	161,866	3,177	18	0.46	0.32	0.4	145	0.0078	305	0.16	0.66	2.2	7.8	0.58	80	7,734	2.8	0.00078	8.7	2.1	51	4,547	8.1	530	0.0062	182,886	255	0.0062	0.062	2.8	0.78	1.6	476	60	11	155,356
2078	262,211	162,267	3,177	18	0.46	0.32	0.4	145	0.0078	311	0.16	0.69	2.2	7.8	0.61	80	7,796	2.9	0.00078	8.8	2.2	51	4,547	8.4	530	0.0063	184,639	255	0.0063	0.063	2.8	0.78	1.6	496	63	11	156,236
2079	265,455	163,902	3,177	18	0.47	0.33	0.41	145	0.0079	311	0.16	0.71	2.2	7.9	0.63	80	7,884	3.0	0.00079	8.9	2.3	51	4,547	8.7	530	0.0064	186,782	255	0.0064	0.064	2.8	0.79	1.6	509	64	12	157,251
2080	268,416	166,108	3,177	18	0.47	0.34	0.41	145	0.0079	311	0.16	0.74	2.3	7.9	0.65	80	7,990	3.1	0.00079	9.0	2.4	51	4,547	9.0	530	0.0064	189,023	255	0.0064	0.065	2.9	0.79	1.6	510	64	12	158,470
2081	270,883	166,367	3,177	18	0.48	0.35	0.41	145	0.0079	316	0.16	0.76	2.3	7.9	0.67	80	8,041	3.1	0.00079	9.1	2.4	51	4,548	9.2	530	0.0065	190,209	255	0.0065	0.065	2.9	0.79	1.6	518	65	12	158,838
2082	271,299	170,361	3,177	19	0.48	0.35	0.41	145	0.008	304	0.16	0.77	2.3	8.0	0.68	80	8,150	3.2	0.0008	9.1	2.5	51	4,548	9.3	530	0.0065	192,048	255	0.0065	0.065	2.9	0.8	1.6	505	64	12	159,814
2083	270,406	174,128	3,178	20	0.48	0.35	0.42	145	0.008	294	0.16	0.78	2.3	8.0	0.69	80	8,248	3.2	0.0008	9.1	2.5	51	4,548	9.4	530	0.0065	193,181	255	0.0065	0.065	2.9	0.8	1.6	514	65	12	160,383
2084	272,860	176,718	3,178	20	0.48	0.36	0.42	145	0.0081	295	0.16	0.79	2.3	8.1	0.7	80	8,376	3.3	0.00081	9.2	2.6	51	4,548	9.6	530	0.0066	195,290	255	0.0066	0.066	2.9	0.81	1.6	510	64	12	161,637
2085	272,104	178,645	3,178	20	0.48	0.36	0.43	145	0.0081	293	0.16	0.79	2.3	8.1	0.7	80	8,448	3.3	0.00081	9.2	2.6	51	4,548	9.7	530	0.0066	195,692	255	0.0065	0.065	2.9	0.81	1.6	520	66	12	161,890
2086	274,233	180,244	3,178	20	0.48	0.37	0.43	145	0.0081	296	0.16	0.81	2.4	8.1	0.72	80	8,554	3.3	0.00081	9.2	2.6	51	4,548	9.8	530	0.0066	197,239	255	0.0066	0.066	2.9	0.81	1.6	510	64	12	162,778
2087	274,498	182,023	3,178	19	0.48	0.37	0.43	145	0.0082	298	0.16	0.8	2.4	8.2	0.72	80	8,645	3.3	0.00082	9.2	2.6	51	4,548	9.8	530	0.0066	198,011	255	0.0066	0.066	2.9	0.82	1.6	514	65	12	163,470
2088	278,287	184,335	3,178	20	0.49	0.37	0.43	145	0.0082	293	0.16	0.81	2.4	8.2	0.73	80	8,791	3.4	0.00082	9.4	2.6	51	4,548	9.9	530	0.0067	200,610	255	0.0067	0.067	3.0	0.82	1.7	488	62	11	164,570
2089	278,103	188,088	3,178	22	0.49	0.37	0.44	145	0.0082	274	0.16	0.81	2.4	8.2	0.72	80	8,913	3.3	0.00082	9.4	2.6	51	4,548	9.8	530	0.0066	202,044	255	0.0067	0.067	3.0	0.82	1.7	486	61	11	164,772
2090	277,811	191,638	3,178	23	0.49	0.37	0.44	145	0.0083	268	0.17	0.81	2.4	8.3	0.73	80	9,038	3.3	0.00083	9.4	2.6	51	4,549	9.7	530	0.0066	203,304	255	0.0067	0.067	3.0	0.83	1.7	459	58	11	165,462
2091	278,428	193,988	3,178	23	0.49	0.37	0.45	145	0.0083	267	0.17	0.81	2.4	8.3	0.72	80	9,159	3.3	0.00083	9.4	2.6	51	4,549	9.7	530	0.0066	204,448	255	0.0067	0.067	3.0	0.83	1.7	466	59	11	166,285
2092	280,491	196,915	3,178	23	0.49	0.37	0.45	145	0.0084	268	0.17	0.81	2.4	8.4	0.73	80	9,318	3.3	0.00084	9.4	2.6	51	4,549	9.8	530	0.0067	206,468	255	0.0068	0.067	3.0	0.84	1.7	462	58	11	167,587
2093	278,918	201,019	3,178	24	0.49	0.37	0.46	145	0.0084	258	0.17	0.8	2.4	8.4	0.72	80	9,439	3.3	0.00084	9.4	2.6	51	4,549	9.7	530	0.0066	207,376	256	0.0067	0.067	3.0	0.84	1.7	480	61	11	168,175
2094	276,748	206,424	3,178	25	0.49	0.37	0.47	145	0.0085	249	0.17	0.8	2.4	8.5	0.71	80	9,600	3.3	0.00085	9.3	2.6	51	4,549	9.7	530	0.0066	208,538	256	0.0067	0.067	3.0	0.85	1.7	496	63	11	169,130
2095	275,408	208,789	3,178	25	0.49	0.36	0.47	145	0.0085	248	0.17	0.79	2.4	8.5	0.7	80	9,687	3.3	0.00085	9.3	2.5	51	4,549	9.6	530	0.0066	208,823	256	0.0066	0.066	2.9	0.85	1.7	524	66	12	169,816
2096	273,448	212,623	3,178	26	0.48	0.36	0.48	145	0.0085	246	0.17	0.77	2.4	8.5	0.68	80	9,817	3.2	0.00085	9.2	2.5	51	4,549	9.4	530	0.0065	209,393	256	0.0066	0.066	2.9	0.85	1.7	553	70	13	170,905
2097	273,679	213,477	3,178	26	0.48	0.36	0.48	145	0.0086	247	0.17	0.78	2.4	8.6	0.68	80	9,883	3.2	0.00086	9.2	2.5	51	4,549	9.5	530	0.0065	209,764	256	0.0066	0.066	2.9	0.86	1.7	583	74	13	171,124
2098	273,719	215,844	3,179	25	0.48	0.36	0.49	145	0.0086	248	0.17	0.78	2.4	8.6	0.68	80	10,008	3.3	0.00086	9.2	2.5	51	4,549	9.6	530	0.0065	210,638	256	0.0066	0.066	2.9	0.86	1.7	614	78	14	171,837
2099	275,097	216,739	3,179	25	0.49	0.36	0.49	145	0.0086	252	0.17	0.79	2.4	8.6	0.68	80	10,088	3.3	0.00086	9.3	2.5	51	4,549	10	530	0.0066	211,548	256	0.0066	0.066	2.9	0.86	1.7	646	82	15	172,453
2100	278,144	219,910	3,179	26	0.49	0.36	0.49	145	0.0087	245	0.17	0.79	2.4	8.7	0.68	80	10,271	3.3	0.00087	9.4	2.5	51	4,549	10	530	0.0066	214,133	256	0.0067	0.067	3.0	0.87	1.7	677	86	16	173,472
2101	280,827	221,205	3,179	26	0.5	0.37	0.49	145	0.0087	248	0.17	0.81	2.4	8.7	0.69	80	10,378	3.4	0.00087	9.5	2.6	51	4,549	10	530	0.0067	215,799	256	0.0067	0.068	3.0	0.87	1.7	709	90	16	174,383
2102	282,435	222,914	3,179	26	0.5	0.37	0.49	145	0.0088	250	0.18	0.81	2.4	8.8	0.69	80	10,510	3.4	0.00088	9.5	2.6	51	4,550	10	530	0.0068	217,116	256	0.0068	0.068	3.0	0.88	1.8	741	94	17	175,164
2103	287,764	225,069	3,179	28	0.51	0.38	0.49	145	0.0088	242	0.18	0.84	2.4	8.8	0.71	80	10,667	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069	220,356	256	0.0069	0.069	3.1	0.88	1.8	774	98	18	175,863
2104	291,969	227,497	3,179	28	0.51	0.38	0.5	145	0.0089	244	0.18	0.85	2.5	8.9	0.72	80	10,854	3.6	0.00089	9.8	2.7	51	4,550	11	530	0.007	223,119	256	0.007	0.07	3.1	0.89	1.8	808	102	19	177,220
2105	290,746	229,390	3,179	29	0.51	0.38	0.5	145	0.0089	240	0.18	0.85	2.4	8.9	0.71	80	10,899	3.6	0.00089	9.8	2.6	51	4,550	11	530	0.007	223,336	256	0.007	0.07	3.1	0.89	1.8	837	106	19	177,533
2106	286,225	234,419	3,179	31	0.5	0.37	0.51	145	0.0089	229	0.18	0.82	2.4	8.9	0.68	80	10,998	3.5	0.00089	9.6	2.5	51	4,550	10	530	0.0069	223,299	256	0.0069	0.069	3.1	0.89	1.8	865	109	20	178,211
2107	286,393	238,177	3,179	32	0.5	0.37	0.52	145	0.009	225	0.18	0.83	2.4	9.0	0.69	80	11,130	3.5	0.0009	9.6	2.6	51	4,550	10	530	0.0069	224,857	256	0.0069	0.069	3.1	0.9	1.8	890	113	20	179,040
2108	288,844	241,781	3,179	32	0.51	0.38	0.52	145	0.009	224	0.18	0.84	2.4	9.0	0.7	80	11,329	3.6	0.0009	9.7	2.6	51	4,550	11	530	0.0069	227,313	256	0.0069	0.069	3.1	0.9	1.8	917	116	21	180,178
2109	289,604	243,478	3,180	32	0.51	0.38	0.52	145	0.009	223	0.18	0.85	2.4	9.0	0.7	80	11,430	3.6	0.0009	9.7	2.6	51	4,551	11	530	0.0069	228,265	256	0.007	0.07	3.1	0.9	1.8	937	118	22	180,248
2110	292,022	245,603	3,180	32	0.51	0.38	0.52	145	0.009	223	0.18	0.87	2.5	9.0	0.72	80	11,588	3.7	0.0009	9.8	2.7	51	4,551	11	530	0.007	230,088	256	0.007	0.07	3.1	0.9	1.8	958	121	22	180,830
2111	293,958	247,234	3,180	32	0.52	0.39	0.52	145	0.0091	224	0.18	0.88	2.5	9.1	0.73	80	11,709	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007	231,538	256	0.0071	0.071	3.1	0.91	1.8	979	124	22	181,243
2112	297,657	249,143	3,180	32	0.52	0.4	0.52	145	0.0091	225	0.18	0.91	2.5	9.1	0.75	80	11,877	3.9	0.00091	10	2.8	51	4,551	11	530	0.0071	233,857	256	0.0072	0.072	3.2	0.91	1.8	999	126	23	181,975
2113	298,576	249,671	3,180	32	0.53	0.4	0.52	145	0.0091	226	0.18	0.92	2.5	9.1	0.76	80	11,947	3.9	0.00091	10	2.8	51	4,551	12	530	0.0071	234,413	256	0.0072	0.072	3.2	0.91	1.8	1,010	128	23	181,870
2114	301,761	250,509	3,180	32	0.53	0.41	0.52	145	0.0091	227	0.18	0.94	2.5	9.1	0.78	80	12,063	4.0	0.00091	10	2.9	51	4,551	12	530	0.0072	236,120	256	0.0073	0.073	3.2	0.91	1.8	1,016	128	23	182,135
2115	303,202	251,343	3,180	32	0.53	0.41	0.52	145	0.0091	228	0.18	0.95	2.5	9.1	0.79	80	12,153	4.0	0.00091	10	3.0	51	4,551	12	530	0.0073	237,011	256	0.0073	0.073	3.2	0.91	1.9	1,015	128	23	182,344
2116	307,639	252,867	3,180	32	0.54	0.42	0.52	145	0.0092	232	0.18	0.98	2.6	9.2	0.82	80	12,303	4.1	0.00092	10	3.0	51	4,552	12	530	0.0074	239,554	256	0.0074	0.074	3.3	0.92	1.9	1,005	127	23	183,370
2117	306,517	255,238	3,180	32	0.54	0.42	0.52	145	0.0092	227	0.18	0.98	2.6	9.2	0.82	80	12,375	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	239,961	256	0.0074	0.074	3.3	0.92	1.9	981	124	23	183,400
2118	306,082	258,478	3,180	33	0.54	0.42	0.53	145	0.0092	223	0.18	0.99	2.6	9.2	0.83	80	12,496	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	241,031	256	0.0074	0.074	3.3	0.92	1.9	952	120	22	183,657
2119	305,611	259,895	3,180	33	0.54	0.43	0.53	145	0.0092	222	0.18	0.98	2.6	9.2	0.84	80	12,572	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073	241,308	256	0.0074	0.073	3.3	0.92	1.9	917	116	21	183,671
2120	306,444	262,593	3,181	33	0.54	0.43	0.53	145	0.0092	221	0.18	0.99	2.6	9.2	0.85	80	12,714	4.2	0.00092	10	3.1	51	4,552	12	530	0.0074	242,675	256	0.0074	0.074	3.3	0.92	2.0	886	112	20	184,250
2121	304,851	267,122	3,181	37	0.54	0.43	0.54	145	0.0092	206	0.18	0.99	2.6	9.2	0.85	80	12,830	4.1	0.00092	10	3.1	51	4,552	12	530	0.0074	243,785	256	0.0073	0.073	3.3	0.92	2.0	850	107	20	184,044
2122	301,229	272,900	3,181	39	0.53	0.43	0.55	145	0.0092	197	0.18	0.98	2.7	9.2	0.85	80	12,987	4.1	0.00092	10	3.1	51	4,552	12	531	0.0073	244,406	256	0.0072	0.072	3.2	0.92	2.0	814	103	19	184,430
2123	299,684	275,549	3,181	40	0.53	0.43	0.55	145	0.0092	195	0.18	0.98	2.7	9.2	0.85	80	13,089	4.1	0.00092	10	3.1	51	4,553	12	531	0.0072	244,692	256	0.0072	0.072	3.2	0.92	2.0	784	99	18	184,660
2124	297,851	280,147	3,181	41	0.53	0.43	0.56	145	0.0093	191	0.19	0.97	2.7	9.3	0.85	80	13,268	4.1	0.00093	10	3.1	51	4,553	12	531	0.0072	245,592	256	0.0072	0.072	3.2	0.93	2.0	734	93	17	185,381
2125	296,775	281,667	3,181	41	0.52	0.43	0.57	145	0.0093	190	0.19	0.97	2.7	9.3	0.85	80	13,351	4.0	0.00093	10	3.1	51	4,553	12	531	0.0071	245,610	256	0.0071	0.071	3.2	0.93	1.9	698	88	16	185,380
2126	295,324	284,951	3,181	42	0.52	0.43	0.57	145	0.0093	188	0.19	0.96	2.7	9.3	0.85	80	13,494	4.0	0.00093	9.9	3.1	51	4,553	12	531	0.0071	246,156	256	0.0071	0.071	3.2	0.93	1.9	626	79	14	185,890
2127	294,760	286,541	3,181	42	0.52	0.43	0.57	145	0.0093	186	0.19	0.95	2.7	9.3	0.85	80	13,593	3.9	0.00093	9.9	3.1	51	4,553	12	531	0.0071	246,430	256	0.0071	0.071	3.1	0.93	1.9	587	74	14	185,957
2128	293,597	289,665	3,181	43	0.52	0.43	0.58	145	0.0093	184	0.19	0.94	2.8	9.3	0.84	80	13,762	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.0071	246,996	256	0.0071	0.071	3.1	0.93	1.9	510	64	12	186,328
2129	293,007	290,125	3,181	43	0.52	0.42	0.58	145	0.0093	183	0.19	0.93	2.8	9.3	0.84	80	13,826	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007	246,804	256	0.0071	0.07	3.1	0.93	1.9	476	60	11	185,930
2130	291,816	292,356	3,182	43	0.51	0.42	0.58	145	0.0093	182	0.19	0.91	2.8	9.3	0.83	80	13,964	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	247,001	256	0.007	0.07	3.1	0.93	1.9	417	53	9.6	186,107
2131	292,214	293,256	3,182	43	0.52	0.42	0.58	145	0.0093	182	0.19	0.91	2.8	9.3	0.83	80	14,055	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	247,428	256	0.007	0.07	3.1	0.93	1.9	397	50	9.1	186,064
2132	292,249	295,795	3,182	43	0.52	0.42	0.59	145	0.0093	181	0.19	0.9	2.8	9.3	0.83	80	14,220	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007	248,310	256	0.007	0.07	3.1	0.93	1.9	365	46	8.4	186,657
2133	292,216	295,678	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.9	2.8	9.3	0.83	80	14,264	3.7	0.00093	9.8	3.0	51	4,554	11	531	0.007	248,160	256	0.007	0.07	3.1	0.93	1.9	356	45	8.2	186,125
2134	292,084	297,209	3,182	43	0.51	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,386	3.6	0.00093	9.8	2.9	51	4,554	11	531	0.007	248,556	256	0.007	0.07	3.1	0.93	1.9	342	43	7.9	186,338

Table A8. Annual loads of the NAG backfill for the low nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	293,473	298,007	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,473	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.007	249,424	256	0.0071	0.071	3.1	0.93	1.9	341	43	7.8	186,569
2136	294,228	300,087	3,182	44	0.52	0.42	0.59	145	0.0094	180	0.19	0.88	2.8	9.4	0.82	80	14,624	3.6	0.00094	9.9	2.9	51	4,554	10	531	0.0071	250,465	256	0.0071	0.071	3.1	0.94	1.9	338	43	7.8	187,180
2137	294,638	299,791	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,657	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.0071	250,461	256	0.0071	0.071	3.1	0.93	1.9	337	43	7.7	186,716
2138	292,401	302,917	3,182	45	0.52	0.41	0.59	145	0.0093	175	0.19	0.88	2.8	9.3	0.81	80	14,754	3.6	0.00093	9.8	2.9	51	4,554	10	531	0.007	250,635	256	0.007	0.07	3.1	0.93	1.9	337	43	7.7	186,790
2139	289,806	306,735	3,182	46	0.51	0.41	0.6	145	0.0094	171	0.19	0.87	2.8	9.4	0.8	80	14,872	3.5	0.00094	9.8	2.9	51	4,554	10	531	0.0069	250,917	256	0.007	0.07	3.1	0.94	1.9	337	43	7.7	187,056
2140	288,865	309,435	3,182	47	0.51	0.41	0.61	145	0.0094	170	0.19	0.86	2.8	9.4	0.79	80	15,001	3.5	0.00094	9.7	2.8	51	4,554	10	531	0.0069	251,475	256	0.0069	0.069	3.1	0.94	1.9	338	43	7.8	187,514
2141	285,669	310,955	3,182	48	0.5	0.4	0.61	145	0.0093	167	0.19	0.84	2.7	9.3	0.78	80	15,058	3.4	0.00093	9.6	2.8	51	4,554	10	531	0.0068	250,532	256	0.0069	0.069	3.0	0.93	1.9	338	43	7.8	186,895
2142	284,553	312,156	3,182	48	0.5	0.4	0.61	145	0.0093	166	0.19	0.84	2.7	9.3	0.77	80	15,121	3.4	0.00093	9.6	2.8	51	4,555	10	531	0.0068	250,428	256	0.0068	0.068	3.0	0.93	1.9	338	43	7.8	186,886
2143	282,757	314,534	3,182	48	0.5	0.39	0.62	145	0.0094	164	0.19	0.82	2.7	9.4	0.75	80	15,255	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	250,419	256	0.0068	0.068	3.0	0.94	1.9	339	43	7.8	187,034
2144	282,620	316,435	3,182	49	0.5	0.39	0.62	145	0.0094	164	0.19	0.81	2.7	9.4	0.75	80	15,360	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	251,018	256	0.0068	0.068	3.0	0.94	1.9	340	43	7.8	187,551
2145	280,136	317,427	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.79	2.7	9.4	0.72	80	15,442	3.2	0.00094	9.4	2.6	51	4,555	9.4	531	0.0067	250,138	256	0.0067	0.067	3.0	0.94	1.9	339	43	7.8	187,019
2146	279,462	318,319	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.78	2.7	9.4	0.72	80	15,504	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,109	256	0.0067	0.067	3.0	0.94	1.9	338	43	7.8	187,081
2147	278,291	320,039	3,183	49	0.49	0.38	0.63	145	0.0094	161	0.19	0.76	2.7	9.4	0.7	80	15,627	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,097	256	0.0067	0.067	3.0	0.94	1.9	336	42	7.7	187,212
2148	278,328	321,567	3,183	50	0.49	0.37	0.64	145	0.0094	161	0.19	0.75	2.7	9.4	0.69	80	15,722	3.1	0.00094	9.4	2.5	51	4,555	8.9	531	0.0067	250,648	256	0.0067	0.067	3.0	0.94	1.9	334	42	7.7	187,667
2149	276,244	321,860	3,183	50	0.49	0.37	0.64	145	0.0094	159	0.19	0.73	2.6	9.4	0.67	80	15,777	3.0	0.00094	9.3	2.4	51	4,555	8.7	531	0.0066	249,685	256	0.0066	0.066	2.9	0.94	1.9	324	41	7.5	187,030
2150	275,672	322,362	3,183	50	0.49	0.36	0.64	145	0.0093	159	0.19	0.72	2.6	9.3	0.66	80	15,820	2.9	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,550	256	0.0066	0.066	2.9	0.93	1.9	317	40	7.3	186,985

Table A9. Source terms of the NAG backfill for the high nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2023	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2024	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2025	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2026	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2027	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2028	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2029	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2030	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2031	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2032	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2033	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2034	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2035	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2036	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2037	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2038	6.9	1,210	8.4	29	0.15	0.0021	0.0012	0.0023	1.3	0.00005	28	0.001
2039	7.8	1,302	85	29	0.0094	0.0023	0.0013	0.0023	1.3	0.00005	31	0.001
2040	8.2	1,465	225	29	0.017	0.0026	0.0014	0.0022	1.3	0.00005	34	0.001
2041	8.4	1,508	378	29	0.028	0.0027	0.0015	0.0023	1.3	0.00005	13	0.001
2042	8.5	1,409	396	25	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001
2043	8.4	1,372	388	24	0.029	0.0024	0.0015	0.0024	1.1	0.00005	12	0.001
2044	8.4	1,350	377	23	0.028	0.0024	0.0014	0.0024	1.1	0.00005	13	0.001
2045	8.5	1,399	394	24	0.029	0.0025	0.0015	0.0024	1.1	0.00005	12	0.001
2046	8.5	1,450	399	25	0.029	0.0026	0.0016	0.0023	1.1	0.00005	12	0.001
2047	8.5	1,577	410	25	0.03	0.0028	0.0017	0.0022	1.1	0.00005	12	0.001
2048	8.5	1,714	430	24	0.03	0.003	0.0019	0.0022	1.1	0.00005	11	0.001
2049	8.5	1,776	447	24	0.031	0.0031	0.0021	0.0021	1.1	0.00005	11	0.001
2050	8.5	1,803	451	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001
2051	8.5	1,816	452	24	0.031	0.0032	0.0022	0.0021	1.1	0.00005	11	0.001
2052	8.5	1,827	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001
2053	8.5	1,837	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001
2054	8.5	1,841	452	23	0.031	0.0032	0.0023	0.0021	1.1	0.00005	11	0.001
2055	8.5	1,852	451	23	0.031	0.0033	0.0023	0.0021	1.1	0.00005	11	0.001
2056	8.6	1,808	551	23	0.039	0.0032	0.0023	0.0022	1.1	0.00005	7.4	0.001
2057	8.7	1,730	710	23	0.052	0.0031	0.0022	0.0023	1.1	0.00005	4.7	0.001
2058	8.7	1,684	801	23	0.059	0.003	0.0021	0.0024	1.1	0.00005	3.8	0.001
2059	8.7	1,672	832	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001
2060	8.7	1,671	838	23	0.062	0.0029	0.002	0.0024	1.0	0.00005	3.5	0.001
2061	8.7	1,674	837	23	0.062	0.003	0.002	0.0024	1.0	0.00005	3.5	0.001
2062	8.8	1,663	872	23	0.065	0.0029	0.002	0.0025	1.0	0.00005	3.3	0.001
2063	8.8	1,642	908	22	0.07	0.0029	0.002	0.0025	1.0	0.00005	3.0	0.001
2064	8.8	1,636	915	22	0.069	0.0029	0.002	0.0025	1.0	0.00005	3.0	0.001
2065	8.9	1,636	951	22	0.092	0.0029	0.0019	0.0026	1.0	0.00005	2.4	0.001
2066	8.9	1,609	994	22	0.1	0.0028	0.0019	0.0026	1.0	0.00005	2.1	0.001
2067	8.9	1,588	1,023	22	0.11	0.0028	0.0019	0.0027	1.	0.00005	2.0	0.001
2068	8.9	1,582	1,038	22	0.11	0.0028	0.0019	0.0027	0.99	0.00005	2.0	0.001
2069	8.9	1,578	1,048	21	0.1	0.0028	0.0019	0.0027	0.98	0.00005	2.0	0.001
2070	8.9	1,583	1,048	21	0.1	0.0028	0.0019	0.0027	0.97	0.00005	2.1	0.001
2071	8.9	1,583	1,049	21	0.095	0.0028	0.0019	0.0027	0.96	0.00005	2.1	0.001
2072	8.9	1,598	1,052	21	0.1	0.0028	0.0019	0.0027	0.96	0.00005	2.0	0.001
2073	8.9	1,607	1,049	21	0.1	0.0028	0.0019	0.0027	0.95	0.00005	2.1	0.001
2074	8.9	1,613	1,044	21	0.097	0.0028	0.0019	0.0026	0.95	0.00005	2.1	0.001
2075	8.9	1,623	1,039	21	0.093	0.0029	0.0019	0.0026	0.94	0.00005	2.2	0.001
2076	8.9	1,649	1,044	20	0.11	0.0029	0.002	0.0026	0.94	0.00005	2.0	0.001
2077	8.9	1,665	1,042	20	0.11	0.0029	0.002	0.0026	0.93	0.00005	2.0	0.001
2078	8.9	1,678	1,038	20	0.11	0.003	0.0021	0.0026	0.93	0.00005	2.0	0.001
2079	8.9	1,688	1,042	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001
2080	8.9	1,694	1,048	20	0.11	0.003	0.0021	0.0026	0.92	0.00005	2.0	0.001
2081	8.9	1,705	1,047	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.001
2082	8.9	1,697	1,065	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	2.0	0.001
2083	8.9	1,686	1,085	20	0.11	0.003	0.0022	0.0026	0.91	0.00005	1.9	0.001
2084	8.9	1,688	1,092	20	0.11	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.001
2085	8.9	1,680	1,102	20	0.11	0.003	0.0022	0.0026	0.9	0.00005	1.9	0.001
2086	8.9	1,684	1,106	20	0.11	0.003	0.0022	0.0026	0.89	0.00005	1.9	0.001
2087	8.9	1,679	1,112	19	0.1	0.003	0.0022	0.0026	0.89	0.00005	2.0	0.001
2088	8.9	1,691	1,119	19	0.11	0.003	0.0023	0.0026	0.88	0.00005	1.9	0.001
2089	9.0	1,688	1,141	19	0.13	0.003	0.0022	0.0027	0.88	0.00005	1.7	0.001
2090	9.0	1,679	1,158	19	0.13	0.003	0.0022	0.0027	0.88	0.00005	1.6	0.001
2091	9.0	1,674	1,166	19	0.13	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001
2092	9.0	1,674	1,174	19	0.13	0.003	0.0022	0.0027	0.87	0.00005	1.6	0.001
2093	9.0	1,658	1,195	19	0.14	0.0029	0.0022	0.0027	0.86	0.00005	1.6	0.001
2094	9.0	1,636	1,220	19	0.14	0.0029	0.0022	0.0028	0.86	0.00005	1.5	0.001
2095	9.0	1,622	1,228	19	0.14	0.0029	0.0021	0.0028	0.86	0.00005	1.5	0.001
2096	9.0	1,600	1,243	19	0.14	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.001
2097	9.0	1,599	1,246	19	0.13	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.001
2098	9.0	1,593	1,254	18	0.13	0.0028	0.0021	0.0028	0.85	0.00005	1.5	0.001
2099	9.0	1,595	1,255	18	0.13	0.0028	0.0021	0.0028	0.84	0.00005	1.6	0.001
2100	9.0	1,603	1,267	18	0.14	0.0028	0.0021	0.0028	0.84	0.00005	1.5	0.001
2101	9.0	1,610	1,267	18	0.14	0.0028	0.0021	0.0028	0.83	0.00005	1.5	0.001
2102	9.0	1,612	1,271	18	0.14	0.0028	0.0021	0.0028	0.83	0.00005	1.5	0.001
2103	9.1	1,636	1,280	18	0.16	0.0029	0.0021	0.0028	0.83	0.00005	1.4	0.001
2104	9.1	1,647	1,284	18	0.16	0.0029	0.0022	0.0028	0.82	0.00005	1.4	0.001
2105	9.1	1,637	1,292	18	0.16	0.0029	0.0021	0.0028	0.82	0.00005	1.4	0.001
2106	9.1	1,606	1,315	18	0.17	0.0028	0.0021	0.0029	0.82	0.00005	1.3	0.001
2107	9.1	1,599	1,330	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.001
2108	9.1	1,603	1,342	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.3	0.001
2109	9.1	1,606	1,351	18	0.18	0.0028	0.0021	0.0029	0.81	0.00005	1.2	0.001
2110	9.1	1,614	1,358	18	0.18	0.0028	0.0021	0.0029	0.8	0.00005	1.2	0.001
2111	9.1	1,621	1,364	18	0.18	0.0029	0.0021	0.0029	0.8	0.00005	1.2	0.001
2112	9.1	1,635	1,369	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.001
2113	9.1	1,641	1,372	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.001
2114	9.1	1,656	1,375	17	0.17	0.0029	0.0022	0.0029	0.8	0.00005	1.3	0.001
2115	9.1	1,662	1,378	17	0.17	0.0029	0.0023	0.0029	0.8	0.00005	1.3	0.001
2116	9.1	1,677	1,378	17	0.16	0.003	0.0023	0.0028	0.79	0.00005	1.3	0.001
2117	9.1	1,670	1,391	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.3	0.001
2118	9.1	1,666	1,406	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.3	0.001
2119	9.1	1,663	1,414	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001
2120	9.1	1,662	1,424	17	0.17	0.0029	0.0023	0.0029	0.79	0.00005	1.2	0.001
2121	9.1	1,656	1,451	17	0.2	0.0029	0.0023	0.0029	0.79	0.00005	1.1	0.001
2122	9.1	1,633	1,480	17	0.21	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001
2123	9.1	1,622	1,492	17	0.22	0.0029	0.0023	0.003	0.79	0.00005	1.1	0.001
2124	9.2	1,606	1,511	17	0.22	0.0028	0.0023	0.003	0.78	0.00005	1.0	0.001
2125	9.2	1,600	1,519	17	0.22	0.0028	0.0023	0.0031	0.78	0.00005	1.02	0.001
2126	9.2	1,588	1,533	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.01	0.001
2127	9.2	1,585	1,541	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	1.	0.001
2128	9.2	1,575	1,555	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001
2129	9.2	1,576	1,560	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.99	0.001
2130	9.2	1,568	1,571	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001
2131	9.2	1,570	1,576	17	0.23	0.0028	0.0023	0.0031	0.78	0.00005	0.98	0.001
2132	9.2	1,565	1,585	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.97	0.001
2133	9.2	1,570	1,589	17	0.23	0.0028	0.0022	0.0031	0.78	0.00005	0.97	0.001
2134	9.2	1,567	1,595	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001

Model Year	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2023	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2024	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2025	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2026	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2027	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2028	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2029	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2030	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2031	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2032	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2033	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2034	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2035	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2036	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2037	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2038	0.0057	0.004	0.05	0.0001	0.72	20	0.034	0.000005	0.041	0.0074	0.46	41	0.11	4.8	0.000029
2039	0.0058	0.004	0.05	0.00032	0.72	23	0.034	0.000005	0.044	0.008	0.46	41	0.11	4.8	0.000031
2040	0.0057	0.004	0.05	0.00082	0.72	27	0.032	0.000005	0.049	0.009	0.46	41	0.1	4.8	0.000035
2041	0.0042	0.0081	0.05	0.0017	0.72	30	0.021	0.000005	0.051	0.0089	0.46	41	0.067	4.8	0.000036
2042	0.003	0.0082	0.05	0.002	0.62	28	0.014	0.000005	0.047	0.008	0.39	35	0.042	4.1	0.000034
2043	0.0026	0.0081	0.05	0.002	0.59	28	0.012	0.000005	0.046	0.0077	0.38	34	0.034	4.0	0.000033
2044	0.0026	0.008	0.05	0.002	0.58	27	0.011	0.000005	0.045	0.0075	0.37	33	0.033	3.9	0.000032
2045	0.0028	0.0082	0.05	0.002	0.59	28	0.012	0.000005	0.047	0.0079	0.38	34	0.037	4.0	0.000034
2046	0.003	0.0082	0.05	0.0023	0.62	29	0.013	0.000005	0.049	0.0089	0.39	35	0.04	4.1	0.000035
2047	0.0035	0.0084	0.05	0.0029	0.62	31	0.015	0.000005	0.053	0.011	0.4	35	0.043	4.1	0.000038
2048	0.004	0.0087	0.05	0.0034	0.61	34	0.017	0.000005	0.058	0.013	0.39	35	0.05	4.1	0.000041
2049	0.0045	0.0089	0.05	0.0038	0.61	35	0.019	0.000005	0.06	0.014	0.39	35	0.056	4.0	0.000043
2050	0.0047	0.009	0.05	0.0042	0.6	36	0.02	0.000005	0.061	0.015	0.38	34	0.058	4.0	0.000043
2051	0.0048	0.009	0.05	0.0043	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.058	4.0	0.000044
2052	0.0048	0.009	0.05	0.0045	0.59	36	0.02	0.000005	0.061	0.016	0.38	34	0.057	3.9	0.000044
2053	0.0049	0.009	0.05	0.0046	0.59	36	0.02	0.000005	0.062	0.016	0.38	34	0.057	3.9	0.000044
2054	0.0049	0.009	0.05	0.0047	0.59	36	0.02	0.000005	0.062	0.016	0.37	33	0.057	3.9	0.000044
2055	0.005	0.009	0.05	0.0048	0.58	36	0.02	0.000005	0.062	0.017	0.37	33	0.058	3.9	0.000044
2056	0.0048	0.01	0.05	0.0046	0.58	38	0.02	0.000005	0.061	0.016	0.37	33	0.057	3.8	0.000043
2057	0.0044	0.013	0.05	0.0042	0.58	41	0.018	0.000005	0.058	0.015	0.37	33	0.052	3.8	0.000041
2058	0.0042	0.015	0.05	0.0039	0.58	42	0.017	0.000005	0.057	0.014	0.37	33	0.049	3.8	0.00004
2059	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.37	33	0.048	3.8	0.00004
2060	0.0041	0.014	0.05	0.0038	0.57	43	0.017	0.000005	0.056	0.014	0.36	33	0.048	3.8	0.00004
2061	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.014	0.36	33	0.049	3.8	0.00004
2062	0.0041	0.014	0.05	0.0038	0.57	44	0.017	0.000005	0.056	0.013	0.36	32	0.049	3.8	0.00004
2063	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039
2064	0.004	0.014	0.05	0.0036	0.56	45	0.016	0.000005	0.055	0.013	0.36	32	0.048	3.7	0.000039
2065	0.004	0.014	0.05	0.0035	0.56	46	0.016	0.000005	0.055	0.013	0.35	32	0.048	3.7	0.000039
2066	0.0039	0.014	0.05	0.0034	0.55	47	0.016	0.000005	0.054	0.012	0.35	31	0.048	3.7	0.000039
2067	0.0039	0.013	0.05	0.0033	0.55	47	0.016	0.000005	0.053	0.012	0.35	31	0.047	3.6	0.000038
2068	0.0038	0.013	0.05	0.0033	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038
2069	0.0038	0.013	0.05	0.0032	0.54	48	0.016	0.000005	0.053	0.012	0.34	31	0.047	3.6	0.000038
2070	0.0038	0.013	0.05	0.0032	0.53	48	0.016	0.000005	0.053	0.012	0.34	30	0.048	3.5	0.000038
2071	0.0038	0.013	0.05	0.0032	0.53	49	0.016	0.000005	0.053	0.012	0.34	30	0.047	3.5	0.000038
2072	0.0038	0.013	0.05	0.0033	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038
2073	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.012	0.33	30	0.047	3.5	0.000038
2074	0.0039	0.014	0.05	0.0034	0.52	49	0.016	0.000005	0.054	0.013	0.33	30	0.048	3.5	0.000039
2075	0.004	0.014	0.05	0.0035	0.52	49	0.017	0.000005	0.055	0.013	0.33	30	0.049	3.4	0.000039
2076	0.0041	0.014	0.05	0.0036	0.51	50	0.017	0.000005	0.055	0.013	0.33	29	0.05	3.4	0.000039
2077	0.0043	0.014	0.05	0.0038	0.51	50	0.018	0.000005	0.056	0.014	0.33	29	0.052	3.4	0.00004
2078	0.0044	0.014	0.05	0.0039	0.51	50	0.018	0.000005	0.056	0.014	0.32	29	0.054	3.4	0.00004
2079	0.0045	0.014	0.05	0.004	0.51	50	0.019	0.000005	0.057	0.015	0.32	29	0.055	3.4	0.00004
2080	0.0046	0.014	0.05	0.0041	0.5	50	0.019	0.000005	0.057	0.015	0.32	29	0.057	3.3	0.00004
2081	0.0048	0.014	0.05	0.0042	0.5	51	0.02	0.000005	0.057	0.015	0.32	29	0.058	3.3	0.00004
2082	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.015	0.32	28	0.058	3.3	0.00004
2083	0.0048	0.014	0.05	0.0043	0.5	51	0.02	0.000005	0.057	0.016	0.32	28	0.059	3.3	0.00004
2084	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004
2085	0.0049	0.014	0.05	0.0044	0.49	52	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004
2086	0.005	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.3	0.00004
2087	0.0049	0.015	0.05	0.0044	0.49	53	0.02	0.000005	0.056	0.016	0.31	28	0.06	3.2	0.00004
2088	0.0049	0.015	0.05	0.0044	0.48	53	0.02	0.000005	0.057	0.016	0.31	28	0.06	3.2	0.00004
2089	0.0049	0.015	0.05	0.0044	0.48	54	0.02	0.000005	0.057	0.016	0.31	28	0.059	3.2	0.00004
2090	0.0049	0.015	0.05	0.0044	0.48	55	0.02	0.000005	0.057	0.016	0.31	27	0.059	3.2	0.00004
2091	0.0048	0.015	0.05	0.0043	0.48	55	0.02	0.000005	0.056	0.016	0.31	27	0.058	3.2	0.00004
2092	0.0048	0.015	0.05	0.0043	0.48	56	0.02	0.000005	0.056	0.016	0.3	27	0.058	3.2	0.00004
2093	0.0048	0.014	0.05	0.0043	0.47	56	0.02	0.000005	0.056	0.015	0.3	27	0.058	3.2	0.000039
2094	0.0047	0.014	0.05	0.0042	0.47	57	0.02	0.000005	0.055	0.015	0.3	27	0.057	3.1	0.000039
2095	0.0046	0.014	0.05	0.0041	0.47	57	0.019	0.000005	0.055	0.015	0.3	27	0.056	3.1	0.000039
2096	0.0045	0.014	0.05	0.004	0.47	57	0.019	0.000005	0.054	0.015	0.3	27	0.055	3.1	0.000039
2097	0.0045	0.014	0.05	0.004	0.47	58	0.019	0.000005	0.054	0.015	0.3	27	0.056	3.1	0.000039
2098	0.0045	0.014	0.05	0.0039	0.46	58	0.019	0.000005	0.054	0.014	0.3	26	0.056	3.1	0.000039
2099	0.0046	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.056	3.1	0.000039
2100	0.0046	0.014	0.05	0.0039	0.46	59	0.019	0.000005	0.054	0.014	0.29	26	0.057	3.1	0.000039
2101	0.0046	0.014	0.05	0.004	0.46	60	0.019	0.000005	0.054	0.015	0.29	26	0.057	3.0	0.000039
2102	0.0046	0.014	0.05	0.004	0.45	60	0.02	0.000005	0.054	0.015	0.29	26	0.058	3.0	0.000039
2103	0.0047	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.059	3.0	0.000039
2104	0.0048	0.014	0.05	0.0041	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039
2105	0.0048	0.014	0.05	0.004	0.45	61	0.02	0.000005	0.055	0.015	0.29	26	0.06	3.0	0.000039
2106	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	26	0.058	3.0	0.000039
2107	0.0046	0.014	0.05	0.0038	0.45	62	0.02	0.000005	0.054	0.014	0.28	25	0.058	3.0	0.000038
2108	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.014	0.28	25	0.059	2.9	0.000038
2109	0.0047	0.014	0.05	0.0039	0.44	63	0.02	0.000005	0.054	0.015	0.28	25	0.06	2.9	0.000038
2110	0.0048	0.014	0.05	0.004	0.44	64	0.02	0.000005	0.054	0.015	0.28	25	0.061	2.9	0.000038
2111	0.0049	0.014	0.05	0.004	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.062	2.9	0.000039
2112	0.005	0.014	0.05	0.0041	0.44	65	0.021	0.000005	0.055	0.015	0.28	25	0.063	2.9	0.000039
2113	0.005	0.014	0.05	0.0042	0.44	66	0.021	0.000005	0.055	0.016	0.28	25	0.064	2.9	0.000039
2114	0.0052	0.014	0.05	0.0043	0.44	66	0.022	0.000005	0.056	0.016	0.28	25	0.065	2.9	0.000039
2115	0.0052	0.014	0.05	0.0043	0.44	67	0.022	0.000005	0.056	0.016	0.28	25	0.066	2.9	0.000039
2116	0.0053	0.014	0.05	0.0044	0.43	67	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004
2117	0.0053	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004
2118	0.0054	0.014	0.05	0.0045	0.43	68	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004
2119	0.0054	0.014	0.05	0.0045	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.000039
2120	0.0054	0.014	0.05	0.0046	0.43	69	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.00004
2121	0.0054	0.014	0.05	0.0046	0.43	70	0.023	0.000005	0.056	0.017	0.28	25	0.067	2.9	0.000039
2122	0.0053	0.014	0.05	0.0046	0.43	70	0.022	0.000005	0.055	0.017	0.28	25	0.066	2.9	0.000039
2123	0.0053	0.014	0.05	0.0046	0.43	71	0.022	0.000005	0.055	0.017	0.27	25	0.065	2.9	0.000039
2124	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.065	2.9	0.000038
2125	0.0052	0.015	0.05	0.0046	0.43	72	0.022	0.000005	0.054	0.017	0.27	25	0.064	2.9	0.000038
2126	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.063	2.9	0.000038
2127	0.0051	0.015	0.05	0.0046	0.43	73	0.021	0.000005	0.053	0.017	0.27	24	0.062	2.9	0.000038
2128	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.061	2.8	0.000038
2129	0.005	0.015	0.05	0.0045	0.43	74	0.021	0.000005	0.053	0.016	0.27	24	0.06	2.9	0.000038
2130	0.0049	0.015	0.05	0.0045	0.43	75	0.02	0.000005	0.053	0.016	0.27	24	0.059	2.9	0.000038
2131	0.0049	0.015	0.05	0.0045	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.058	2.9	0.000038
2132	0.0048	0.015	0.05	0.0044	0.43	76	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038
2133	0.0048	0.015	0.05	0.0044	0.43	77	0.02	0.000005	0.053	0.016	0.27	24	0.057	2.9	0.000038
2134	0.0048	0.015	0.05	0.0044	0.43	77	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038

Model Year	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2023	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	24
2024	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	44
2025	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	80
2026	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	125
2027	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	158
2028	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	289
2029	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	270
2030	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	348
2031	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	2,236
2032	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	3,634
2033	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	620
2034	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	2,492
2035	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	7,085
2036	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	12,083
2037	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	13,464
2038	510	2.3	0.000029	0.00029	0.013	0.005	0.01	102	13	2.4	26,952
2039	581	2.3	0.000031	0.00031	0.014	0.005	0.01	99	13	2.3	45,912
2040	712	2.3	0.000035	0.00035	0.016	0.005	0.01	88	11	2.0	79,056
2041	821	2.3	0.000036	0.00036	0.016	0.005	0.01	45	5.7	1.0	110,907
2042	787	2.0	0.000034	0.00034	0.015	0.005	0.01	17	2.1	0.38	128,839
2043	767	1.9	0.000033	0.00033	0.015	0.005	0.01	9.1	1.1	0.21	133,866
2044	752	1.9	0.000032	0.00032	0.014	0.005	0.01	9.8	1.2	0.22	136,575
2045	782	1.9	0.000034	0.00034	0.015	0.005	0.01	12	1.5	0.28	133,758
2046	807	2.0	0.000035	0.00035	0.015	0.005	0.01	12	1.5	0.28	128,763
2047	868	2.0	0.000038	0.00038	0.017	0.005	0.01	9.0	1.1	0.21	128,089
2048	939	2.0	0.000041	0.00041	0.018	0.005	0.01	8.6	1.1	0.2	129,793
2049	974	1.9	0.000043	0.00043	0.019	0.005	0.01	9.2	1.2	0.21	131,172
2050	988	1.9	0.000043	0.00043	0.019	0.005	0.01	7.9	1.0	0.18	132,811
2051	995	1.9	0.000044	0.00044	0.019	0.005	0.01	6.1	0.77	0.14	133,964
2052	1,000	1.9	0.000044	0.00044	0.02	0.005	0.01	3.8	0.48	0.087	135,076
2053	1,004	1.9	0.000044	0.00044	0.02	0.005	0.01	1.9	0.25	0.045	135,145
2054	1,006	1.9	0.000044	0.00044	0.02	0.005	0.01	1.4	0.17	0.031	135,795
2055	1,010	1.9	0.000045	0.00045	0.02	0.005	0.011	1.4	0.18	0.032	136,601
2056	1,036	1.9	0.000043	0.00043	0.019	0.005	0.01	1.6	0.21	0.037	137,639
2057	1,070	1.9	0.000042	0.00042	0.018	0.005	0.01	1.9	0.24	0.044	137,940
2058	1,088	1.8	0.00004	0.00041	0.018	0.005	0.01	2.3	0.29	0.052	138,218
2059	1,095	1.8	0.00004	0.0004	0.018	0.005	0.01	2.7	0.34	0.061	138,460
2060	1,097	1.8	0.00004	0.0004	0.018	0.005	0.01	3.1	0.4	0.072	139,518
2061	1,097	1.8	0.00004	0.0004	0.018	0.005	0.01	3.6	0.46	0.084	139,838
2062	1,108	1.8	0.00004	0.0004	0.018	0.005	0.01	4.2	0.53	0.096	140,676
2063	1,113	1.8	0.000039	0.00039	0.018	0.005	0.01	4.8	0.61	0.11	141,568
2064	1,113	1.8	0.000039	0.00039	0.017	0.005	0.01	5.4	0.68	0.12	142,789
2065	1,128	1.8	0.000039	0.00039	0.017	0.005	0.01	6.1	0.77	0.14	143,409
2066	1,134	1.8	0.000039	0.00039	0.017	0.005	0.01	6.8	0.85	0.16	144,573
2067	1,137	1.8	0.000038	0.00038	0.017	0.005	0.01	7.5	0.94	0.17	145,722
2068	1,139	1.7	0.000038	0.00038	0.017	0.005	0.01	8.1	1.0	0.19	147,284
2069	1,141	1.7	0.000038	0.00038	0.017	0.005	0.01	8.7	1.1	0.2	148,041
2070	1,143	1.7	0.000038	0.00038	0.017	0.005	0.01	8.9	1.1	0.2	149,328
2071	1,143	1.7	0.000038	0.00038	0.017	0.005	0.01	8.4	1.1	0.19	150,505
2072	1,151	1.7	0.000038	0.00038	0.017	0.005	0.01	7.6	0.96	0.17	151,916
2073	1,154	1.7	0.000039	0.00039	0.017	0.005	0.01	7.0	0.88	0.16	152,292
2074	1,155	1.7	0.000039	0.00039	0.017	0.005	0.01	6.8	0.86	0.16	153,237
2075	1,157	1.7	0.000039	0.00039	0.017	0.005	0.01	6.6	0.84	0.15	153,995
2076	1,171	1.6	0.00004	0.0004	0.018	0.005	0.01	6.8	0.86	0.16	155,005
2077	1,177	1.6	0.00004	0.0004	0.018	0.005	0.01	7.0	0.89	0.16	155,356
2078	1,182	1.6	0.00004	0.0004	0.018	0.005	0.01	7.3	0.92	0.17	156,236
2079	1,187	1.6	0.000041	0.00041	0.018	0.005	0.01	7.5	0.94	0.17	157,251
2080	1,192	1.6	0.000041	0.00041	0.018	0.005	0.01	7.4	0.94	0.17	158,470
2081	1,197	1.6	0.000041	0.00041	0.018	0.005	0.01	7.5	0.95	0.17	158,838
2082	1,201	1.6	0.000041	0.00041	0.018	0.005	0.01	7.3	0.92	0.17	159,814
2083	1,204	1.6	0.00004	0.00041	0.018	0.005	0.01	7.4	0.93	0.17	160,383
2084	1,207	1.6	0.000041	0.00041	0.018	0.005	0.01	7.2	0.92	0.17	161,637
2085	1,208	1.6	0.00004	0.0004	0.018	0.005	0.01	7.4	0.94	0.17	161,890
2086	1,211	1.6	0.00004	0.00041	0.018	0.005	0.01	7.2	0.91	0.17	162,778
2087	1,210	1.6	0.00004	0.0004	0.018	0.005	0.01	7.2	0.91	0.17	163,470
2088	1,218	1.6	0.000041	0.00041	0.018	0.005	0.01	6.8	0.86	0.16	164,570
2089	1,226	1.6	0.000041	0.00041	0.018	0.005	0.01	6.7	0.85	0.15	164,772
2090	1,228	1.5	0.00004	0.0004	0.018	0.005	0.01	6.3	0.8	0.14	165,462
2091	1,229	1.5	0.00004	0.0004	0.018	0.005	0.01	6.4	0.8	0.15	166,285
2092	1,232	1.5	0.00004	0.0004	0.018	0.005	0.01	6.2	0.79	0.14	167,587
2093	1,233	1.5	0.00004	0.0004	0.018	0.005	0.01	6.5	0.82	0.15	168,175
2094	1,232	1.5	0.000039	0.00039	0.017	0.005	0.01	6.7	0.85	0.15	169,130
2095	1,229	1.5	0.000039	0.00039	0.017	0.005	0.01	7.1	0.9	0.16	169,816
2096	1,224	1.5	0.000038	0.00038	0.017	0.005	0.01	7.5	0.94	0.17	170,905
2097	1,225	1.5	0.000038	0.00038	0.017	0.005	0.01	7.9	1.	0.18	171,124
2098	1,225	1.5	0.000038	0.00038	0.017	0.005	0.01	8.3	1.05	0.19	171,837
2099	1,226	1.5	0.000038	0.00038	0.017	0.005	0.01	8.7	1.1	0.2	172,453
2100	1,234	1.5	0.000038	0.00039	0.017	0.005	0.01	9.1	1.15	0.21	173,472
2101	1,237	1.5	0.000039	0.00039	0.017	0.005	0.01	9.5	1.21	0.22	174,383
2102	1,238	1.5	0.000039	0.00039	0.017	0.005	0.01	10.0	1.26	0.23	175,164
2103	1,253	1.5	0.000039	0.00039	0.017	0.005	0.01	10.4	1.31	0.24	175,863
2104	1,259	1.4	0.00004	0.0004	0.018	0.005	0.01	10.8	1.36	0.25	177,220
2105	1,257	1.4	0.000039	0.00039	0.017	0.005	0.01	11.2	1.41	0.26	177,533
2106	1,253	1.4	0.000039	0.00039	0.017	0.005	0.01	11.5	1.46	0.26	178,211
2107	1,255	1.4	0.000038	0.00038	0.017	0.005	0.01	11.8	1.5	0.27	179,040
2108	1,261	1.4	0.000039	0.00039	0.017	0.005	0.01	12.1	1.53	0.28	180,178
2109	1,266	1.4	0.000039	0.00039	0.017	0.005	0.01	12.4	1.57	0.28	180,248
2110	1,272	1.4	0.000039	0.00039	0.017	0.005	0.01	12.6	1.6	0.29	180,830
2111	1,277	1.4	0.000039	0.00039	0.017	0.005	0.01	12.9	1.6	0.3	181,243
2112	1,284	1.4	0.000039	0.00039	0.017	0.005	0.01	13.1	1.7	0.3	181,975
2113	1,288	1.4	0.000039	0.00039	0.018	0.005	0.01	13.3	1.7	0.31	181,870
2114	1,295	1.4	0.00004	0.0004	0.018	0.005	0.01	13.4	1.7	0.31	182,135
2115	1,299	1.4	0.00004	0.0004	0.018	0.005	0.01	13.3	1.7	0.31	182,344
2116	1,305	1.4	0.00004	0.0004	0.018	0.005	0.01	13.1	1.7	0.3	183,370
2117	1,307	1.4	0.00004	0.0004	0.018	0.005	0.01	12.8	1.6	0.29	183,400
2118	1,311	1.4	0.00004	0.0004	0.018	0.005	0.011	12.4	1.6	0.28	183,657
2119	1,313	1.4	0.00004	0.0004	0.018	0.005	0.011	11.9	1.5	0.27	183,671
2120	1,316	1.4	0.00004	0.0004	0.018	0.005	0.011	11.4	1.4	0.26	184,250
2121	1,324	1.4	0.00004	0.0004	0.018	0.005	0.011	10.9	1.4	0.25	184,044
2122	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	10.4	1.3	0.24	184,430
2123	1,325	1.4	0.000039	0.00039	0.017	0.005	0.011	10.0	1.3	0.23	184,660
2124	1,324	1.4	0.000039	0.00039	0.017	0.005	0.011	9.3	1.2	0.21	185,381
2125	1,325	1.4	0.000039	0.00038	0.017	0.005	0.011	8.8	1.1	0.2	185,380
2126	1,324	1.4	0.000038	0.00038	0.017	0.005	0.01	7.8	0.98	0.18	185,890
2127	1,325	1.4	0.000038	0.00038	0.017	0.005	0.01	7.3	0.92	0.17	185,957
2128	1,325	1.4	0.000038	0.00038	0.017	0.005	0.01	6.2	0.78	0.14	186,328
2129	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	5.8	0.73	0.13	185,930
2130	1,327	1.4	0.000038	0.00038	0.017	0.005	0.01	5.0	0.63	0.11	186,107
2131	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	4.7	0.59	0.11	186,064
2132	1,330	1.4	0.000038	0.00038	0.017	0.005	0.01	4.2	0.54	0.097	186,657
2133	1,333	1.4	0.000038	0.00038	0.017	0.005	0.01	4.1	0.52	0.095	186,125
2134	1,334	1.4	0.000038	0.00038	0.017	0.005	0.01	3.9	0.5	0.09	186,338

Table A9. Source terms of the NAG backfill for the high nitrogen scenario.

Model Year	pH	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	-	mg/L	mg/L as CaCO3	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	m^3/year
2135	9.2	1,573	1,597	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.97	0.001	0.0048	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.057	2.8	0.000038	1,337	1.4	0.000038	0.00038	0.017	0.005	0.01	3.9	0.49	0.09	186,569
2136	9.2	1,571	1,603	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0047	0.015	0.05	0.0044	0.43	78	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,338	1.4	0.000038	0.00038	0.017	0.005	0.01	3.8	0.49	0.088	187,180
2137	9.2	1,577	1,606	17	0.23	0.0028	0.0022	0.0032	0.78	0.00005	0.96	0.001	0.0048	0.015	0.05	0.0044	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,341	1.4	0.000038	0.00038	0.017	0.005	0.01	3.9	0.49	0.089	186,716
2138	9.2	1,565	1,622	17	0.24	0.0028	0.0022	0.0032	0.78	0.00005	0.94	0.001	0.0047	0.015	0.05	0.0043	0.43	79	0.019	0.000005	0.053	0.016	0.27	24	0.056	2.8	0.000038	1,342	1.4	0.000038	0.00038	0.017	0.005	0.01	3.8	0.49	0.088	186,790
2139	9.2	1,549	1,640	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.92	0.001	0.0046	0.015	0.05	0.0043	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.055	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.017	0.005	0.01	3.8	0.49	0.088	187,056
2140	9.2	1,540	1,650	17	0.25	0.0027	0.0022	0.0032	0.78	0.00005	0.91	0.001	0.0046	0.015	0.05	0.0042	0.43	80	0.019	0.000005	0.052	0.015	0.27	24	0.054	2.8	0.000037	1,341	1.4	0.000037	0.00037	0.016	0.005	0.01	3.8	0.49	0.088	187,514
2141	9.2	1,528	1,664	17	0.26	0.0027	0.0022	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0042	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.054	2.8	0.000037	1,340	1.4	0.000037	0.00037	0.016	0.005	0.01	3.9	0.49	0.089	186,895
2142	9.2	1,522	1,670	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.89	0.001	0.0045	0.015	0.05	0.0041	0.43	81	0.018	0.000005	0.051	0.015	0.27	24	0.053	2.8	0.000037	1,340	1.4	0.000037	0.00037	0.016	0.005	0.01	3.9	0.49	0.089	186,886
2143	9.2	1,512	1,682	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.88	0.001	0.0044	0.015	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.052	2.8	0.000036	1,339	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,034
2144	9.2	1,507	1,687	17	0.26	0.0027	0.0021	0.0033	0.78	0.00005	0.87	0.001	0.0043	0.014	0.05	0.004	0.43	82	0.018	0.000005	0.051	0.014	0.27	24	0.051	2.8	0.000036	1,338	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,551
2145	9.2	1,498	1,697	17	0.26	0.0026	0.0021	0.0034	0.78	0.00005	0.87	0.001	0.0042	0.014	0.05	0.0039	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.05	2.8	0.000036	1,337	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,019
2146	9.2	1,494	1,701	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0042	0.014	0.05	0.0038	0.43	83	0.017	0.000005	0.05	0.014	0.27	24	0.049	2.8	0.000036	1,337	1.4	0.000036	0.00036	0.016	0.005	0.01	3.9	0.49	0.089	187,081
2147	9.2	1,486	1,709	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.0041	0.014	0.05	0.0037	0.43	83	0.017	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000036	1,336	1.4	0.000036	0.00036	0.016	0.005	0.01	3.8	0.48	0.088	187,212
2148	9.2	1,483	1,714	17	0.26	0.0026	0.002	0.0034	0.78	0.00005	0.86	0.001	0.004	0.014	0.05	0.0037	0.42	84	0.016	0.000005	0.05	0.013	0.27	24	0.048	2.8	0.000036	1,335	1.4	0.000036	0.00036	0.016	0.005	0.01	3.8	0.48	0.087	187,667
2149	9.2	1,477	1,721	17	0.27	0.0026	0.002	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0036	0.43	84	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000036	1,335	1.4	0.000036	0.00036	0.016	0.005	0.01	3.7	0.46	0.084	187,030
2150	9.2	1,474	1,724	17	0.27	0.0026	0.0019	0.0034	0.78	0.00005	0.85	0.001	0.0039	0.014	0.05	0.0035	0.43	85	0.016	0.000005	0.05	0.013	0.27	24	0.046	2.8	0.000035	1,335	1.4	0.000035	0.00035	0.016	0.005	0.01	3.6	0.45	0.082	186,985

Table A10. Annual loads of the NAG backfill for the high nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year
2023	29	0.2	0.69	0.0037	0.000052	0.000029	0.000055	0.032	0.0000012	0.67	0.000024	0.00014
2024	53	0.37	1.3	0.0067	0.000094	0.000053	0.0001	0.057	0.0000022	1.2	0.000044	0.00025
2025	97	0.68	2.3	0.012	0.00017	0.000097	0.00018	0.11	0.000004	2.2	0.00008	0.00046
2026	152	1.1	3.6	0.019	0.00027	0.00015	0.00029	0.16	0.0000063	3.5	0.00013	0.00072
2027	191	1.3	4.5	0.024	0.00034	0.00019	0.00036	0.21	0.0000079	4.4	0.00016	0.0009
2028	349	2.4	8.2	0.044	0.00062	0.00035	0.00066	0.38	0.000014	8.0	0.00029	0.0017
2029	326	2.3	7.7	0.041	0.00057	0.00032	0.00062	0.35	0.000013	7.5	0.00027	0.0015
2030	421	2.9	9.9	0.053	0.00074	0.00042	0.0008	0.45	0.000017	9.7	0.00035	0.002
2031	2,706	19	64	0.34	0.0048	0.0027	0.0051	2.9	0.00011	62	0.0022	0.013
2032	4,396	31	104	0.56	0.0078	0.0044	0.0083	4.7	0.00018	101	0.0036	0.021
2033	750	5.2	18	0.095	0.0013	0.00075	0.0014	0.81	0.000031	17	0.00062	0.0035
2034	3,015	21	71	0.38	0.0053	0.003	0.0057	3.3	0.00012	69	0.0025	0.014
2035	8,571	60	202	1.1	0.015	0.0085	0.016	9.3	0.00035	197	0.0071	0.041
2036	14,618	102	345	1.9	0.026	0.015	0.028	16	0.0006	336	0.012	0.069
2037	16,289	113	385	2.1	0.029	0.016	0.031	18	0.00067	374	0.013	0.077
2038	32,606	227	770	4.1	0.057	0.032	0.062	35	0.0013	749	0.027	0.15
2039	59,768	3,889	1,312	0.43	0.11	0.058	0.1	60	0.0023	1,430	0.046	0.27
2040	115,810	17,792	2,260	1.3	0.2	0.11	0.18	103	0.004	2,717	0.079	0.45
2041	167,259	41,951	3,172	3.1	0.29	0.16	0.25	145	0.0055	1,465	0.11	0.46
2042	181,534	50,979	3,172	3.8	0.32	0.19	0.31	145	0.0064	1,508	0.13	0.39
2043	183,623	51,985	3,171	3.9	0.32	0.19	0.32	145	0.0067	1,598	0.13	0.35
2044	184,376	51,422	3,171	3.8	0.33	0.2	0.33	145	0.0068	1,711	0.14	0.35
2045	187,181	52,658	3,172	3.9	0.33	0.2	0.32	145	0.0067	1,574	0.13	0.37
2046	186,758	51,405	3,172	3.8	0.33	0.2	0.3	145	0.0064	1,506	0.13	0.39
2047	201,983	52,505	3,173	3.8	0.36	0.22	0.29	145	0.0064	1,495	0.13	0.44
2048	222,440	55,777	3,173	3.9	0.39	0.25	0.28	145	0.0065	1,455	0.13	0.52
2049	232,908	58,594	3,174	4.1	0.41	0.27	0.28	145	0.0066	1,399	0.13	0.59
2050	239,498	59,850	3,174	4.2	0.42	0.29	0.28	145	0.0066	1,406	0.13	0.63
2051	243,292	60,490	3,174	4.2	0.43	0.3	0.28	145	0.0067	1,419	0.13	0.64
2052	246,757	61,046	3,174	4.3	0.44	0.3	0.28	145	0.0068	1,433	0.14	0.65
2053	248,235	61,113	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,436	0.14	0.66
2054	249,944	61,330	3,174	4.3	0.44	0.31	0.28	145	0.0068	1,448	0.14	0.66
2055	252,972	61,615	3,174	4.3	0.45	0.32	0.29	145	0.0068	1,465	0.14	0.68
2056	248,809	75,807	3,175	5.3	0.44	0.31	0.3	145	0.0069	1,019	0.14	0.67
2057	238,664	97,994	3,175	7.1	0.42	0.3	0.32	145	0.0069	642	0.14	0.61
2058	232,800	110,780	3,176	8.2	0.41	0.28	0.33	145	0.0069	519	0.14	0.58
2059	231,450	115,170	3,176	8.6	0.41	0.28	0.34	145	0.0069	487	0.14	0.57
2060	233,135	116,900	3,176	8.7	0.41	0.28	0.34	145	0.007	485	0.14	0.57
2061	234,102	116,981	3,176	8.7	0.41	0.28	0.34	145	0.007	488	0.14	0.58
2062	233,986	122,647	3,176	9.2	0.41	0.28	0.35	145	0.007	457	0.14	0.58
2063	232,497	128,575	3,176	9.9	0.41	0.28	0.36	145	0.0071	422	0.14	0.57
2064	233,632	130,611	3,176	9.9	0.41	0.28	0.36	145	0.0071	426	0.14	0.57
2065	234,589	136,385	3,176	13	0.41	0.28	0.37	145	0.0072	343	0.14	0.57
2066	232,604	143,755	3,176	15	0.41	0.28	0.38	145	0.0072	307	0.14	0.56
2067	231,421	149,117	3,177	16	0.41	0.27	0.39	145	0.0073	293	0.15	0.56
2068	232,959	152,880	3,177	16	0.41	0.28	0.39	145	0.0074	294	0.15	0.56
2069	233,639	155,103	3,177	16	0.41	0.27	0.4	145	0.0074	299	0.15	0.56
2070	236,312	156,526	3,177	15	0.42	0.28	0.4	145	0.0075	311	0.15	0.57
2071	238,190	157,850	3,177	14	0.42	0.28	0.4	145	0.0075	323	0.15	0.57
2072	242,807	159,755	3,177	16	0.43	0.29	0.41	145	0.0076	307	0.15	0.58
2073	244,657	159,770	3,177	15	0.43	0.29	0.4	145	0.0076	315	0.15	0.59
2074	247,171	160,010	3,177	15	0.44	0.29	0.41	145	0.0077	327	0.15	0.6
2075	249,872	159,970	3,177	14	0.44	0.3	0.4	145	0.0077	340	0.15	0.62
2076	255,542	161,841	3,177	17	0.45	0.31	0.41	145	0.0078	305	0.16	0.64
2077	258,637	161,819	3,177	17	0.46	0.32	0.4	145	0.0078	309	0.16	0.66
2078	262,179	162,204	3,177	17	0.46	0.32	0.4	145	0.0078	316	0.16	0.69
2079	265,408	163,840	3,177	17	0.47	0.33	0.41	145	0.0079	317	0.16	0.71
2080	268,368	166,029	3,177	17	0.47	0.34	0.41	145	0.0079	319	0.16	0.74
2081	270,820	166,272	3,177	17	0.48	0.35	0.41	145	0.0079	325	0.16	0.76
2082	271,220	170,249	3,177	18	0.48	0.35	0.41	145	0.008	314	0.16	0.77
2083	270,326	173,983	3,178	18	0.48	0.35	0.42	145	0.008	306	0.16	0.78
2084	272,779	176,556	3,178	18	0.48	0.36	0.42	145	0.0081	310	0.16	0.79
2085	272,007	178,451	3,178	18	0.48	0.36	0.42	145	0.0081	310	0.16	0.79
2086	274,151	180,017	3,178	18	0.48	0.37	0.43	145	0.0081	317	0.16	0.81
2087	274,417	181,762	3,178	17	0.48	0.37	0.43	145	0.0082	322	0.16	0.8
2088	278,238	184,154	3,178	19	0.49	0.37	0.43	145	0.0082	308	0.16	0.81
2089	278,070	188,038	3,178	22	0.49	0.37	0.44	145	0.0082	278	0.16	0.81
2090	277,778	191,572	3,178	22	0.49	0.37	0.44	145	0.0083	272	0.17	0.81
2091	278,395	193,905	3,178	22	0.49	0.37	0.45	145	0.0083	273	0.17	0.81
2092	280,457	196,798	3,178	22	0.49	0.37	0.45	145	0.0084	275	0.17	0.81
2093	278,867	200,885	3,178	23	0.49	0.37	0.46	145	0.0084	266	0.17	0.8
2094	276,697	206,272	3,178	24	0.49	0.37	0.47	145	0.0085	259	0.17	0.8
2095	275,374	208,602	3,178	24	0.49	0.36	0.47	145	0.0085	259	0.17	0.79
2096	273,397	212,401	3,178	24	0.48	0.36	0.48	145	0.0085	258	0.17	0.77
2097	273,610	213,221	3,178	23	0.48	0.36	0.48	145	0.0086	262	0.17	0.78
2098	273,650	215,552	3,179	23	0.48	0.36	0.49	145	0.0086	266	0.17	0.78
2099	275,011	216,411	3,179	22	0.48	0.36	0.49	145	0.0086	272	0.17	0.79
2100	278,058	219,736	3,179	25	0.49	0.36	0.49	145	0.0087	255	0.17	0.79
2101	280,722	220,996	3,179	24	0.49	0.37	0.49	145	0.0087	260	0.17	0.81
2102	282,312	222,686	3,179	24	0.5	0.37	0.49	145	0.0088	264	0.18	0.81
2103	287,641	225,051	3,179	28	0.51	0.38	0.49	145	0.0088	242	0.18	0.84
2104	291,827	227,479	3,179	28	0.51	0.38	0.5	145	0.0089	244	0.18	0.85
2105	290,604	229,372	3,179	29	0.51	0.38	0.5	145	0.0089	240	0.18	0.85
2106	286,118	234,384	3,179	31	0.5	0.37	0.51	145	0.0089	230	0.18	0.82
2107	286,285	238,141	3,179	31	0.5	0.37	0.52	145	0.009	226	0.18	0.83
2108	288,736	241,745	3,179	32	0.51	0.38	0.52	145	0.009	226	0.18	0.84
2109	289,478	243,424	3,180	32	0.51	0.38	0.52	145	0.009	224	0.18	0.85
2110	291,896	245,531	3,180	32	0.51	0.38	0.52	145	0.009	225	0.18	0.87
2111	293,813	247,161	3,180	32	0.52	0.39	0.52	145	0.0091	226	0.18	0.88
2112	297,475	249,052	3,180	32	0.52	0.4	0.52	145	0.0091	228	0.18	0.91
2113	298,394	249,580	3,180	31	0.53	0.4	0.52	145	0.0091	229	0.18	0.92
2114	301,579	250,399	3,180	31	0.53	0.41	0.52	145	0.0091	232	0.18	0.94
2115	303,001	251,216	3,180	30	0.53	0.41	0.52	145	0.0091	233	0.18	0.95
2116	307,438	252,720	3,180	30	0.54	0.42	0.52	145	0.0092	238	0.18	0.98
2117	306,315	255,073	3,180	31	0.54	0.42	0.52	145	0.0092	234	0.18	0.98
2118	305,880	258,295	3,180	31	0.54	0.42	0.53	145	0.0092	230	0.18	0.98
2119	305,409	259,693	3,180	31	0.54	0.43	0.53	145	0.0092	229	0.18	0.98
2120	306,242	262,372	3,181	31	0.54	0.43	0.53	145	0.0092	229	0.18	0.99
2121	304,685	267,104	3,181	37	0.54	0.43	0.54	145	0.0092	206	0.18	0.99
2122	301,081	272,882	3,181	39	0.53	0.43	0.55	145	0.0092	197	0.18	0.98
2123	299,555	275,531	3,181	40	0.53	0.43	0.55	145	0.0092	195	0.18	0.98
2124	297,758	280,129	3,181	41	0.52	0.43	0.56	145	0.0093	191	0.19	0.97
2125	296,664	281,630	3,181	41	0.52	0.43	0.57	145	0.0093	190	0.19	0.97
2126	295,249	284,933	3,181	42	0.52	0.43	0.57	145	0.0093	188	0.19	0.96
2127	294,686	286,522	3,181	42	0.52	0.43	0.57	145	0.0093	186	0.19	0.95
2128	293,522	289,647	3,181	43	0.52	0.43	0.58	145	0.0093	184	0.19	0.94
2129	292,933	290,125	3,181	43	0.52	0.42	0.58	145	0.0093	183	0.19	0.93
2130	291,760	292,356	3,182	43	0.51	0.42	0.58	145	0.0093	182	0.19	0.91
2131	292,139	293,237	3,182	43	0.52	0.42	0.58	145	0.0093	182	0.19	0.91
2132	292,174	295,795	3,182	43	0.52	0.42	0.59	145	0.0093	181	0.19	0.9
2133	292,141	295,678	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.9
2134	291,991	297,209	3,182	43	0.51	0.42	0.59	145	0.0093	180	0.19	0.89

Model Year	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag
	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year
2023	0.000097	0.0012	0.0000024	0.017	0.49	0.00081	0.00000012	0.00098	0.00018	0.011	0.99	0.0027	0.12	0.0000007
2024	0.00018	0.0022	0.0000044	0.031	0.89	0.0015	0.00000022	0.0018	0.00033	0.02	1.8	0.0048	0.21	0.0000013
2025	0.00032	0.004	0.0000081	0.058	1.6	0.0027	0.0000004	0.0033	0.0006	0.037	3.3	0.0089	0.38	0.0000023
2026	0.0005	0.0063	0.000013	0.09	2.5	0.0042	0.00000063	0.0051	0.00093	0.057	5.1	0.014	0.6	0.0000036
2027	0.00063	0.0079	0.000016	0.11	3.2	0.0053	0.00000079	0.0064	0.0012	0.072	6.5	0.017	0.75	0.0000046
2028	0.0012	0.014	0.000029	0.21	5.8	0.0097	0.0000014	0.012	0.0021	0.13	12	0.032	1.4	0.0000084
2029	0.0011	0.013	0.000027	0.19	5.5	0.0091	0.0000013	0.011	0.002	0.12	11	0.03	1.3	0.0000078
2030	0.0014	0.017	0.000035	0.25	7.0	0.012	0.0000017	0.014	0.0026	0.16	14	0.038	1.7	0.00001
2031	0.0089	0.11	0.00022	1.6	45	0.075	0.000011	0.091	0.017	1.0	91	0.25	11	0.000065
2032	0.015	0.18	0.00036	2.6	73	0.12	0.000018	0.15	0.027	1.7	149	0.4	17	0.00011
2033	0.0025	0.031	0.000062	0.44	13	0.021	0.0000031	0.025	0.0046	0.28	25	0.068	3.0	0.000018
2034	0.01	0.12	0.00025	1.8	50	0.084	0.000012	0.1	0.019	1.1	102	0.28	12	0.000072
2035	0.028	0.35	0.00071	5.1	143	0.24	0.000035	0.29	0.053	3.2	290	0.78	34	0.00021
2036	0.048	0.6	0.0012	8.7	244	0.41	0.00006	0.49	0.09	5.5	494	1.3	58	0.00035
2037	0.054	0.67	0.0014	9.6	272	0.45	0.000067	0.55	0.1	6.2	551	1.5	64	0.00039
2038	0.11	1.3	0.0027	19	545	0.91	0.00013	1.1	0.2	12	1,102	3.0	128	0.00078
2039	0.18	2.3	0.015	33	1,040	1.5	0.00023	2.0	0.37	21	1,878	5.0	219	0.0014
2040	0.32	4.0	0.065	57	2,136	2.5	0.0004	3.9	0.71	36	3,235	8.2	377	0.0028
2041	0.89	5.5	0.18	79	3,331	2.4	0.00055	5.6	0.98	51	4,540	7.5	529	0.004
2042	1.1	6.4	0.25	79	3,653	1.8	0.00064	6.1	1.0	51	4,539	5.4	529	0.0044
2043	1.1	6.7	0.27	79	3,688	1.5	0.00067	6.2	1.0	51	4,539	4.6	529	0.0044
2044	1.1	6.8	0.27	79	3,693	1.5	0.00068	6.2	1.0	51	4,539	4.6	529	0.0044
2045	1.1	6.7	0.27	79	3,765	1.6	0.00067	6.3	1.1	51	4,539	4.9	529	0.0045
2046	1.1	6.4	0.3	79	3,749	1.7	0.00064	6.3	1.1	51	4,540	5.1	529	0.0045
2047	1.1	6.4	0.37	80	4,017	1.9	0.00064	6.8	1.4	51	4,541	5.6	529	0.0048
2048	1.1	6.5	0.45	80	4,406	2.2	0.00065	7.5	1.6	51	4,542	6.5	529	0.0053
2049	1.2	6.6	0.5	80	4,623	2.5	0.00066	7.8	1.9	51	4,542	7.3	529	0.0056
2050	1.2	6.6	0.55	80	4,749	2.6	0.00066	8.1	2.0	51	4,543	7.7	529	0.0057
2051	1.2	6.7	0.58	80	4,816	2.7	0.00067	8.2	2.1	51	4,543	7.8	529	0.0058
2052	1.2	6.8	0.61	80	4,878	2.7	0.00068	8.3	2.2	51	4,543	7.7	529	0.0059
2053	1.2	6.8	0.62	80	4,900	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.0059
2054	1.2	6.8	0.63	80	4,930	2.7	0.00068	8.4	2.2	51	4,543	7.7	529	0.006
2055	1.2	6.8	0.65	80	4,984	2.7	0.00068	8.5	2.3	51	4,543	8.0	529	0.0061
2056	1.4	6.9	0.63	80	5,234	2.7	0.00069	8.4	2.2	51	4,544	7.8	529	0.006
2057	1.8	6.9	0.58	80	5,609	2.5	0.00069	8.0	2.1	51	4,544	7.2	530	0.0057
2058	2.0	6.9	0.54	80	5,859	2.3	0.00069	7.8	1.9	51	4,545	6.7	530	0.0056
2059	2.0	6.9	0.53	80	5,973	2.3	0.00069	7.8	1.9	51	4,545	6.6	530	0.0055
2060	2.0	7.0	0.53	80	6,057	2.3	0.0007	7.8	1.9	51	4,545	6.7	530	0.0056
2061	2.0	7.0	0.53	80	6,083	2.4	0.0007	7.9	1.9	51	4,545	6.9	530	0.0056
2062	2.0	7.0	0.53	80	6,200	2.4	0.0007	7.9	1.9	51	4,546	6.9	530	0.0056
2063	2.0	7.1	0.51	80	6,344	2.3	0.00071	7.8	1.8	51	4,546	6.8	530	0.0056
2064	2.0	7.1	0.51	80	6,427	2.4	0.00071	7.9	1.8	51	4,546	6.9	530	0.0056
2065	2.0	7.2	0.5	80	6,581	2.4	0.00072	7.9	1.8	51	4,546	6.9	530	0.0056
2066	2.0	7.2	0.49	80	6,736	2.3	0.00072	7.8	1.8	51	4,546	6.9	530	0.0056
2067	2.0	7.3	0.49	80	6,873	2.3	0.00073	7.8	1.8	51	4,546	6.9	530	0.0055
2068	2.0	7.4	0.48	80	7,026	2.4	0.00074	7.8	1.8	51	4,546	7.0	530	0.0056
2069	2.0	7.4	0.48	80	7,131	2.4	0.00074	7.9	1.8	51	4,546	7.0	530	0.0056
2070	2.0	7.5	0.48	80	7,234	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057
2071	2.0	7.5	0.49	80	7,324	2.4	0.00075	8.0	1.8	51	4,547	7.1	530	0.0057
2072	2.0	7.6	0.5	80	7,442	2.4	0.00076	8.2	1.8	51	4,547	7.1	530	0.0058
2073	2.1	7.6	0.51	80	7,481	2.5	0.00076	8.2	1.9	51	4,547	7.2	530	0.0059
2074	2.1	7.7	0.53	80	7,527	2.5	0.00077	8.3	1.9	51	4,547	7.3	530	0.0059
2075	2.1	7.7	0.54	80	7,572	2.6	0.00077	8.4	2.0	51	4,547	7.5	530	0.006
2076	2.1	7.8	0.56	80	7,693	2.7	0.00078	8.6	2.0	51	4,547	7.8	530	0.0061
2077	2.2	7.8	0.58	80	7,740	2.8	0.00078	8.7	2.1	51	4,547	8.1	530	0.0062
2078	2.2	7.8	0.61	80	7,803	2.9	0.00078	8.8	2.2	51	4,547	8.4	530	0.0062
2079	2.2	7.9	0.63	80	7,891	3.0	0.00079	8.9	2.3	51	4,547	8.7	530	0.0063
2080	2.3	7.9	0.65	80	7,996	3.1	0.00079	9.0	2.4	51	4,547	9.0	530	0.0064
2081	2.3	7.9	0.67	80	8,048	3.1	0.00079	9.1	2.4	51	4,548	9.2	530	0.0064
2082	2.3	8.0	0.68	80	8,156	3.2	0.0008	9.1	2.5	51	4,548	9.3	530	0.0064
2083	2.3	8.0	0.69	80	8,253	3.2	0.0008	9.1	2.5	51	4,548	9.4	530	0.0064
2084	2.3	8.1	0.7	80	8,381	3.3	0.00081	9.2	2.6	51	4,548	9.6	530	0.0065
2085	2.3	8.1	0.7	80	8,453	3.3	0.00081	9.2	2.6	51	4,548	9.7	530	0.0064
2086	2.4	8.1	0.72	80	8,558	3.3	0.00081	9.2	2.6	51	4,548	9.8	530	0.0065
2087	2.4	8.2	0.72	80	8,648	3.3	0.00082	9.2	2.6	51	4,548	9.8	530	0.0065
2088	2.4	8.2	0.73	80	8,795	3.4	0.00082	9.4	2.6	51	4,548	9.9	530	0.0066
2089	2.4	8.2	0.72	80	8,919	3.3	0.00082	9.4	2.6	51	4,548	9.8	530	0.0066
2090	2.4	8.3	0.73	80	9,044	3.3	0.00083	9.3	2.6	51	4,549	9.7	530	0.0066
2091	2.4	8.3	0.72	80	9,165	3.3	0.00083	9.4	2.6	51	4,549	9.7	530	0.0066
2092	2.4	8.4	0.73	80	9,323	3.3	0.00084	9.4	2.6	51	4,549	9.8	530	0.0067
2093	2.4	8.4	0.72	80	9,445	3.3	0.00084	9.4	2.6	51	4,549	9.7	530	0.0066
2094	2.4	8.5	0.71	80	9,605	3.3	0.00085	9.3	2.6	51	4,549	9.7	530	0.0066
2095	2.4	8.5	0.7	80	9,692	3.3	0.00085	9.3	2.5	51	4,549	9.6	530	0.0066
2096	2.4	8.5	0.68	80	9,823	3.2	0.00085	9.2	2.5	51	4,549	9.4	530	0.0066
2097	2.4	8.6	0.68	80	9,888	3.2	0.00086	9.2	2.5	51	4,549	9.5	530	0.0066
2098	2.4	8.6	0.68	80	10,014	3.3	0.00086	9.2	2.5	51	4,549	9.6	530	0.0066
2099	2.4	8.6	0.68	80	10,094	3.3	0.00086	9.3	2.5	51	4,549	9.7	530	0.0066
2100	2.4	8.7	0.68	80	10,279	3.3	0.00087	9.4	2.5	51	4,549	9.8	530	0.0067
2101	2.4	8.7	0.69	80	10,385	3.4	0.00087	9.4	2.6	51	4,549	10.0	530	0.0068
2102	2.4	8.8	0.69	80	10,518	3.4	0.00088	9.5	2.6	51	4,550	10.1	530	0.0068
2103	2.4	8.8	0.71	80	10,678	3.5	0.00088	9.7	2.6	51	4,550	10	530	0.0069
2104	2.5	8.9	0.72	80	10,865	3.6	0.00089	9.8	2.7	51	4,550	11	530	0.007
2105	2.4	8.9	0.71	80	10,911	3.6	0.00089	9.8	2.6	51	4,550	11	530	0.007
2106	2.4	8.9	0.68	80	11,011	3.5	0.00089	9.6	2.5	51	4,550	10	530	0.0069
2107	2.4	9.0	0.69	80	11,144	3.5	0.0009	9.6	2.6	51	4,550	10	530	0.0069
2108	2.4	9.0	0.7	80	11,343	3.6	0.0009	9.7	2.6	51	4,550	11	530	0.0069
2109	2.4	9.0	0.7	80	11,444	3.6	0.0009	9.7	2.6	51	4,551	11	530	0.0069
2110	2.5	9.0	0.72	80	11,602	3.7	0.0009	9.8	2.7	51	4,551	11	530	0.0069
2111	2.5	9.1	0.73	80	11,723	3.8	0.00091	9.9	2.7	51	4,551	11	530	0.007
2112	2.5	9.1	0.75	80	11,891	3.9	0.00091	10.0	2.8	51	4,551	11	530	0.0071
2113	2.5	9.1	0.76	80	11,962	3.9	0.00091	10.0	2.8	51	4,551	12	530	0.0071
2114	2.5	9.1	0.78	80	12,076	4.0	0.00091	10	2.9	51	4,551	12	530	0.0071
2115	2.5	9.1	0.79	80	12,166	4.0	0.00091	10	3.0	51	4,551	12	530	0.0072
2116	2.6	9.2	0.82	80	12,316	4.1	0.00092	10	3.0	51	4,552	12	530	0.0073
2117	2.6	9.2	0.82	80	12,388	4.1	0.00092	10	3.1	51	4,552	12	530	0.0073
2118	2.6	9.2	0.83	80	12,508	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073
2119	2.6	9.2	0.83	80	12,582	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073
2120	2.6	9.2	0.85	80	12,724	4.2	0.00092	10	3.1	51	4,552	12	530	0.0073
2121	2.6	9.2	0.85	80	12,842	4.1	0.00092	10	3.1	51	4,552	12	530	0.0073
2122	2.7	9.2	0.85	80	12,999	4.1	0.00092	10	3.1	51	4,552	12	531	0.0072
2123	2.7	9.2	0.85	80	13,100	4.1	0.00092	10	3.1	51	4,553	12	531	0.0072
2124	2.7	9.3	0.85	80	13,279	4.1	0.00093	10	3.1	51	4,553	12	531	0.0071
2125	2.7	9.3	0.85	80	13,361	4.0	0.00093	10.0	3.1	51	4,553	12	531	0.0071
2126	2.7	9.3	0.85	80	13,503	4.0	0.00093	9.9	3.1	51	4,553	12	531	0.0071
2127	2.7	9.3	0.85	80	13,601	3.9	0.00093	9.9	3.1	51	4,553	12	531	0.0071
2128	2.8	9.3	0.84	80	13,769	3.9	0.00093	9.9	3.1	51	4,553	11	531	0.007
2129	2.8	9.3	0.84	80	13,832	3.8	0.00093	9.9	3.0	51	4,553	11	531	0.007
2130	2.8	9.3	0.83	80	13,970	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007
2131	2.8	9.3	0.83	80	14,059	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007
2132	2.8	9.3	0.83	80	14,224	3.7	0.00093	9.8	3.0	51	4,553	11	531	0.007
2133	2.8	9.3	0.83	80	14,267	3.7	0.00093	9.8	3.0	51	4,554	11	531	0.007
2134	2.8	9.3	0.82	80	14,389	3.6	0.00093	9.8	2.9	51	4,554	11	531	0.007

Model Year	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2023	12	0.056	0.0000007	0.000007	0.00031	0.00012	0.00024	2.5	0.31	0.057	24
2024	22	0.1	0.0000013	0.000013	0.00057	0.00022	0.00044	4.5	0.57	0.1	44
2025	41	0.18	0.0000023	0.000023	0.001	0.0004	0.0008	8.2	1.0	0.19	80
2026	64	0.29	0.0000036	0.000036	0.0016	0.00063	0.0013	13	1.6	0.3	125
2027	81	0.36	0.0000046	0.000046	0.002	0.00079	0.0016	16	2.0	0.37	158
2028	147	0.66	0.0000084	0.000084	0.0037	0.0014	0.0029	30	3.7	0.68	289
2029	138	0.62	0.0000078	0.000078	0.0035	0.0013	0.0027	28	3.5	0.63	270
2030	178	0.8	0.00001	0.0001	0.0045	0.0017	0.0035	36	4.5	0.82	348
2031	1,141	5.1	0.000065	0.00065	0.029	0.011	0.022	229	29	5.3	2,236
2032	1,854	8.3	0.00011	0.0011	0.047	0.018	0.036	372	47	8.5	3,634
2033	316	1.4	0.000018	0.00018	0.008	0.0031	0.0062	63	8.0	1.5	620
2034	1,271	5.7	0.000072	0.00072	0.032	0.012	0.025	255	32	5.9	2,492
2035	3,614	16	0.00021	0.0021	0.092	0.035	0.071	725	92	17	7,085
2036	6,163	28	0.00035	0.0035	0.16	0.06	0.12	1,236	156	28	12,083
2037	6,868	31	0.00039	0.0039	0.17	0.067	0.13	1,377	174	32	13,464
2038	13,748	62	0.00078	0.0078	0.35	0.13	0.27	2,757	349	63	26,952
2039	26,682	105	0.0014	0.014	0.64	0.23	0.46	4,560	577	105	45,912
2040	56,264	182	0.0028	0.028	1.2	0.4	0.79	6,967	881	160	79,056
2041	91,088	255	0.004	0.04	1.8	0.55	1.1	4,991	631	115	110,907
2042	101,408	255	0.0044	0.044	1.9	0.64	1.3	2,152	272	49	128,839
2043	102,699	255	0.0044	0.044	2.0	0.67	1.3	1,212	153	28	133,866
2044	102,665	255	0.0044	0.044	2.0	0.68	1.4	1,333	169	31	136,575
2045	104,596	255	0.0045	0.045	2.0	0.67	1.3	1,614	204	37	133,758
2046	103,927	255	0.0045	0.045	2.0	0.64	1.3	1,560	197	36	128,763
2047	111,227	255	0.0049	0.049	2.2	0.64	1.3	1,157	146	27	128,089
2048	121,828	255	0.0054	0.053	2.4	0.65	1.3	1,115	141	26	129,793
2049	127,787	255	0.0056	0.056	2.5	0.66	1.3	1,209	153	28	131,172
2050	131,275	255	0.0058	0.058	2.6	0.66	1.3	1,052	133	24	132,811
2051	133,239	255	0.0058	0.059	2.6	0.67	1.3	814	103	19	133,964
2052	135,022	255	0.0059	0.059	2.6	0.68	1.4	510	64	12	135,076
2053	135,713	255	0.006	0.06	2.7	0.68	1.4	262	33	6.0	135,145
2054	136,555	255	0.006	0.06	2.7	0.68	1.4	185	23	4.2	135,795
2055	138,022	255	0.0061	0.061	2.7	0.68	1.5	191	24	4.4	136,601
2056	142,580	255	0.006	0.06	2.7	0.69	1.4	224	28	5.2	137,639
2057	147,637	255	0.0057	0.057	2.5	0.69	1.4	265	34	6.1	137,940
2058	150,367	255	0.0056	0.056	2.5	0.69	1.4	314	40	7.2	138,218
2059	151,559	255	0.0056	0.056	2.5	0.69	1.4	370	47	8.5	138,460
2060	153,010	255	0.0056	0.056	2.5	0.7	1.4	436	55	10	139,518
2061	153,444	255	0.0056	0.056	2.5	0.7	1.4	509	64	12	139,838
2062	155,812	255	0.0056	0.056	2.5	0.7	1.4	590	75	14	140,676
2063	157,594	255	0.0056	0.056	2.5	0.71	1.4	678	86	16	141,568
2064	158,910	255	0.0056	0.056	2.5	0.71	1.4	773	98	18	142,789
2065	161,808	255	0.0056	0.056	2.5	0.72	1.4	871	110	20	143,409
2066	163,990	255	0.0056	0.056	2.5	0.72	1.4	976	123	22	144,573
2067	165,642	255	0.0056	0.056	2.5	0.73	1.5	1,086	137	25	145,722
2068	167,815	255	0.0056	0.056	2.5	0.74	1.5	1,196	151	27	147,284
2069	168,960	255	0.0056	0.056	2.5	0.74	1.5	1,287	163	30	148,041
2070	170,682	255	0.0057	0.057	2.5	0.75	1.5	1,328	168	31	149,328
2071	172,012	255	0.0057	0.057	2.5	0.75	1.5	1,269	160	29	150,505
2072	174,885	255	0.0058	0.058	2.6	0.76	1.5	1,151	146	26	151,916
2073	175,699	255	0.0059	0.059	2.6	0.76	1.5	1,061	134	24	152,292
2074	176,912	255	0.0059	0.059	2.6	0.77	1.5	1,038	131	24	153,237
2075	178,095	255	0.006	0.06	2.7	0.77	1.5	1,018	129	23	153,995
2076	181,465	255	0.0062	0.061	2.7	0.78	1.6	1,053	133	24	155,005
2077	182,839	255	0.0062	0.062	2.8	0.78	1.6	1,091	138	25	155,356
2078	184,593	255	0.0063	0.063	2.8	0.78	1.6	1,141	144	26	156,236
2079	186,720	255	0.0064	0.064	2.8	0.79	1.6	1,172	148	27	157,251
2080	188,943	255	0.0064	0.065	2.9	0.79	1.6	1,173	148	27	158,470
2081	190,130	255	0.0065	0.065	2.9	0.79	1.6	1,193	151	27	158,838
2082	191,952	255	0.0065	0.065	2.9	0.8	1.6	1,162	147	27	159,814
2083	193,053	255	0.0065	0.065	2.9	0.8	1.6	1,183	150	27	160,383
2084	195,161	255	0.0066	0.066	2.9	0.81	1.6	1,171	148	27	161,637
2085	195,547	255	0.0065	0.065	2.9	0.81	1.6	1,198	151	28	161,890
2086	197,076	255	0.0066	0.066	2.9	0.81	1.6	1,170	148	27	162,778
2087	197,831	255	0.0066	0.066	2.9	0.82	1.6	1,182	149	27	163,470
2088	200,479	255	0.0067	0.067	3.0	0.82	1.7	1,114	141	26	164,570
2089	201,978	255	0.0067	0.067	3.0	0.82	1.7	1,110	140	26	164,772
2090	203,237	255	0.0067	0.067	3.0	0.83	1.7	1,042	132	24	165,462
2091	204,381	255	0.0067	0.067	3.0	0.83	1.7	1,058	134	24	166,285
2092	206,401	255	0.0067	0.067	3.0	0.84	1.7	1,046	132	24	167,587
2093	207,275	256	0.0067	0.067	3.0	0.84	1.7	1,091	138	25	168,175
2094	208,419	256	0.0066	0.067	3.0	0.85	1.7	1,132	143	26	169,130
2095	208,687	256	0.0066	0.066	2.9	0.85	1.7	1,202	152	28	169,816
2096	209,256	256	0.0066	0.066	2.9	0.85	1.7	1,274	161	29	170,905
2097	209,610	256	0.0066	0.066	2.9	0.86	1.7	1,350	171	31	171,124
2098	210,449	256	0.0066	0.066	2.9	0.86	1.7	1,427	180	33	171,837
2099	211,341	256	0.0066	0.066	2.9	0.86	1.7	1,506	190	35	172,453
2100	213,995	256	0.0067	0.067	3.0	0.87	1.7	1,584	200	36	173,472
2101	215,642	256	0.0067	0.068	3.0	0.87	1.7	1,664	210	38	174,383
2102	216,923	256	0.0068	0.068	3.0	0.88	1.8	1,745	221	40	175,164
2103	220,268	256	0.0069	0.069	3.1	0.88	1.8	1,826	231	42	175,863
2104	223,031	256	0.007	0.07	3.1	0.89	1.8	1,912	242	44	177,220
2105	223,230	256	0.007	0.07	3.1	0.89	1.8	1,983	251	46	177,533
2106	223,210	256	0.0069	0.069	3.1	0.89	1.8	2,053	260	47	178,211
2107	224,767	256	0.0069	0.069	3.1	0.9	1.8	2,117	268	49	179,040
2108	227,205	256	0.0069	0.069	3.1	0.9	1.8	2,183	276	50	180,178
2109	228,157	256	0.007	0.07	3.1	0.9	1.8	2,233	282	51	180,248
2110	229,980	256	0.007	0.07	3.1	0.9	1.8	2,287	289	53	180,830
2111	231,411	256	0.0071	0.071	3.1	0.91	1.8	2,338	296	54	181,243
2112	233,711	256	0.0072	0.072	3.2	0.91	1.8	2,389	302	55	181,975
2113	234,267	256	0.0072	0.072	3.2	0.91	1.8	2,417	306	56	181,870
2114	235,938	256	0.0073	0.073	3.2	0.91	1.8	2,432	307	56	182,135
2115	236,829	256	0.0073	0.073	3.2	0.91	1.9	2,429	307	56	182,344
2116	239,352	256	0.0074	0.074	3.3	0.92	1.9	2,403	304	55	183,370
2117	239,759	256	0.0074	0.074	3.3	0.92	1.9	2,342	296	54	183,400
2118	240,810	256	0.0074	0.074	3.3	0.92	1.9	2,269	287	52	183,657
2119	241,087	256	0.0074	0.073	3.3	0.92	1.9	2,180	276	50	183,671
2120	242,454	256	0.0074	0.074	3.3	0.92	2.0	2,102	266	48	184,250
2121	243,656	256	0.0073	0.073	3.3	0.92	2.0	2,011	254	46	184,044
2122	244,314	256	0.0072	0.072	3.2	0.92	2.0	1,921	243	44	184,430
2123	244,600	256	0.0072	0.072	3.2	0.92	2.0	1,846	233	42	184,660
2124	245,518	256	0.0072	0.072	3.2	0.93	2.0	1,720	217	40	185,381
2125	245,536	256	0.0071	0.071	3.2	0.93	1.9	1,629	206	37	185,380
2126	246,100	256	0.0071	0.071	3.2	0.93	1.9	1,447	183	33	185,890
2127	246,374	256	0.0071	0.071	3.1	0.93	1.9	1,350	171	31	185,957
2128	246,940	256	0.0071	0.071	3.1	0.93	1.9	1,155	146	27	186,328
2129	246,766	256	0.0071	0.07	3.1	0.93	1.9	1,070	135	25	185,930
2130	246,964	256	0.007	0.07	3.1	0.93	1.9	921	117	21	186,107
2131	247,391	256	0.007	0.07	3.1	0.93	1.9	872	110	20	186,064
2132	248,254	256	0.007	0.07	3.1	0.93	1.9	791	100	18	186,657
2133	248,104	256	0.007	0.07	3.1	0.93	1.9	768	97	18	186,125
2134	248,519	256	0.007	0.07	3.1	0.93	1.9	733	93	17	186,338

Table A10. Annual loads of the NAG backfill for the high nitrogen scenario.

Model Year	SO4	Alkalinity	Cl	Al	Sb	As	Ba	B	Cd	Ca	Cr	Co	Cu	Fe	Pb	Li	Mg	Mn	Hg	Mo	Ni	P	K	Se	Si	Ag	Na	Sr	Tl	Sn	U	V	Zn	NO3	NH3	NO2	Seepage Rate
	kg/year	kg/year as CaCO3	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	kg/year	m^3/year
2135	293,380	298,007	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,476	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.0071	249,369	256	0.0071	0.071	3.1	0.93	1.9	729	92	17	186,569
2136	294,116	300,087	3,182	44	0.52	0.42	0.59	145	0.0094	180	0.19	0.88	2.8	9.4	0.82	80	14,627	3.6	0.00094	9.9	2.9	51	4,554	10	531	0.0071	250,409	256	0.0071	0.071	3.1	0.94	1.9	720	91	17	187,180
2137	294,526	299,791	3,182	43	0.52	0.42	0.59	145	0.0093	180	0.19	0.89	2.8	9.3	0.82	80	14,660	3.6	0.00093	9.9	2.9	51	4,554	11	531	0.0071	250,386	256	0.0071	0.071	3.1	0.93	1.9	719	91	17	186,716
2138	292,307	302,917	3,182	45	0.52	0.41	0.59	145	0.0093	175	0.19	0.88	2.8	9.3	0.81	80	14,758	3.6	0.00093	9.8	2.9	51	4,554	10	531	0.007	250,579	256	0.007	0.07	3.1	0.93	1.9	718	91	17	186,790
2139	289,713	306,716	3,182	46	0.51	0.41	0.6	145	0.0094	171	0.19	0.87	2.8	9.4	0.8	80	14,875	3.5	0.00094	9.7	2.9	51	4,554	10	531	0.007	250,880	256	0.007	0.07	3.1	0.94	1.9	719	91	17	187,056
2140	288,790	309,416	3,182	47	0.51	0.41	0.61	145	0.0094	170	0.19	0.86	2.8	9.4	0.79	80	15,004	3.5	0.00094	9.7	2.8	51	4,554	10	531	0.007	251,418	256	0.0069	0.069	3.1	0.94	1.9	722	91	17	187,514
2141	285,594	310,955	3,182	48	0.5	0.4	0.61	145	0.0093	167	0.19	0.84	2.7	9.3	0.78	80	15,062	3.4	0.00093	9.6	2.8	51	4,554	10	531	0.0069	250,495	256	0.0069	0.069	3.0	0.93	1.9	721	91	17	186,895
2142	284,497	312,138	3,182	48	0.5	0.4	0.61	145	0.0093	166	0.19	0.84	2.7	9.3	0.77	80	15,125	3.4	0.00093	9.6	2.8	51	4,555	10	531	0.0068	250,391	256	0.0068	0.068	3.0	0.93	1.9	722	91	17	186,886
2143	282,701	314,516	3,182	48	0.5	0.39	0.62	145	0.0094	164	0.19	0.82	2.7	9.4	0.75	80	15,260	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	250,382	256	0.0068	0.068	3.0	0.94	1.9	724	91	17	187,034
2144	282,564	316,417	3,182	49	0.5	0.39	0.62	145	0.0094	164	0.19	0.81	2.7	9.4	0.75	80	15,365	3.3	0.00094	9.5	2.7	51	4,555	10	531	0.0068	250,980	256	0.0068	0.068	3.0	0.94	1.9	726	92	17	187,551
2145	280,098	317,409	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.79	2.7	9.4	0.72	80	15,447	3.2	0.00094	9.4	2.6	51	4,555	9	531	0.0067	250,100	256	0.0067	0.067	3.0	0.94	1.9	724	91	17	187,019
2146	279,425	318,300	3,183	49	0.49	0.38	0.63	145	0.0094	162	0.19	0.78	2.7	9.4	0.72	80	15,509	3.2	0.00094	9.4	2.6	51	4,555	9.2	531	0.0067	250,071	256	0.0067	0.067	3.0	0.94	1.9	723	91	17	187,081
2147	278,254	320,021	3,183	49	0.49	0.38	0.63	145	0.0094	161	0.19	0.76	2.7	9.4	0.7	80	15,631	3.1	0.00094	9.4	2.5	51	4,555	9.0	531	0.0067	250,059	256	0.0067	0.067	3.0	0.94	1.9	716	91	16	187,212
2148	278,291	321,567	3,183	50	0.49	0.37	0.64	145	0.0094	161	0.19	0.75	2.7	9.4	0.69	80	15,727	3.1	0.00094	9.4	2.5	51	4,555	8.9	531	0.0067	250,610	256	0.0067	0.067	3.0	0.94	1.9	712	90	16	187,667
2149	276,225	321,860	3,183	50	0.49	0.37	0.64	145	0.0094	159	0.19	0.73	2.6	9.4	0.67	80	15,781	3.0	0.00094	9.3	2.4	51	4,555	8.7	531	0.0066	249,667	256	0.0066	0.066	2.9	0.94	1.9	687	87	16	187,030
2150	275,653	322,343	3,183	50	0.49	0.36	0.64	145	0.0093	159	0.19	0.72	2.6	9.3	0.66	80	15,824	2.9	0.00093	9.3	2.4	51	4,555	8.6	531	0.0066	249,532	256	0.0066	0.066	2.9	0.93	1.9	669	85	15	186,985

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Appendix C Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2024)

Prepared for : Telkwa Mining Ltd. Project number: CAPR0002055. Issued December. 2024. (SRK Consulting (Canada) Inc.

Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2024)

Prepared for

Telkwa Mining Ltd

Prepared by

SRK Consulting (Canada) Inc.
CAPR002055
December 2024

Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2024)

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Attachments

Attachment A AGRA 1999 Report
Attachment B Baseflow Separation Results
Attachment C AGRA Data

Executive Summary

As part of the Tenas Project Environmental Assessment, SRK Consulting (Canada) Inc. was retained by Telkwa Mining Ltd (TCM) to complete a hydrometeorological analysis for the Tenas Project (the Project).

The Project is located approximately 25 km southwest of the town of Smithers, BC within the Telkwa River watershed and is composed of an open pit, backfill, external stockpiles, water management ponds, control ponds, process plant and rail load out.

This report presents the hydrometeorological baseline of the Project. The key objective of this report is to to develop inputs to the Project water management plan and water and load balance model.

Site hydrometeorological conditions are monitored via a site weather station and five (5) hydrometric stations located on each of the major watercourses (Goathorn-Hydro, Telkwa-Hydro, Tenas-Hydro/Tenas-Hydro B, and Four-Hydro). The weather station was operated from 2017 to 2022. Hydrometric stations have two to three complete hydrologic years of data recorded within the 2017 to 2022 period. For this assessment, the relatively short site datasets are supplemented with regional datasets and climate re-analysis models.

Synthetic long-term Project climate datasets were developed based on transposing the regional datasets at Smithers Airport to the site and adjusting for observed orographic effects. These datasets were used to derive Project design parameters and water and load balance inputs, as well as to support development of a rainfall-runoff model. This model was developed and calibrated for each of the local hydrometric stations. A combination of the calibrated models from Goathorn Creek and Tenas Creek were applied to the Tenas Project area.

Selected climate parameters are summarized in Table 1-1 to Table 1-3.

Table 1-1: Derived Monthly and Annual Project Climate Normals

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Temperature (°C)	-9.2	-6.1	-2.7	2.1	6.8	10.7	13.0	12.5	8.4	2.6	-3.8	-7.9	2.2
Rainfall (mm)	8.0	9.7	10.4	21.5	35.9	45.7	48.1	43.1	50.8	58.6	20.0	8.0	359.9
Snowfall (mm)	61.8	35.9	22.0	4.9	0.7	0.0	0.0	0.0	0.3	13.6	49.4	59.7	248.1
Total Precipitation (mm)	69.7	45.6	32.4	26.4	36.6	45.7	48.1	43.1	51.1	72.2	69.4	67.7	608.0
Evaporation (mm)	0	0	0	60	97	108	116	99	50	0	0	0	529

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Evaporation_rev02.Rmd

Table 1-2: Extreme Precipitation

Return Period	24-hour Precipitation [mm]	72-hour Precipitation [mm]
2	42.0	56.7
5	56.1	75.6
10	66.3	89.3
25	80.2	108.1
50	91.3	123.0
100	103.1	138.9
200	115.6	155.7
500	133.3	179.6
1000	147.7	199.1
PMP (Spring)	234.0	-
PMP (Summer/Autumn)	283.0	-

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Precipitation_1CT027.003_rev01.Rmd

Table 1-3: Extreme Snowmelt

Return Period	24-hour Snowmelt [mm SWE]	72-hour Snowmelt [mm SWE]
2	34.0	57.5
5	43.3	73.3
10	50.9	86.1
25	62.8	106.4
50	74.0	125.4
100	87.7	148.5
200	104.4	176.8
500	132.4	224.3
1000	159.4	269.9

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\ \Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Model\SnowmeltModel\SWE_ModelledOutput_09172020.xlsx

Mean annual runoff for the Project was determined to be 219 mm/year with an annual runoff coefficient of 0.36 with the highest flows occurring in May and June due to freshet, and low flows occurring during the winter.

Climate change scenarios for RCP4.5, RCP6.5 and RCP8.5 were evaluated for the Project Area. The effects of the RCP4.5 scenario were used to generate mean annual and monthly temperature and precipitation correction factors, which also affect runoff and evaporation rates, as summarized in Table 1-4.

Table 1-4: Projected Climate Change Impacts on Selected Climate Parameters

Timeframe	Mean Annual Temperature (°C)	Mean Annual Precipitation (mm)	Mean Annual Evaporation (mm)
2011-2040	1.2°C	+5%	+2%
2041-2070	2.4°C	+12%	+4%
2071-2100	3.0°C	+15%	+5%

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Climate_Change_rev03.Rmd

Extreme precipitation magnitudes are expected to increase. Monthly streamflow is expected to experience an overall increase in flow magnitude and a shift to an earlier spring freshet. No significant trend in peak flows is projected.

The short duration of the Project meteorological and hydrometric datasets is a limitation of this hydrometeorological baseline report. SRK recommends ongoing monitoring of Project meteorologic conditions, and continued hydrometric station monitoring at Four-Hydro and Tenas-Hydro B as a minimum.This report should be updated when additional data become available. In particular, the Four-Hydro discharge record requires additional flow measurements to characterize baseline conditions for effects assessments and to support predictive modelling.

1 Introduction

SRK Consulting (Canada) Inc. has been tasked with updating the meteorological and hydrological characterization to develop inputs required for the Tenas Project (the Project) in support of the Environmental Assessment (EA). The EA has been prepared in accordance with the BC Environmental Assessment Office (BC EAO) Guidelines for Preparing Environmental Assessments (BC EAO 2016).

The following report provides an updated summary of baseline meteorology and hydrology data collected between 2017 and 2022. Regional records were used to extend the local records in order to develop statistical climate and hydrologic parameters that will be used to support various technical studies for the EA, including water management designs, groundwater modeling, and the water and load balance model. The main changes pertain to the updating of the synthetic climate record based on additional data from the local station since the development of the EA baseline report (SRK 2022a) and the hydrological parameters based on new calibration to the available data.

1.1 Project Setting

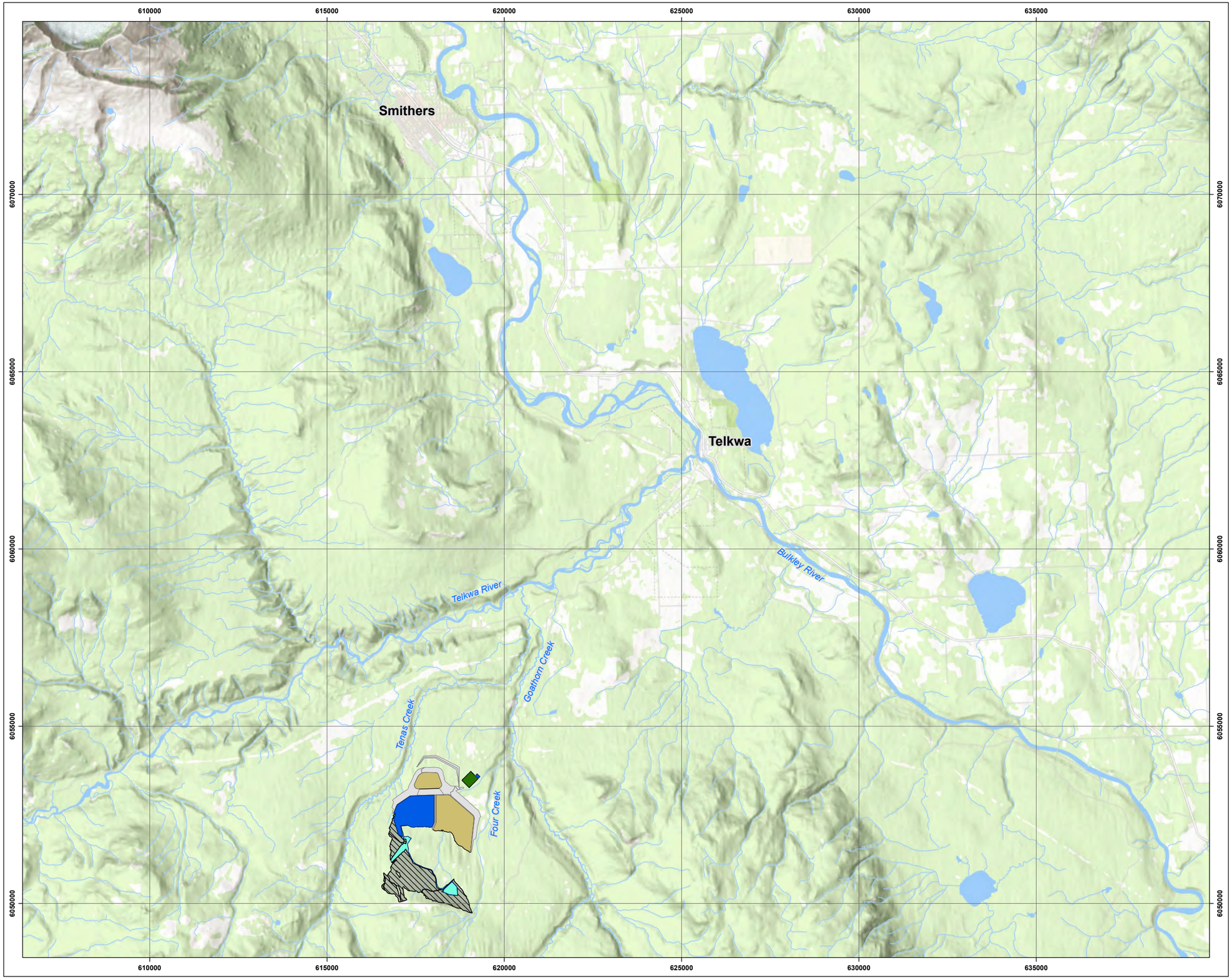
The Tenas Coal Project is a proposed coal mine located in the Coast Mountains of the Cordilleran Region near the Town of Telkwa approximately 25 km southwest of Smithers, British Columbia. The coal preparation plant, maintenance facilities and service facilities would be located approximately 6 km southwest of Telkwa. The Project footprint elevation ranges from 750 to 1050 meters above sea level (masl) with a median elevation of 800 masl. The Ministry of Environment and Climate Change Strategy (MECCS) have published hydrological zones that represent areas of homogeneous hydrologic and geomorphic characteristics. The Tenas Project is within Zone 8 – Nechako Plateau.

The Project encompasses the lower reaches of the Telkwa River, Tenas Creek, Goathorn Creek and Four Creek. The Telkwa River is a major tributary to the Bulkley River near the village of Telkwa, British Columbia, which ultimately flows into the Skeena River. Four Creek is a tributary of Goathorn Creek, and Goathorn Creek and Tenas Creek are tributaries of the Telkwa River.

Figure 1-1 shows the Project location.

Tenas Project

Site Location



Legend

- Backfill
- Core Footprint
- Pit Lake
- Plant and Maintenance Area
- Pond
- Rock Cover
- Watercourse

Notes

1. All mapped features are approximate and should be used for discussion purposes only.
2. This map is not intended to be a “stand-alone” document, but a visual aid of the information contained within the referenced Report. It is intended to be used in conjunction with the scope of services and limitations described therein.

Sources

- Project Features: Allegiance Coal, 2020
- Basedata: Government of British Columbia
- Basemap: World Topo Base

N

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0 1 2 3 4 5

Kilometers

NAD 1983 UTM Zone 9N

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1.2 Scope of Report

Meteorology and hydrology studies conducted as part of the Telkwa Coal Project Prefeasibility studies (SRK 2017a, 2017b) identified gaps in the existing meteorological and hydrological datasets. Site specific hydrometeorological data started being collected in 2017. The first years of records (2017-2019) wereused by SRK to develop a hydrometeorological baseline for the site (SRK, 2022). Project data collection continued between 2020 and 2022. These new records were incorporated into the hydrometeorological analysis to support Project advancement in 2022 and are documented in this report.

This report is an update to the the baseline Project climate and hydrology previously developed by SRK (SRK, 2022) and generates projections of future climate conditions. This update includes available data up to October 2023.

- Section 2 presents the available meteorological datasets (2017-2022)
- Section 3 presents the available hydrometric datasets (2017-2022)
- Section 4 describes how available datasets were used to develop the Project Area meteorology and hydrometric synthetic time series
- Section 5 outlines how climate change impacts on Project air temperature, precipitation, lake evaporation and streamflow were evaluated from 2022 onwards.

2 Baseline Meteorology

2.1 Section Overview

Meteorological characteristics are typically assessed by integrating Project-specific and regional meteorology records as well as comparing previous studies related to the Project and regional indices. Placing the Project-specific parameters in context using regional analyses is important to be able to provide meteorological inputs to the Project based on extended periods of record.

2.2 Available Meteorological Data

Baseline meteorological monitoring was initiated at the Telkwa Coal Project site in September 2017 by ERM Consultants.

This section summarizes the available monitoring data for the Telkwa Coal Project. Regional climate data from the surrounding area has also been assessed to place the Telkwa Coal Project climate into context.

2.2.1 Project Data

Baseline climate data for the Project Area was collected at the Tenas Deposit automatic weather station (54.59° N, 127.19° W), installed on 29 September 2017 and operated through September

2022. Figure 2-1 illustrates the location of the Tenas Deposit Station and Table 2-1 provides the metadata.

The monitoring record from the Tenas Deposit Station was compiled, reviewed, and validated by ERM (ERM 2019). The following data is recorded at the weather station:

- Hourly average wind speed
- Hourly wind direction and standard deviation of wind direction for 2017
- Hourly average air temperature
- Hourly average relative humidity
- Hourly average solar radiation
- Hourly average barometric pressure
- Hourly sampled snow depth
- 5-minute and hourly accumulated total precipitation

Details concerning the meteorological station configuration, data collection and preliminary gap-filling procedures are outlined in Section 4 of The Tenas Project 2017 to 2019 Baseline Report (ERM 2019).

2.2.2 Regional Data

Regional meteorological data for British Columbia is available from private as well as provincial and federal government sources. Regional re-analysis products for historical climate and future scenarios are available as gridded products developed by third parties based on government datasets. Within the Nechako Plateau hydrological zone, there are over 90 regional meteorological stations monitored by the Meteorological Service of Canada (MSC). This division of Environment and Climate Change Canada provides public historical meteorological data and information.

Figure 2-1 illustrates the locations of selected regional meteorological stations with respect to the Project. Three stations have historically operated in the town of Smithers. Smithers Airport Auto and Smithers A are understood to be the same station, after an upgrade in 2018. Table 2-1 presents the metadata for the selected regional stations.

Table 2-1: Regional Meteorological Station Selections

Station Name	Climate Identifier	Latitude [° N]	Longitude [° W]	Elevation [masl]	Record Start	Record End	Distance from Project [km]
QUICK	1076638	54.62	126.90	533	1962	1995	19.1
SMITHERS AIRPORT AUTO	1077501	54.82	127.19	518	2013	2023	25.2
SMITHERS A	1077500	54.82	127.18	522	1942	2018	25.2
SMITHERS	1077499	54.83	127.18	523	2010	2023	26.3
HOUSTON	1073615	54.40	126.67	610	1957	2023	40.0
TOPLEY LANDING	1078209	54.82	126.16	722	1962	2017	71.0
EQUITY SILVER	1072692	54.2	126.28	1280	1981	2021	73.6
SUSKWA VALLEY	107G879	55.29	127.17	534	1982	2023	77.5
BURNS LAKE DECKER LAKE	1091174	54.38	125.96	713	1990	2023	83.1

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.html

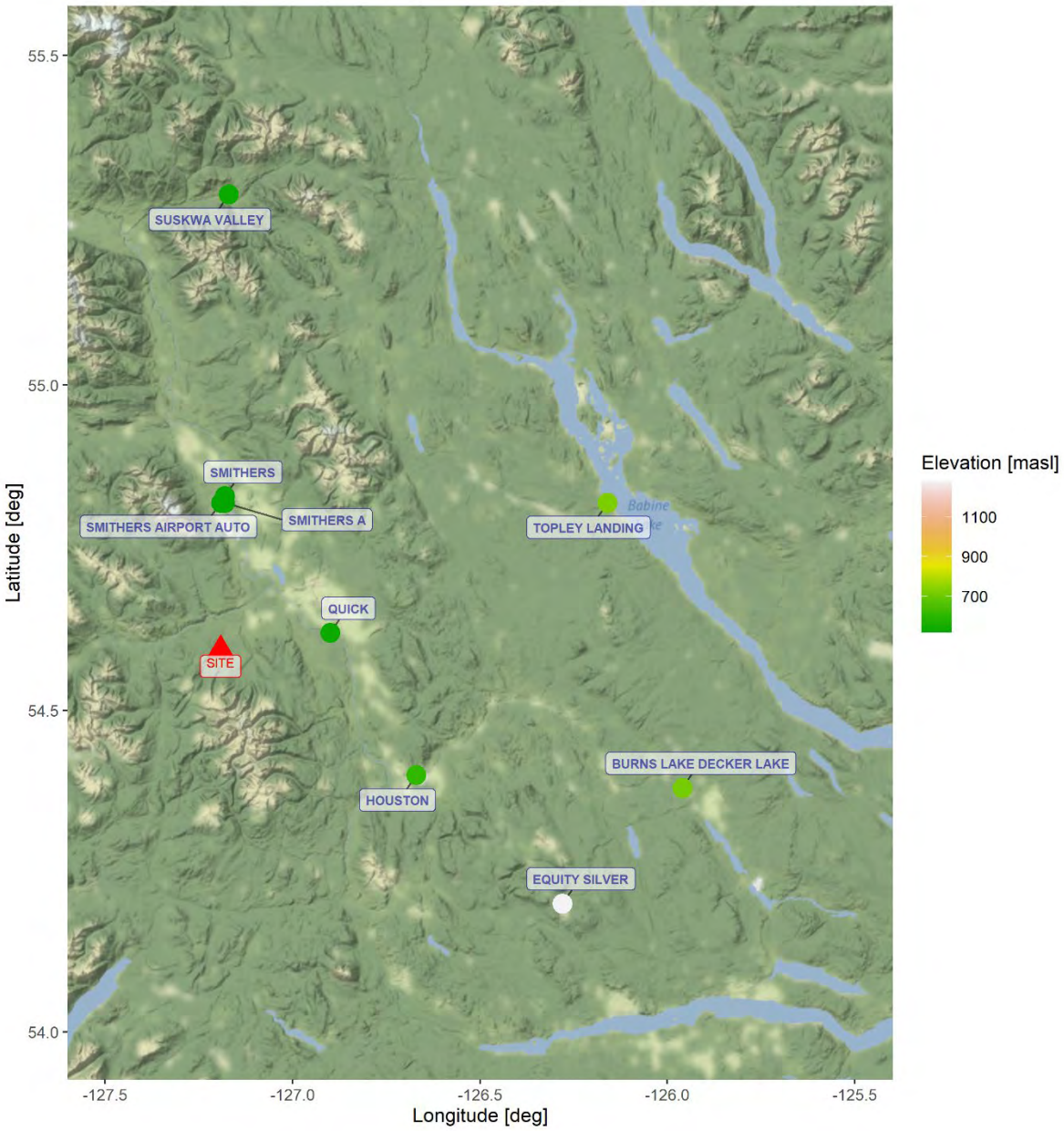


Figure 2-1: Meteorological Stations Used in Project ("Site") and Regional Assessment

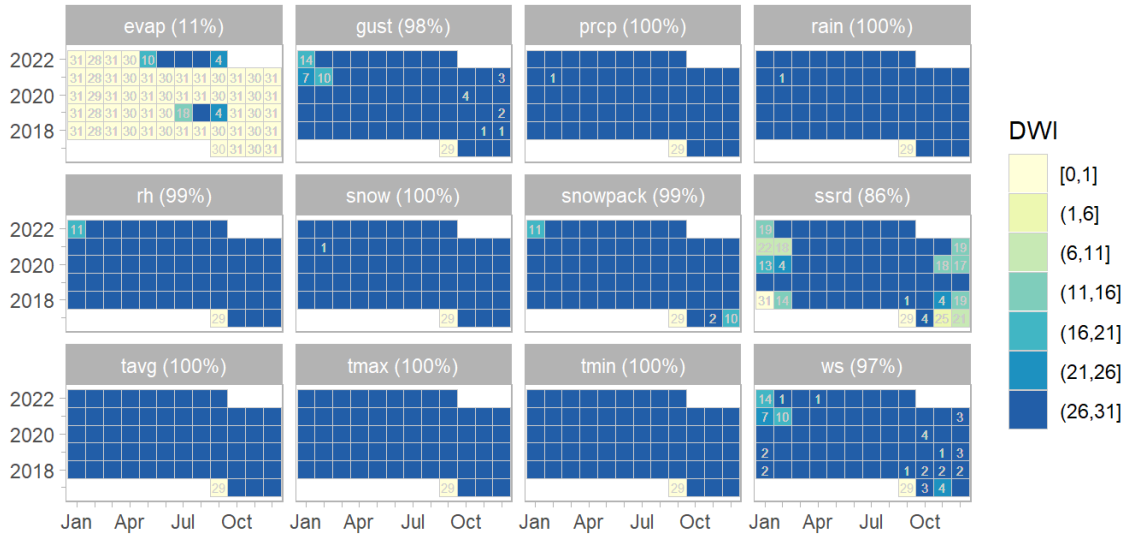
Note: Smithers A and Smithers Airport Auto are located at the same geographic location.

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.html

2.2.3 Missing Data

The meteorological records from the Tenas Deposit Station have low amount of absent records with practicaly 100% of records available for precipitation and air temperature (maximum, minimum, and daily averages). Higher quantity of missing records were found for solar radiation -

mostly during the winter, presumably because of snow cover – and pan evaporation. The missing records and data availability are provided in Figure 2-2 for all measured variables.

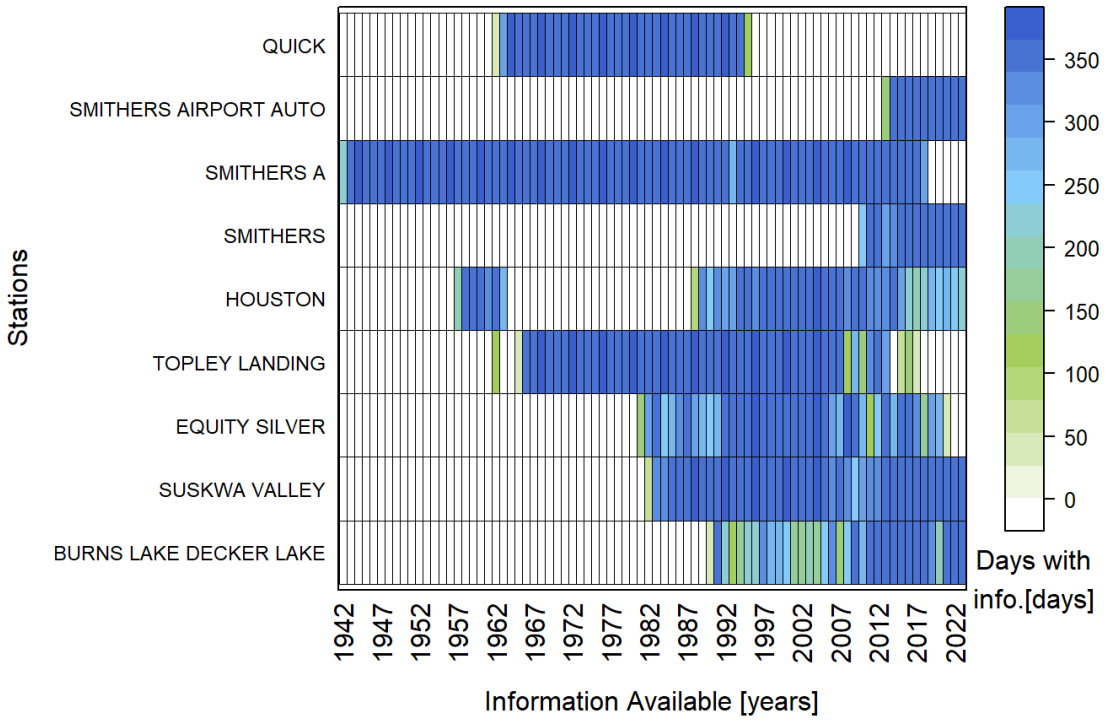


Source: compiled from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Note: Total data availability is presented after the variable name in parenthesis. Abbreviations have the following measing, ir row-wise order: evap = Pan Evaporation, gust = Wind Gust, prcp = Precipitation, rain = Rainfall, rh = Relative Humidity, snow = Snowfall, snowpack = Snowpack, ssrd = Shortwave Solar Radiation, tavg = Average Daily Temperature, tmax = Maximum Daily Temperature, tmin = Minimum Daily Temperature, ws = Wind Speed.

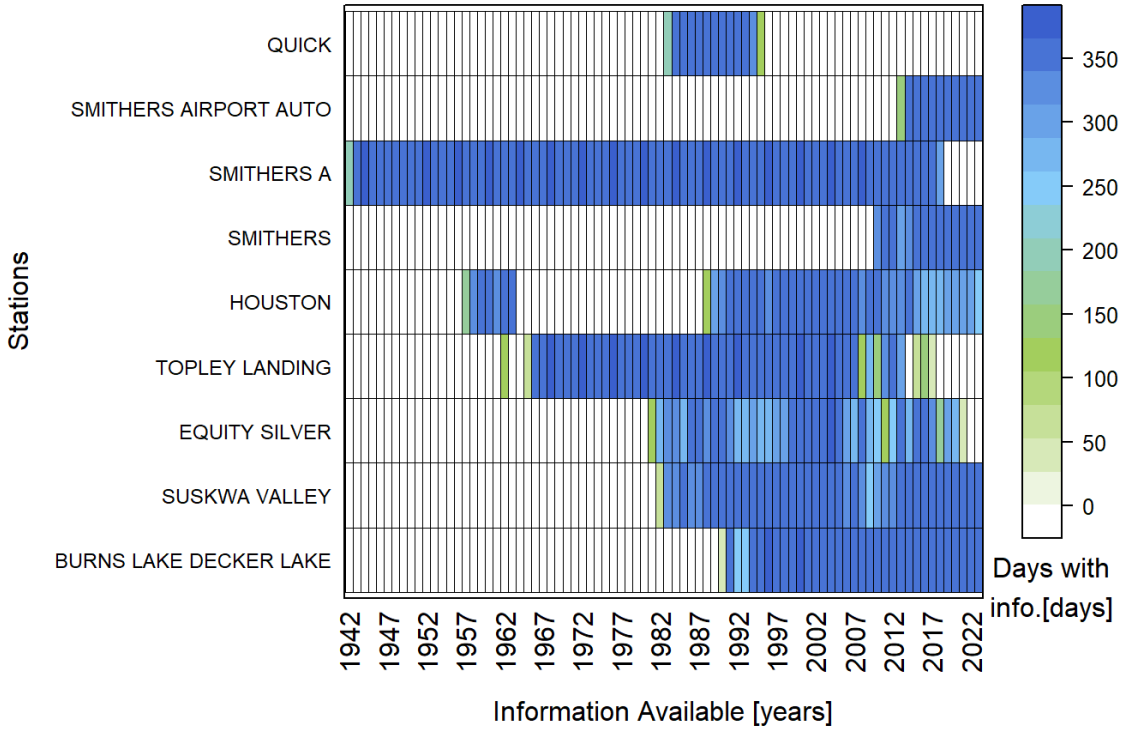
Figure 2-2: Site meteorological records availability

In terms of regional datasets, most stations also present some gaps in their records. Based on the correlations between stations these gaps could be patched appropriately as described in the sections below. Figure 2-3 and Figure 2-4 present the number of days with mean temperature and precipitation records respectively available at each regional station from 1942 to 2023. The color ramp on the right-hand side indicates 0 days of data (white) to a full 366 days (dark blue).



Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-3: Number of Days with Mean Temperature Data Available Every Year from Regional Stations



Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-4: Number of Days with Precipitation Data Available Every Year from Regional Stations

2.2.4 Regional Snow Datasets

The British Columbia Snow Survey Data includes datasets from two regional networks:

The Automated Snow Weather Station (ASWS) network is comprised of stations operated by the Ministry of Environment, BC Hydro and others. These stations collect hourly snow water equivalent, snow depth, air temperature, and precipitation. Data is available in near-real-time. Tsai Creek Station is the closest station of this type to the Project and is published by the Ministry of Environment and Climate Change Strategy (MECCS).

The Manual Snow Survey Sites network is operated by the province of British Columbia and manually measures snow depth and snow water equivalent. Measurements are taken monthly when snow is present, providing a record of snowpack across the province. Hudson Bay is the closest manual survey site to the Project. This data is also published by MECCS.

Figure 2-5 illustrates the locations of Tsai Creek and Hudson Bay snow survey stations, and Table 2-2 presents details pertaining to these stations.

Table 2-2: Regional Snow Survey Stations

Station Name	Station Identifier	Latitude [°]	Longitude [°]	Elevation [masl]	Record Start	Record End	Distance from Project [km]
Tsai Creek	4B17P	54.64	-127.68	1360	2003	Current	31.8
Hudson Bay	4B03A	54.76	-127.27	1480	1972	Current	19.4

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork Snowpack_rev02.Rmd

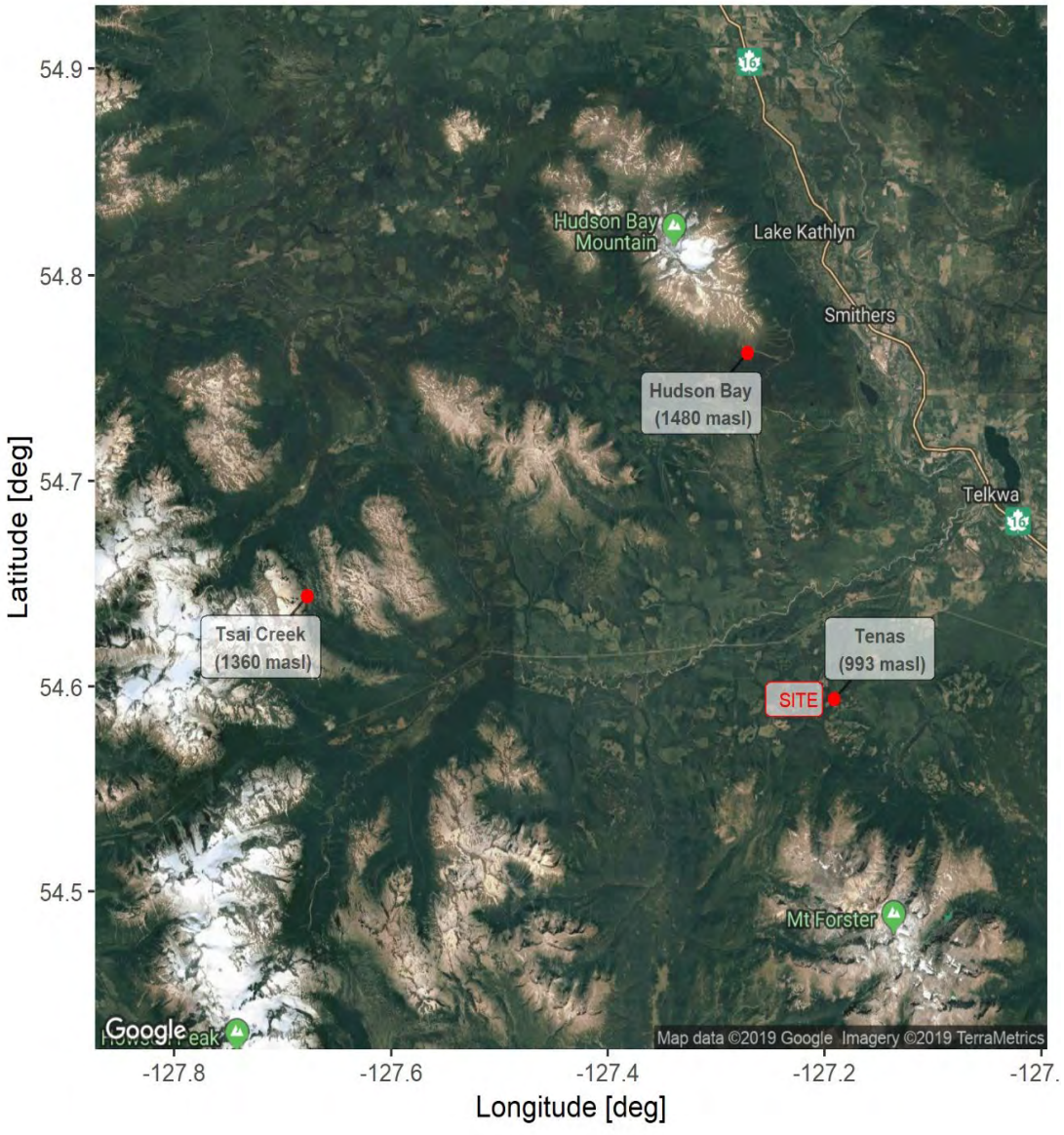


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Figure 2-5: Regional Snow Pillow Stations Hudson Bay and Tsai Creek Shown in Relation to Tenas Deposit Station

2.2.5 Reanalysis Meteorological Datasets

Reanalysis products were used to calculate regional orographic trends for precipitation and temperature. The regional stations could not account for these orographic trends, particularly in winter due to inversions present at some stations, and Project data did not produce a meaningful relationship to regional stations due to its relatively short duration of record.

Climate reanalysis combines gridded global models with observed historical data to produce historical climate and to incorporate adjustments based on developed relationships. Multiple reanalysis datasets are available in different spatiotemporal resolutions. Table 2-3 presents the three reanalysis datasets examined for this study.

Table 2-3: Overview of Reanalysis Datasets Examined in this Study

Reanalysis	Institution	Period of Record
ERA-5	European Centre for Medium-Range Weather Forecast (ECMWF)	1979-current
MERRA-2 Modern-Era Retrospective Analysis for research and applications	US National Aeronautics and Space Administration (NASA)	1980- current
PRISM	Pacific Climate Impact Consortium (PCIC)	1950-2007

Source: Compiled in text.

ERA-5 and MERRA-2 are global datasets that provide sub-daily values for multiple meteorological parameters. PRISM is a climate-elevation regression model, used to generate a reanalysis dataset that provides precipitation and maximum and minimum temperature averages on a monthly timestep for the Pacific Region of Canada and the northwestern USA.

2.3 Summary of Available Data

This section presents a summary of the Project Area and regional meteorological datasets.

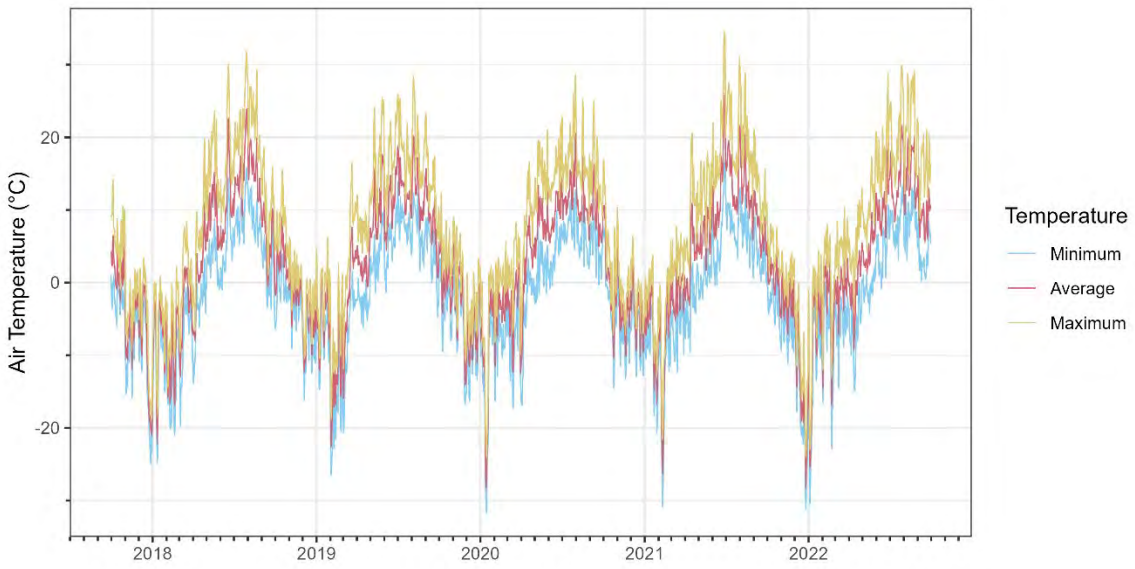
Meteorological parameters were summarized for the three years of Project data using monthly averages of daily minimum, mean and maximum air temperatures. Monthly average sums of the minimum, mean and maximum total precipitation were calculated. Annual maximum snow water equivalent (SWE) was computed for the Project based on regional snow survey data, transposed to the Project Area.

Other parameters measured at the Tenas Deposit Station include: Wind speed and direction, solar radiation, relative humidity, and barometric/atmospheric pressure. Evaporation rates were calculated based on thes parameters. Measured and calculated parameters are summarized for the Project Area and the long-term regional records in the following sections.

2.3.1 Air Temperature

Project

Temperature is used to estimate snowmelt, evaporation, evapotranspiration, and other inputs such as pond freeze depths. Air temperatures recorded at the Tenas Deposit Station ranged from -31.7°C (January 15, 2020) to 34.5°C (June 27, 2021). Figure 2-6 presents the daily maximum, average and minimum temperature at the Tenas Deposit Station. During the period of record, the coldest month was the month of December 2021 with a mean temperature of -14.0°C, and the hottest month was the month of July 2018 at 15.5°C. The summary of monthly maximum, average and minimum daily temperatures is presented in Table 2-4.



Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\graphs\ts_site_airtemp.png

Figure 2-6: Tenas Deposit Meteorological Station Temperature Record

Table 2-4: Tenas Deposit Meteorological Station Daily Air Temperature (°C) for October 2017-2022

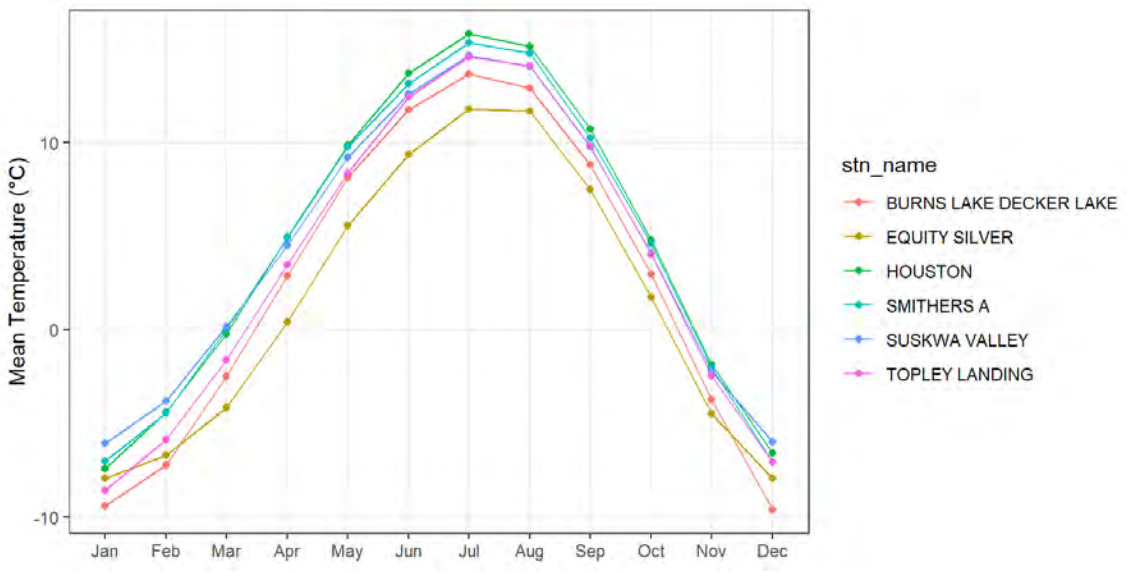
Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017	Max.										14.2	2.5	3.4	14.2
	Mean										1.9	-5.6	-8.9	-4.2
	Min.										-5.9	-15.9	-24.9	-24.9
2018	Max.	0.8	2.2	8.3	19.8	23.7	30.1	31.8	29.3	18.5	15.5	6.2	0.6	31.8
	Mean	-7.6	-9.8	-3.3	1.1	9.4	10.6	15.5	15.3	5.9	3.0	-1.0	-6.1	2.8
	Min.	-24.7	-21.0	-19.7	-13.9	-1.1	-1.0	5.0	4.9	-5.2	-6.3	-9.1	-16.1	-24.7
2019	Max.	6.2	2.7	16.5	12.7	25.6	24.8	25.9	28.4	23.2	12.3	9.1	1.3	28.4
	Mean	-3.8	-12.7	-1.3	2.4	10.5	10.9	12.9	12.9	8.2	0.7	-1.9	-7.9	2.6
	Min.	-14.7	-26.5	-20.7	-6.2	-1.4	-1.3	3.8	1.7	-4.8	-9.5	-16.8	-16.3	-26.5
2020	Max.	2.4	5.7	8.3	16.6	21.0	21.9	28.6	25.3	25.1	17.0	10.4	6.4	28.6
	Mean	−9.8	−3.5	−3.2	2.0	8.3	9.3	12.6	10.7	9.4	0.7	−3.4	−3.8	2.4
	Min.	−31.7	−16.3	−17.3	−16.8	−3.0	−0.8	4.6	1.9	−0.3	−14.5	−13.2	−12.9	-31.7
2021	Max.	3.7	5.8	7.7	20.6	18.0	34.5	31.1	29.4	21.1	8.1	4.4	0.6	34.5
	Mean	−6.4	−8.9	−1.5	3.1	6.5	13.0	14.4	13.1	7.7	0.6	−2.4	−14.0	2.1
	Min.	−20.7	−30.9	−12.3	−9.6	−2.3	−0.4	3.3	0.7	0.0	−8.8	−11.2	−31.1	-31.1
2022	Max.	4.4	8.0	10.3	13.1	20.8	28.8	29.9	29.1	22.0				29.9
	Mean	−7.6	−3.5	−0.6	−0.7	4.9	11.0	14.3	15.0	9.4				4.7
	Min.	−30.4	−22.9	−14.5	−14.9	−4.2	−0.8	3.1	3.0	0.3				-30.4

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

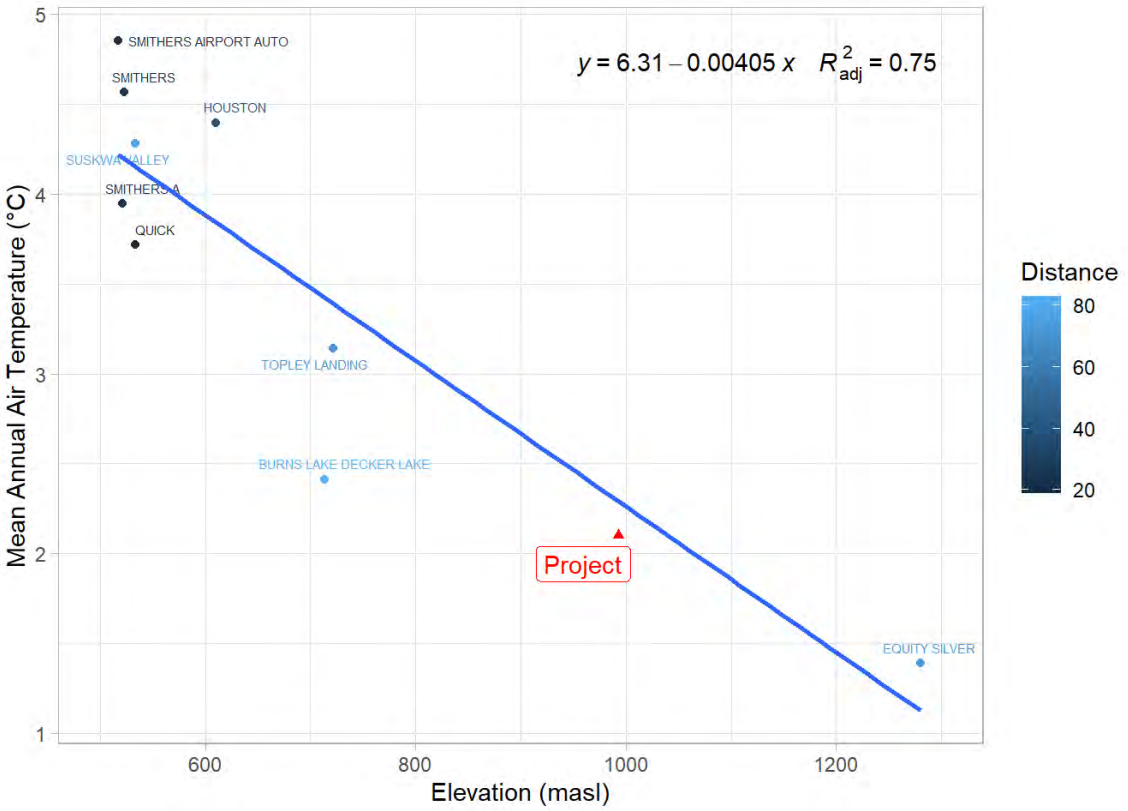
Temperature records for the Smithers Airport station were extended and patched using data from the Houston station. Figure 2-7 shows the annual distribution of regional temperatures, where the coldest and warmest months are typically January and July, respectively. Regional stations show similar temperature behaviour throughout the year except for Tsai Creek and Equity Silver. These two regional stations appear to show milder winters suggesting a temperature inversion for higher elevations. This suggests monthly correction factors are more appropriate to account for the potential of temperature inversions during the winter months.



Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-7: Monthly Average Temperatures at Regional Meteorological Stations

Regionally, mean annual temperature decreases with increasing elevation. For a Project site elevation of 993 m (corresponding to the location of the Tenas Deposit Station), the mean annual temperature is approximately 2.5°C colder than temperatures recorded at the Smithers Airport Station (Figure 2-8).



Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-8: Regional Mean Annual Temperature – Elevation Trend

2.3.2 Precipitation

Project

The Tenas Deposit Station recorded from 502 mm to 719 mm in 2018 – 2021. Figure 2-9 presents the recorded daily precipitation from October 2017 to September 2022. The largest single-day precipitation events occurred on 24 October 2017 for rainfall (73 mm) and on 7 February 2018 for snowfall (65 mm). The 24 October 2017 event corresponds to an exceptional runoff event that exceeded historical streamflow records for regional stations in the area (ERM 2019).

The recorded total precipitation at the Tenas Deposit Station (Figure 2-9) was divided into rainfall (mm) and snowfall (mm SWE) components if the Project air temperature record was less than 0 degrees Celsius. Using this estimation, snow ranged from 34% to 71% of total annual precipitation (see Table 2-8 for regional comparison). Monthly cumulative values of measured total precipitation and estimated rainfall and snowfall are summarized in Table 2-5.

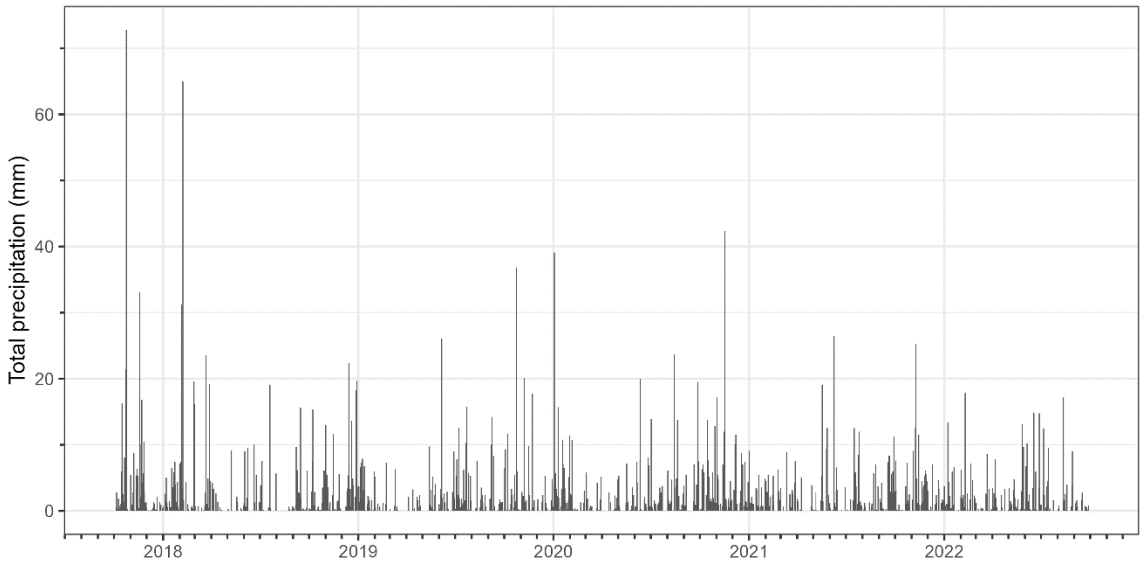


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Figure 2-9: Tenas Deposit Meteorological Station Measured Total Precipitation for October 2017-2019

Table 2-5: Tenas Deposit Meteorological Station Total Precipitation (measured), Rain (estimated), Snow (estimated)

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2017	Total Precipitation [mm]										147	134	10	--
	Rainfall [mm]										114	0	0	--
	Snowfall [mm SWE]										33	134	10	--
2018	Total Precipitation [mm]	50	150	81	14	14	42	50	2	50	54	51	113	672
	Rainfall [mm]	0	0	1	3	14	42	50	2	30	42	9	0	195
	Snowfall [mm SWE]	50	150	80	10	0	0	0	0	20	11	42	113	477
2019	Total Precipitation [mm]	60	19	8	13	26	57	83	21	47	93	73	22	522
	Rainfall [mm]	5	0	0	7	26	57	83	21	46.5	69	32	0	346
	Snowfall [mm SWE]	55	19	8	6	0	0	0	0	0.5	24	41	22	176
2020	Total Precipitation [mm]	126	26	30	14	25	63	35	84	55	84	107	70	719
	Rainfall [mm]	0	1	1	14	25	63	35	84	55	20	23	18	339
	Snowfall [mm SWE]	126	25	29	0	0	0	0	0	0	64	84	51	380

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2021	Total Precipitation [mm]	43	40	36	14	56	52	61	24	75	32	107	29	568
	Rainfall [mm]	0	1	4	5	53	52	61	24	75	16	13	0	305
	Snowfall [mm SWE]	43	39	32	9	3	0	0	0	0	15	94	29	263
2022	Total Precipitation [mm]	43	55	21	28	48	75	41	41	11				--
	Rainfall [mm]	0	23	9	3	47	75	41	41	11				--
	Snowfall [mm SWE]	43	31	12	25	1	0	0	0	0				--

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

A regional precipitation analysis was carried out to identify trends and elevation correlations. The Smithers Airport Auto and Smithers A stations (10775001 and 1077500) were merged to generate a long-term record. Remaining gaps in this record were patched with Quick as well as ERA-5, using quantile mapping methods. The resulting patched Smithers A record provides 73 years of complete data.

Average yearly precipitation, rainfall and snowfall for regional stations are presented in Table 2-6 for their corresponding period of record. Regional stations present varying mean annual precipitation (MAP) in the range of 415 mm to 760 mm with precipitation occurring mainly as rainfall except for Equity Silver where almost half of the precipitation falls as snow due to its higher elevation.

Table 2-6: Regional Stations Annual Precipitation, Rain, Snow and Corresponding Proportions

Station	Mean Annual Precipitation [mm]	Mean Annual Rainfall [mm]	Mean Annual Rainfall [%]	Mean Annual Snowfall [SWE mm]	Mean Annual Snowfall [%]
SMITHERS A (patched)	511	344	67%	166	33%
QUICK	469	308	66%	161	34%
HOUSTON	425	293	69%	132	31%
TOPLEY LANDING	539	310	58%	229	42%
EQUITY SILVER	661	348	53%	314	47%
SUSKWA VALLEY	756	552	73%	204	27%
BURNS LAKE DECKER LAKE	415	249	60%	166	40%

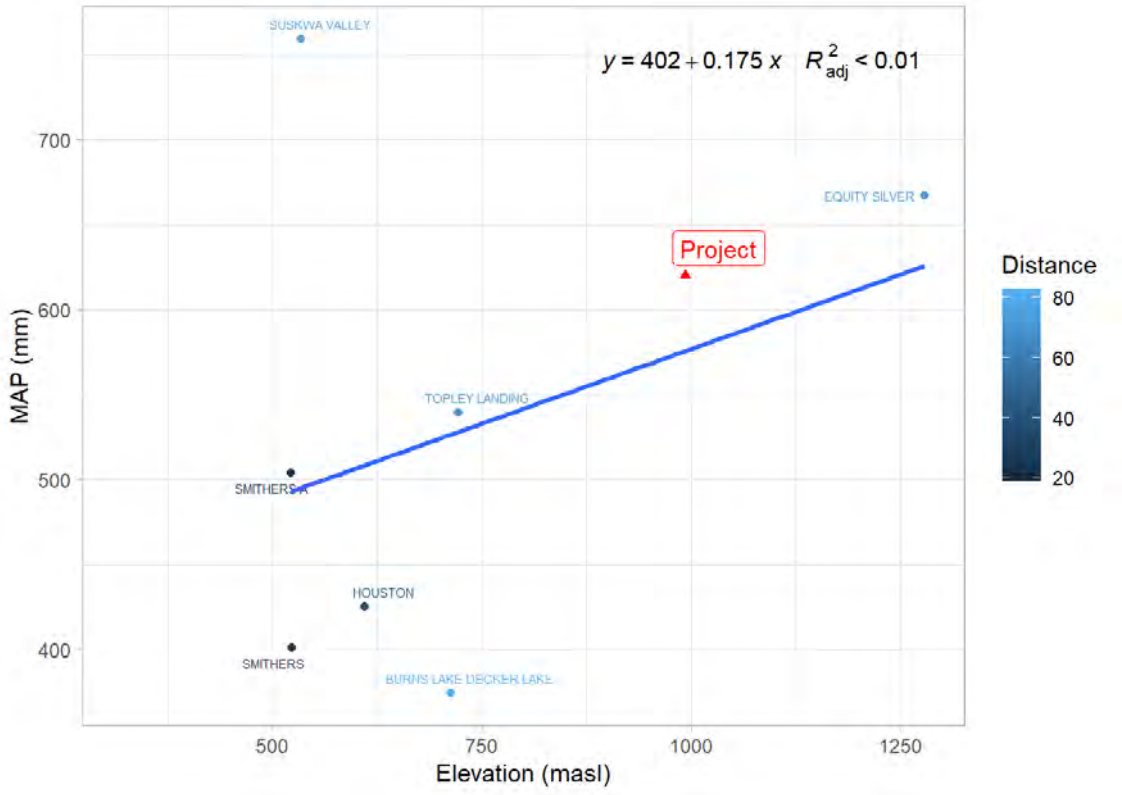
Notes:

1. Rainfall and snowfall proportions as percentages of the mean annual precipitation.
2. Smithers A patched with Smithers Airport Auto, Quick and ERA-5.
3. Mean annual values calculated based only on years with snow and rain measurements

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html and Canadian Climate Normals https://climate.weather.gc.ca/climate_normals/index_e.html

Figure 2-10 illustrates the regional correlation between MAP and elevation. A negative value for the determination coefficient (R^2 presented in Figure 2-10) indicates the correlation between elevation and MAP using only the regional meteorological datasets is poor.

The relationship between MAP and elevation is likely less significant at this location due to the more dominant effects of topography and the Pacific Ocean as a moisture source. The west-east gradient and proximity to mountain range with rain shadow effects are the most important factors affecting precipitation in this area. Orographic gradients were further evaluated using Reanalysis datasets and are discussed in Section 4.1.2.



Note: Quick station data not included due to differing timelines
Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-10: Regional Mean Annual Precipitation – Elevation Trend

Monthly precipitation was also reviewed and compared to site data over the concurrent period of record. Monthly precipitation data for the regional stations is presented in Table 2-7.

Table 2-7: Regional Stations Monthly Precipitation Records

Year	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2017	SMITHERS A (patched)	45	11	7	17	86	46	255	21	89	143	68	3	579
	HOUSTON	0[1]	10[1]	1[1]	6[1]	83[1]	34[1]	7[1]	1[1]	3[1]	81[1]	17 [1]	4[1]	245
	TOPLEY LANDING			0[1]	24[1]	62[1]								--
	EQUITY SILVER	52	50	44		116	74	30	26	50	133	95	23	692
	SUSKWA VALLEY	38	17	36	32	120	69[1]	75	55	104	149	83	26	804
	BURNS LAKE DECKER LAKE	21	12	13	23	68	38	30	11	48	70	48	4	385
2018	SMITHERS A (patched)	21	24	33	10	21	69	17	0	23	38	68	28	404
	HOUSTON	8[1]	39[1]	33[1]	2[1]	12[1]	23[1]	41[1]	0[1]	31[1]	24[1]	40[1]	20[1]	245
	TOPLEY LANDING													--
	EQUITY SILVER	77	130	64	21	29	24[1]							--
	SUSKWA VALLEY	53	46[1]	67	22	20	49	46	7	58	55	76	78	575
	BURNS LAKE DECKER LAKE	37	54	25	6	15	36	37	3	40	44	48	0[1]	346
2019	SMITHERS A (patched)	55	6	7	21	21	41	68	28	26	79	85	19	381
	HOUSTON	23[1]	1[1]	0[1]	0[1]	16.8[1]	40[1]	42[1]	26	49.4	73[1]	12[1]	13[1]	297
	TOPLEY LANDING													--
	EQUITY SILVER	0[1]	5[1]	10	24	37.6	68	121	40	41[1]	24[1]	44[1]	38	451
	SUSKWA VALLEY	94	22	12	42	31	43	99	70	51	105	88	28	685
	BURNS LAKE DECKER LAKE	8[1]	11	2	14	34	39	72	20	26	58	34	16	334
2020	SMITHERS A (patched)	32	21	12	10	31	66	59	115	19	2	1	0	498
	HOUSTON	54[1]	17[1]	5[1]	11[1]	14[1]	56	59[1]	55[1]	16[1]	63[1]	41[1]	10[1]	402
	TOPLEY LANDING													--
	EQUITY SILVER		16[1]	22[1]	22	34	93	68	111	64	67	65[1]	34[1]	--
	SUSKWA VALLEY	83	39	60	24	45	94	100	174	102	94	68	71	954
	BURNS LAKE DECKER LAKE	66	12	10	14	3[1]					0[1]	63	36	--
2021	SMITHERS A (patched)	2	21	27	5	22	24	38	31	91	21	79	6	369
	HOUSTON	3[1]	18[1]	6[1]	2[1]	52[1]	19[1]	27[1]	19	40[1]	14[1]	21[1]	19[1]	250
	TOPLEY LANDING													--
	EQUITY SILVER	42												--

Year	Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
	SUSKWA VALLEY	47	36	61	25	53	47	50	54	128	46	118	53	717
	BURNS LAKE DECKER LAKE	30	28	11	9	63	23	52	37	60	21	41	26	402
2022	SMITHERS A (patched)	47	43	8	28	45	49	17	35	9	49	39	29	388
	HOUSTON	27[1]	4[1]	1[1]	2[1]	49[1]	70	49[1]	34[1]	4[1]	30[1]	15[1]	19[1]	304
	TOPLEY LANDING													--
	EQUITY SILVER													--
	SUSKWA VALLEY	50	71	20	42	63	79	70	62	37	80	63	52	690
	BURNS LAKE DECKER LAKE	42	17	10	12	47	75	62	65	5	11	32		415
2023	SMITHERS A (patched)	16	40	9	25	7	12	26	23	18	32	28[1]		--
	HOUSTON	7[1]	13[1]	3[1]	0[1]	0[1]	6[1]	79	8[1]	17[1]	11[1]	0[1]		--
	TOPLEY LANDING													--
	EQUITY SILVER													--
	SUSKWA VALLEY	64	85	18	72	32	21	60	44	48	47	85		--
	BURNS LAKE DECKER LAKE	23	42	9	25	9	105	106	25	22	41	16		--

[1]Incomplete month. More than 5 days missing from record.

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

2.3.3 Snow Depth

Project

The winter snowpack in 2017-2018 began accumulating at the Tenas Deposit October 16, 2017 and finished melting in May 2018. During this period, the snow depth peaked at 149 cm on March 30, 2018. Table 2-8 presents the daily mean snow depth data recorded at the Tenas Deposit Station. Snowpack at the Project does not have a large potential of being redistributed by wind as the general surrounding area is heavily forested and recorded wind speeds are low (see Section 2.3.4). Snow depth measurements recorded at the Tenas Deposit Station are believed to be representative of the Project (ERM 2019). Snow depths are measured continuously at the Project while snowpack snow water equivalent measurements are not available.

Table 2-8: Snow Depth Summary at Tenas Deposit Station for October 2017 to 2019

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	Maximum Snow Depth [cm]										16	60	51
	Average Snow Depth [cm]										4	28	47
	Minimum Snow Depth [cm]										0	3	44
2018	Maximum Snow Depth [cm]	78	122	149	140	64	0	0	0	8	4	16	75
	Average Snow Depth [cm]	63	101	119	110	12	0	0	0	1	0	9	38
	Minimum Snow Depth [cm]	51	76	97	68	0	0	0	0	0	0	3	13
2019	Maximum Snow Depth [cm]	76	83	83	55	6	0	0	0	0	29	19	15
	Average Snow Depth [cm]	66	75	74	32	0	0	0	0	0	5	5	14
	Minimum Snow Depth [cm]	56	72	56	10	0	0	0	0	0	0	0	12
2020	Maximum Snow Depth [cm]	72	83	80	73	1	0	0	0	0	23	45	60
	Average Snow Depth [cm]	58	70	73	45	0	0	0	0	0	9	23	46
	Minimum Snow Depth [cm]	27	65	66	5	0	0	0	0	0	0	4	32
2021	Maximum Snow Depth [cm]	78	100	100	93	20	0	0	0	0	2	40	60
	Average Snow Depth [cm]	68	91	94	70	2	0	0	0	0	0	27	50
	Minimum Snow Depth [cm]	63	77	89	25	0	0	0	0	0	0	1	40
2022	Maximum Snow Depth [cm]	74	88	86	80	50	0	0	0	0			
	Average Snow Depth [cm]	71	78	79	73	15	0	0	0	0			
	Minimum Snow Depth [cm]	63	71	72	53	0	0	0	0	0			

*Light grey denotes no measurements.

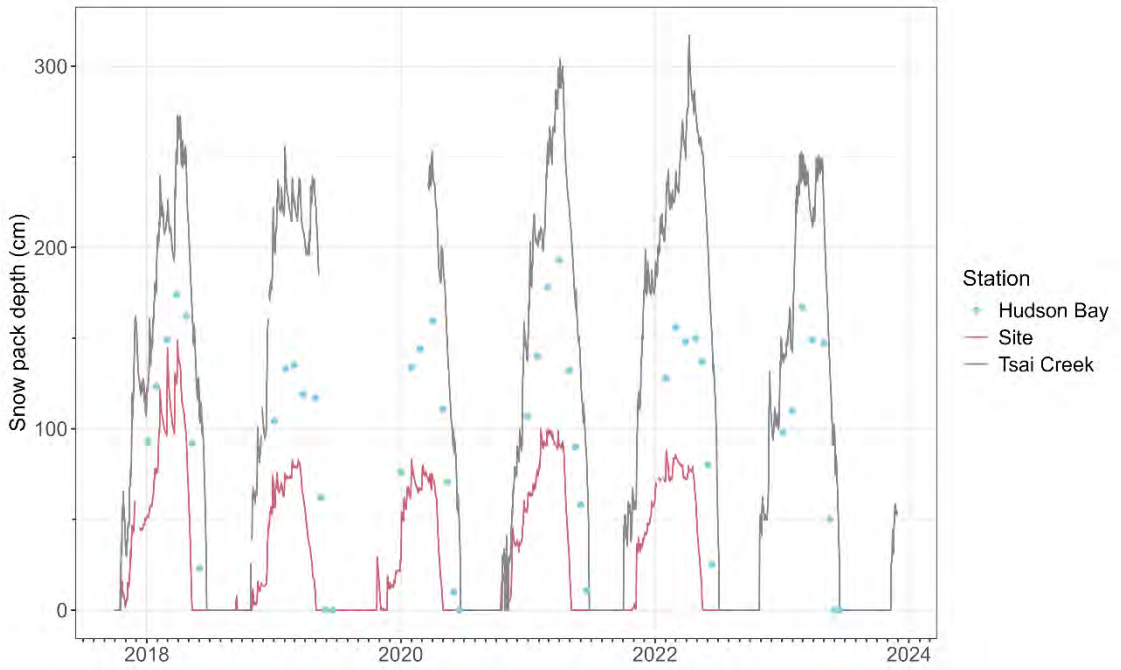
Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

The Tenas Deposit Station records total precipitation and snow depth but does not measure the snow water equivalent. The automated regional snow pillow station operated by environment Canada at Tsai Creek measures precipitation, temperature, snow depth and hourly snow water equivalent. The snow depth record at Tsai Creek is much higher than the snow depth record at the Tenas Deposit Station although the accumulation pattern is similar. However, melt timing occurs later at Tsai Creek due to the elevation difference between the two stations as well as

other physiographic characteristics such as aspect. At Tsai Creek, snowmelt typically begins in April, peaks in May and then is finished by early June.

Hudson Bay manual survey station also offers records near the Project. Figure 2-11 illustrates snow depth records at these regional stations compared to the project records, and Table 2-9 presents monthly average snow depth at Tsai Creek together with monthly survey results carried out at Hudson Bay.



Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-11: Snow Depth Records at Tsai Creek, Hudson Bay and Tenas Deposit

Table 2-9: Average Snow Depth at Tsai Creek and Hudson Bay Stations for October 2017 to 2024

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017	Average Snow Depth at Tsai Creek [cm]									0	23	85	126
	Hudson Bay monthly Snow Depth Survey [cm]	105		127		126	25						
2018	Average Snow Depth at Tsai Creek [cm]	155	215	219	249	155	60	0	0	0	4	80	148
	Hudson Bay monthly Snow Depth Survey [cm]	108	149	174	162	92	23						108
2019	Average Snow Depth at Tsai Creek [cm]	219	229	220	215	197	0	0					
	Hudson Bay monthly Snow Depth Survey [cm]	104	134	119		60	0						
2020	Average Snow Depth at Tsai Creek [cm]			240	211	140	45	0	0	0	10	47	117
	Hudson Bay monthly Snow Depth Survey [cm]	105	144		135	70	5						107
2021	Average Snow Depth at Tsai Creek [cm]	195	218	269	264	177	78	0	0	0	47	109	181
	Hudson Bay monthly Snow Depth Survey [cm]	140	178	193	132	90	34						
2022	Average Snow Depth at Tsai Creek [cm]	202	228	248	285	247	141	4	0	0	5	67	110
	Hudson Bay monthly Snow Depth Survey [cm]	128		152	150	137	52						
2023	Average Snow Depth at Tsai Creek [cm]	147	218	231	238	149	34	0	0	0	0	30	
	Hudson Bay monthly Snow Depth Survey [cm]	104	167	149		98	0						

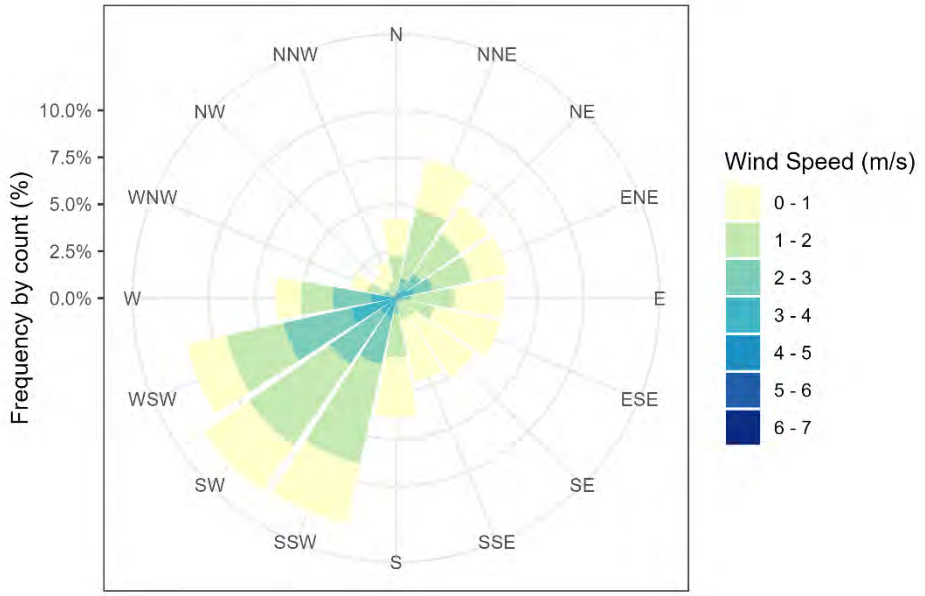
*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

2.3.4 Wind

Project

Wind speeds at the Project are generally low (less than 2 m/s) and are predominantly from the southwest (i.e., travelling down the Tenas Creek watershed). Figure 2-12 illustrates the wind rose representing wind speed data for the hydrologic year from October 2017 to September 2022. Table 2-10 presents the monthly average wind speed for each year of record from the Project station. The maximum hourly mean wind speed recorded at the Tenas Deposit Station between October 2017 to September 2022 was 6.7 m/s and the maximum wind gust speed was 15.9 m/s.



Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-12: Wind Rose at Project for 2017-2022 Hydrologic Year

Table 2-10: Project Daily Average Wind Speed Summary [m/s]

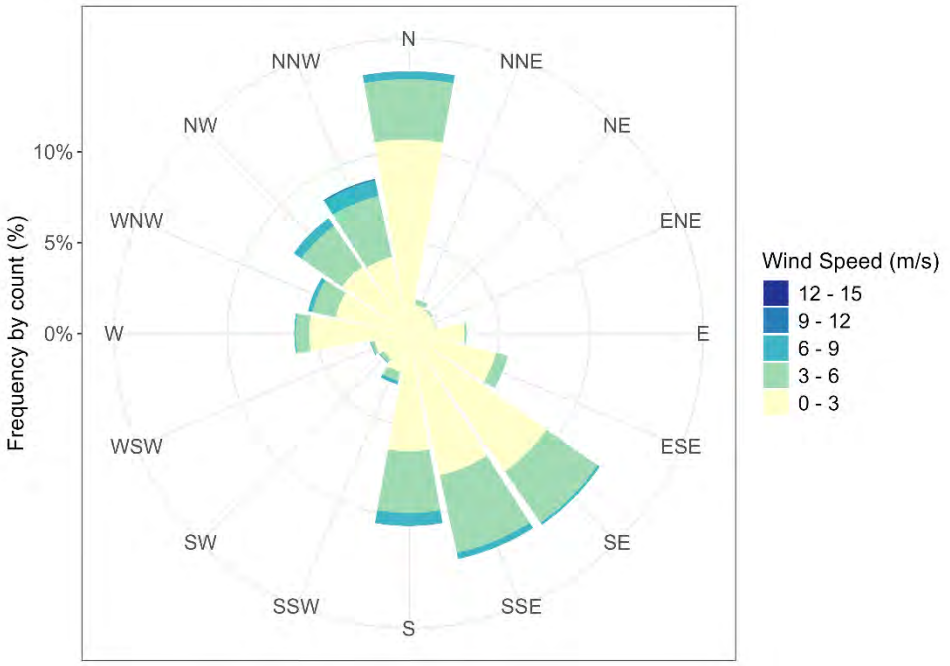
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2017										1.2	1.1	0.9
2018	0.7	1.2	1.5	2.0	2.5	2.9	3.3	2.3	1.4	1.1	0.9	1.1
2019	1.0	1.4	1.3	1.6	1.8	1.7	1.4	1.5	1.3	1.1	1.2	0.7
2020	1.2	1.5	1.8	1.7	1.9	1.8	1.7	1.6	1.1	1.2	1.2	1.0
2021	1.2	1.6	1.7	1.7	1.5	1.6	1.5	1.6	1.4	1.3	1.3	1.0
2022	1.5	1.6	1.3	1.6	1.5	1.5	1.6	1.4	1.2			

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

Winds at the Smithers Airport station were found to be predominantly from the southeast and slightly higher than the Project Area. Wind speeds are typically used to evaluate evaporation and wave run-up and setup for freeboard estimates. Given the short period of record overlap, it was determined that higher wind speed measured at the Smithers Airport station is conservative and appropriate for application to the Project.

Figure 2-13 illustrates the wind roses based on wind speeds recorded from October 2017 to November 2023 at Smithers Airport station.



Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-13: Wind Rose for Smithers A – October 2017 to November 2023

Smithers A values have been adapted to the Project for design purposes but should be replaced with Project-specific data when it becomes available. Wind speeds are typically not transposable across large distances and due to physiographic characteristics unique to each location. Table 2-11 summarizes the monthly average wind speeds and Table 2-12 presents the frequency analysis for sustained wind speeds adopted for the Project.

Table 2-11: Average Monthly Wind Speed [m/s] at Smithers A Regional Station

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average (m/s)	2.0	1.9	2.0	2.2	2.0	1.8	1.6	1.5	1.4	1.9	1.9	2.0	1.9

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 2-12: Sustained Wind Speed Frequency Analysis for Smithers Airport Station

Return Period	Wind Speed [m/s]
2	12.6
5	14.8
10	16.3
25	18.2
50	19.5
100	20.9
200	22.3

Return Period	Wind Speed [m/s]
500	24.1
1000	25.5

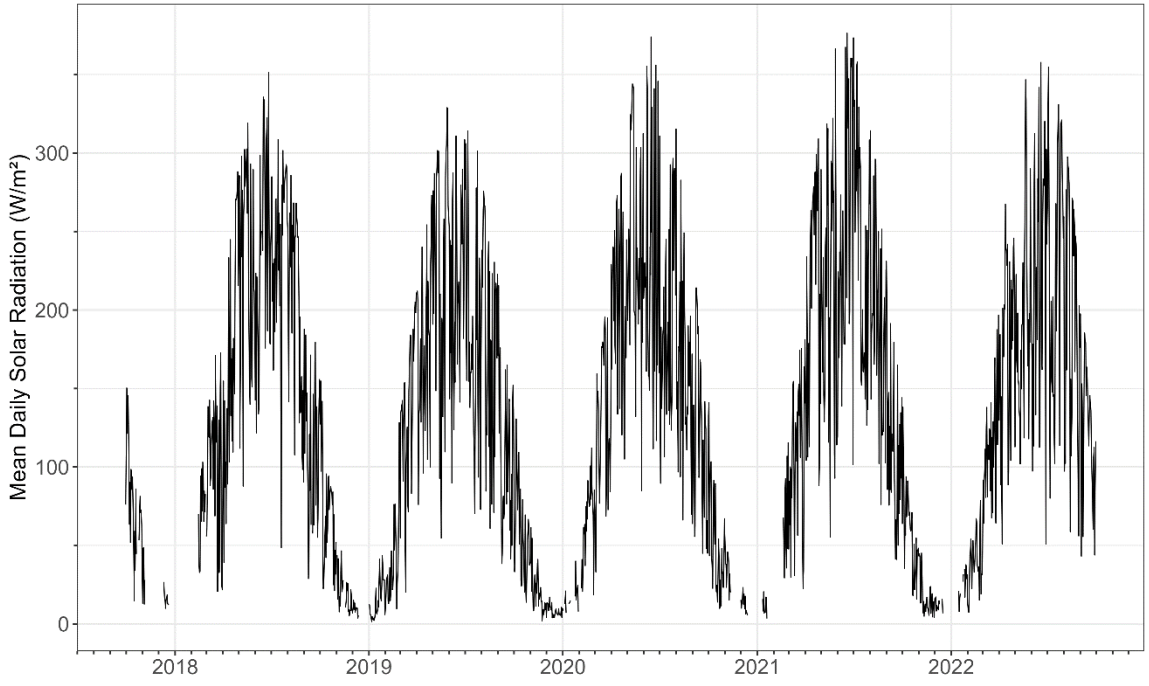
Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\ Wind_and_Freeboard_EA_rev00.Rmd

2.3.5 Solar Radiation

Project

The amount and intensity of solar radiation is a function of elevation, latitude, catchment orientation (slope and aspect) and shadows cast by topographic features and the atmosphere (i.e., cloud cover). Solar radiation at the Tenas Deposit Station is measured in power density units of W/m^2. Many periods of erroneous data were removed from the dataset due to snow accumulation on top of the sensor. Figure 2-14 illustrates daily solar radiation measured at the Tenas Deposit Station from October 2017 to September 2022.

Average daily solar radiation ranged from 1.5 W/m^2 to 376 W/m^2. As illustrated, incoming solar radiation has both seasonal and annual cycles. Diurnal variation in the sub-daily record (not shown) demonstrate typically higher values at midday and during summer while lower values typically occur between late evening to morning, and in winter. Table 2-13 presents the average monthly solar radiation at the Tenas Deposit Station.



Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-14: Average Daily Solar Radiation at the Tenas Deposit Station for October 2017 to 2019

Table 2-13: Average Monthly Solar Radiation at the Tenas Deposit Station for October 2017 to 2019 [W/m^2]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017										79.8	30.2	15.7	
2018		72.0	99.3	165.2	233.0	237.6	242.2	202.3	112.5	73.1	20.1	9.2	
2019	18.4	40.8	137.3	181.4	230.5	219.5	182.3	183.6	108.5	58.4	20.9	11.1	115.5
2020	16.8	66.4	126.8	206.2	245.4	228.2	196.0	165.5	120.2	51.3	34.3	12.3	122.4
2021	11.6	67.4	105.1	214.3	213.0	249.1	242.4	196.5	112.1	59.1	17.1	12.4	125.0
2022	25.8	38.7	109.9	176.2	192.7	221.1	229.4	194.4	125.0				

*Light grey denotes no measurements.

Source: compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

The Smithers Airport Station does not record solar radiation. The Canadian Weather Energy and Engineering Dataset (CWEEDS) dataset is available for the location of Smithers Airport and was compared to incoming solar radiation recorded at the Tenas Deposit Station. Table 2-14 presents the average monthly solar radiation at the Smithers Airport station from the CWEEDS dataset.

Table 2-14: Average Monthly Solar Radiation [W/m^2] at Smithers Airport Location

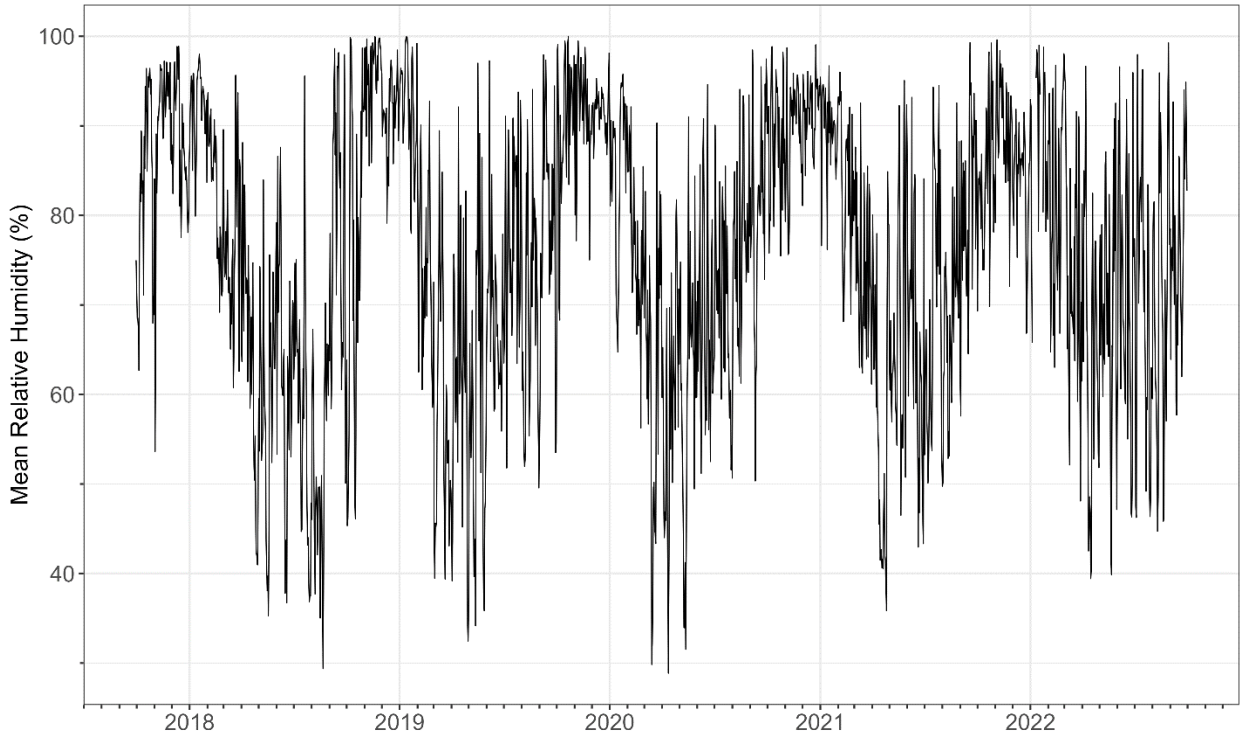
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	67	133	249	366	465	485	425	327	232	147	77	48	196

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

Based on available data, incoming solar radiation at the Project was found to be lower than the solar radiation from the CWEEDS dataset for the Smithers Airport location, understood to be due to the former being located in the north face of a mountain while the latter is located in an open, flat location and receives greater insolation.

2.3.6 Relative Humidity

Relative humidity refers to the ratio of the amount of moisture in the air to the relative maximum potential amount that air could hold at a given temperature and atmospheric pressure. As relative humidity approaches 100%, the likelihood of precipitation increases. On a monthly basis, the average relative humidity was typically greatest from November to January, remaining consistently above 85%, and was the lowest overall during the months of July and August (Figure 2-16). The monthly maximum, average and minimum daily relative humidity values are summarized in Table 2-15.



Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-15: Average Daily Relative Humidity at the Tenas Deposit Station for October 2017 to September 2022

Table 2-15: Tenas Deposit Monthly Average Relative Humidity [%]

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2017	Max										94.9	95.4	93.1	95.4
	Avg										80.8	83.2	90.0	88.3
	Min										72.0	65.6	83.5	65.6
2018	Max	95.5	91.5	91.4	85.9	82.9	84.7	78.9	72.5	94.2	89.5	99.6	96.1	99.6
	Avg	92.0	83.2	76.8	63.9	59.6	63.2	58.2	51.6	78.3	75.5	96.0	91.3	74.1
	Min	87.5	72.3	59.9	42.9	37.9	42.8	38.8	32.0	59.2	59.6	89.7	84.9	32.0
2019	Max	96.7	86.8	77.7	84.9	82.4	90.3	93.9	90.7	93.9	98.1	97.4	94.8	98.1
	Avg	96.7	86.8	77.7	84.9	82.4	90.3	93.9	90.7	93.9	98.1	97.4	94.8	98.1
	Min	86.3	59.1	40.0	38.6	36.8	47.1	56.9	48.9	59.8	75.1	81.7	86.9	36.8
2020	Max	90.3	90.8	81.7	82.3	86.0	89.2	88.5	93.3	94.6	97.4	95.5	97.0	97.4
	Avg	85.6	76.9	62.9	58.3	60.4	68.9	70.4	76.4	81.1	88.5	89.2	91.6	75.9
	Min	79.3	61.3	43.8	36.9	36.5	47.4	51.8	56.9	63.6	75.4	80.0	83.6	36.5
2021	Max	95.0	90.5	92.3	78.6	90.6	88.6	91.3	91.4	95.9	96.3	97.4	89.0	97.4
	Avg	89.6	83.7	74.1	56.8	67.4	66.2	69.7	68.8	81.7	83.7	90.3	83.5	76.3
	Min	82.4	75.0	53.7	35.5	45.6	43.2	48.6	46.6	61.7	66.8	78.6	77.4	35.5
2022	Max	92.4	94.1	94.8	88.7	93.6	94.3	92.3	91.8	96.9				96.9
	Avg	84.9	82.0	74.1	64.8	69.8	71.2	70.4	70.6	76.7				73.8
	Min	75.8	67.9	49.6	41.1	44.3	48.2	48.7	49.8	52.1				44.1

*Light grey denotes no measurements.

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

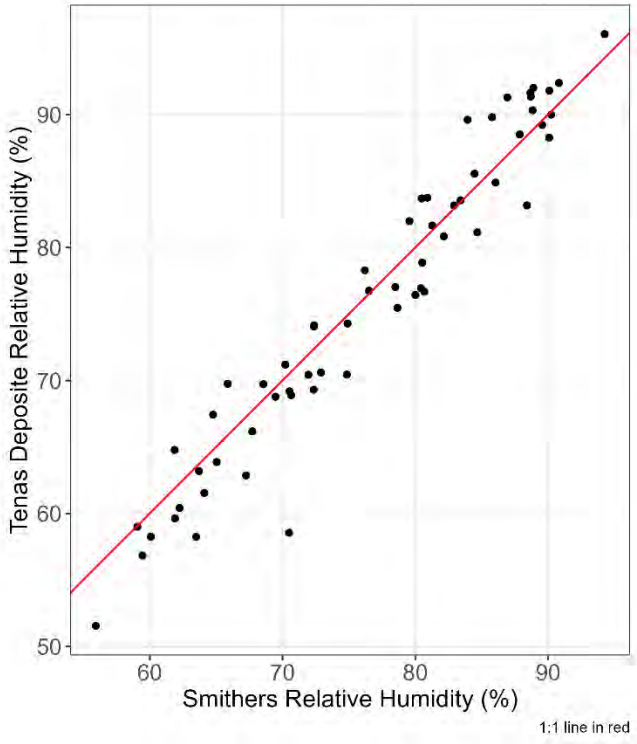
Hourly relative humidity recorded at the Smithers Airport station was evaluated for the period of record (1953-2023) and the monthly average values are presented in Table 2-16. Patterns in relative humidity were similar to what was observed at the Tenas Deposit Station.

Table 2-16: Average Monthly Relative Humidity [%] at Smithers A Location

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average (%)	83.3	79.3	71.6	63.8	62.2	66.4	69.8	73.4	80.2	82.2	85.8	85.0	75.2

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

Monthly relative humidity values were compared between October 2017 and September 2022 and are shown in Figure 2-16, where the red line represents the identity function. Based on these records, the Smithers Airport station relative humidity is generally lower than at the Tenas Deposit Station.



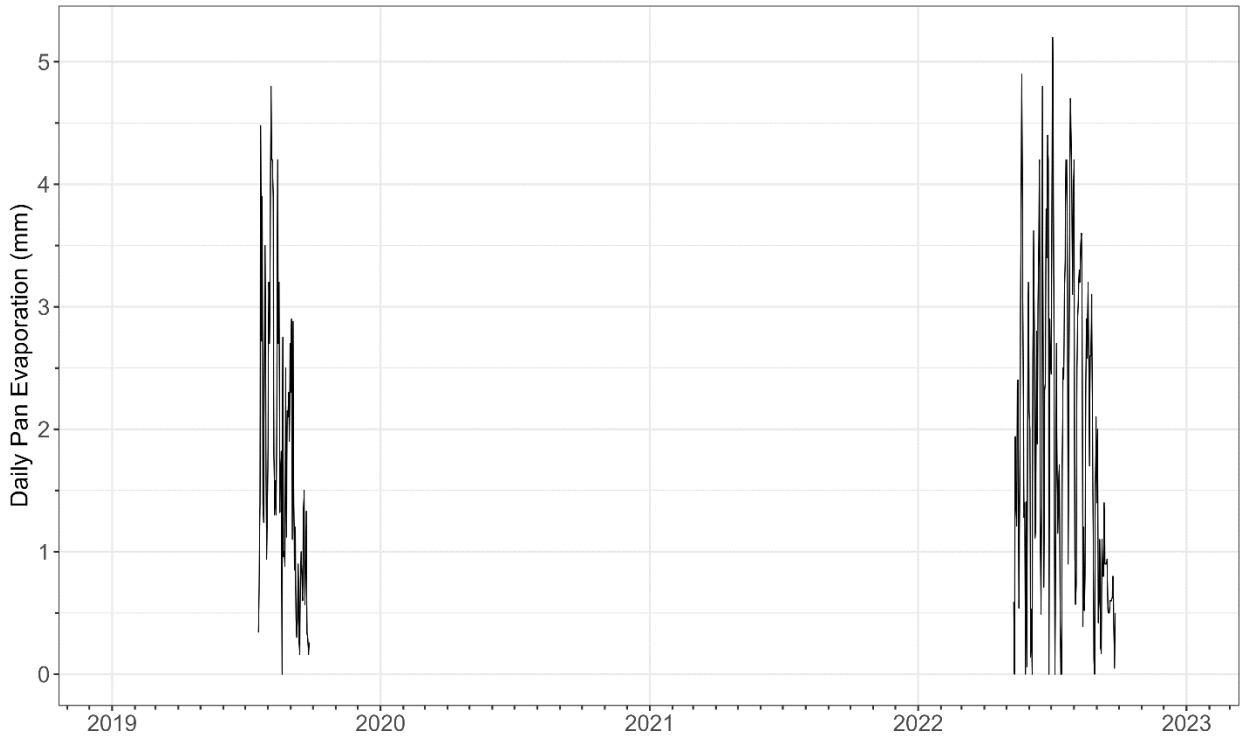
Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-16: Monthly Average Relative Humidity at Smithers Airport Station and Tenas Deposit Station for October 2017 to September 2022

2.3.7 Evaporation

Project

Open water evaporation is an important component of the water balance for the Project area. Since the EAC Project Case (Aug 2022), new pan evaporation data from site has become available from 2019 and 2022 readings. Daily records are illustrated in Figure 2-17. The monthly total evaporation values are summarized in Table 2-17 showing only complete months of data (August 2019 and June-September 2022)..



Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 2-17: Daily Pan Evaporation at the Tenas Deposit Station for July 2019 to September 2022

Table 2-17: Monthly Pan Evaporation at the Tenas Deposit Station for July 2019 to 2022 [mm]

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2019								72.0				
2022						68.9	79.4	65.2				

*Light grey denotes no measurements.

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Regional

Two approaches were used in order to evaluate open water evaporation: (1) Penman (Penman, 1948) and (2) Morton CRWE (Morton, 1983b) approaches. The Penman and Morton CRWE approaches were applied to three datasets to estimate mean daily potential evaporation and then subsequently compared to the Topley Landing pan evaporation measurements (adjusted to represent lake evaporation). The three datasets are: (1) patched regional data (Smithers Airport Station), (2) patched Project data (Tenas Deposit Station) and (3) derived Project data based on reanalysis and regional datasets. Monthly average lake evaporation results are presented in Figure 2-18.

The Penman formula is a semi-empirical equation that incorporates energy budget and mass transfer approaches to estimate daily potential evapotranspiration or open water evaporation. Open water evaporation E_0 (in mm/day) is calculated according to the formula:

$$E_o = \frac{\left(\frac{\Delta}{\gamma} H + E_a\right)}{\frac{\Delta}{\gamma} + 1}$$

Where $\frac{\Delta}{\gamma}$ is an empirical parameter dependent on temperature, H is calculated based on incoming solar radiation, outgoing radiation, albedo of the open water surface and the proportion of cloudiness.

E_a is calculated semi-empirically as well using windspeed, and vapour pressure.

The Morton CRWE formula generates an estimate of monthly potential evaporation using the input parameters in Table 2-18.

Table 2-18: Morton CRWE Evaporation Formulation Input Parameters

Parameter	Description	Value
T_{max}, T_{min}	Timeseries of daily maximum and minimum project temperatures	See Section 2.3.1, 4.2.2
RH_{max}, RH_{min}	Timeseries of daily maximum and minimum project relative humidity	See Section 2.3.6, 4.1.5
T_{dew}	Timeseries of daily project dew point temperature.	Computed with the Magnus Formula (Magnus, 1844)
Rs	Timeseries of daily project solar irradiance	See Section 2.3.5, 4.2.5
epsilon	Surface emissivity (Morton, 1986)	0.92

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

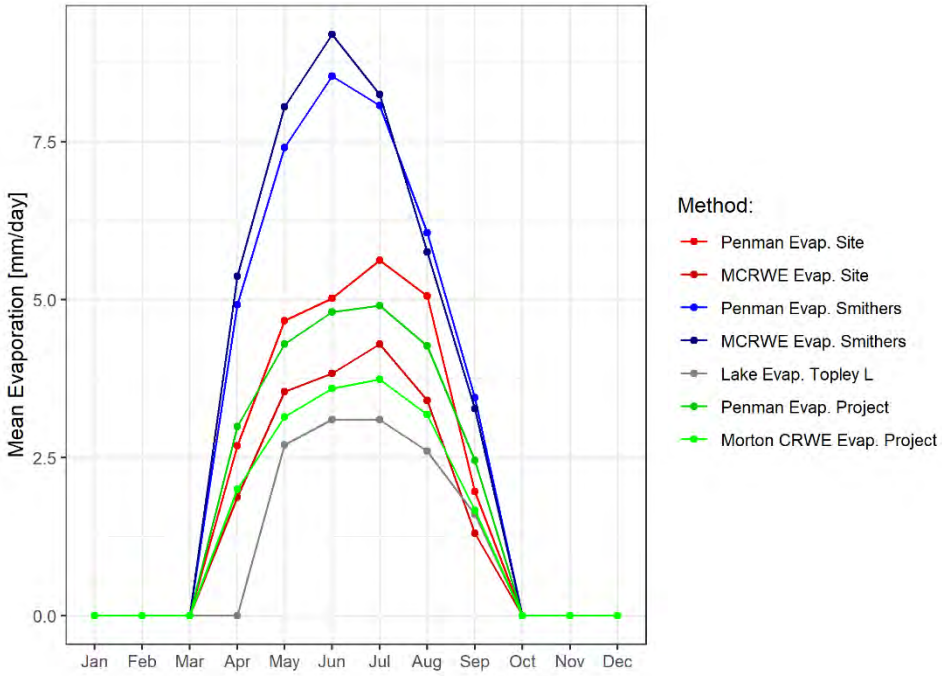


Figure 2-18: Estimated Monthly Average Lake Evaporation

The only regional station with evaporation measurements is Topley Landing, located 71 km northeast of the Project at an elevation of 722 masl. Mean annual lake evaporation at Topley Landing was 401 mm based on the 1981-2010 Canadian Climate Normals published by Environment Canada. Note that relative humidity and solar radiation are not measured at Topley Landing so the methods listed above could not be directly compared for Topley Landing.

3 Baseline Hydrology

3.1 Section Overview

The baseline characterization incorporates historical flow records from selected long-term Water Survey of Canada (WSC) stations as well as available data from local Project hydrometric stations.

Local data has been collected as part of the Tenas Project baseline monitoring program. Information from September 2017 to September 2018 is synthesized in the Tenas Project 2017 to 2018 Baseline Report (ERM 2019) with more recent information provided by ERM in the form of field reports. New hydrologic data has also been collected at Tenas-Hydro, and Four-Hydro stations between 2021 and 2022. Additional data collected by AGRA Earth and Environmental Ltd in 1997-1998 is presented in Attachment C.

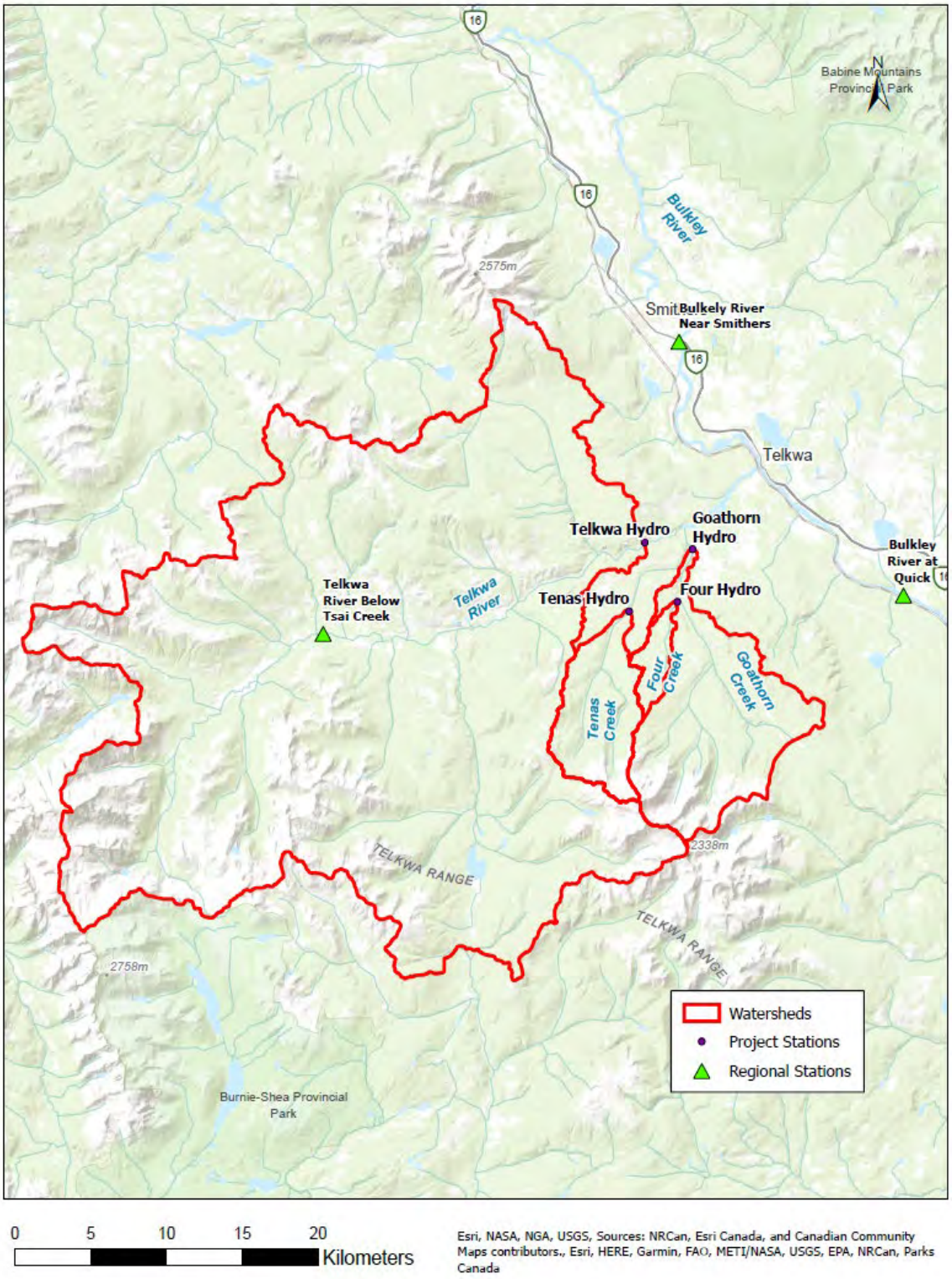
Hydrometric records generated for the Project Area spanning 2017 to 2022 are shown in Section 3.2 for the open water period. Regional data for each Water Survey of Canada station are discussed in Section 3.2 and summarized in Section 3.3.

3.2 Available Hydrometric Data

3.2.1 Project Data

Catchment Delineations

Catchment areas were defined by ERM (ERM 2019) and verified by SRK. Project Area hydrometric stations as well as regional Water Survey of Canada stations are shown in Figure 3-1.



Source: \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!080_Deliverables\Hydromet Baseline Update\040_Figures\ Figure3.1_Hydrometric_Stations_20201023.jpg

Figure 3-1: Map of Project Area With Project Hydrometric Station Catchments Delineated

Hydrometric Data

Historical hydrometric data was collected in 1997-1998 by AGRA Earth and Environmental Ltd for development of the Project Area by Luscar Ltd. Hydrometric spot measurements were collected at Four Creek and Tenas Creek and converted to continuous discharge for a subset of each open-water season. Four Creek data from this period was assessed in more detail than Tenas Creek records due to the short duration of data collect in 2020 by ERM.

Table 3-1 summarizes relevant information for each Project hydrometric station.

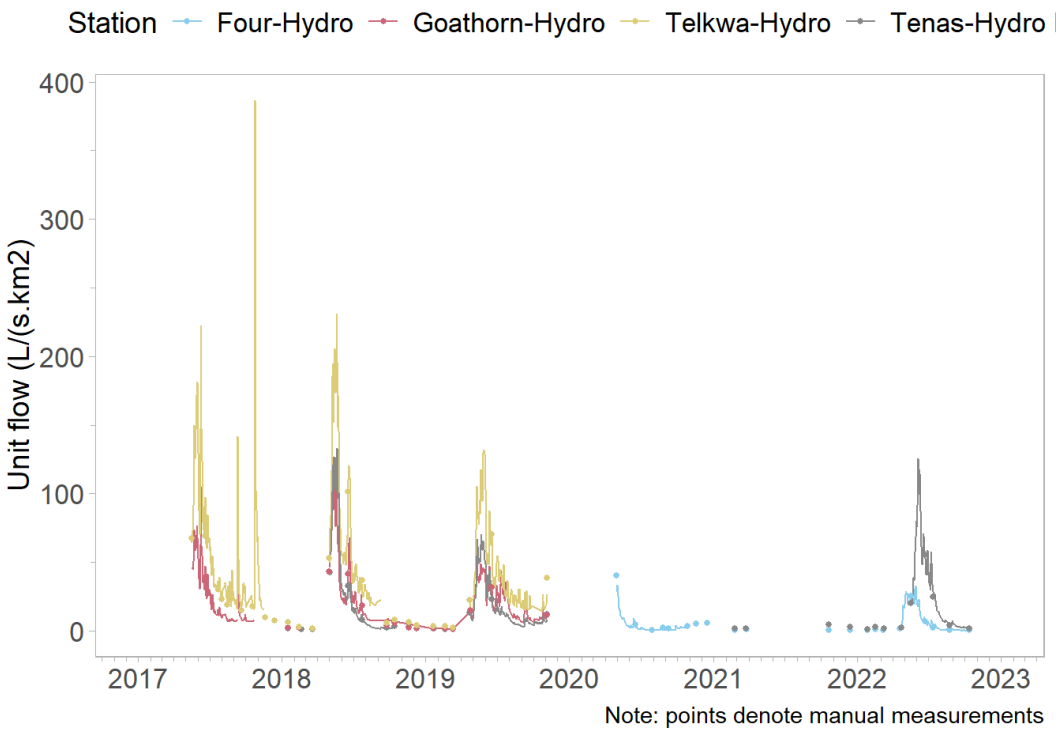
Recent rating curves and continuous discharge were developed for each hydrometric station by ERM (Figure 3-2). Additional details on the instrumentation and rating curve development is summarized in the 2017-2018 Baseline Report (ERM 2019). The Tenas-Hydro station was moved approximately 200 m upstream in 2018. Additional monitoring, rating curve development and analysis for 2019 hydrometric data was completed by ERM.

The Four-Hydro station was installed in April 2020 and a rating curve was developed based on six discharge measurements with two additional measurements completed in late 2020. Monitoring of other local hydrometric stations in 2020 was not completed. A discharge measurement was completed at Four-Hydro in February 2021 to obtain some understanding of winter low flows in Four Creek.

Table 3-1: Summary of Project Area Hydrometric Stations Location and Measurement Information

Station Name	Longitude	Latitude	Average Catchment Elevation (masl)	Area (km^2)	Period of Measurement	Rating Curve Equation $Q = C(h-a)b$ (developed at)	# of Manual Measurements
Telkwa-Hydro	54.65	-127.17	1,243	997.2	May 2017 – November 2019	C: 56.634 a: 97.955 b: 2.113 (March 2020)	8 (2017) 10 (2018) 6 (2019)
Tenas-Hydro & Tenas-Hydro B	54.62	-127.19	1,181	47.6 46.8	May 2017 – November 2022	C: 13.233 a: 97.21 b: 2.278 (October 2022)	5 (2017) 10 (2018) 6 (2019) 4 (2021) 9 (2022)
Goathorn-Hydro	54.65	-127.12	1,243	123.5	May 2017 – November 2019	C: 9.383 a: 98.18 b: 2.361 (March 2020)	9 (2017) 10 (2018) 6 (2019)
Four-Hydro	54.62	-127.14	985	11.0	Established 30 April 2020	breakpoint at h = 99.330 for h ≤ 99.330 C: 36.987 a: 99.311 b: 1.964 for h > 99.330 C: 18.379 a: 99.246 b: 2.860 (October 2022)	8 (2020) 4 (2021) 9 (2022)

Source: Compiled in text. \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!020_Project_Data\020_Client\20200312_HydrologyData_DFarmer\2.0 Rating Curves and Hydrographs



Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 3-2: Available Streamflow Data Recorded at the Project Hydrometric Stations

3.2.2 Regional Data

Water Survey of Canada (WSC) is the national authority responsible for the collection, interpretation and dissemination of standardized water resource data in Canada. Stations within the same BC hydrological zone were evaluated and additional selection criteria were subsequently applied.

Figure 3-1 illustrates the four regional WSC stations selected based on proximity to the Project hydrometric stations as well as for having similar flow regimes. These stations have more than 10 years of data and catchment areas ranging between 125 km^2 to 8,940 km^2. Table 3-2 summaries the metadata for these stations and the length of published historical record. Additional provisional data was downloaded from the WSC website where the archived record did not extend to 2020. The provisional data records may change slightly as Water Survey of Canada evaluates data and adjusts rating curves to account for any changes that may have occurred between years.

Table 3-2: Summary of Regional Hydrometric Stations

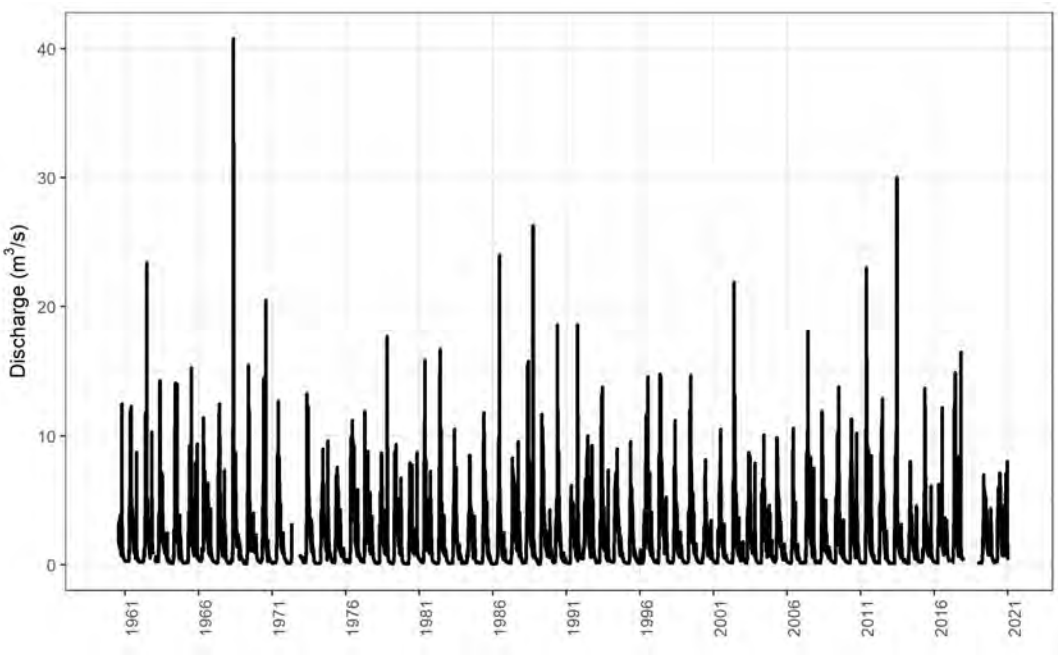
Station ID	Station Name	Longitude [°]	Latitude [°]	Area [km^2]	First Year	Last Year
08EE008	Goathorn Creek near Telkwa	54.65	-127.12	125	1960	2020[1]
08EE020	Telkwa River below Tsai Creek	54.61	-127.50	367	1975	2020
08EE004	Bulkley River at Quick	54.62	-126.90	7,340	1930	2020
08EE005	Bulkley River near Smithers	54.77	-127.13	8,940	1945	2020

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.002 2017-18 permitting Support (Phase 2)\0200_SurfaceWater\Hydrology\R files\Flows_update_rev02.Rmd

Notes:

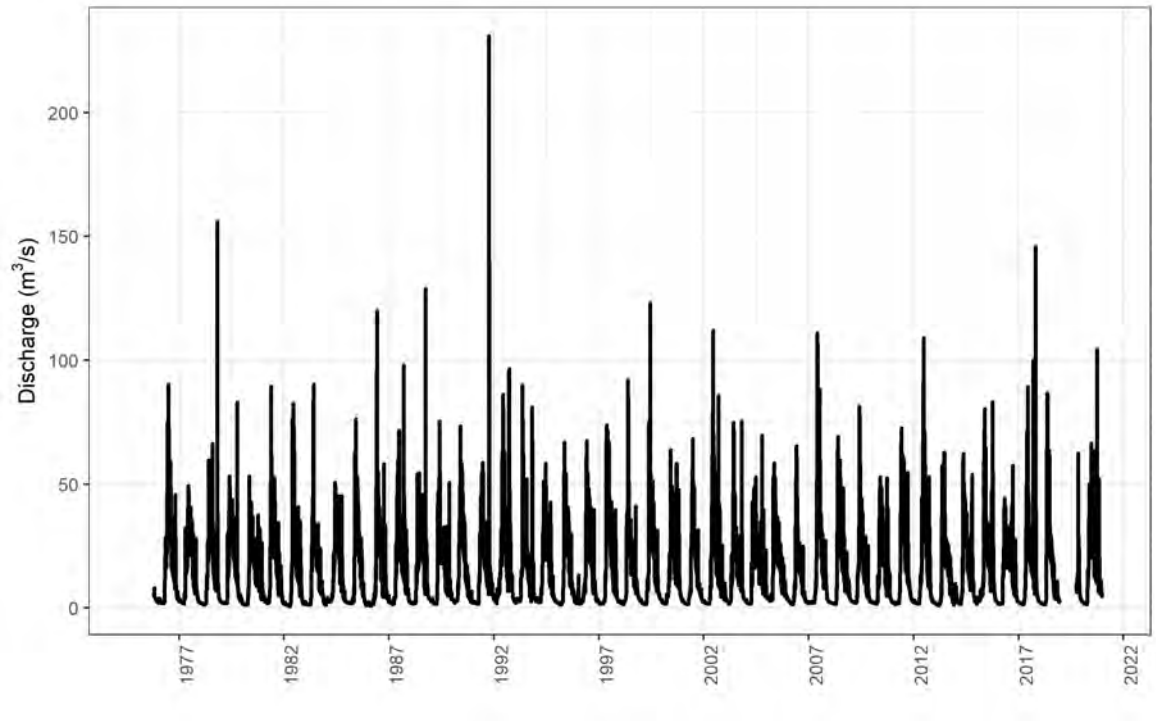
1. Goathorn Creek near Telkwa (08EE008) was decommissioned in January 2018 and re-installed in October 2019.

Discharge from all four Water Survey of Canada regional stations (Table 3-2) followed a nival regime with an initial increase in discharge observed in April followed by annual maximum in response to snowmelt during May. Discharge responded to rainfall events throughout the summer and a recession to annual low flows was observable in the late fall and winter. The time series of each regional hydrometric station are shown in Figure 3-3, Figure 3-4 , Figure 3-5, Figure 3-6.



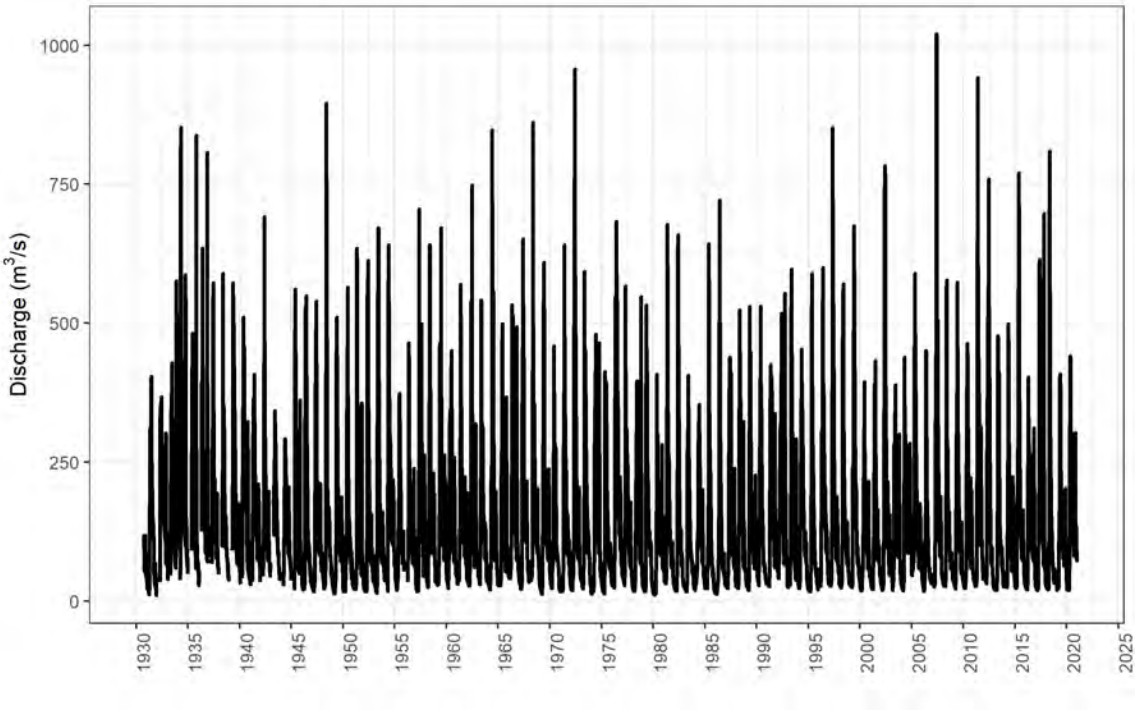
Source: Compiled in R \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_flows_1CT027003_Plots_njs.R

Figure 3-3: Goathorn Creek Near Telkwa (08EE008) Discharge data from 1960-2020.



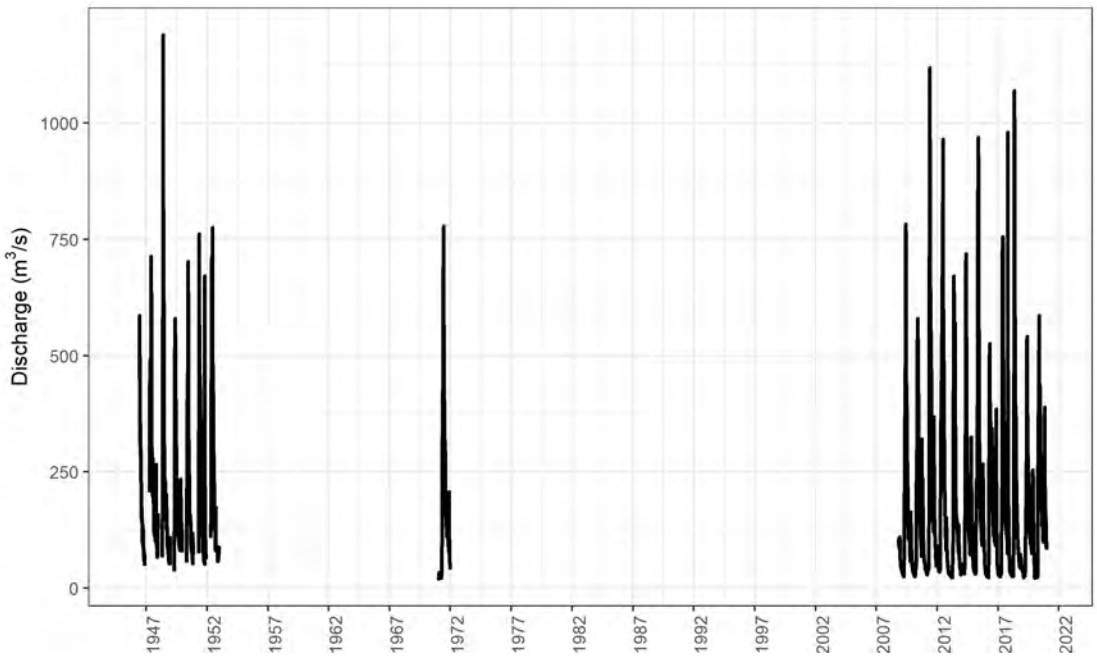
Source: Compiled in R \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_flows_1CT027003_Plots_njs.R

Figure 3-4: Telkwa River Below Tsai Creek (08EE020) Discharge from 1975-2020



Source: Compiled in R \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_flows_1CT027003_Plots_njs.R

Figure 3-5: Bulkley River At Quick (08EE004) Discharge for 1930-2020



Source: Compiled in R \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_flows_1CT027003_Plots_njs.R

Figure 3-6: Bulkley River Near Smithers (08EE005) Discharge for 1945-2020

3.3 Summary of Available Data

3.3.1 Project Hydrometric Monitoring Data

Discharge

Historical discharge data for 1997-1998 will not be presented in this section but is summarized in Attachment C. Continuous discharge was generated from water level measurements and rating curves developed for each Project Area hydrometric station for the open water period. Unit discharge values are presented for each station in Table 3-4 and were calculated by dividing monthly average flow by the associated catchment area (Table 3-1).

Table 3-3: Average Monthly Discharge for the Open-Water Period (m^3/s)

Station Name	Year	April [1]	May[1]	June	July	Aug	Sept	October	November[1]
Telkwa-Hydro	2017		121.0*	93.9	37.6	28.3	32.2	51.5	25.3*
	2018		135.5	66.1	34.7	22.3	21.7*		
	2019	16.1*	84.9	56.1	36.3	23.2	18.8	16.5	20.5*
Tenas-Hydro	2017		4.0	2.4	0.5	0.2			
Tenas-Hydro B	2018		4.2	1.2	0.5	0.1	0.1	0.1*	
	2019	0.4*	2.2	1.3	0.6	0.3	0.3	0.3	0.3*
	2020								
	2021								
	2022		2.0*	3.3	1.2	0.3	0.1	0.1*	
Goathorn-Hydro	2017		7.3	5.1	2.0	1.1	1.6	6.0	
	2018		8.7	3.7	2.2	1.1	1.0		
	2019	1.3	4.6	3.3	3.4	1.3	1.3	1.1	1.2
Four-Hydro	2020	0.321*	0.122	0.030	0.009	0.008	0.011	0.025	
	2021								
	2022	0.129*	0.261	0.122	0.039	0.006	0.003	0.002*	

Source: \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_summaries\Telkwa_1CT027.003_FlowSummaries_Collated_njs_cog.xlsx

Notes:

1. Measurements in April, May and November were conducted on differing days per month between years and stations.
2. Light grey denotes no measurements.
3. Months with less than 20 measurements are marked with *

Table 3-4: Average Monthly Unit Discharge (L/s/km^2) for the Open-Water Period

Station Name	Catchment Area (km^2)	Year	April	May	June	July	Aug	Sept	October	November
Telkwa-Hydro	966.9	2017		121.4*	94.2	37.8	28.4	32.3	51.6	25.4*
		2018		135.9	66.3	34.8	22.4	21.7*		
		2019	16.1*	85.1	56.3	36.4	23.3	18.8	16.5	20.5*
Tenas-Hydro	47.6	2017		84.2	49.7	11.3	5.2			
Tenas-Hydro B	46.75	2018		89.7	25.7	10.0	2.9	1.9	2.7*	
		2019	8.8*	46.5	26.9	13.1	5.5	5.3	6.1	7.1*
		2020								
		2021								
		2022		43.6*	71.5	26.5	6.4	3.1	2.1*	
Goathorn-Hydro	123.5	2017		59.0	41.3	16.3	8.5	12.6	48.4	
		2018		70.4	30.0	17.5	8.7	8.0		
		2019	10.8	37.2	26.9	27.3	10.5	10.3	9.0	9.9
Four-Hydro	11.0	2020	29.2*	11.1	2.7	0.8	0.7	1.0	2.3	
		2021								
		2022	11.7*	23.7	11.1	3.6	0.6	0.3	0.2*	

*Light grey denotes no measurements.

Source: \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_summaries\Telkwa_1CT027.003_FlowSummaries_Collated_njs_cog.xlsx

Notes:
1. Light grey denotes no measurements.
2. Months with less than 20 measurements are marked with *

Low Flows

Low flows are critically important parameters due to their low dilution capacity as well the implications for biological organisms. Low flow statistics are based on available records to estimate the lowest flow within a watercourse over some period of time. Low flow statistics are expressed as an averaging period (e.g., 7 day average) over a recurrence interval where 10 years is common for hydrologically-based flows (7Q10). A low flow calculation requires several years of record as a distribution model (i.e, Log Pearson Type III) is applied to the collected lowest flow event from each year of record. The short length of the Project Area hydrometric records does not allow for a 7Q10 calculation. Low flows were therefore conservatively estimated as the minimum daily average flow for each month for each station (Table 3-5).

Low flow data for Four-Hydro was limited to the open water season in 2020 with additional low flow measurements captured on 24-25 February 2021 at three locations along Four Creek. The low flows measurements were 0.008 m^3/s at Four-Hydro with 0.006 m^3/s (E 619344, N 6052005) and 0.007 m^3/s (E 619269, N 6051447) at separate locations. Historical spot measurements and continuous discharge records were consulted and revealed no reliable low flow measurements of as stated in AGRA (1999) in Attachment A.

Table 3-5: Minimum Instantaneous Discharge (m^3/s)

Station Name	Year	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Telkwa-Hydro	2017					61.8	56.1	21.8	16.6	14.6	14.8	9.8	7.5	7.5
	2018	6.5	2.5	1.7		45.0	32.5	22.4	15.3	5.6	7.7	5.9	4.1	1.7
	2019	3.2	3.4	2.4	13.1	14.6	29.3	18.9	14.2	12.7	12.8	13.0		2.4
Tenas-Hydro	2017					2.4	0.8	0.3	0.2	0.3	0.3	0.3	0.2	0.2
Tenas-Hydro B	2018	0.1	0.1	0.1	1.4	0.6	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	2019	0.1	0.0	0.0	0.3	0.5	0.6	0.4	0.1	0.1	0.2	0.3		0.0
	2020													
	2021													
	2022				1.0	1.9	0.5	0.2	0.1	0.1				
Goathorn-Hydro	2017					4.7	2.7	1.2	0.8	0.8	0.7	0.7	0.5	0.5
	2018					2.7	2.1	1.3	0.9	0.9	0.7	0.3	0.2	0.2
	2019	0.2	0.2	0.1	1.1	1.2	1.7	1.9	0.7	0.6	0.7	1.0		0.1
Four-Hydro	2020					0.03	0.01	0.002	0.002	0.004	0.02[1]	0.06[2]	0.06[2]	
	2021		0.008[2]											
	2022				0.035[1]	0.207	0.042	0.008	0.002	0.002	0.001[1]			

Source: \\srk.ad\dfs\na\van\Projects \01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_summaries\Telkwa_1CT027.003_FlowSummaries_Collated_njs_cog.xlsx

Notes:
[1]Incomplete month.

[2]Single measurement.

*Light grey denotes no measurements.

3.3.2 Regional Hydrometric Records

Discharge

Discharge data from Water Survey of Canada compiled for each station was summarized as average monthly and annual discharge for the four regional hydrometric stations (Table 3-6).

Table 3-6: Average Monthly and Mean Annual Discharge (m^3/s)

Station Name	Year	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn Creek near Telkwa (08EE008)	1960-2020	0.2	0.2	0.2	1.2	5.0	5.3	3.2	1.7	1.3	1.4	0.9	0.4	1.8
Telkwa River below Tsai Creek (08EE020)	1975-2020	2.6	2.1	2.1	5.3	27.2	40.7	30.9	21.4	15.6	12.8	7.2	3.5	14.3
Bulkley River at Quick (08EE004)	1930-2020	38.3	31.1	29.2	87.6	315.5	365.1	230.2	142.4	101.4	110.0	102.7	59.3	139.2
Bulkley River near Smithers (08EE005)	1946-2020	37.3	31.2	35.7	134.7	447.4	455.2	265.5	158.1	118.7	126.9	115.5	64.8	179.8

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_1CT027.003_WSC_FlowSummaries_20201130_njs.xlsx

Unit Discharge

The monthly average discharge for each regional station was converted to unit discharge, which normalizes discharge per unit area of the catchment (Table 3-7).

Table 3-7: Average Monthly and Annual Unit Discharge ($L/s/km^2$)

Station Name	Years of Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn Creek near Telkwa (08EE008)	1960-2020	1.8	1.5	1.6	9.3	40.3	42.0	25.9	13.9	10.3	11.2	7.5	3.1	14.1
Telkwa River below Tsai Creek (08EE020)	1975-2020	7.1	5.8	5.7	14.5	74.0	110.8	84.3	58.2	42.5	35.0	19.7	9.4	38.9
Bulkley River at Quick (08EE004)	1930-2020	5.2	4.2	4.0	11.9	43.0	49.7	31.4	19.4	13.8	15.0	14.0	8.1	19.0
Bulkley River near Smithers (08EE005)	1946-2020	4.2	3.5	4.0	15.1	50.0	50.9	29.7	17.7	13.3	14.2	12.9	7.2	20.1

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_1CT027.003_WSC_FlowSummaries_20201130_njs.xlsx

Lowest 7-Day Average Flow (7Q10)

For the regional records, the 7-day average flow that occurred (on average) once every 10 years was calculated for each regional hydrometric station (Table 3-8).

Table 3-8: 7Q10 Values for Regional Stations (m^3/s)

Station Name	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Goathorn Creek near Telkwa (08EE008)	0.1	0.1	0.1	0.1	1.0	2.1	1.2	0.7	0.5	0.4	0.2	0.1	0.1
Telkwa River below Tsai Creek (08EE020)	1.6	1.4	1.2	1.4	4.9	19.7	17.4	11.6	5.9	4.2	2.3	1.7	1.2
Bulkley River at Quick (08EE004)	19.1	17.2	16.2	18.2	77.0	196.9	127.9	84.6	59.3	48.8	36.4	24.7	15.1
Bulkley River near Smithers (08EE005)	26.1	23.5	22.4	23.7	129.8	214.2	141.4	90.0	65.2	50.2	39.5	30.5	22.9

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Flows_update_rev09.Rmd

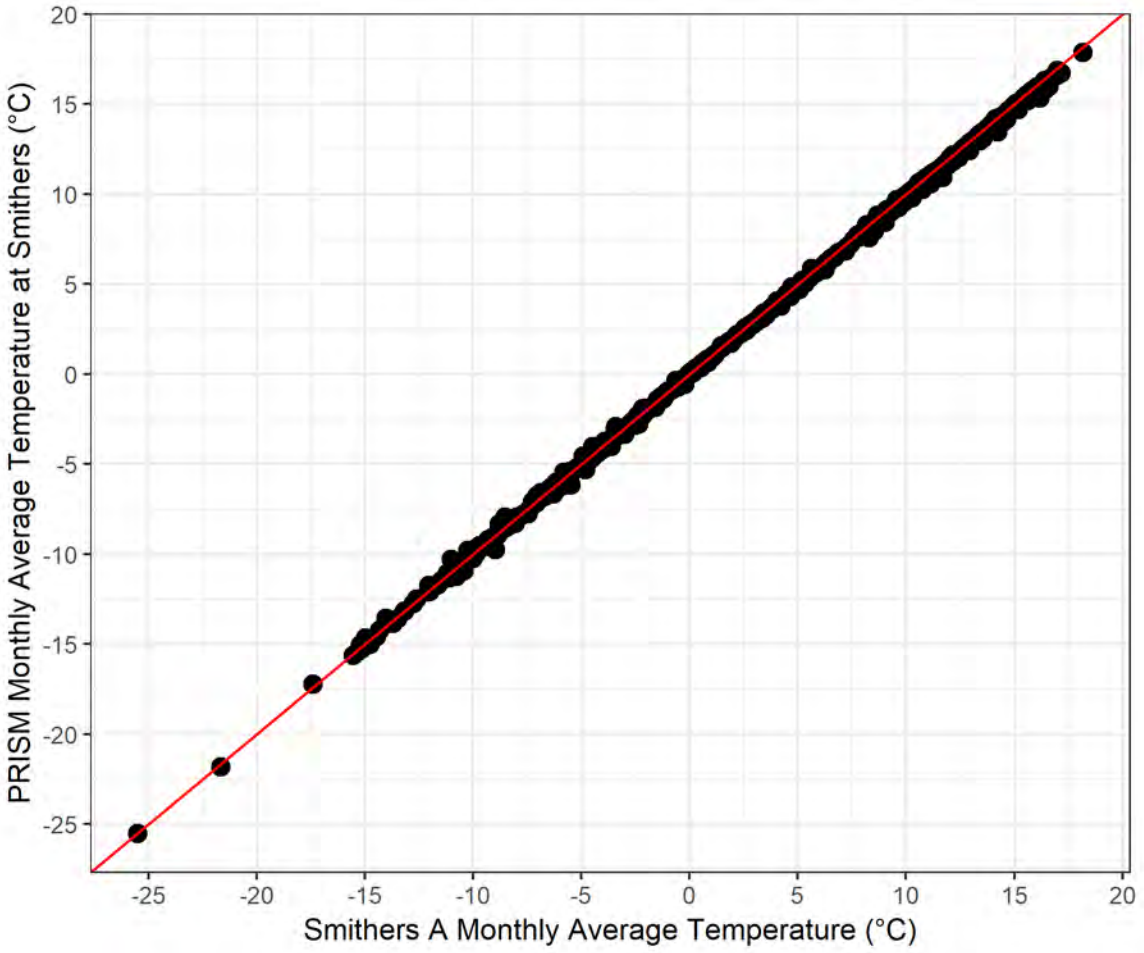
4 Derived Project Parameters

4.1 Derived Meteorological Parameters

Due the the relatively short record of Tenas Deposit Station data, meteorological parameters for the Project are derived by adjusting the patched long-term datasets at Stewart Airport to the site, based on spatial and orographic gradients. Adjustment factors are derived based on trends in regional stations, or when these are not adequate, reanalysis datasets, as described in the following sections.

4.1.1 Air Temperature

Historical Smithers Airport monthly temperatures were compared to the reanalysis datasets for the same location. Of the reanalysis datasets investigated, the PRISM model was determined to provide the best fit for precipitation as described in Section 4.1.2. Figure 4-1 illustrates the monthly temperature regression between measured and modelled PRISM temperatures at the Smithers Airport Station. Given the good correlation, PRISM data for the Project at the Tenas Deposit Station was obtained and monthly correction factors relative to the Smithers Airport station were developed to account for orographic gradients and temperature inversion effects (Table 4-1).



Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

Figure 4-1: Smithers Airport vs PRISM Reanalysis

Correction Factors and Expected Project Air Temperature

The correction factors presented in Table 4-1 were applied to the patched Smithers Airport Station temperature record to create a Project-adjusted long-term temperature record for design and modelling.

Table 4-1: Temperature Correction Factors

Month	Minimum Temperature			Average Temperature			Maximum Temperature		
	Smithers Airport (°C)	PRISM at Project (°C)	Absolute Temp. Ratio	Smithers Airport (°C)	PRISM at Project (°C)	Absolute Temp. Ratio	Smithers Airport (°C)	PRISM at Project (°C)	Absolute Temp. Ratio
January	-13.6	-13.5	1.000	-9.5	-9.9	0.998	-5.5	-6.3	0.997
February	-9.5	-10.2	0.997	-4.9	-6.0	0.996	-0.2	-1.7	0.994
March	-5.9	-7.6	0.993	-0.7	-2.8	0.992	4.5	2.0	0.991
April	-1.6	-3.3	0.994	4.3	1.9	0.991	10.1	7.1	0.989
May	2.5	0.3	0.992	8.9	6.3	0.991	15.4	12.3	0.989
June	6.0	4.4	0.994	12.5	10.4	0.992	19.0	16.3	0.991
July	8.1	6.5	0.994	14.7	12.6	0.993	21.1	18.6	0.991
August	7.5	6.1	0.995	14.1	12.1	0.993	20.6	18.1	0.991
September	3.9	2.9	0.996	9.8	8.1	0.994	15.7	13.4	0.992
October	0.1	-1.6	0.994	4.4	2.4	0.993	8.7	6.4	0.992
November	-5.6	-7.2	0.994	-2.5	-4.1	0.994	0.7	-1.1	0.994
December	-10.8	-11.2	0.998	-7.2	-7.9	0.998	-3.7	-4.5	0.997

Source compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

Table 4-2 summarizes the expected monthly air temperatures at the Project and Figure 4-2 illustrates the modelled average monthly temperature compared to measured temperature at the Tenas Deposit Station.

Table 4-2: Expected Project Temperature Summary [°C] From Derived Long-term Time Series

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
Maximum	-5.8	-1.8	2.2	7.4	12.9	16.5	19.0	18.6	13.7	6.5	-0.8	-4.6	7.0
Average	-9.2	-6.1	-2.7	2.1	6.8	10.7	13.0	12.5	8.4	2.6	-3.8	-7.9	2.2
Minimum	-12.6	-10.4	-7.5	-3.1	0.8	4.7	6.9	6.4	3.1	-1.4	-6.8	-11.2	-2.6

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

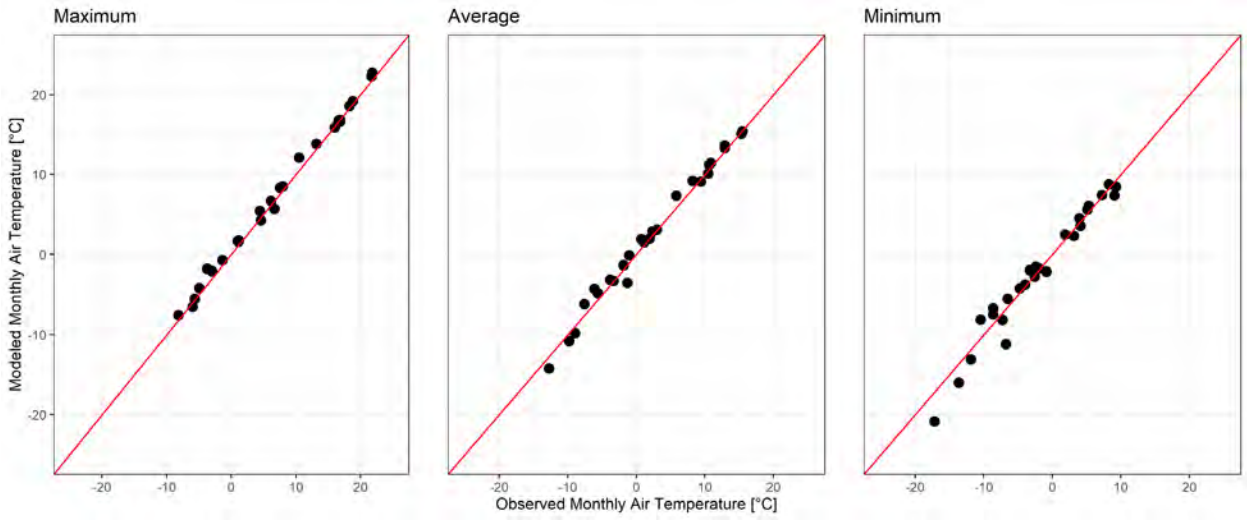


Figure 4-2: Comparison between Observed and Modelled Monthly Average Temperatures for October 2017 to December 2019

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Temperature_1CT027.003_rev01.Rmd

4.1.2 Precipitation

Figure 4-3 illustrates the monthly precipitation correlation between the 26 months of measured Project precipitation and patched precipitation records at Smithers for the overlapping period from September 2017 to December 2019. The total measured precipitation at the Tenas Deposit Station was approximately 34% greater than that at Stewart A over this period. The monthly precipitation difference ranged between -15 mm to +91 mm for Project data over the 59 months and suggests monthly correction factors are more appropriate to account for seasonality.

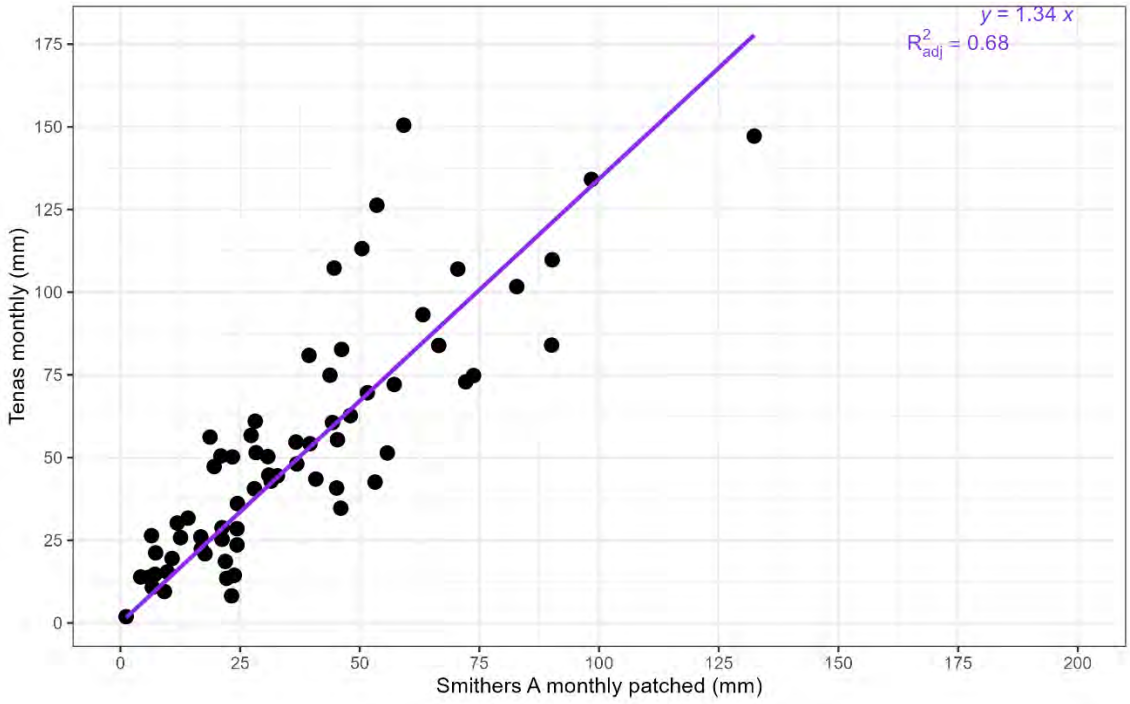


Figure 4-3: Comparison between Observed Total Precipitation at Tenas Deposit Station and Smithers A

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\graphs\Site_Smithers_Precipitation.png

Typically, precipitation depths are expected to be greater at higher elevations. However, as previously demonstrated in Figure 2-10, there is a poor regional correlation between mean annual precipitation and elevation at the regional stations. Therefore, Reanalysis datasets were evaluated against the patched Smithers A record to develop transposition factors to adjust the longer-term dataset to site (Table 4-3).

Table 4-3: Smithers A and Reanalysis Mean Monthly and Annual Precipitation Comparison [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Smithers A (patched)	51	28	22	22	35	46	45	41	51	62	54	50	508
ERA 5	62	41	45	45	59	79	70	65	69	86	79	59	760
Merra 2	92	60	76	60	72	101	97	94	94	117	105	92	1059
PRISM	48	23	24	24	34	55	46	46	49	66	54	49	517

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Precipitation_1CT027.003_rev01.Rmd

The PRISM reanalysis data was found to best represent the spatial precipitation distribution across elevations. The PRISM mean annual precipitation for the region surrounding the Project, shown in Figure 4-4, demonstrates the spatial and orographic variability of precipitation in the region.

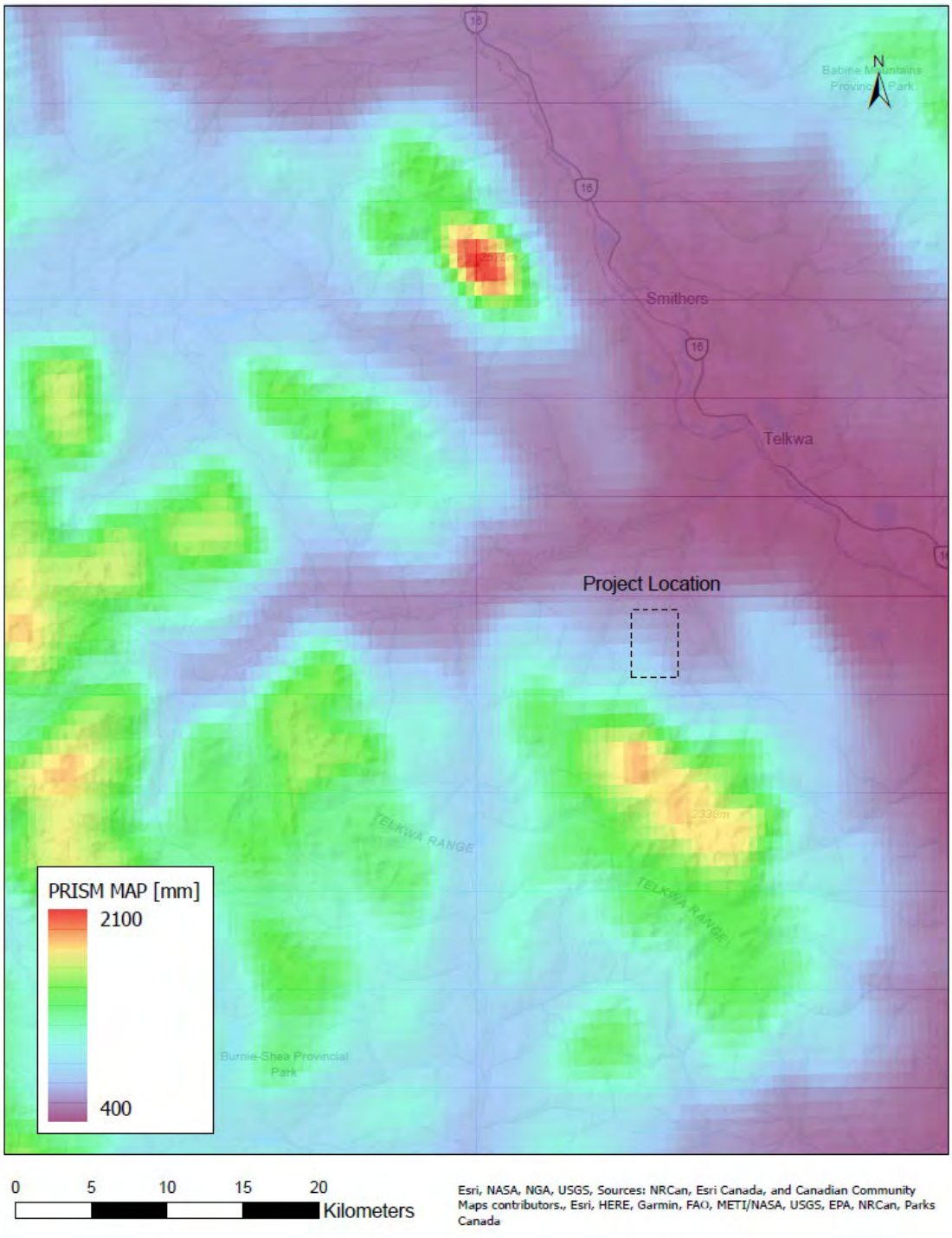


Figure 4-4: PRISM Mean Annual Precipitation in the project Area

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\!080_Deliverables\Hydromet Baseline Update\040_Figures\Figure4.4_PRISM_MAP.pdf

4.1.2.1 Correction Factors and Expected Project Precipitation

The Smithers A station record was gap-filled using the Smithers Airport Auto station. The Smithers A station was subsequently gap-filled using the Quick station and then a quantile-

mapped ERA5 reanalysis product for the Smithers A location to generate a complete time series spanning 1946-2023. The 2017-2022 Tenas Deposit station records were assessed in relation to regional station records on a monthly and daily basis. This assessment was done for hourly, daily, and monthly precipitation totals as well as seasonally by lumping multiple months together. Ultimately, the gap-filled regional time series at Smithers A was adjusted to the Project area using the linear regression provided in Figure 4-3 developed from the monthly precipitation totals (R2 of 0.71). No bias correction was undertaken to avoid overfitting the data due to the length of the overlapping period.

Table 4-6 summarizes expected average monthly precipitation at the Project based on the modelled time series. The mean annual precipitation (MAP) is estimated to be 608 mm which is approximately 19% greater than average precipitation recorded in the valley at the Smithers Airport station.

Table 4-4: Total Precipitation Measured at Tenas Deposit Station and Final EAC Project Case (2024) Synthetic Precipitation Time Series

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2017	Total Measured Precipitation [mm]	M	M	M	M	M	M	M	M	M	147	134	10	291[1]
	Total Modelled Precipitation [mm]	-	-	-	-	-	-	-	-	-	178	132	12	321[1]
2018	Total Measured Precipitation [mm]	50	150	81	14	14	42	50	2	50	54	51	113	672
	Total Modelled Precipitation [mm]	41	79	53	7	32	71	28	2	31	53	75	67	540
2019	Total Measured Precipitation [mm]	60	19	8	13	26	57	83	21	47	93	73	22	522
	Total Modelled Precipitation [mm]	59	29	31	30	19	37	62	24	26	85	96	23	520
2020	Total Measured Precipitation [mm]	126	26	30	14	25	63	35	84	55	84	107	M	647[1]
	Total Modelled Precipitation [mm]	72	22	16	9	28	64	62	121	61	89	60	-	603[1]
2021	Total Measured Precipitation [mm]	M	M	12	14	56	51	61	24	75	31	107	29	460[1]
	Total Modelled Precipitation [mm]	-	-	33	6	25	38	38	33	99	23	94	28	416[1]

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2022	Total Measured Precipitation [mm]	17	55	21	28	48	75	41	41	11	M	M	M	337[1]
	Total Modelled Precipitation [mm]	55	49	10	33	49	59	61	37	9	-	-	-	361[1]

Notes:
M denotes a month with greater than 10 (typically 20-25) days of missing data. – indicates that the synthetic data was removed over this period for meaningful comparison with measured Tenas Deposit data.

[1] Indicates that calculated annual total precipitation is for a partial year as one or more months had >10 days of missing data.

Source: compiled in text from \NA CAPR002055 Telkwa Project General EA Support - Internal\Surface Water IR Responses\Updated Responses_20230906\1CT027.003_Telkwa_ITT_SW_IRs_Round2_WaterBalanceOnly_20240603_njs_ccm df.docx

Finally, PRISM correction factors were applied to account for the elevation distribution across the Project Area. The correction factors are presented in section 4.2.5.

Table 4-5: Project Precipitation Summary [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall	8.0	9.7	10.4	21.5	35.9	45.7	48.1	43.1	50.8	58.6	20.0	8.0	359.9
Snowfall	61.8	35.9	22.0	4.9	0.7	0.0	0.0	0.0	0.3	13.6	49.4	59.7	248.1
Total	69.7	45.6	32.4	26.4	36.6	45.7	48.1	43.1	51.1	72.2	69.4	67.7	608.0

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_hydrology_summary.csv

Figure 4-5 illustrates the average monthly precipitation as rain and snow. Precipitation typically falls as snow during the months of November to March. Annually, the average snowfall (314 mm) is approximately 50% of mean annual precipitation.

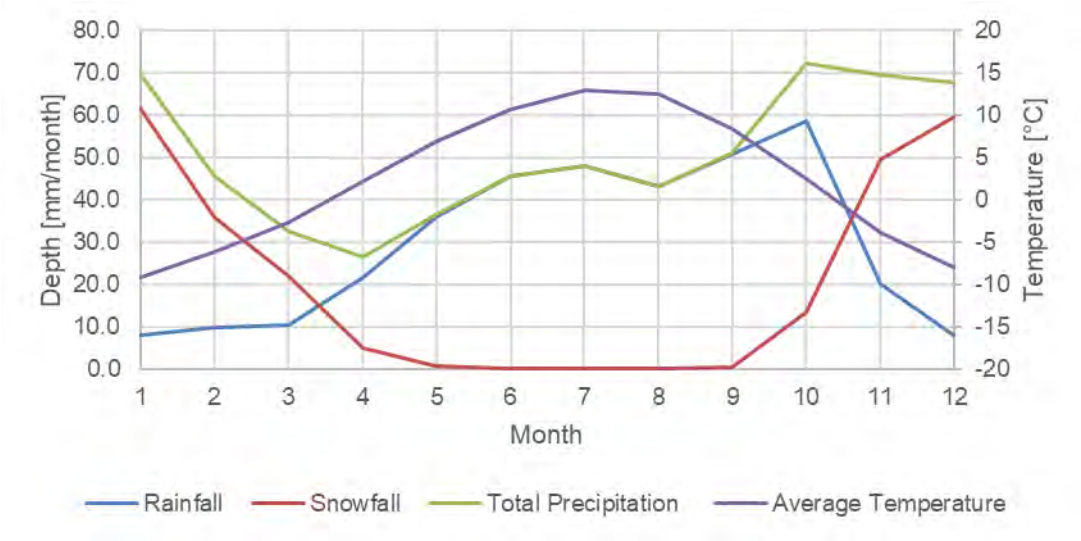


Figure 4-5: Monthly Precipitation as Snow and Rain

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Precipitation_1CT027.003_rev02.Rmd

4.1.2.2 Extreme Precipitation

Annual Frequency Analysis

A frequency analysis was performed using annual precipitation estimates derived from the long-term Project precipitation time series, developed using adjustments to Smithers Airport Station. The frequency analysis tested a range of probability distributions and found that a three-parameter log normal distribution provides the best fit to the long-term annual precipitation data for the Project.

The results of the annual frequency precipitation analysis are presented in Table 4-6 for extreme conditions ranging from a 1,000-year dry to a 1,000-year wet return periods.

Table 4-6: Annual Precipitation Frequency Analysis

Hydrological Condition	Return Period [years]	Annual Precipitation [mm]
Wet	1000	960
	500	937
	200	906
	100	880
	50	852
	25	823
	20	813
	10	780
	5	742
Mean Annual Precipitation (MAP)		664
Dry	5	592
	10	542
	20	493
	25	477
	50	427
	100	375
	200	320
	500	243
	1000	181

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Extreme Precipitation

The annual maximum daily and 3-day precipitation depths were calculated following the Regional Frequency Analysis framework proposed by Hosking & Wallis (1997). This is a refined approach compared to local frequency analysis (one station) aimed to increase the accuracy of low probability events (e.g., 1,000-year precipitation), fundamental for engineering design and risk assessment. The RFA considered as homogeneous group the following stations:

Within the RFA framework, a range of probability distributions were tested and it was found that a Generalized Extreme Value distribution provided the best fit to both the 24-hour and 72-hour datasets.

Annual maximum 1-day and 3-day precipitations were converted to maximum 24-hour and 72-hour precipitation using a factor of 1.13 and 1.04, respectively (WMO, 2009).

Table 4-7 presents the 24-hour and 72-hour precipitation depths for a range of return periods based on the RFA of the long-term Project precipitation record.

Table 4-7: Extreme Project Precipitation for 24-hour and 72-hour Events

Return Period	24-hour Precipitation [mm]	72-hour Precipitation [mm]
2	42.0	56.7
5	56.1	75.6
10	66.3	89.3
25	80.2	108.1
50	91.3	123.0
100	103.1	138.9
200	115.6	155.7
500	133.3	179.6
1000	147.7	199.1

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

For durations less than 24-hours, the depth-duration-frequency curve data from the Smithers Airport station were obtained and modified to account for the 24-hour results presented in Table 4-7. Sub-daily annual maximum records from Smithers A stations were obtained from the IDF_CC Tool (Version 7.5). An IDF based on GEV distribution (Koutsoyiannis, Kozonis, & Manetas, 1998) was fitted to these records with the same shape parameter estimated in the regional approach described above for consistency. Frequency and duration factors were calculated based on the 24-hour precipitation depths for Smithers Airport, and were applied to the Project 24-hour depths presented in Table 4-7. Table 4-8 summarizes the baseline depth-duration-frequency curve for the Project.

Table 4-8: Project Baseline Precipitation-Duration-Frequency Curve

Storm Duration		Precipitation (mm)						
		Return Period (years)						
min	hours	2	5	10	25	50	100	200
5	0.08	3.6	4.9	5.8	7	7.9	8.9	10
10	0.17	4.9	6.6	7.8	9.4	10.7	12.1	13.5
15	0.25	5.9	7.8	9.2	11.2	12.7	14.4	16.1
30	0.5	7.9	10.6	12.5	15.1	17.2	19.4	21.7
60	1	10.7	14.2	16.8	20.3	23.2	26.1	29.3
120	2	14.4	19.2	22.7	27.4	31.2	35.3	39.5
360	6	23.1	30.9	36.4	44.1	50.2	56.7	63.5
720	12	31.2	41.6	49.2	59.5	67.7	76.4	85.7
1440	24	42	56.1	66.3	80.2	91.3	103.1	115.6
4320	72	56.7	75.6	89.3	108.1	123	138.9	155.7

Source: compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Probable Maximum Precipitation

The probable maximum precipitation (PMP) was calculated using the Hershfield methodology (Hershfield 1965; WMO 2009), and the Project-adjusted precipitation record. The Canadian Dam Association Guidelines (2013) recommends evaluating two Probable Maximum Floods (PMF):

Summer/autumn PMF, which is generated by the summer/autumn PMP

Spring PMF is defined as the maximum of two cases:

1. PMF computed with Spring PMP and snow accumulation with frequency of 100 year (Rainfall Dominated)
2. PMF computed with the Probable Maximum Snow Accumulation (PMSA) and a rainstorm with a frequency of 100 year (Snowmelt Dominated)

Two separate PMFs are estimated for the Spring season as it is not reasonable to assume that the PMSA and a Spring PMP, which are two independent phenomena, would occur simultaneously.

Based on the typical hydrograph for the Project (see Section 3, snow at the Project is expected to be present until as late as June.

Table 4-9 presents the Spring and Summer/Autumn PMPs for the Project where Spring was defined as April to June and summer was defined as July through October.

Table 4-9: Project 24-hour Probable Maximum Precipitation

Season	PMP (mm)
Spring	234
Summer/Autumn	283

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\Rwork\Telkwa_EA_Precipitation_1CT027.003_rev01.Rmd

Results were verified using the British Columbia MetStorm Probable Maximum Precipitation webtool (DTN, 2020), which was developed in support of the BC Extreme Flood Project. This web-based tool provides an indication of potential precipititaion depths based on regionally available datasets at select points across the province. The maximum point PMP estimated from the webtool within the Project vicinity is 218 mm. The results in Table 4-9 are based on Project-specific precipitation datasets and present a more conservative PMP estimate. For this reason, the Project data were used for the purpose of infrastructure design.

4.1.3 Snow Depth and Snowmelt

The SNOW-17 snow accumulation and ablation model developed by the National Weather Service River Forecast System (NWSRFS) was implemented to model snowmelt for the Project. The main processes included in this model are dividing precipitation into rain or snow, accumulation of snowpack, energy exchange, heat deficit in the snowpack, ground melt and

snowmelt as a snow water equivalent (Anderson 2006). Model inputs are average temperature and precipitation and input parameters to model a column of snow. The Project weather station recorded an accumulated depth of snow. Data collection at the Project did not include snow courses or snow density to convert snow depth to snow water equivalent (SWE) but regional estimates were used to check the SNOW-17 model accuracy.

Table 4-10 summarizes the model input parameters based on guidelines of initial estimates (Anderson 2002) and validation against the snow water equivalent records at Tsai Creek. Temperature and precipitation time series for the Tsai Creek elevation were developed using PRISM corrections, similarly to the Project records. Figure 4-7 illustrates the measured and modelled snow water equivalent snow depths at Tsai Creek.

Table 4-10: SNOW-17 Model Input Parameters

Parameter	Description	Value
PXTEMP	Temperature threshold	1.5 °C
SCF	Loss coefficient during period of snow (i.e. sublimation)	1
UADJ	Average wind function during rain-on-snow events	0.04 mm/mbar/hr
MBASE	Temperature above which melt occurs	0 °C
MFMAX	Maximum melt factor	0.51 $mm \cdot °C \cdot 6hr^{-1}$
MFMIN	Minimum melt factor	0.10 $mm \cdot °C \cdot 6hr^{-1}$
TIPM	Antecedent temperature index factor	0.1
NMF	Maximum negative maximum factor	0.25 $mm \cdot °C \cdot 6hr^{-1}$
PLWHC	Percent liquid water holding capacity. Maximum amount of liquid water as a fraction of the ice portion of the snow	4%

Source: from snowmelt calibration model for Tsai Creek. \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Model\SnowmeltModel \ TsaiCreek_Snow17.gsm

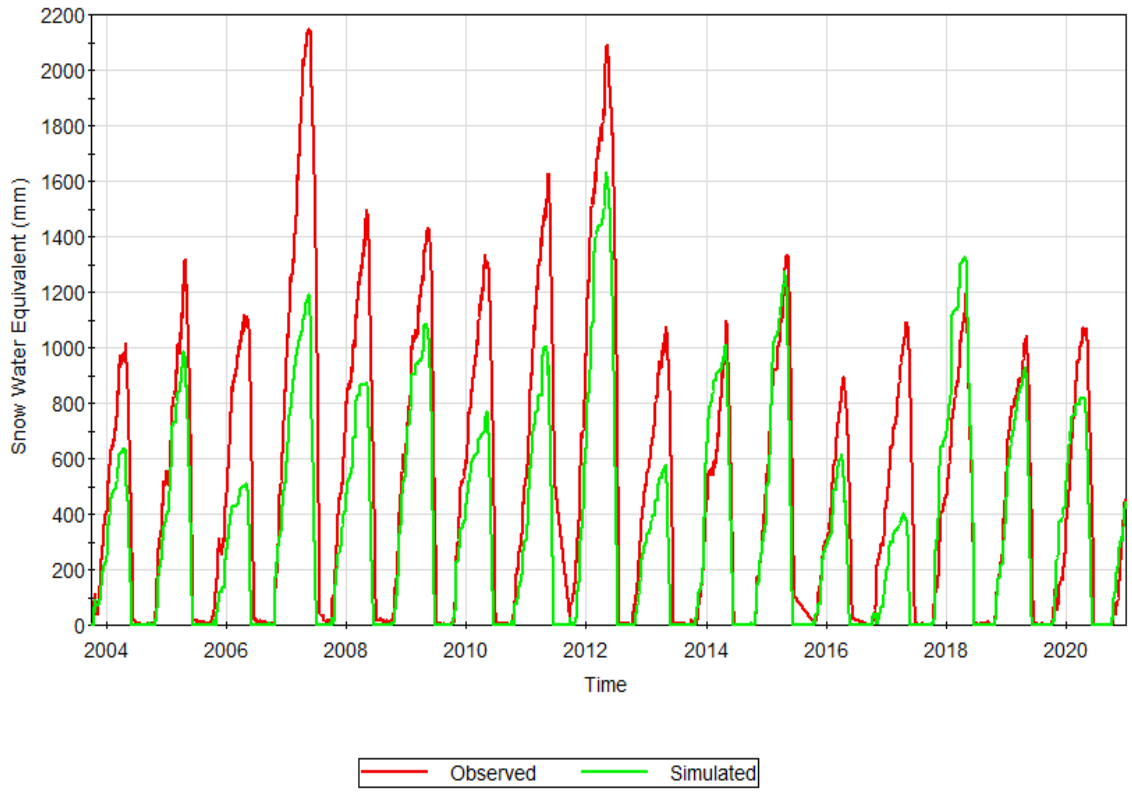


Figure 4-6: Tsai Creek Snowmelt Snow Water Equivalent Calibration

Source: from snowmelt calibration model for Tsai Creek. Z:\01_SITES\Telkwa Coal\1CT027.002 2017-18 permitting Support (Phase 2)\0200_SurfaceWater\Snowmelt Model\ TsaiCreek_Snow17.gsm

The validation with Tsai Creek suggests the snowmelt timing is well captured, with some understimations of maximum snowpack. This may be a result of inaccuracies in the precipitation record estimated for Tsai Creek. For the purpose of water management planning and design and water balance modeling, the SNOW-17 model and inputs were applied to the Project. Figure 4-7 illustrates the average snow water equivalent depths for the Project based on the adjusted precipitation and temperature records from 1942 to 2020.

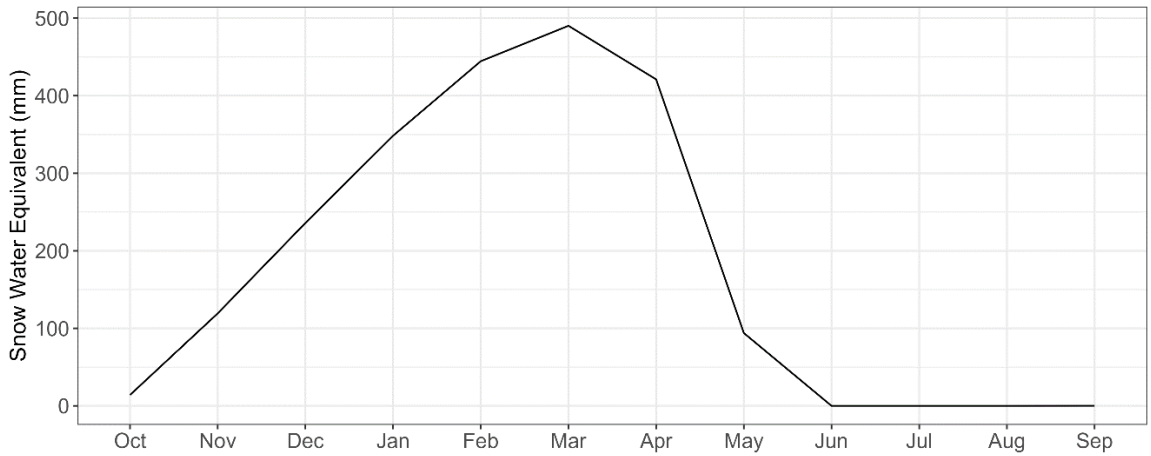


Figure 4-7: Project Snow Water Equivalent

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

In addition to snow-water-equivalent, the snowmelt model produces a daily excess water term, which represents the sum of rainfall and snowmelt and can be interpreted as the daily depth of water available to generate runoff. Table 4-11 presents the monthly average excess water results for the Project, along with the monthly average distribution.

Table 4-11: Project Excess Water Monthly Average Summary [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Total Excess Water	2	3	18	145	184	70	58	54	67	60	9	2	672
Monthly Excess Water Distribution	0%	0%	3%	22%	27%	10%	9%	8%	10%	9%	1%	0%	100%

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

A frequency analysis was performed on the maximum 1-day and 3-day (72-hour) snow water equivalent results from the Project snowmelt model based on the adjusted record from 1981 to 2023. Results for return periods up to the 1000-year snowmelt event are presented in Table 4-12.

Table 4-12: Project Snowmelt Frequency Analysis

Return Period	24-hour Snowmelt [mm SWE]	72-hour Snowmelt [mm SWE]
2	34.0	57.5
5	43.3	73.3
10	50.9	86.1
25	62.8	106.4
50	74.0	125.4
100	87.7	148.5
200	104.4	176.8
500	132.4	224.3
1000	159.4	269.9

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

4.1.4 Solar Radiation

Given the short period of record at the Tenas Deposit Station and large differences to Smithers Airport Station, the FAO model (Allen et al. 1998) was adopted to calculate historical baseline averages of solar radiation using the corrected temperature timeseries developed for the Project (Table 4-13). The appropriateness of the FAO model to approximate incoming solar radiation at the Tenas Deposit Station was illustrated from October 2017 to September 2022 in Figure 4-8.

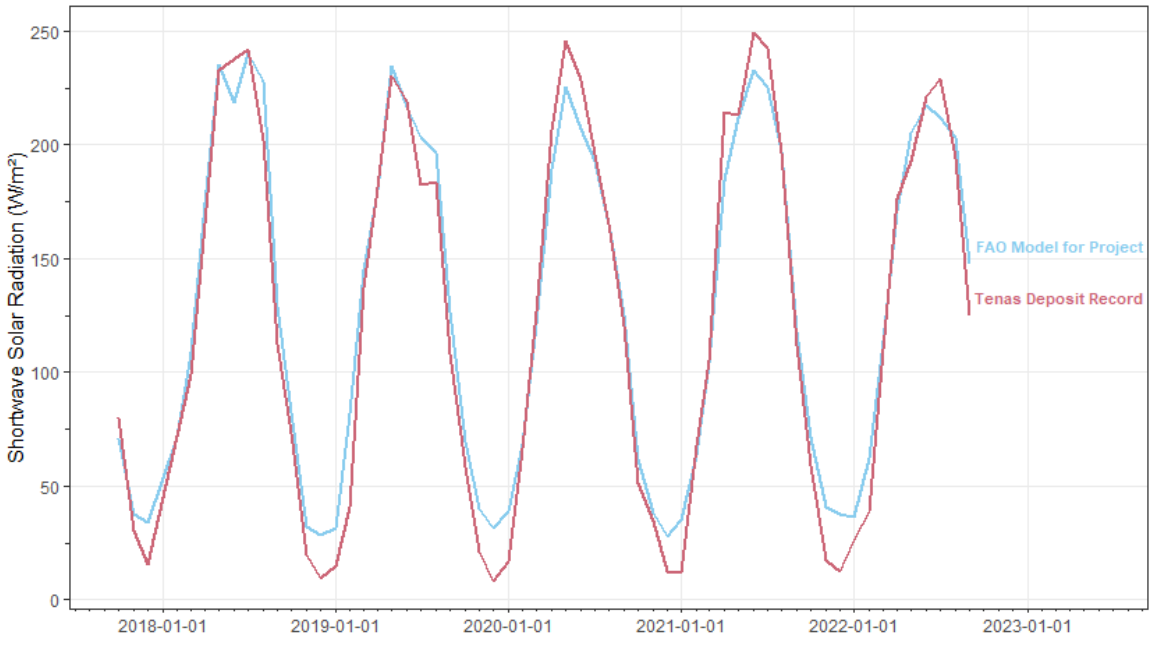


Figure 4-8: Solar Radiation – Modelled versus Measured (October 2017 to September 2022)

Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Table 4-13: Average Monthly Solar Radiation [W/m^2] at Project

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average	38	64	114	173	220	224	224	201	134	73	40	34	128

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

4.1.5 Relative Humidity

Given the short period of record at the Tenas Deposit Station and the similarities observed between Smithers Airport Station records presented in Section 2.3.6, Smithers Airport station relative humidity was applied to the Project. Table 4-14 presents the monthly average relative humidity for the Project.

Table 4-14: Average Monthly Relative Humidity [%] at Project

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average (%)	83.6	79.3	71.2	63.3	61.3	65.7	68.8	72.1	79.5	82.1	85.9	85.4	74.8

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Evaporation_1CT027.003_rev01.Rmd

4.1.6 Evaporation

Large and shallow water bodies can experience direct water losses from evaporation. Lake surface evaporation for the Project was estimated using the Morton CRWE shallow lake evaporation method (Morton 1983). Table 2-18 summarizes the input parameters required for this method including the Project-specific solar radiation generated using the FAO model.

Based on the adjusted temperature record, modelled solar radiation and relative humidity and wind speeds from the Smithers Airport station, the estimated mean annual evaporation for the Project is 529 mm. Table 4-15 and Figure 4-9 demonstrate the mean open water evaporation rates for the Project. The potential evaporation estimates generated using the Morton CRWE results for the derived Project timeseries were closest to the Topley Landing Normals.

Table 4-15: Project Monthly Total Lake Evaporation [mm]

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Evaporation	0	0	0	60	97	108	116	99	50	0	0	0	529

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Evaporation_rev02.Rmd

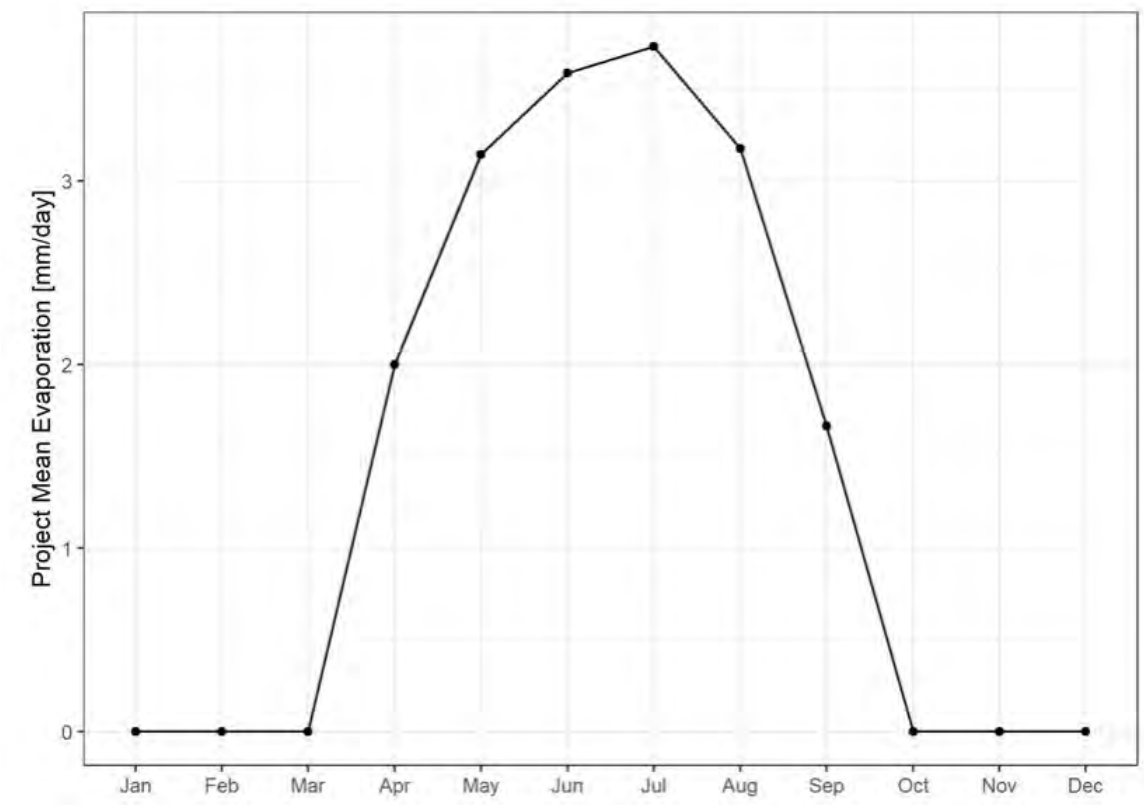


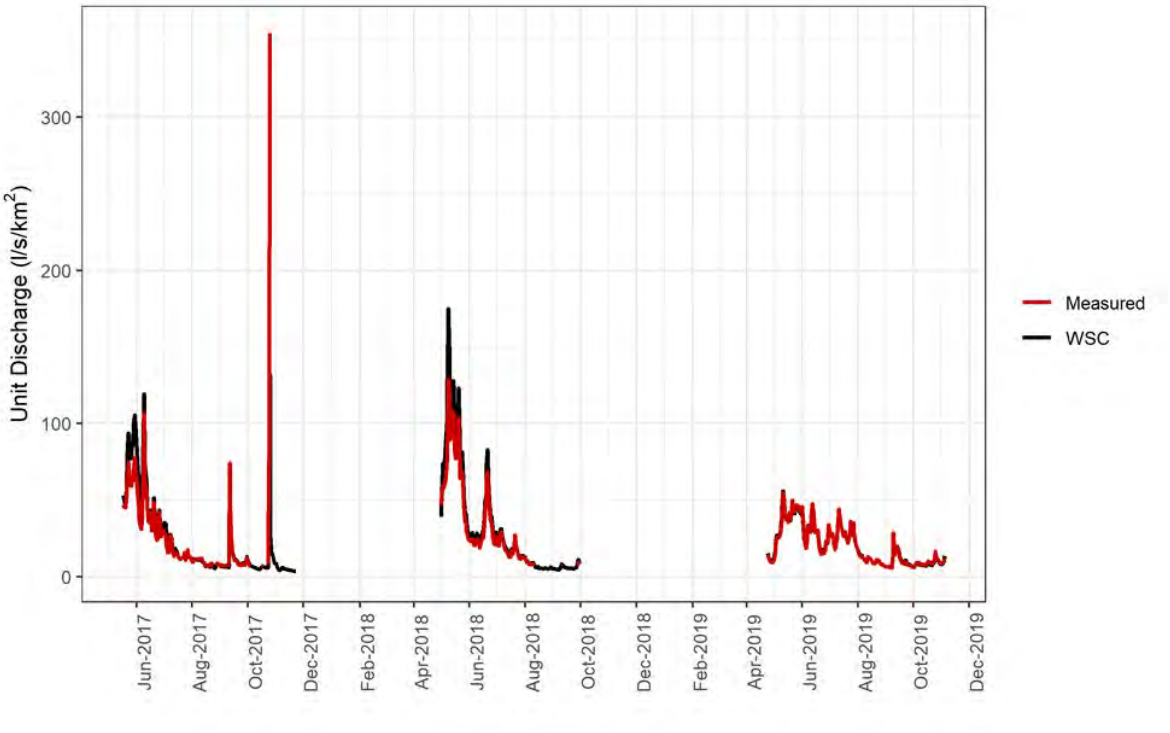
Figure 4-9: Mean Daily Open Water Evaporation Rates

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Evaporation_rev02.Rmd

4.2 Derived Hydrological Parameters

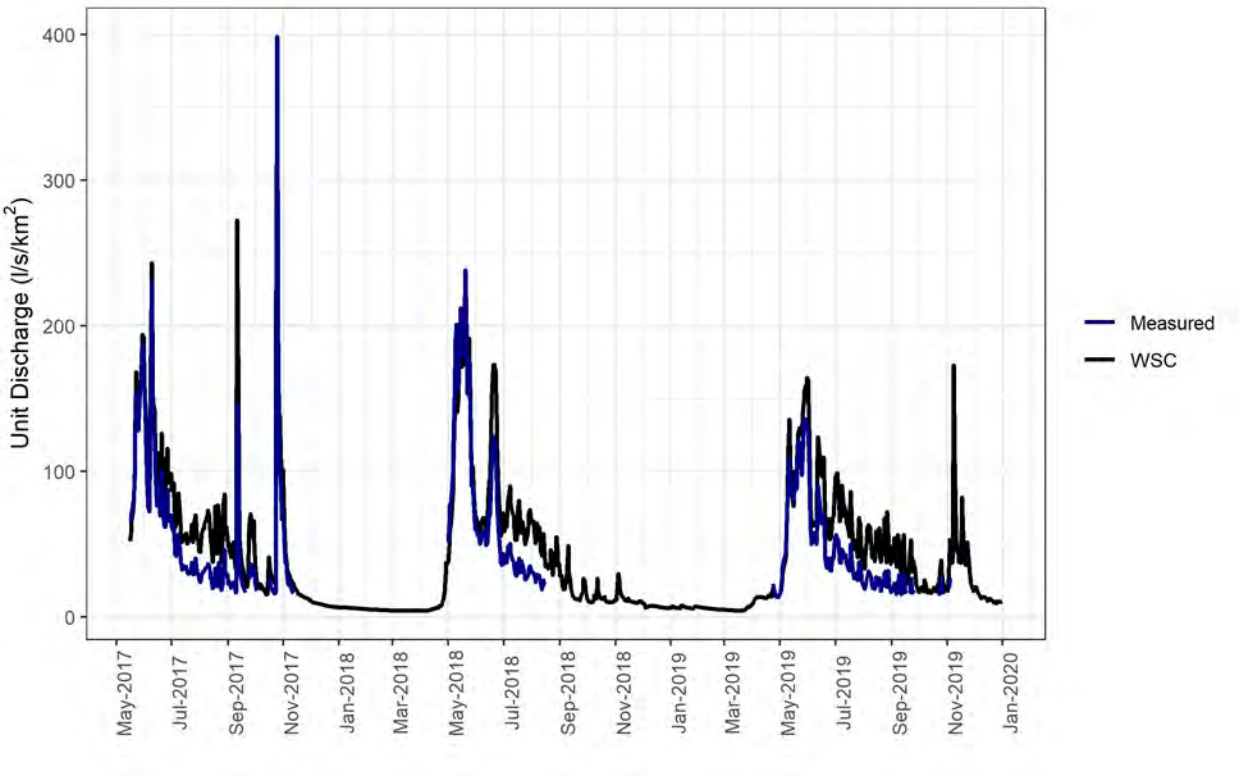
4.2.1 Time Series Comparison

Comparisons of the unit discharge at each Project hydrometric station with regional station data records led to pairing of the Project record with the most appropriate regional analogue (Table 4-18). Regression approaches were used for the periods of overlap between each of the Project hydrometric stations and their respective regional analogue. Time series of Project Area and regional station unit discharge records for Goathorn-Hydro and Goathorn Creek (08EE008), Telkwa-Hydro and Telkwa River (08EE020) Tenas-Hydro B and Goathorn Creek (08EE008), and Four-Hydro and Goathorn Creek (08EE008) are shown in Figure 4-10, Figure 4-11, Figure 4-12, and Figure 4-13, respectively. Additional comparisons for Four Creek based on 1999 baseline data are also described.



Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Telkwa_flows.R

Figure 4-10: Project Hydrometric Station Goathorn-Hydro (red-Measured) and Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) (black-WSC)



Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Telkwa_flows.R

Figure 4-11: Project Hydrometric Station Telkwa-Hydro (blue-Measured) and Water Survey of Canada Telkwa River Below Tsai Creek (08EE020) (black-WSC)

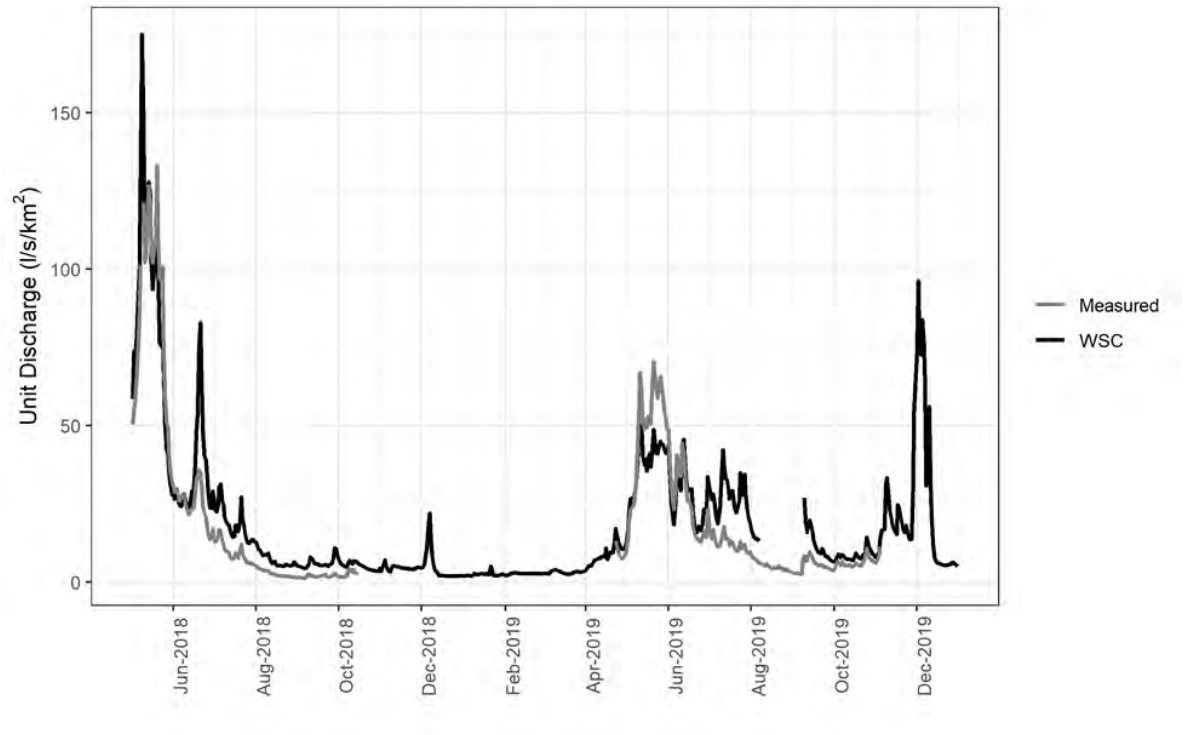


Figure 4-12: Project Hydrometric Station Tenas-Hydro B (grey-Measured) and Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) (black-WSC)

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Telkwa_flows.R

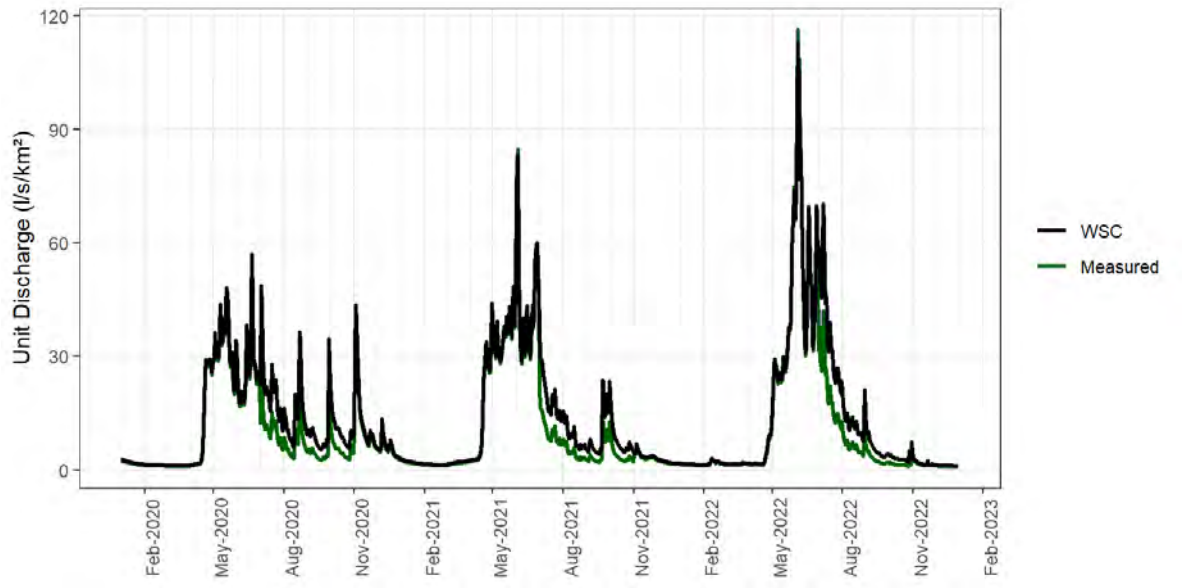


Figure 4-13: Project Hydrometric Station Four-Hydro (green-Measured) and Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) (black-WSC)

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Telkwa_flows.R

A previous investigation into the hydrology of Four Creek was completed in 1997 (October to November) to 1998 (June to November) to support the Telkwa Coal Project 1999 Baseline Surface Flow and Water Quality Final Data Report (AGRA, 1999; Attachment A). The precise location of the AGRA hydrometric stations are not known, which limits the transferability of analyses using historical data. Based on the station descriptions in AGRA 1999, approximate locations were estimated and catchment areas were calculated.

Unit flows and monthly runoff rates were calculated based on assumed catchment areas and compared between Tenas, Four and Goathorn creeks, presented in Table 4-16 and Figure 4-15 and described in Attachment A and in tabular form in Attachment C. Runoff rates by month show a lower yield in Four Creek than in Tenas Creek, and higher rates in Goathorn Creek than in Tenas Creek during summer months of August and September. Unit flows in October 1997 show a storm response peak flow in all three streams, while 1998 records show a consistently lower yield in Four Creek than in Goathorn Creek.

Table 4-16: Comparison of Monthly Runoff Rates based on Hydrometric Data from AGRA 1999 at Goathorn, Tenas and Four Creeks (Attachment A, C)

Stream	Year	Runoff (mm/month)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tenas Creek	1997	ND	ND	ND	ND	ND	ND	ND	22	12	47	ND	ND
	1998	ND	ND	ND	ND	40	ND	ND	5	8	11	ND	ND
Four Creek	1997	ND	ND	ND	ND	ND	ND	ND	ND	ND	9	4	ND
	1998	ND	ND	ND	ND	ND	ND	3	1	1	2	ND	ND
Goathorn Creek	1997	4	5	5	49	166	142	88	54	32	46	16	6
	1998	3	3	4	28	145	68	50	25	16	27	12	6

Notes:

1. Monthly runoff is calculated for months containing greater than 25 days of runoff data
2. ND: No Data or less than 25 days with data in a month

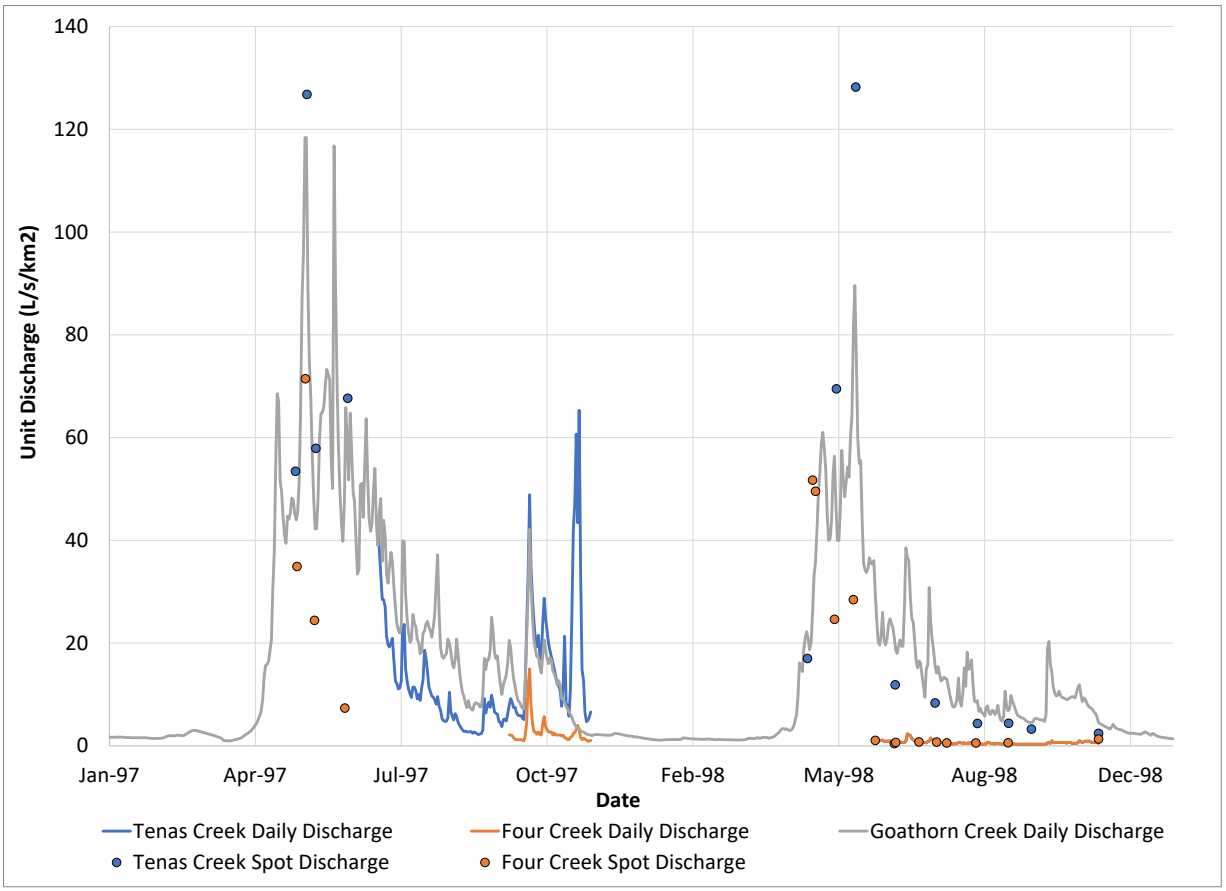


Figure 4-14: Comparison of Unit Flows based on Hydrometric Data from AGRA 1999 at Goathorn, Tenas and Four Creeks (Attachment A, C)

AGRA 1999 describes runoff ratios, based on annual runoff yield and annual precipitation data from Smithers Airport. The runoff ratios for WSC's Goathorn Creek station were calculated as 0.65 and 0.83 in 1997 and 1998, respectively, and 0.28 in both years for Four Creek. Note that results from Section 4.1.2 show that precipitation data from Smithers Airport is expected to be distinct from precipitation that falls near the Telkwa Project Area or within each stream's catchment, limiting the applicability of these ratios. This discrepancy is also noted in AGRA 1999. AGRA 1999 stated that the difference in runoff ratios between Goathorn and Four Creek could be attributed to potential orographic gradients in precipitation and the difference in the altitude range between Goathorn Creek (1745 m, from 550 to 2295 masl) versus Four Creek (670 m from 700 to 1370 masl). The Four Creek basin generally faces the northeast, where as the Goathorn Creek basin faces northeast and northwest, which is expected to cause differences in snowpack accumulation and ablation (AGRA 1999). AGRA also concluded that groundwater baseflows would be more pronounced in Goathorn Creek as it extends lower in the basin than Four Creek, which may result in an increased occurrence of springs surfacing from fractures.

4.2.2 Regression Equation Development

The regression approach ultimately selected to develop regressions between measured, Project hydrometric records and regional analogues was chosen based on: (1) The simplicity of the

regression, (2) the Nash-Sutcliffe Efficiency (NSE) between the estimated flows and the measured flows for the period of overlap and (3) the ability of the regression to approximate both high and low flows based on flow duration curves. The regressions were then used to generate synthetic flow records for each Project hydrometric stations using the long-term, regional records from Water Survey of Canada as a foundation. The time series generated from the developed regression equations for each hydrometric station were compared to the measured unit discharges at each station using tables.

Table 4-18 summarizes the pairings between Project hydrometric stations and the most suitable regional analogue, catchment areas for each station and the NSE from the regression. Three equations were developed using linear regression and provisional WSC Goathorn flow data that has not been approved by WSC. The 2020 WSC Goathorn flows show a jump in February that is likely erroneous and will require correction by WSC. Given the provisional WSC data and the short period of record at Four-Hydro, it was unsurprising that neither equation adequately captured the correct magnitude for freshet. Additional regression options were explored but were not successful.

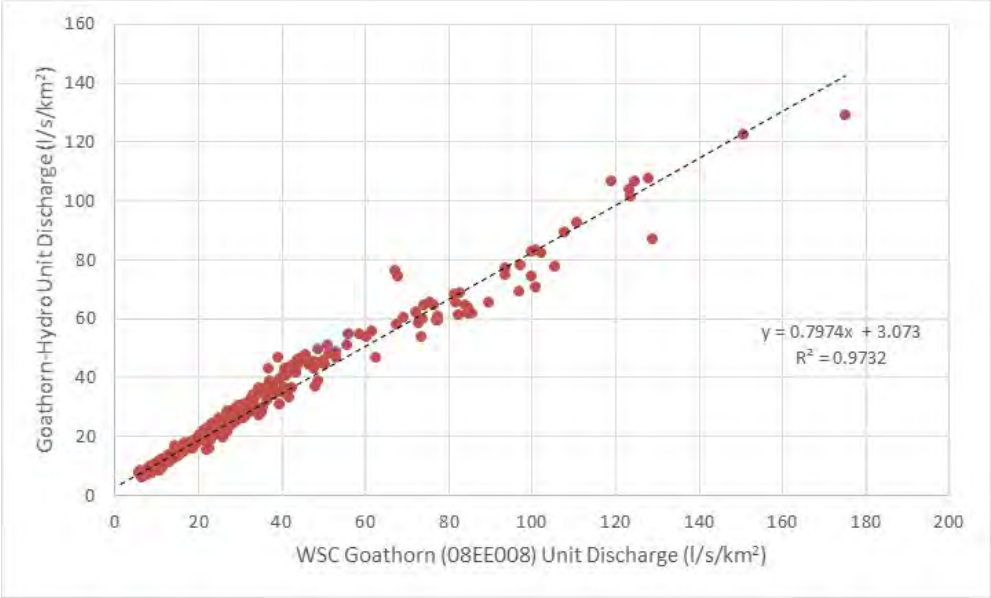
Table 4-17: Project and WSC Regional Regression Type and Fit Parameter

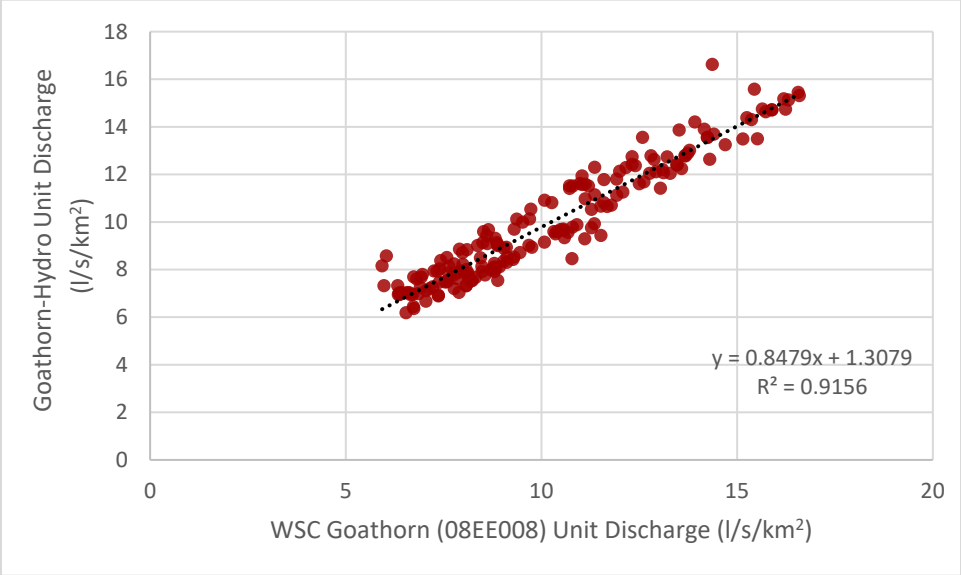
Project Station ID	Project Station Catchment Area (km^2)	Regional Station ID	Regional Catchment Area (km^2)	Regression Type	Regression NSE
Goathorn-Hydro	123.5	Goathorn (08EE008)	125	Linear, Chronological Pairing	0.96
Tenas-Hydro B	46.8	Goathorn (08EE008)	125	Linear, Chronological Pairing	0.85
Telkwa-Hydro	997.2	TelkwaBTC (08EE020)	367	Ranked Regression, Time-independent	0.96
Four-Hydro	11.0	Goathorn (08EE008)	46.8	Ranked Regression, Time-independent	0.54

Source: Compiled in text.

Goathorn-Hydro

The linear regression for Goathorn-Hydro was developed for moderate to high flows while a separate linear regression was developed to generate low flows. The low flow regression was developed from low flows in November. The linear regression developed excluded a high flow event recorded at Goathorn-Hydro on 25 October 2017 (Table 4-18). This event was removed from the dataset as its occurrence was not supported by any similarly large discharge event recorded at the Water Survey of Canada Goathorn station. The recorded daily average unit flow at Goathorn-Hydro was 354 L/s/km^2 while the WSC Goathorn station recorded 132 L/s/km^2.





Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\ 01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Goathorn_regression_rev00_20200421_njs.xlsx

Figure 4-15: Linear regressions developed for WSC Goathorn Creek Near Telkwa (08EE008) and Goathorn-Hydro stations for moderate to high flows (upper panel) and low flows (lower panel)

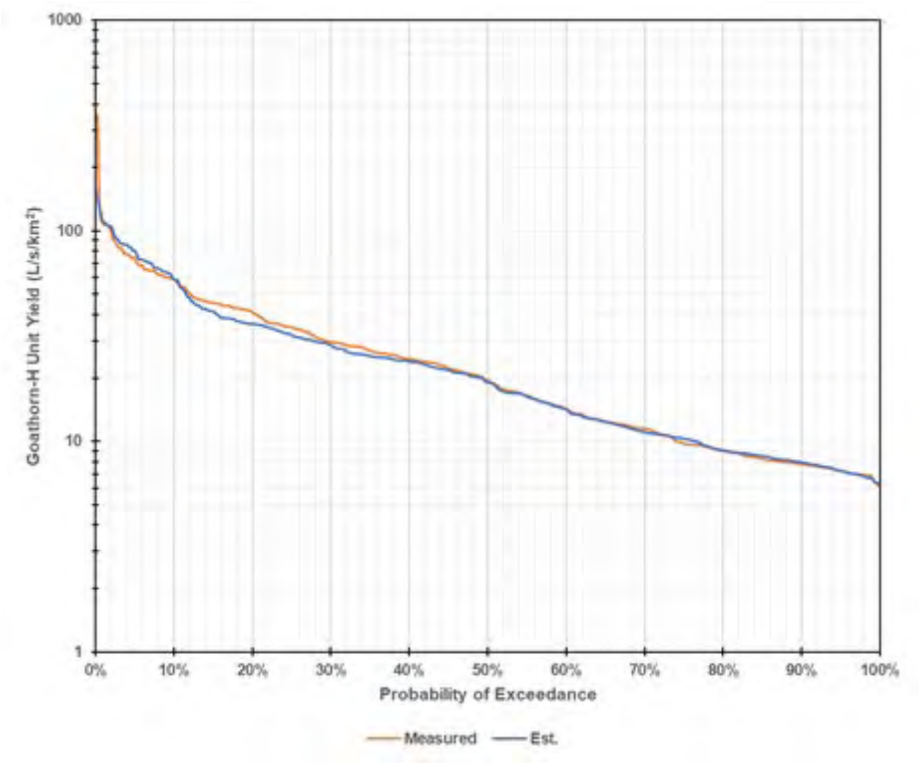
Table 4-18 shows the unit discharge measured at Goathorn Hydro compared to the unit discharge calculated from the regression equations for the same time period each year. The measured unit discharge and the regressed values are very similar with slight overestimation in 2017 and 2018 and some underestimation in 2019.

Exceedance probabilities of the measured and regressed unit discharge are presented in Figure 4-16, which shows that estimate flows are very similar in magnitude for low and high flows.

Table 4-18: Measured and Regressed Unit Discharge Values at Goathorn-Hydro

Year	Month	Goathorn-Hydro Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Regression Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
2017	May	59.9	24	65.7	25
	Jun	41.9		42.6	
	Jul	16.5		16.8	
	Aug	9.3		9.0	
	Sep	12.8		11.9	
	Oct	15.2		13.3	
2018	May	71.5	35	75.3	36
	Jun	30.4		30.8	
	Jul	17.7		17.6	
	Aug	8.9		9.3	
	Sep	8.1		9.0	
2019	Apr	11.0	20	11.5	17
	May	37.8		33.4	
	Jun	27.4		24.4	
	Jul	27.7		24.7	
	Aug	10.6		4.1	
	Sep	10.5		9.0	
	Oct	9.2		8.6	
	Nov	10.0		9.7	

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Goathorn_regression_rev00_20200421_njs.xlsx



Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Goathorn_regression_rev00_20200421_njs.xlsx

Figure 4-16: Probability Exceedance of Goathorn-Hydro Unit Discharge

Tenas-Hydro B

The Tenas-Hydro B station was paired with Goathorn Creek Near Telkwa (08EE008) for developing a regression to develop a synthetic time series. The linear regression was separated into two periods, based on the month, as shown in Figure 4-17.

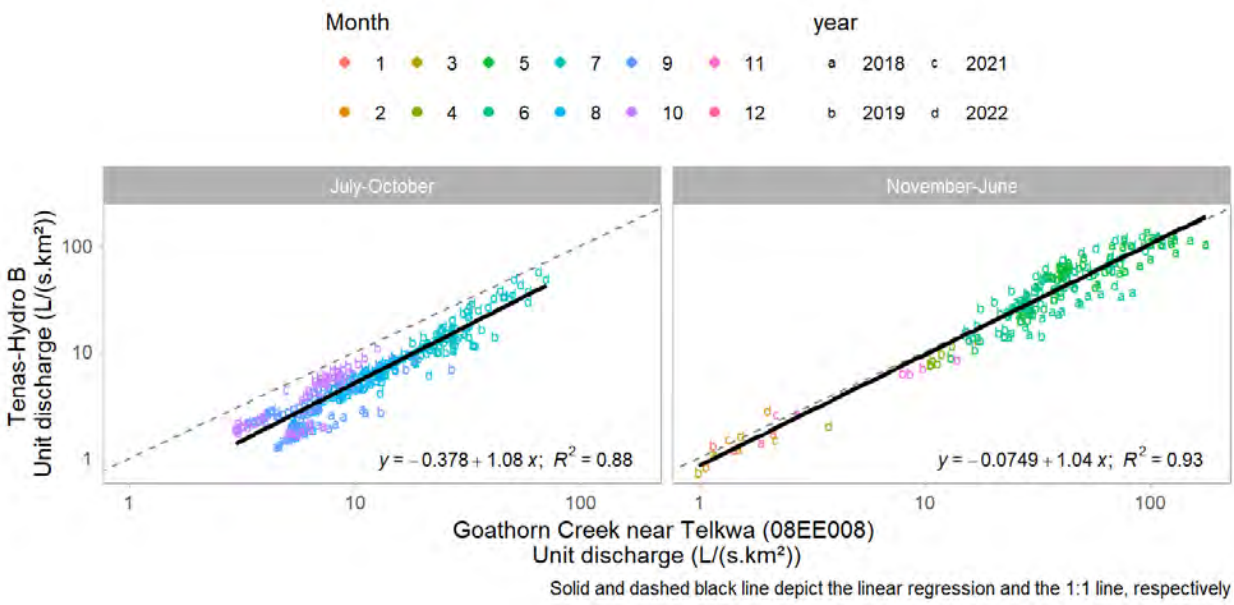
Table 4-19 shows the unit discharge measured at Tenas Hydro compared to the unit discharge calculated from the regression equations for the same time period each year. Both years present very similar annual average flows.

Exceedance probabilities of the measured and regressed unit discharge are presented in Figure 4-19 which shows that estimate flows are very similar in magnitude for low and high flows, with extreme low flows being slightly overestimated in the synthetic dataset.

Table 4-19: Measured and Regressed Unit Discharge Values at Tenas-Hydro B

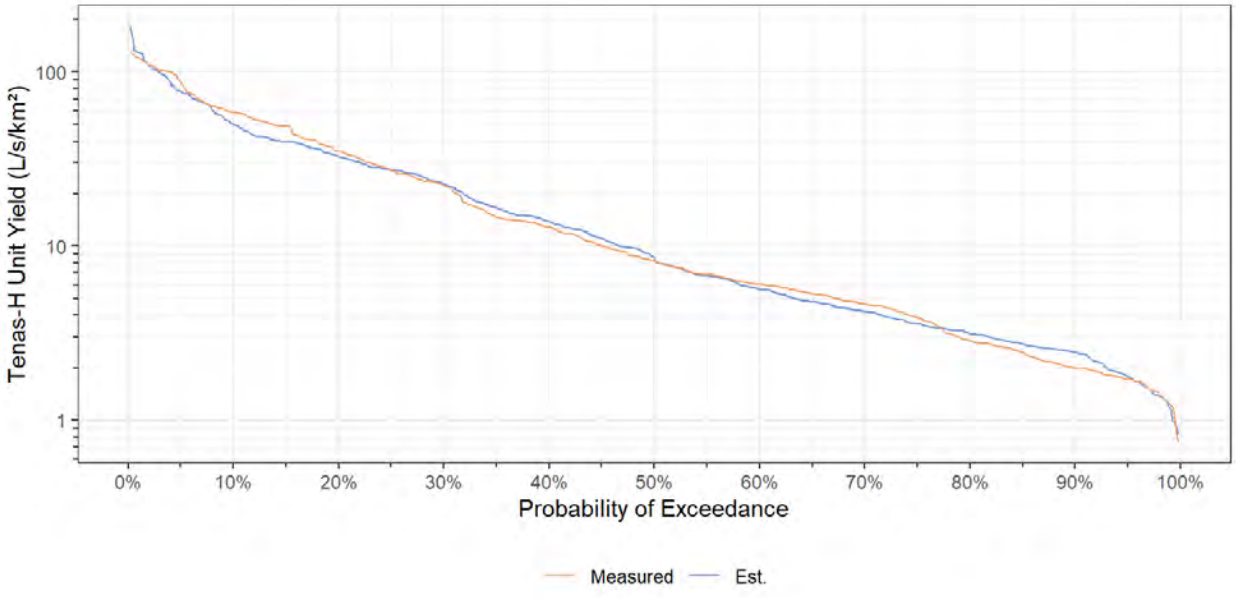
Year	Month	Tenas-Hydro B Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Regression Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
2018	May	88.1	22.3	91.7	24.8
	Jun	25.7		34.2	
	Jul	10.0		10.3	
	Aug	2.9		3.5	
	Sep	1.9		3.0	
	Oct	2.7		3.0	
2019	Apr	9.4	16.5	11.5	14.9
	May	46.5		36.7	
	Jun	26.9		25.6	
	Jul	13.1		14.7	
	Aug	5.5		5.6	
	Sep	5.3		5.4	
	Oct	6.1		4..2	
	Nov	7.1		9.4	
2022	May	41.7	25.4	45.7	22.2
	Jun	71.5		60.0	
	Jul	26.4		21.2	
	Aug	6.4		6.4	
	Sep	3.1		2.7	
	Oct	2.1		1.5	

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html



Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Figure 4-17: Linear regression between WSC Goathorn Creek Near Telkwa (08EE008) station and Tenas-Hydro B for the months of April, May, June, October and November (top) and July to September (bottom)



Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html elkwa-Hydro

Figure 4-18: Probability Exceedance of Tenas-Hydro Unit Discharge

Telkwa-Hydro

The Telkwa-Hydro hydrometric data was regressed against Water Survey of Canada Telkwa River Below Tsai Creek (08EE020) using ranked regressions, which uses paired discharge records independent of chronological order. Monthly ranked regression results are presented in Figure 4-19, and regression equations with goodness of fit indicators are presented in Table 4-20.

Table 4-21 presents the unit discharge measured at Telkwa Hydro compared to the unit discharge calculated from the monthly regressions with Telkwa River Below Tsai Creek for the same time period each year. The regressed values underestimated flow in 2017 but provided similar results for 2018 and 2019.

Exceedance probabilities of the measured and regressed unit discharge are presented in Figure 4-19 which shows that estimated flows are very similar in magnitude for average and high flows, but less accurate for low flows (higher exceedance probability results), where the estimated results are lower than the measured values.

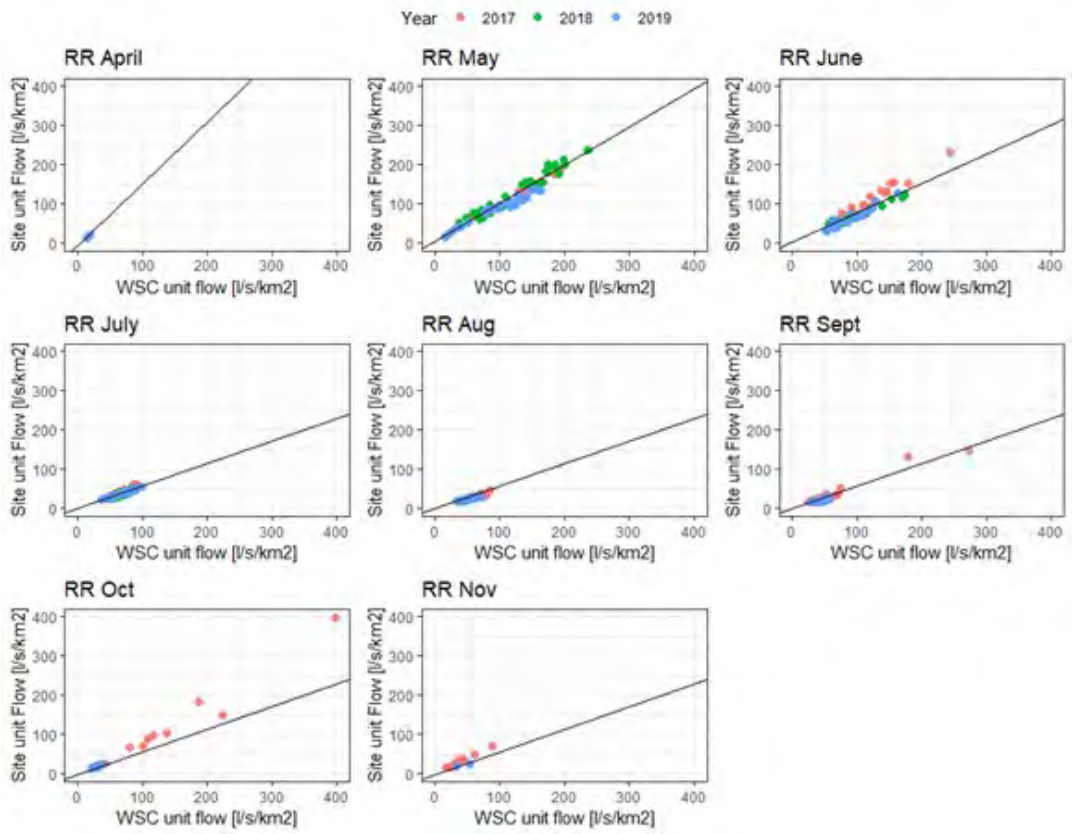


Figure 4-19: Monthly ranked regression between WSC Telkwa River Below Tsai Creek (08EE020) and Telkwa-Hydro stations

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\ Flows_update_rev12_monthlyregr.Rmd

Table 4-20: Monthly Ranked Regression Equations and R-squared Value

Month	April	May	June	July	Aug	Sept	Oct	Nov
Equation	1.58x-7.29	0.97x+4.69	0.75x+2.12	0.57x -0.73	0.43x+2.49	0.55x-1.95	0.96x-8.93	0.79x+0.93
R^2	0.84	0.88	0.81	0.75	0.76	0.83	0.95	0.85

Source: Compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\ Flows_update_rev12_monthlyregr.Rmd

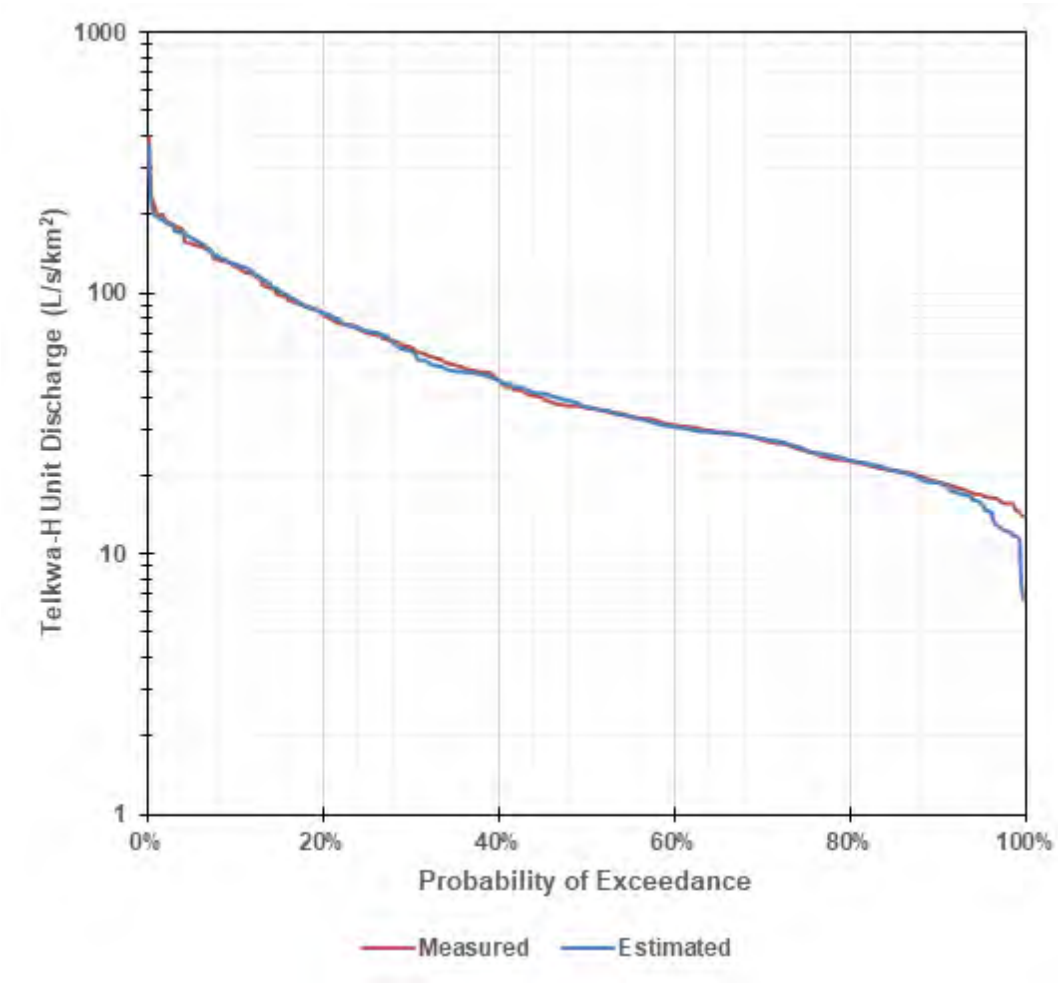


Figure 4-20: Probability Exceedance of Unit Discharge (L/s/km2) at Telkwa-Hydro

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_regressions\Telkwa_regression_rev00_20200423_njs.xlsx

Table 4-21: Measured and Regressed Unit Discharge Values at Telkwa-Hydro

Year	Month	Telkwa-Hydro Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Regression Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
2017	May	125.2	61	88.9	48
	Jun	97.1		86	
	Jul	38.9		35.2	
	Aug	29.3		28.1	
	Sep	34.7		29.5	
	Oct	75.6		50.3	
	Nov	28.3		16.7	
2018	May	140.1	58.5	135.3	55
	Jun	68.4		69.9	
	Jul	35.9		37.2	
	Aug	25		23	
	Sep	23.1		9.3	
2019	Apr	16.6	36	12.3	38
	May	87.8		98.1	
	Jun	58		63.4	
	Jul	37.6		37.2	
	Aug	24		23.6	
	Sep	20		18.2	
	Oct	19.3		11	
	Nov	23.5		35.9	

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

Four-Hydro

The Four-Hydro hydrometric data was regressed against Water Survey of Canada Goathorn Creek Near Telkwa (08EE008) flows using ranked regressions (Figure 4-21), which uses paired discharge records independent of chronological order.

Linear chronological pairing was assessed, but a good relationship with regional stations was not obtained. A ranked regression was then developed without grouping the data by month, as done for Telkwa-Hydro. In fact, the low availability of flow records in some months hindered this more refined type of regression for Four-Hydro station. Despite this, the regression undertaken provides valuable insight that the unit flows measured in Four-Hydro are smaller than the other stations, so assuming other station as analog without a bias correction may impose an overestimation of flows in Four-Hydro.

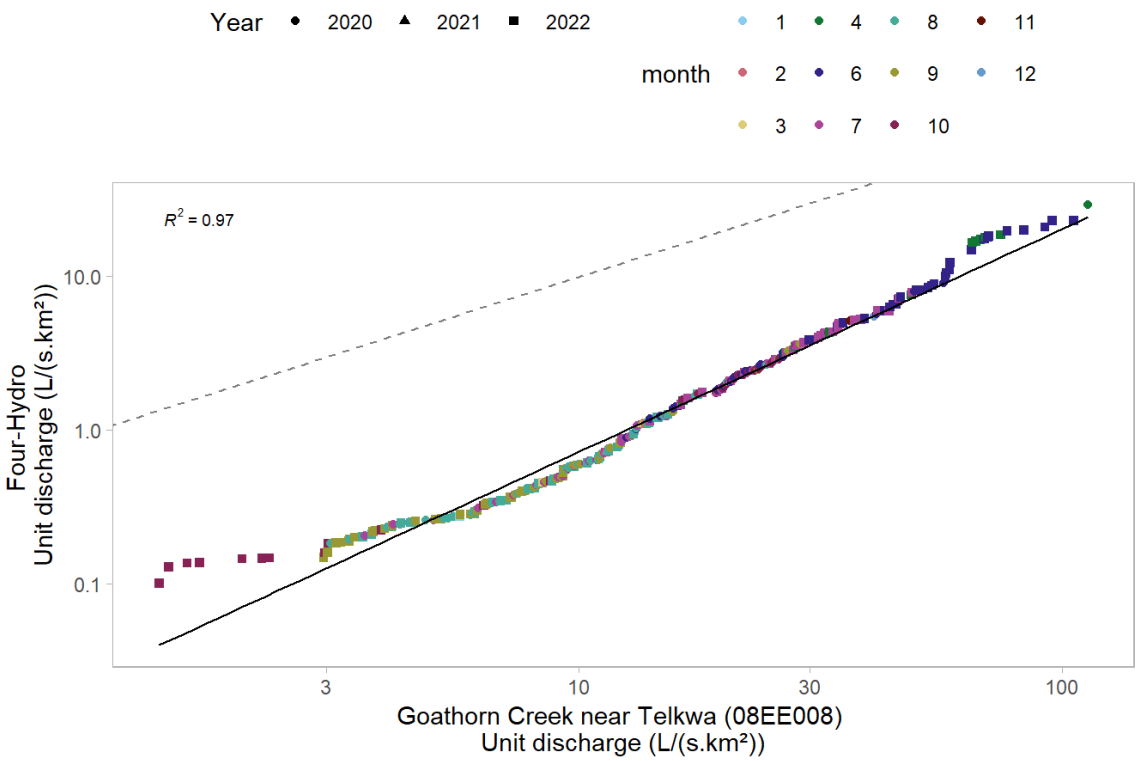


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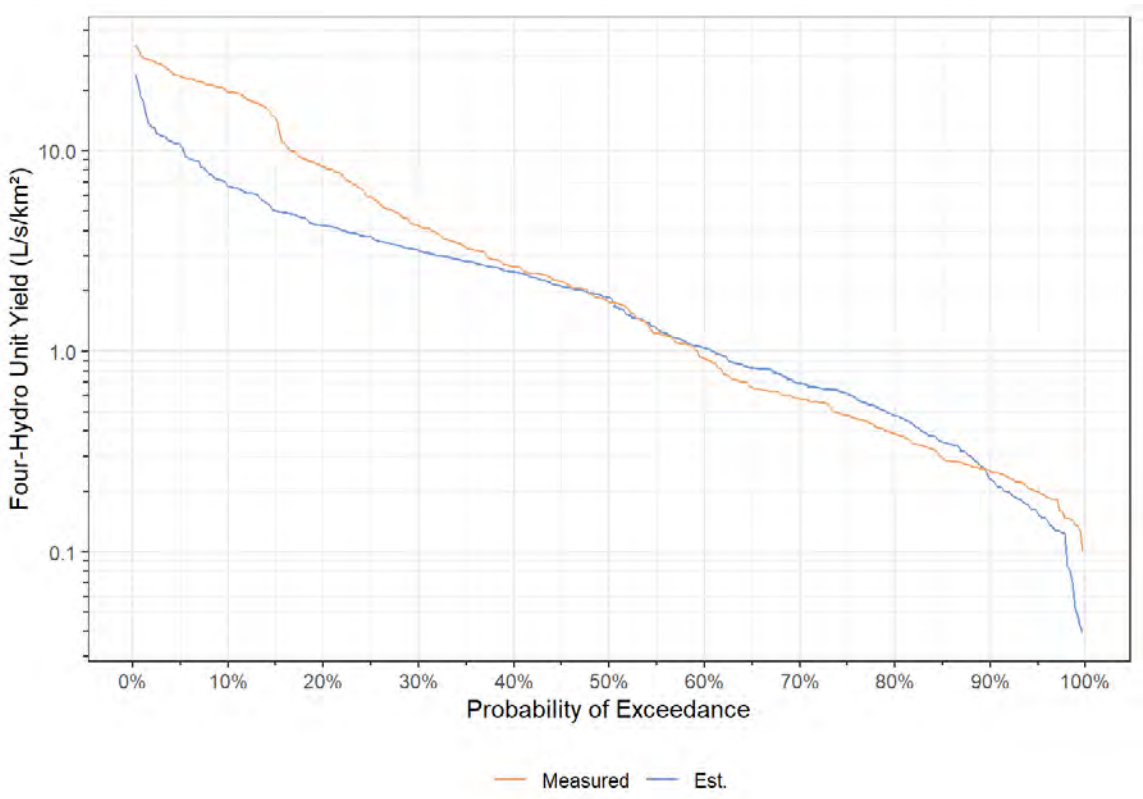
Figure 4-21: Ranked regression between WSC Goathorn Creek Near Telkwa (08EE008) station and Four-Hydro station

Exceedance probabilities of the measured and regressed unit discharge are presented in Figure 4-22, which shows that estimated flows are representing well medium flows, but underpredicting high and low flows.



Source: Compiled from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 4-22: Probability Exceedance of Unit Discharge (L/s/km²) at Four-Hydro

Table 4-22 presents the unit discharge measured at Telkwa Hydro compared to the unit discharge calculated from the regression with Tenas creek for the same time period each year. The regressed values underestimated average and high flows, but remained close to the measured low flows.

Table 4-22: Measured and Regressed Unit Discharge Values at Four-Hydro

Year	Month	Telkwa- Four Unit Discharge (L/s/km²)	Annual Average (L/s/km²)	Regression Unit Discharge (L/s/km²)	Annual Average (L/s/km²)
2020	May	11.1	3.3	4.3	2.1
	Jun	2.7		3.1	
	Jul	0.8		2.2	
	Aug	0.7		1.3	
	Sep	1.0		0.8	
	Oct	2.4		0.8	
2022	Apr	10.7	7.4	0.5	3.6
	May	23.7		4.5	
	Jun	11.1		10.0	

Year	Month	Telkwa- Four Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)	Regression Unit Discharge (L/s/km^2)	Annual Average (L/s/km^2)
	Jul	3.6		5.1	
	Aug	0.6		1.0	
	Sep	0.3		0.3	
	Oct	0.2		0.1	

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

4.2.3 Extended (Synthetic) Time Series for Project Hydrometric Stations

The regressions developed for Goathorn-Hydro, Telkwa-Hydro, Tenas-Hydro and Four-Hydro were used to generate a long-term, extended or synthetic time series based on the Water Survey of Canada regional records. The synthetic unit discharge time series are shown in Figure 4-23 for Goathorn-Hydro, Figure 4-24 for Telkwa-Hydro, Figure 4-25 for Tenas-Hydro B and Figure 4-26 for Four-Hydro.

Table 4-23, Table 4-24, and Table 4-25 present the monthly average streamflow, unit flow, and runoff yield for each hydrometric station based on the extended time series results, and Table 4-35 presents the monthly 7Q10.

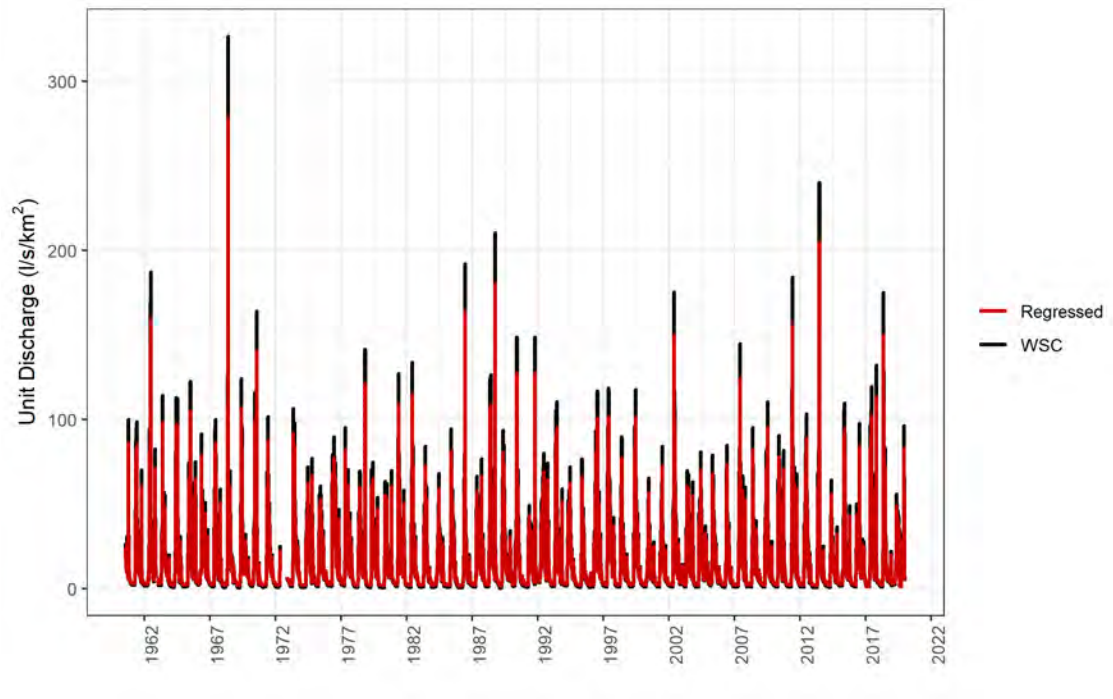


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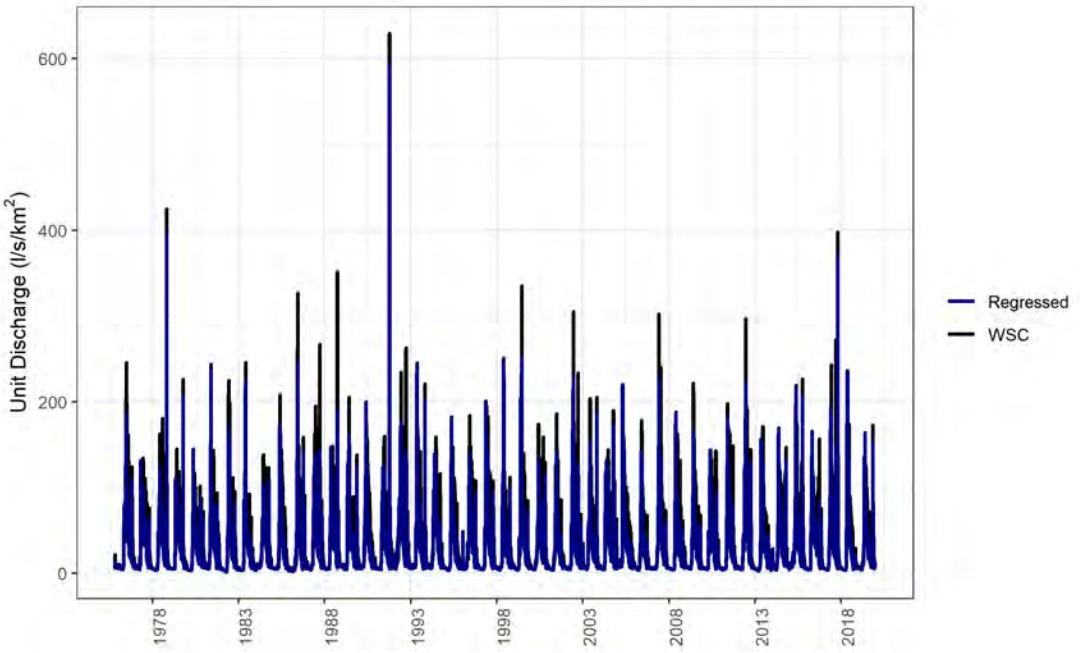
Figure 4-23: Synthetic time series for Goathorn Hydro (red – regressed) and Water Survey of Canada Goathorn Creek Near Telkwa stations



Source: Compiled in R \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\RegionalFlows\Telkwa_flows_1CT027003_Plots_njs.R

Figure 4-24: Synthetic time series for Telkwa-Hydro (blue-regressed) and Water Survey of Canada Telkwa Below Tsai Creek stations

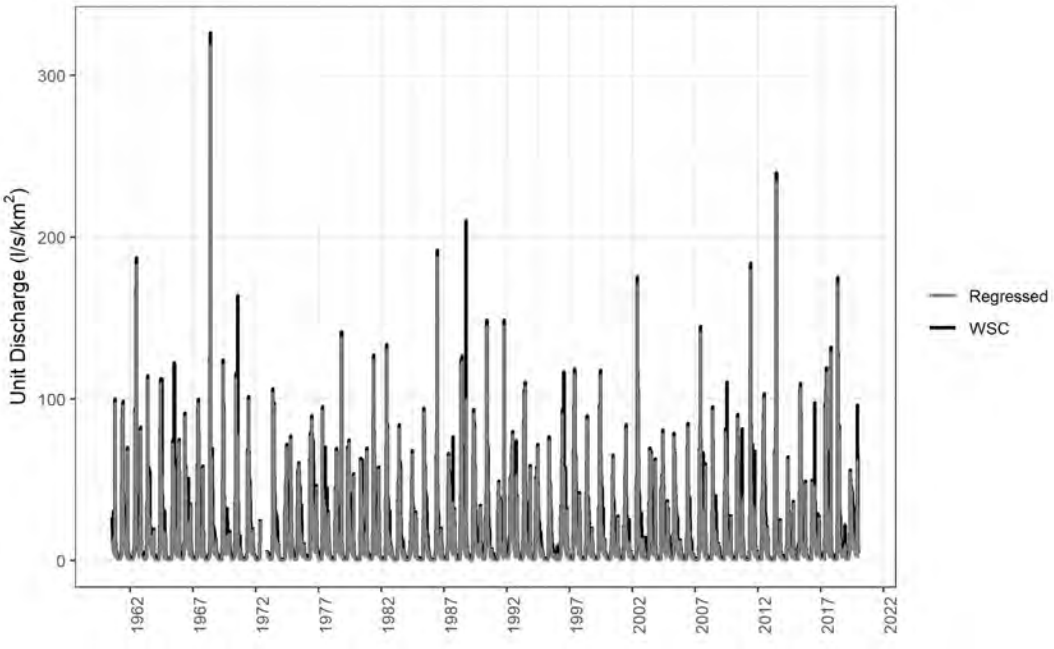


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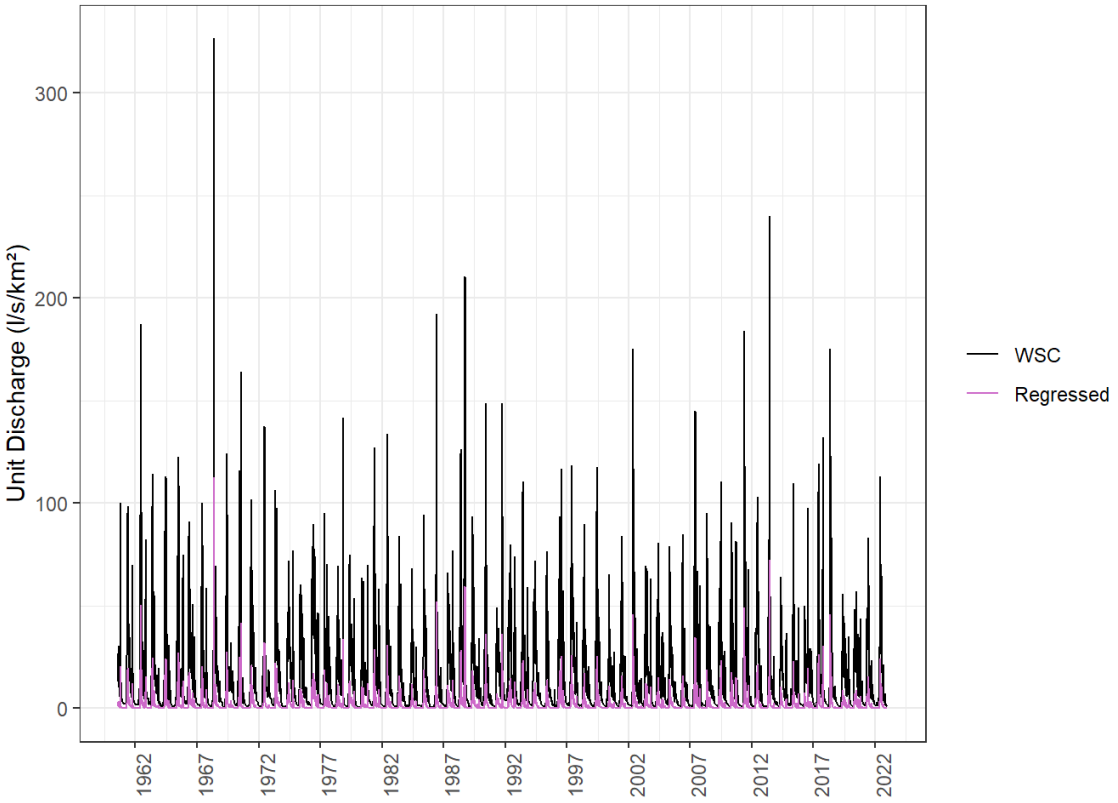
Figure 4-25: Synthetic time series for Tenas-Hydro B (grey-regressed) and Water Survey of Canada Goathorn Creek Near Telkwa stations



Source: Compiled in R \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 4-26: Synthetic time series for Four-Hydro (purple-regressed) and Water Survey of Canada Goathorn Creek Near Telkwa stations

Table 4-23: Average Monthly and Mean Annual Discharge (m^3/s)

Station Name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	0.4	0.3	0.3	1.1	4.5	4.6	2.9	1.6	1.2	1.3	0.9	0.5	1.7
Telkwa-Hydro (Synthetic)	6.4	5.3	5.4	16.2	74.1	81.9	45.7	26.5	20.3	24.5	13.2	7.5	27.3
Tenas-Hydro B (Synthetic)	0.075	0.058	0.065	0.411	1.907	1.960	0.670	0.335	0.245	0.266	0.310	0.119	0.537
Four-Hydro (Synthetic)	0.0007	0.0005	0.0007	0.0100	0.0684	0.0689	0.0339	0.0135	0.0094	0.0110	0.0063	0.0015	0.0188

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_summaries\Telkwa_1CT027.003_FlowSummaries_Collated_njs.xlsx

Table 4-24: Average Monthly and Annual Unit Discharge (L/s/km^2)

Station Name	Area (km^2)	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	123.5	2.87	2.6	2.67	9.12	36.2	37.1	23.2	12.9	10.0	10.7	7.43	4.1	13.2
Telkwa-Hydro (Synthetic)	966.9	6.7	5.5	5.56	16.8	76.6	84.7	47.3	27.4	20.9	25.3	13.6	7.7	28.2
Tenas-Hydro B (Synthetic)	46.75	1.6	1.2	1.4	8.8	40.8	41.9	14.3	7.2	5.2	5.7	6.6	2.5	11.5
Four-Hydro (Synthetic)	11	0.07	0.05	0.06	0.91	6.22	6.26	3.08	1.22	0.85	1.00	0.58	0.13	1.71

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_summaries\Telkwa_1CT027.003_FlowSummaries_Collated_njs.xlsx

Table 4-25: Average Monthly and Annual Runoff Yield (mm)

Station Name	Area (km^2)	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	123.5	7.7	6.3	7.2	23.9	97.0	95.7	63.0	34.3	25.7	28.5	19.3	10.9	413
Telkwa-Hydro (Synthetic)	966.9	17.9	13.4	14.9	43.5	205.2	219.5	126.7	73.4	54.2	67.8	35.3	20.6	892
Tenas-Hydro B (Synthetic)	46.75	4.3	3.0	3.7	22.8	109.2	108.6	38.3	19.2	13.6	15.2	17.2	6.8	361.8
Four-Hydro (Synthetic)	11	0.2	0.1	0.2	2.4	16.7	16.2	8.3	3.3	2.2	2.7	1.5	0.4	54.0

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\Streamflow_summaries\Telkwa_1CT027.003_FlowSummaries_Collated_njs.xlsx

4.2.4 Baseflow separation

The rate at which groundwater discharges into surface streams was characterized using a recursive digital filter to separate baseflow from surface runoff. A single filter parameter, typically ranging from 0.9 to 0.99 based on visual observations was incorporated (Nathan and McMahon 1990) to separate total streamflow into a baseflow component and surface runoff component for each of the local and regional hydrometric stations. In this method, the filter is passed over the data 1 to 3 times, where the more passes processed results in a more consistent seasonal baseflow value. Flow records from 2000 to 2019 were used in the separation model, and an upper range of filter parameters were incorporated to simulate a uniform baseflow regime with reduced peaks. A series of parameter combinations were tested, and select results are presented

in Attachment B, showing baseflow and total flow from 2010 to 2015. A filter parameter of 0.99 was selected with three passes (n=3).

Monthly average baseflows were calculated over the 19-year modelled period for Four-Hydro, Tenas Hydro, Telkwa Hydro, Goathorn Hydro and Bulkley River at Quick (WSC) based on the selected filter parameter inputs. Unit baseflows were calculated by dividing by respective catchment areas and are presented in Table 4-26.

Table 4-26: Unit Baseflows (L/s/km^2) for Each Major Stream within Project Area

Month	Bulkley	Telkwa	Goathorn	Tenas	Four
1	3.24	4.65	2.03	1.50	0.051
2	3.02	4.43	1.96	1.20	0.038
3	2.95	4.38	1.93	1.10	0.031
4	3.06	4.52	1.98	1.90	0.046
5	3.94	5.85	2.60	3.10	1.187
6	6.22	9.41	4.05	4.70	2.469
7	7.94	11.57	4.91	5.00	1.260
8	7.95	10.01	4.49	4.10	0.597
9	6.78	7.49	3.76	3.50	0.433
10	5.78	6.24	3.17	3.30	0.342
11	4.62	5.38	2.51	3.20	0.148
12	3.57	4.97	2.09	2.10	0.068

Source: Compiled in text from Z:\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\300_Hydrology_Update\BaseflowSeparation\UpdatedBaseflows_07212020_sab.xlsx and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\02 - Climate Review.html

4.2.5 Rainfall-Runoff Model Configuration

Surface runoff is defined as the total amount of surface water discharged from a watershed and is frequently presented as the depth of water distributed evenly throughout the watershed area. The Project is located within the Goathorn Creek, Tenas Creek and Four Creek watersheds.

A daily rainfall-runoff model was generated to support streamflow estimations in the water and load balance model and to provide Project-specific runoff rates. The runoff model for the Project Area was developed using a snowmelt model (see Section 4.2.4), a minimum baseflow function, a lag time, recession coefficient and monthly runoff coefficients for each of the main catchments. Monthly runoff coefficients were calibrated automatically within GoldSim by optimizing the Nash Sutcliffe Efficiency, based on the difference between observed and modelled daily flow.

The model required long-term precipitation and temperature inputs for the same period as the synthetic streamflow datasets. The long-term Project temperature and precipitation records were adjusted using PRISM datasets to estimate climate parameters for each of the hydrometric stations. An average monthly precipitation for each hydrometric station watershed was derived from the gridded PRISM monthly precipitation model. These monthly precipitation values were compared against the monthly precipitation estimates for the Project, and a ratio was calculated for each month and each station (Table 4-27).

Table 4-27: Monthly Precipitation Correction Factors applied to Project Precipitation based on PRISM

Month	Tenas Hydro	Four-Hydro	Goathorn Hydro	Telkwa Hydro	Bulkley Hydro
Jan	2.26	1.30	1.92	2.07	1.71
Feb	2.05	1.19	1.74	1.89	1.81
Mar	2.45	1.42	2.07	2.29	2.06
Apr	2.15	1.39	1.93	2.05	1.81
May	1.42	1.04	1.25	1.31	1.12
Jun	1.25	1.15	1.27	1.19	1.08
Jul	1.15	1.13	1.20	1.10	1.02
Aug	1.45	1.03	1.29	1.31	1.14
Sep	1.83	1.09	1.55	1.60	1.30
Oct	1.85	1.09	1.59	1.79	1.70
Nov	2.34	1.37	1.97	2.20	1.93
Dec	2.35	1.36	2.00	2.22	1.90

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Summary_Models_20241105_rev0_jls.xlsx

A similar process was employed for temperature. A monthly average temperature for each hydrometric station watershed was derived from the gridded PRISM monthly temperature model. These monthly temperature values were compared against the monthly temperature estimates for the Project, and a correction addend was calculated for each month and each station (Table 4-28).

Table 4-28: Monthly Average Temperature Correction Addends (in degrees Celsius) applied to Project Average Temperature based on PRISM

Month	Tenas Hydro	Four-Hydro	Goathorn Hydro	Telkwa Hydro	Bulkley Hydro
Jan	-0.45	-0.24	-0.57	-0.45	-0.13
Feb	-0.88	-0.37	-1.07	-1.03	-0.69
Mar	-1.27	-0.43	-1.75	-1.66	-0.90
Apr	-1.64	-0.68	-2.21	-2.14	-1.32
May	-1.74	-0.78	-2.25	-2.30	-1.55
Jun	-1.81	-0.74	-2.26	-2.46	-1.41
Jul	-1.77	-0.80	-2.19	-2.34	-1.25
Aug	-1.48	-0.51	-1.89	-2.01	-1.06
Sep	-1.28	-0.43	-1.68	-1.73	-0.62
Oct	-1.17	-0.55	-1.68	-1.50	-0.76
Nov	-0.93	-0.30	-1.21	-1.16	-0.43
Dec	-0.32	-0.04	-0.40	-0.37	-0.28

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Summary_Models_20241105_rev0_jls.xlsx

Using the daily temperature and precipitation time series adjusted for each streamflow station, the remaining runoff model inputs were calibrated in order to mimic the long-term synthetic streamflow records. Calibrated inputs included monthly runoff coefficients, baseflow, lag time and recession value.

Figure 4-27 illustrates the observed and modelled flows at the Goathorn-Hydro station from August 1990 to December 2021. Results produced an average Nash Sutcliffe Efficiency (NSE) of approximately 0.42 . The modelled flow resembles the synthetic record derived from the Water Survey of Canada station flows, however, peaks in modelled flows occasionally exceed the peaks observed in the synthetic and Water Survey of Canada observed flow record.

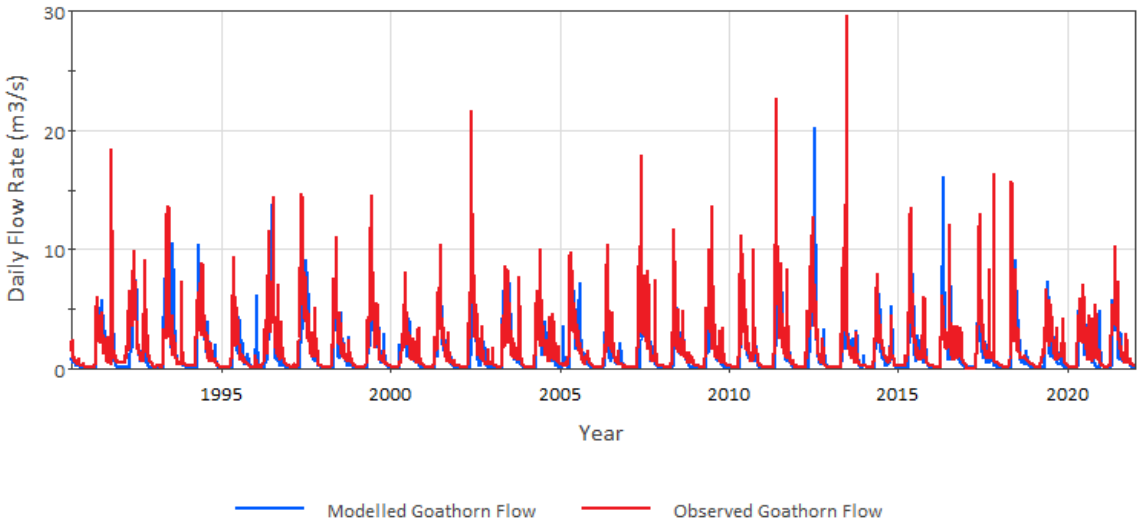


Figure 4-27: Rainfall-Runoff Model Calibration for Goathorn Creek

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Goathorn_v6_20231124

This process was repeated for Tenas Creek. Monthly runoff coefficients were calibrated automatically within GoldSim by optimizing the Nash Sutcliffe Efficiency, based on the difference between observed and modelled daily flow. Figure 4-28 illustrates the measured and modelled flows at the Tenas-Hydro B station from 2017 to November 2022. Results produced an average Nash Sutcliffe Efficiency (NSE) of approximately 0.47. At this location, observed data is superimposed atop modelled flow with records from Tenas-Hydro and Tenas-Hydro B. The modelled flow record shows an underestimation of synthetic and measured flow at the Tenas-Hydro B location along Tenas Creek. Derivation of runoff coefficients was tested over multiple periods to ensure that the rainfall-runoff model flow results were as representative as possible. The rainfall-runoff model currently underestimates flows and should be revisited once more flow data is available from the Tenas-Hydro station.

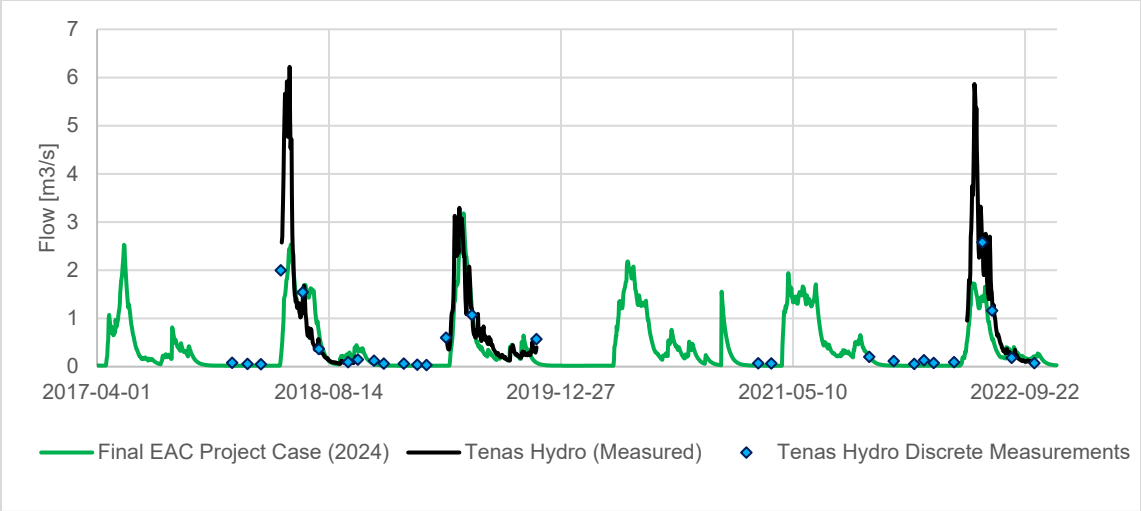


Figure 4-28: Rainfall-Runoff Model Calibration for Tenas-Hydro B

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Updated RainfallRunoff Results_20231124_rev01_njs.xlsx

The Bulkley River rainfall-runoff model for 2000 to 2018 resulted in a NSE value of 0.74 (Figure 4-29). The flows produced by the Bulkley River rainfall-runoff model show good correspondence with the observed flows at the Water Survey of Canada hydrometric station. For most of the observed flow record spanning 2000 to 2018, the modelled flows match or exceed peak flows. In some years, the model underestimates peak flows although the hydrograph shape remains similar despite the difference in magnitudes.

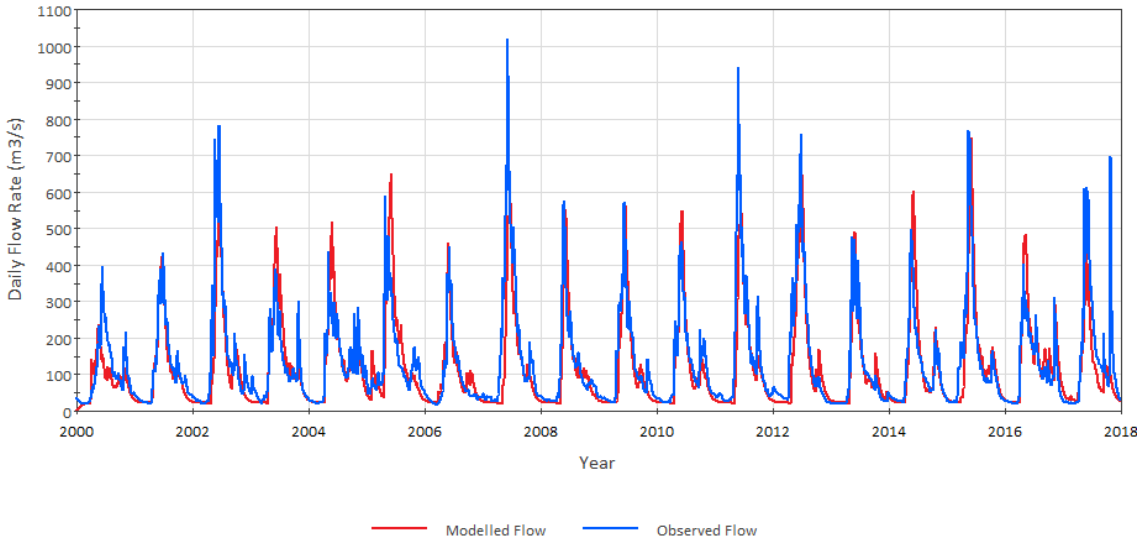


Figure 4-29: Rainfall-Runoff Model Calibration for Bulkley River

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Bulkley_v2_2000-2018_20200421.gsm

The Telkwa-Hydro rainfall-runoff model is shown in Figure 4-30 for 2016 to 2022 with a NSE of 0.55. The modelled flows correspond well with the observed flow record generated for the Telkwa-Hydro station. The observed and modelled flows are typically similar in both magnitude

and shape although the modelled flow can recede more quickly post-freshet than the synthetic record leading to lower flows in early summer.

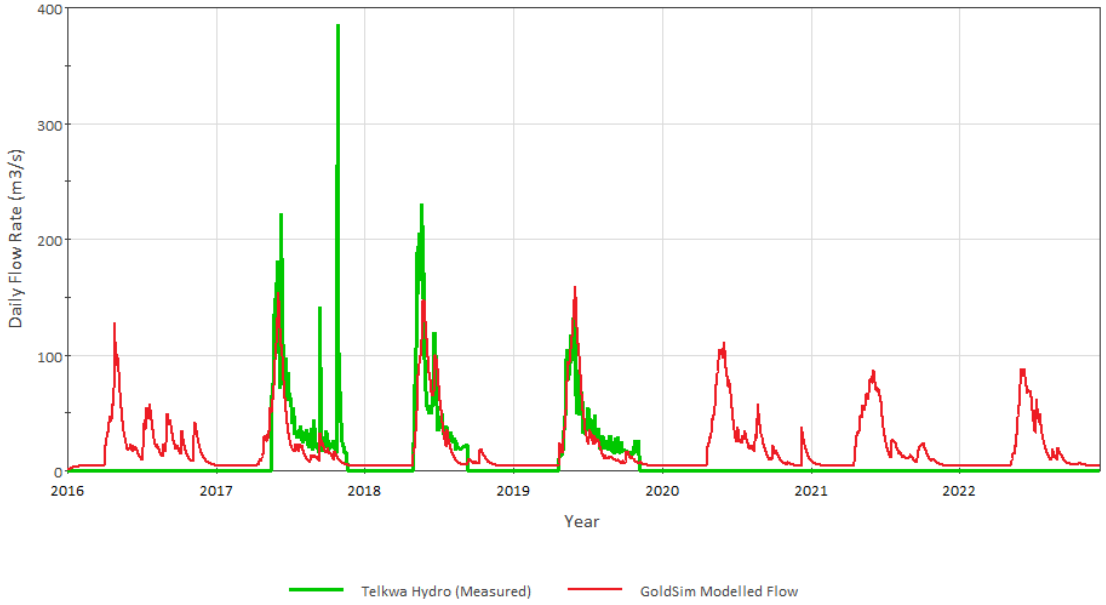


Figure 4-30: Rainfall-Runoff Model Calibration for Telkwa River

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Telkwa-Hydro_v3_20200430_20240211.gsm

Calibration of Four-Hydro was conducted using the available 2020 and 2022 records. The continuous flow record in Four Creek from 1997 and 1998 did not include spring freshet (October and November 1997 and July through October 1998). For this reason, the data was not used in the model calibration. With only few flow records available, the monthly runoff coefficients are specific to the period used for calibration. Figure 4-31 presents the modelled and measured Four-Hydro flows. The calibration resulted in a NSE value of 0.64.

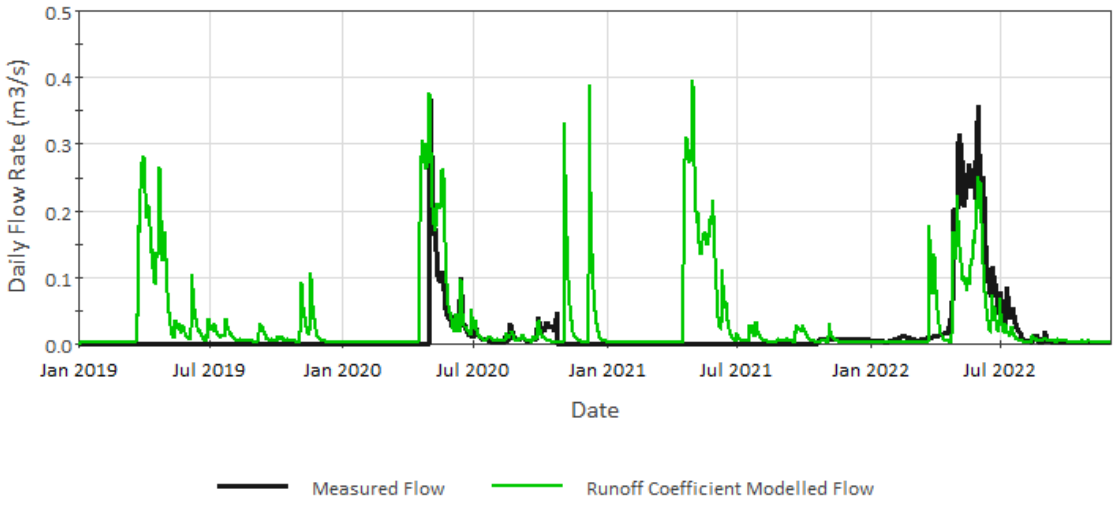


Figure 4-31: Rainfall-Runoff Model Calibration for Four Creek

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Telkwa_FlowCalibrationModel_Four_v3_20231212.gsm

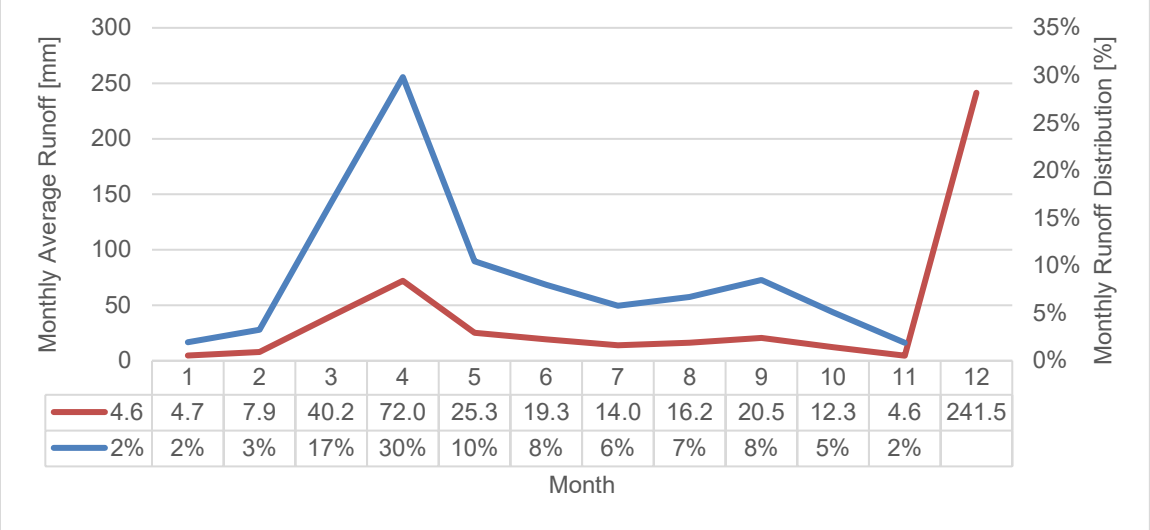
Table 4-29 presents the calibrated parameters for each catchment with the average of Tenas and Goathorn results for runoff coefficients, recession value and baseflow parameters applied to the Project Area. Four Creek parameters were developed based on the 2020 and 2022 monitoring dataset only and should be reviewed when additional data become available.

Table 4-29: Rainfall-Runoff Model Inputs

Location		Goathorn	Telkwa	Tenas	Bulkley	Four	Project
Minimum Unit Baseflow [L/s/km^2]		1.4	4.1	0.43	3.0	0.27	0.92
Lag Time [days]		1	1	1	1	1	1
Recession		0.90	0.92	0.91	0.96	0.77	0.91
Runoff Coefficient	January	1	1	1	1	1	1
	February	1	1	1	1	1	1
	March	0.45	1	1	1	0.73	1
	April	0.91	1	1	0.67	0.96	0.43
	May	0.26	0.78	0.31	0.54	0.29	0.30
	June	0.21	0.28	0.11	0.34	0.16	0.18
	July	0.76	0.92	0.12	0.53	0.44	0.28
	August	0.28	0.54	0.20	0.26	0.24	0.18
	September	0.14	0.28	0.10	0.35	0.12	0.24
	October	0.37	0.49	0.15	0.39	0.26	0.28
	November	0.14	0.98	0.88	0.9	0.51	0.72
	December	1	1	1	1	1	1

Source: \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\500_Water_Balance\Model\RunoffCalibration\Project_RunoffModel.gsm

The synthetic long-term Project precipitation and temperature records were incorporated to the snowmelt and runoff model to generate Project-specific runoff rates using the calibrated values from Tenas and Goathorn Creek. Figure 4-32 presents the monthly average runoff distribution based on the 41-year synthetic record (1981-2021), which produced a mean annual runoff (MAR) of 242 mm. Based on the mean annual precipitation calculated for the Project, the annual runoff coefficient is equal to 0.36.



	1	2	3	4	5	6	7	8	9	10	11	12
4.6	4.7	7.9	40.2	72.0	25.3	19.3	14.0	16.2	20.5	12.3	4.6	241.5
2%	2%	3%	17%	30%	10%	8%	6%	7%	8%	5%	2%	

Figure 4-32: Project Area Monthly Average Runoff Depth [mm] and Distribution

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\Runoff Models\Rev2_Nov 2023\Summary_Models_20241105_rev0_jls.xlsx

A frequency analysis was performed using the time series of annual runoff rates generated from the model, producing annual runoff rates associated with a range of exceedance probabilities. Multiple distributions were tested against the historical data, including the Normal, Log Normal, Gumbel, Gamma, Pearson III, Log Pearson III, and GEV distributions, and the Gamma distribution was selected as the best statistical fit to observed data. Results of annual runoff for a range of return periods are presented in Table 4-29.

Table 4-30: Return Periods Calculated for Mean Annual Runoff

Hydrological Condition	Return Period [years]	Annual Runoff [mm]
Wet	1000	361
	500	351
	200	338
	100	328
	50	316
	25	304
	20	300
	10	286
	5	270
Mean Annual Runoff (MAR)		240
Dry	5	212
	10	199
	20	188
	25	185
	50	177
	100	169
	200	163
	500	155
	1000	150

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

4.2.6 Baseflow Review

The calibrated rainfall-runoff model incorporates a constant baseflow value for each stream. Results of the calibration were compared against the monthly baseflow estimates calculated from the baseflow separation technique described in Section 4.2.4 and are presented in Figure 4-33.

Points on the plot represent the constant and calibrated unit baseflow estimates for each stream, while lines show the monthly results from the baseflow separation model.

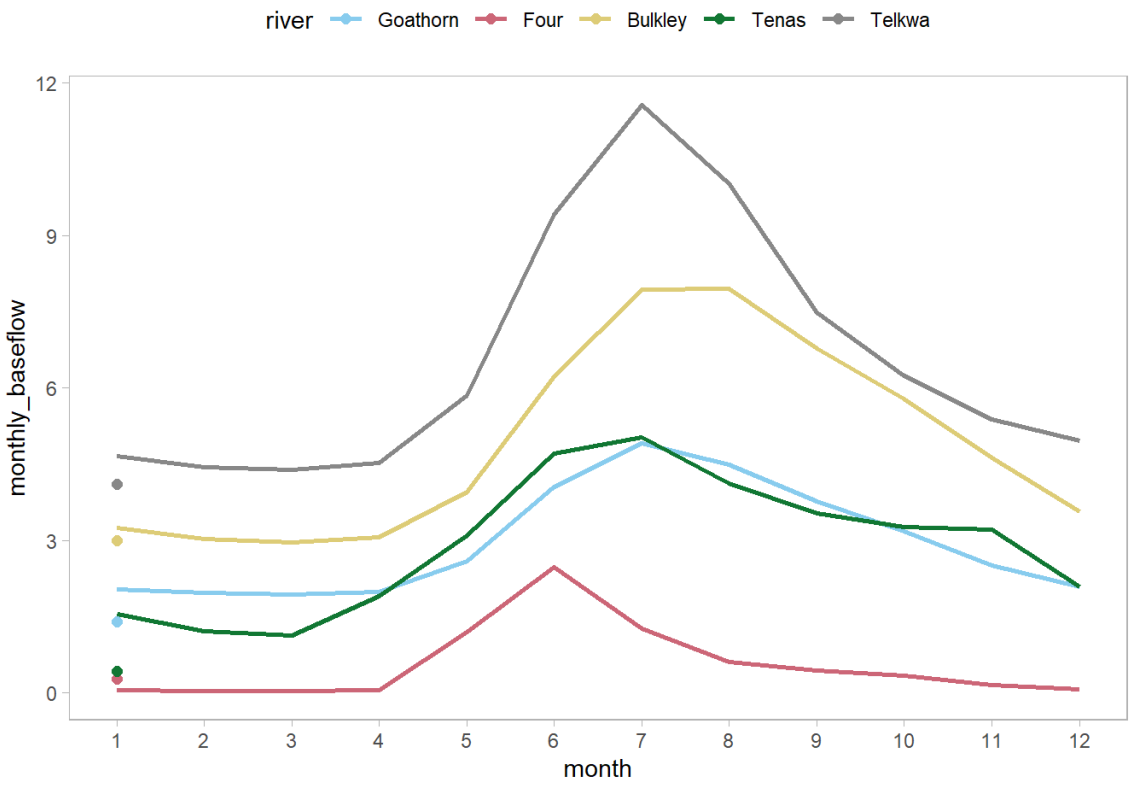


Figure 4-33: Comparison of Calibrated Unit Baseflows and Monthly Baseflow Separation Results

Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

The constant calibrated baseflow estimates are representative of the winter and low flow monthly baseflow results from the baseflow separation. Based on the rainfall-runoff model used, the only time of year where the constant baseflow input is used is during winter months without rainfall or snowmelt. This is reasonable since the monthly runoff coefficients are calibrated to match flows in the open water season, and therefore account for baseflow contributions in their development.

The calibrated constant baseflow selected for Four-Hydro was compared against the available low-flow manual measurements collected since 2020 and presented in AGRA 1999, in the development of station rating cures. Measurement statistics are presented in Table 4-31 and show that the selected model baseflow for Four Creek, selected as 0.0030 m3/s, is approximately the mean of minimum baseflow measurements collected from Four Creek in 2020-2022.

Table 4-31: Four Creek Baseflow and Available Measurements Comparison

Type	Date	Statistic	Unit Flow [L/s/km^2]
Manual Measurement	All year	Minimum	0.18
Manual Measurement	All year	25th percentile	0.59
Manual Measurement	All year	50th percentile	1.08
Manual Measurement	All year	Average	1.71
Manual Measurement	Winter	Minimum	0.27
Manual Measurement	Winter	25th percentile	0.73
Manual Measurement	Winter	50th percentile	1.18
Manual Measurement	Winter	Average	1.94
SRK Rainfall-Runoff Model	n.a	n.a	**0.27**

Source: Compile in text from \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\2024_FourCreek-GW\data\Telkwa_NACAPR002055_FourCreek_flow_rev02_njs.xlsx

The calibrated constant unit baseflows were used in groundwater modeling calibration to develop base case estimates of baseflow.

4.2.7 Peak Flows

A peak flow analysis was performed for Tenas Creek, Goathorn Creek, Telkwa River and Four Creek based on the synthetic records detailed in section 4.2.3. The Bulkley River peak flow analysis was based on the extended records from WSC Bulkley River at Quick 08EE004 hydrometric station. Table 4-32 presents the unit peak-flows for each identified stream.

Table 4-32: Unit Peak Flows from Extended Records [L/s/km^2]

Return Period [years]	Goathorn-Hydro (Synthetic)	Telkwa-Hydro (Synthetic)	Tenas-Hydro B (Synthetic)	Four-Hydro (Synthetic)	WSC Bulkley River at Quick 08EE004
1000	388	620	506	173	165
500	356	516	441	147	160
200	313	404	363	117	153
100	280	336	311	97	147
50	248	278	264	79	140
25	215	230	221	63	133
20	205	216	208	59	130
10	172	178	171	46	122
5	140	144	137	34	111
2	98	105	96	21	91

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

4.2.8 Low Flows

A low flow analysis was performed for Tenas Creek, Goathorn Creek, Telkwa River and Four Creek based on the synthetic records detailed in section 4.2.8. The Bulkley River low flow analysis was based on the extended records from WSC Bulkley River at Quick 08EE004 station. Table 4-33 presents the day low-flows for each identified stream.

Table 4-33: 7-Day Low Flows from Extended Records [L/s]

Return Period [years]	Goathorn-Hydro (Synthetic)	Tenas-Hydro B (Synthetic)	Telkwa-Hydro (Synthetic)	Four-Hydro (Synthetic)	WSC Bulkley River at Quick 08EE004
2	269	10.0	4,220	0.302	22,743
5	234	5.1	3,655	0.192	17,373
10	218	3.7	3,381	0.145	15,090
20	206	3.0	3,166	0.110	13,413
25	202	2.8	3,105	0.101	12,955
50	193	2.5	2,934	0.075	11,711
100	186	2.3	2,785	0.054	10,671
200	179	2.1	2,653	0.036	9,778
500	172	2.1	2,499	0.015	8,761
1000	167	2.0	2,393	0.001	8,087

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Seven-day low flows for a 10 year return period (7Q10) were also computed for Tenas Creek, Goathorn Creek,Telkwa River and Four Creek during each month of the synthetic records. Table 4-34 and Table 4-35 present the 7Q10 results for these series as low flows and unit low flows respectively.

Table 4-34: 7-day Low Flows for 10-year Return Period for Synthetic Records

Station Name	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic) (m^3/s)	0.24	0.24	0.23	0.26	0.99	1.9	1.2	0.70	0.51	0.49	0.32	0.27	0.22
Telkwa-Hydro (Synthetic) (m^3/s)	4.2	3.7	3.4	3.7	15	40	25	15	6.7	6.8	5.6	3.4	3.4
Tenas-Hydro B (Synthetic) (m^3/s)	0.032	0.028	0.025	0.037	0.354	0.665	0.232	0.125	0.082	0.070	0.058	0.038	0.025
Four-Hydro (Synthetic) (L/s)	0.21	0.18	0.17	0.25	6.04	16.40	6.70	3.18	1.96	1.40	0.50	0.27	0.14

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Table 4-35: 7-day Unit Low Flows for 10-year Return Period Flows for Synthetic Records (L/s/km^2)

Station Name	Area (km^2)	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann.
Goathorn-Hydro (Synthetic)	123.5	1.94	1.94	1.86	2.11	8.02	15.4	9.72	5.67	4.13	4.00	2.59	2.19	1.78
Telkwa-Hydro (Synthetic)	966.9	4.34	3.83	3.52	3.83	15.5	41.4	25.9	15.5	6.93	7.03	5.79	3.52	3.52
Tenas-Hydro B (Synthetic)	46.75	0.69	0.60	0.52	0.80	7.56	14.21	4.96	2.67	1.76	1.51	1.25	0.81	0.52
Four-Hydro (Synthetic)	11	0.82	0.72	0.64	0.95	1.59	0.87	0.1	0.08	0.19	0.24	1.43	0.96	0.04

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Flows_update_rev11.Rmd and \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

5 Climate Change

Climate change is considered one of human civilization's many challenges as it has the potential to impact current social and ecological systems. Estimating potential variation in future climate conditions to identify vulnerability, assess risk and develop adaptive management strategies is in the best interest of mine developers and operators.

The section below discusses climate change trends and effects that may impact the Project. This analysis was completed for temperature and precipitation, and incorporated into the evaporation and streamflow models discussed in Section 4.

5.1 Contextual Framework

While observed historical datasets have traditionally been used to investigate climate patterns and trends, global circulation models (GCMs, aka climate change models) are better suited to generate synthetic datasets with which to investigate the potential range of impacts of climate change into the future on a global or continental scale. GCM results can be scaled to local weather station datasets or gridded climate datasets to provide localized, site-specific projections.

The Coupled Model Intercomparison Project (CMIP) is organized under the support of the World Climate Research Program's (WCRP) working group on coupled modelling. It coordinates experiments on coupling computer-based models of the Earth's climate such as GCMs. The objective of CMIP is to better understand past, present, and future climate change arising from natural unforced variability or in response to changes in radiative forcing in a multi-model context (Eyring 2016). The CMIP is currently in its sixth phase (CMIP6) and its outcomes contribute to the most recent assessments and reports from the International Panel on Climate Change (IPCC).

CMIP6 includes the most up to date and peer-reviewed models for the simulation and projection of various aspects of climate change. The CMIP6 models include new and better representations of physical, chemical, and biological processes at higher resolution than its previous phases. This has improved the simulation of the recent mean state of most large-scale indicators of climate change and many other aspects across the climate system.

This climate change assessment was based on results from GCMs included in CMIP6 and the corresponding IPCC Sixth Assessment Report (AR6) (Masson-Delmotte, 2021). The data compilation and subsequent analysis was conducted in the R Software (R Core Team, 2023) environment.

5.2 Climate Change Methodology

Climate change scenarios were evaluated considering Shared Socioeconomic Pathways (SSP). SSPs are a set of scenarios that describe potential future developments in the absence of climate policy intervention. These pathways are used to explore the possible impacts of different socioeconomic trends on climate change and to assess the challenges associated with mitigation and adaptation strategies. Figure 5-1 shows possible combinations of SSPs with different radiative forcing levels. Four scenarios (Tier 1) are generally recommended for climate change assessments - SSP 1-2.6, SSP 2-4.5, SSP 3-7.0 and SSP 5-8.5 (O'Neill, et al., 2016)-, which span the range of radiative forcing levels and SSPs.

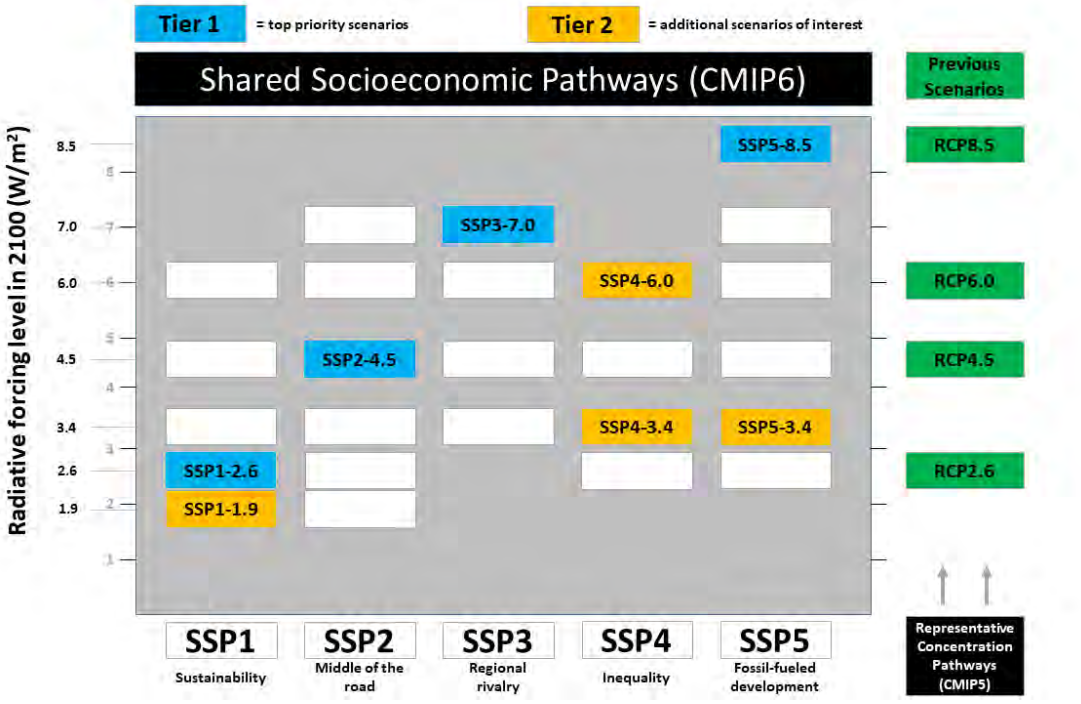


Figure 5-1: Shared Socio-economic Pathways and year 2100 radiative forcing combinations

Source: https://climate-scenarios.canada.ca/?page=cmip6-overview-notes

A short description of these scenarios is provided below.

- SSP5-8.5: With an additional radiative forcing of 8.5 W/m² by the year 2100, this scenario represents the upper boundary of the range of scenarios described in the literature. It can be understood as an update of the CMIP5 scenario RCP8.5, now combined with socioeconomic reasons.
- SSP3-7.0: With 7 W/m² by the year 2100, this scenario is in the upper-middle part of the full range of scenarios. It was newly introduced after the RCP scenarios, closing the gap between RCP6.0 and RCP8.5.
- SSP2-4.5: As an update to scenario RCP4.5, SSP245 with an additional radiative forcing of 4.5 W/m² by the year 2100 represents the medium pathway of future greenhouse gas emissions. This scenario assumes that climate protection measures are being taken.
- SSP1-2.6: This scenario with 2.6 W/m² by the year 2100 is a remake of the optimistic scenario RCP2.6 and was designed with the aim of simulating a development that is compatible with the 2°C target. This scenario, too, assumes climate protection measures being taken.

National Aeronautics and Space Administration (NASA) provides access to gridded global climate data NEX-GDDP-CMIP6 (Thrasher, et al., 2022), which comprises 26 CMIP6 models for the period of 1950 – 2100, with historical results from 1950 to 2014 and forecast results from 2015 to 2100. Data for the Tenas Project location were obtained and processed by SRK to evaluate predicted trends up to year 2100, deemed the maximum reasonable prediction range (IPCC, 2023).

Once the Global Circulation Models (GCM) are developed in a coarse spatial resolution, a bias correction procedure is required to adjust their estimates to represent local climate conditions of a specific site considering its microclimate. In this work, GCM historical and forecasted data are bias corrected with Quantile Delta Mapping (QDM) (Cannon, Sobie, & Murdock, 2015) referencing the derived historical timeseries introduced in Section 4 as the observed variables. QDM is applied to the meteorological variables grouped by month – i.e., the bias correction preserves month-specific variability.

Each model under each different SSP represents one possible future climate scenario. Summarizing the models' results by the median or average may facilitate the interpretation and provide insights into agreement among models, but it may hinder extreme conditions that are usually of interest to stakeholders for risk assessment. Thus, SRK chose to show the results for four conditions that will encompass extreme cases of high and low water availability, as well as an average case that will represent the midpoint trend of the GCMs.

Projected climate change effects were evaluated relative to a defined baseline period for three consecutive 30-year forecast periods, defined as follows:

- Baseline period from 1985 to 2014 (CMIP6)
- First forecast period from 2015 to 2040 (CMIP6)
- Second forecast period from 2041 to 2070 (CMIP6)

- Third forecast period from 2071 to 2100 (CMIP6)

One model within the GCM/SSP ensamble was selected to represent each of the following four conditions for each forecast period:

- Minimum long term net water balance (precipitation - evaporation) – $min_{(P-E)}$
- Maximum long term net water balance – $max_{(P-E)}$
- Midpoint condition (median precipitation with median evaporation) – $med_P med_E$
- Lowest long term Precipitation – min_P

These conditions were selected based on the critical components of the Project, and aim to cover climate change related uncertainty during the life of the Project.

The following sections present the climate change analysis for mean annual and monthly air temperature as well as mean annual and monthly precipitation. Changes to lake evaporation and streamflow were also assessed based on the climate change forecasts.

5.3 Model Selection

For each time period, the models were assessed by comparing rates of change for precipitation and evaporation in order to identify extreme and average conditions. Figure 5.2 showcases these rates of change envelope for modelled climate outcomes from the GCM's for all scenarios. Models selected by SRK to illustrate the range of climate change outcomes are highlighted (thick circle lines). The selected models are also presented in Table 5-1.

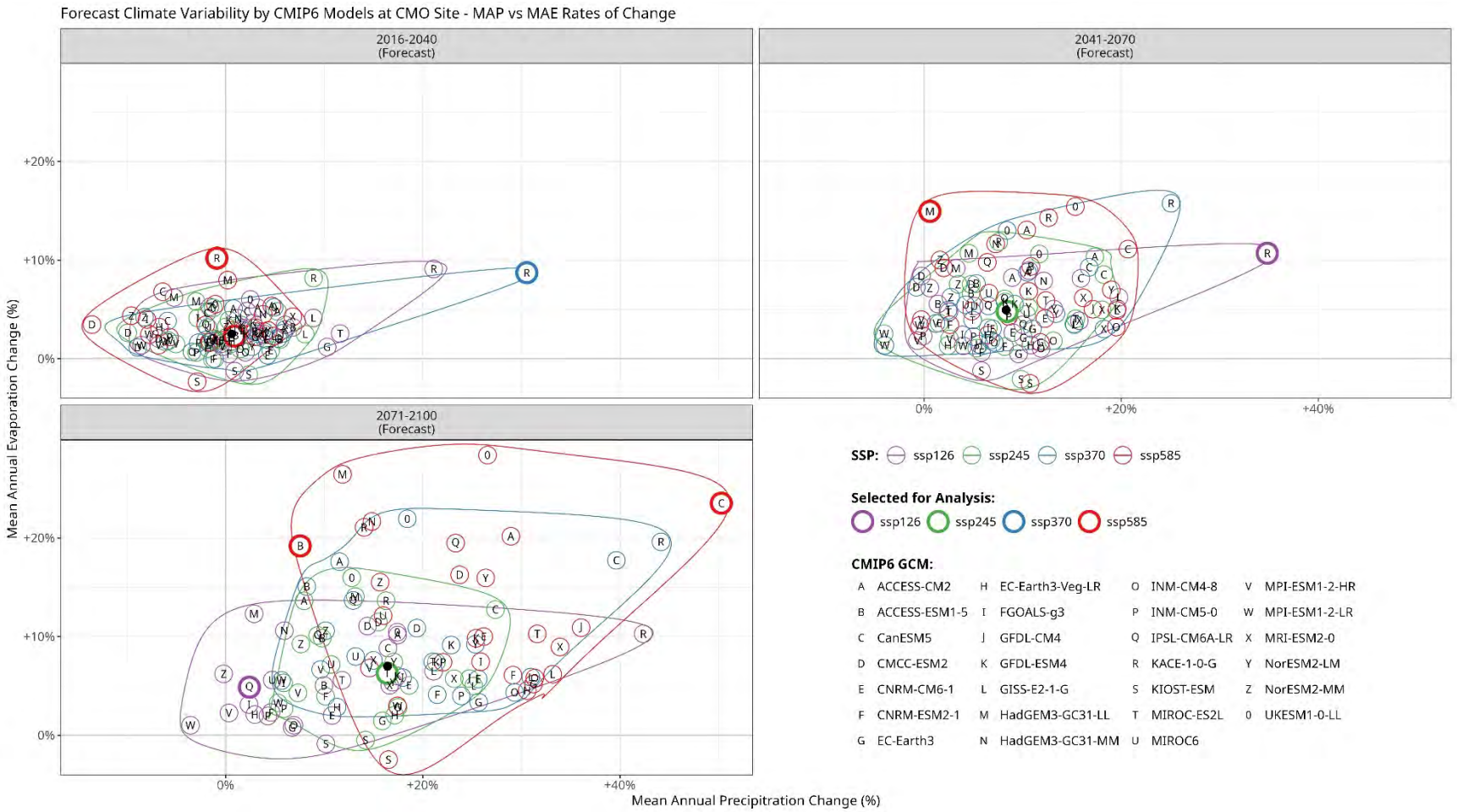


Figure 5.2: Model selection per forecast period

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\figures\cc_model_prcp_evap.tif

Table 5-1: Adopted models for each forecast period

Forecast Period	Condition	Model (SSP)
2015 – 2040	$med_P med_E$	MIROC-ES2L (SSP5-8.5)
	$max_{(P-E)}$	KACE-1-0-G (SSP3-7.0)
	$min_{(P-E)}$	KACE-1-0-G (SSP5-8.5)
	min_P	CMCC-CM2-SR5 (SSP2-4.5)
2051 – 2070	$med_P med_E$	GISS-E2-1-G(SSP2-4.5)
	$max_{(P-E)}$	KACE-1-0-G(SSP1-2.6)
	$min_{(P-E)}$	HadGEM3-GC31-LL(SSP5-8.5)
	min_P	IITM-ESM(SSP3-7.0)
2071 – 2100	$med_P med_E$	MIROC-ES2L(SSP2-4.5)
	$max_{(P-E)}$	CanESM5(SSP5-8.5)
	$min_{(P-E)}$	ACCESS-ESM1-5(SSP5-8.5)
	min_P	IPSL-CM6A-LR(SSP1-2.6)

5.4 Climate Change Effects to Temperature

5.4.1 Annual Temperature Trends

Figure 5-3 presents the mean annual air temperature (MAAT) from the Project record during the baseline period, as well as the historical CMIP6 ensemble results over the same period and the forecasted MAAT for the four different SSPs.

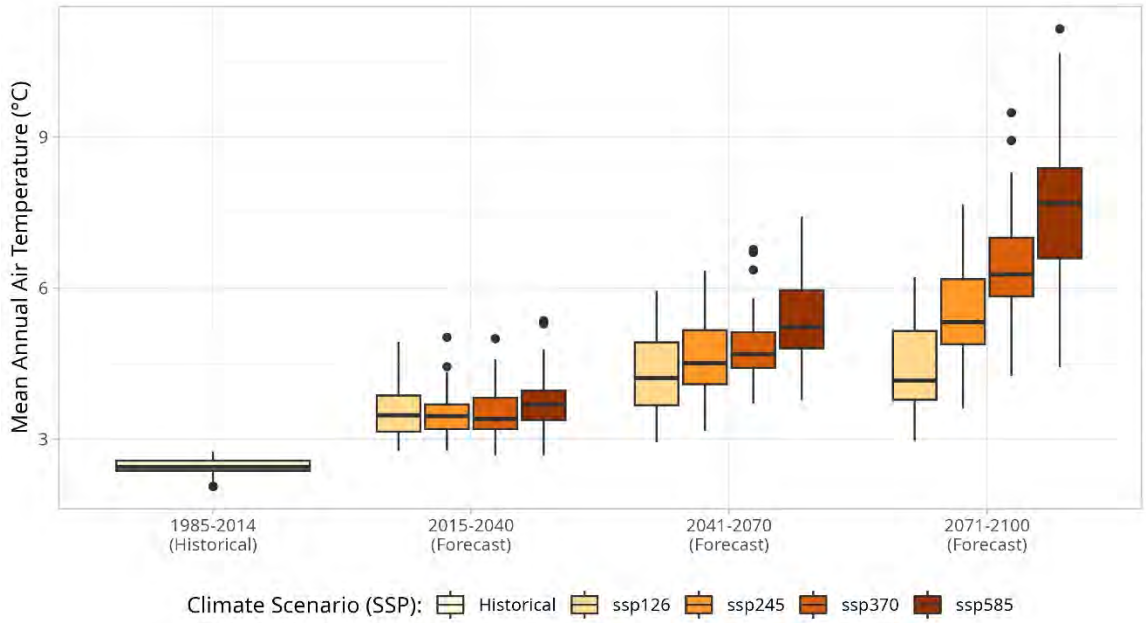


Figure 5-3: Forecast of Climate Change Effect on Mean Annual Air Temperature

Source: SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\figures\cc_periods_tavg.tiff

Table 5-2 presents the rates of change relative to the historical results for the four conditions up to year 2100 using CIMP6 data.

Table 5-2: MAAT Increase from Baseline (in °C)

Timeframe	$med_P med_E$	$max_{(P-E)}$	$min_{(P-E)}$	min_P
2015-2040	1.0	2.5	2.8	0.4
2041-2070	2.2	3.1	4.1	1.3
2071-2100	2.3	8.2	5.7	1.7

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

Based on the selected scenarios, the mean annual temperature for the Project is expected to increase by 2°C to 8°C by year 2100.

5.4.2 Monthly Temperature Rates of Change

Monthly impacts to temperature as a result of climate change were evaluated using the same methodology as described above. The projections are shown below in Table 5-3 for the four conditions and three time periods.

Table 5-3: Monthly Average Temperature Increase from Baseline (in °C)

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
$med_P med_E$													
2015-2040	0.9	1.0	1.0	1.2	1.0	1.5	1.0	0.9	1.0	0.9	1.3	0.1	1
2041-2070	4.0	-0.4	2.4	1.6	1.2	1.6	2.5	3.6	2.4	2.0	2.7	2.3	2.2
2071-2100	2.6	1.9	1.5	2.1	2.0	2.2	2.4	2.4	2.5	1.6	3.3	2.5	2.3
$max_{(P-E)}$													
2015-2040	1.7	2.1	2.4	1.4	1.3	3.3	3.7	3.2	2.3	1.3	3.0	4.8	2.5
2041-2070	3.1	2.5	2.1	1.9	2.4	3.8	4.5	3.8	3.0	2.1	3.5	4.7	3.1
2071-2100	10.8	8.8	6.3	7.1	9.4	8.0	7.6	8.8	8.2	7.8	8.2	7.8	8.2
$min_{(P-E)}$													
2015-2040	1.6	2.5	3.2	2.1	2.2	3.6	3.6	3.4	2.5	1.5	3.3	4.5	2.8
2041-2070	4.4	3.8	3.5	3.4	4.7	4.6	4.9	4.4	3.4	3.9	4.7	3.0	4.1
2071-2100	5.3	5.2	3.9	5.1	6.2	4.6	7.6	7.1	6.4	6.0	4.9	5.5	5.7
min_P													
2015-2040	-1.4	-0.1	-0.4	0.2	0.8	1.2	2.3	1.3	1	0.3	0.8	-1.3	0.4
2041-2070	-0.4	1.4	1.1	1.5	1.3	1.5	1.3	1.2	1.3	1.2	2.0	1.8	1.3
2071-2100	0.4	2.9	1.6	1.5	2.3	2.3	1.6	1.8	1.9	1.6	1.4	1.5	1.7

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.5 Climate Change Effects to Precipitation

5.5.1 Annual Precipitation Trends

Figure 5-4 illustrates the mean annual precipitation (MAP) from the Project record during the baseline period, as well as the historical CMIP6 ensemble results over the same period, and the forecasted forecast MAP for the four different SSPs.

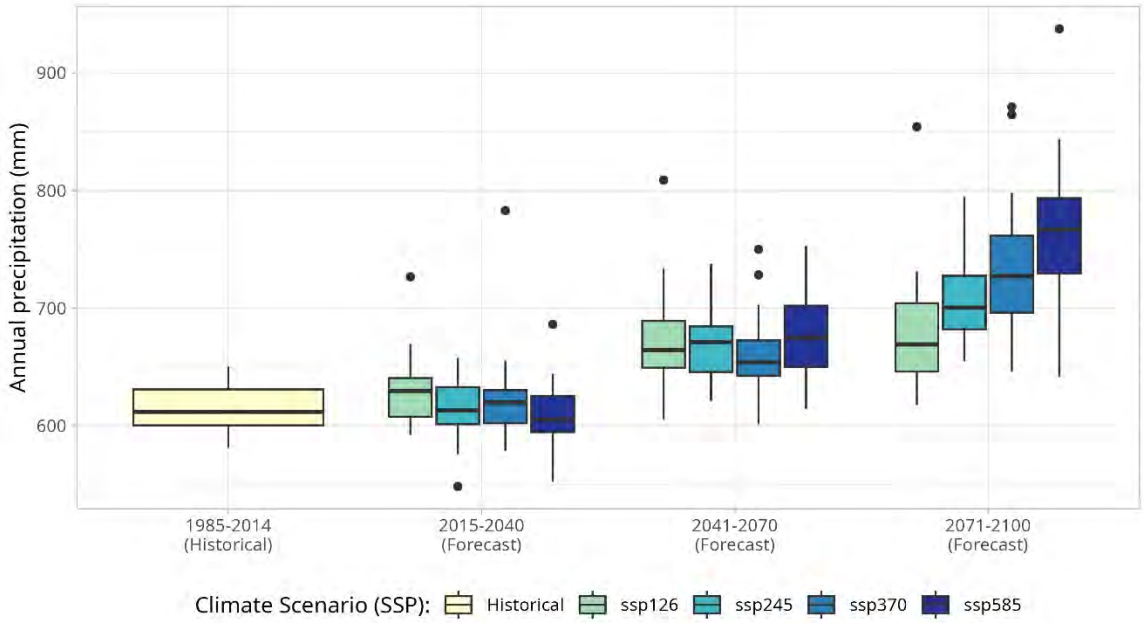


Figure 5-4: Forecast of Climate Change Effect on Mean Annual Precipitation

Source: R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

Table 5-4 presents the percent increase of mean annual precipitation for the three RCPs up to 2100.

Table 5-4: Mean Annual Precipitation Percent Increase from Historical Baseline Average

Timeframe	$med_P med_E$	$max_{(P-E)}$	$min_{(P-E)}$	min_P
2015-2040	1%	31%	-1%	-13%
2041-2070	8%	35%	1%	-5%
2071-2100	16%	50%	8%	2%

Source: R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.5.2 Monthly Precipitation Rates of Change

Monthly impacts to precipitation as a result of climate change were evaluated using the same methodology as described above. The projections are shown below in Table 5-5 for the four conditions and three time periods.

Table 5-5: Monthly Average Precipitation Percent Increase from Baseline

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
$med_P med_E$													
2015-2040	14%	-29%	10%	-21%	3%	13%	-2%	-5%	17%	-2%	-8%	15%	1
2041-2070	18%	-15%	5%	-2%	16%	13%	3%	-15%	30%	19%	5%	10%	2.2
2071-2100	46%	-36%	28%	-8%	29%	28%	17%	4%	33%	2%	16%	30%	2.3
$max_{(P-E)}$													
2015-2040	83%	1%	34%	9%	35%	92%	38%	-13%	87%	5%	-5%	4%	2.5
2041-2070	69%	18%	69%	17%	80%	103%	38%	-13%	69%	4%	8%	-5%	3.1
2071-2100	63%	49%	66%	51%	61%	14%	6%	-8%	49%	75%	85%	62%	8.2
$min_{(P-E)}$													
2015-2040	19%	-3%	26%	-26%	-18%	-19%	-15%	-28%	-6%	-6%	22%	15%	2.8
2041-2070	0%	15%	-19%	-2%	27%	6%	-18%	-31%	5%	27%	3%	-15%	4.1
2071-2100	-4%	-17%	36%	58%	26%	-18%	-47%	1%	32%	1%	49%	8%	5.7
min_P													
2015-2040	-8%	-19%	-17%	-5%	-17%	-30%	-6%	1%	-6%	-16%	-5%	-19%	0.4
2041-2070	-17%	-22%	-14%	-5%	-10%	-15%	-2%	7%	9%	12%	-13%	6%	1.3
2071-2100	-6%	21%	9%	-10%	23%	32%	17%	1%	-18%	8%	-20%	4%	1.7

Source: compiled in text from R code SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.5.3 Extreme Precipitation with Climate Change

Rates of change for extreme precipitation under climate change conditions were estimated for each time period. Rates of change are expressed by the ratio between future and historical precipitation for a set of return periods. For this, the Generalized Extreme Value (GEV) distribution was fitted using L-moments method (Hosking, 2023) to bias corrected historical and future annual maximum daily rainfall to represent extreme precipitation frequency under historical and projected future conditions. The rates of change are provided in Table 5-6. Depth-Duration-Frequency can be obtained by multiplying the historical quantiles (Table 4-8) by the rates of change presented in this section.

Table 5-6: Rates of change for Project Depth-Duration-Frequency Curves with Climate Change

Percentile	Return Period							
	2	5	10	25	50	100	200	1000
Period 2015 – 2040								
10	−9%	−12%	−12%	−15%	−18%	−21%	−24%	−30%
25	−4%	−2%	−3%	−6%	−7%	−10%	−12%	−15%
50	4%	5%	4%	6%	7%	6%	4%	4%
75	11%	13%	15%	18%	22%	25%	29%	34%
90	18%	23%	25%	32%	39%	50%	57%	66%

Percentile	Return Period							
	2	5	10	25	50	100	200	1000
Period 2041 – 2070								
10	−3%	−5%	−5%	−8%	−10%	−14%	−18%	−24%
25	3%	2%	1%	−1%	−5%	−8%	−10%	−12%
50	11%	10%	10%	9%	12%	14%	14%	15%
75	18%	21%	21%	26%	29%	31%	36%	43%
90	28%	33%	35%	40%	46%	56%	62%	82%
Period 2071 – 2100								
10	2%	2%	2%	−1%	−4%	−5%	−9%	−14%
25	11%	9%	10%	10%	9%	8%	6%	3%
50	20%	20%	21%	23%	24%	25%	26%	28%
75	29%	32%	32%	38%	46%	54%	64%	75%
90	38%	43%	47%	56%	65%	74%	87%	118%

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

5.6 Climate Change Effects to Lake Evaporation

Changes to lake evaporation were assessed by updating the Morton CRWE methodology described in Section 2.3.7 with the temperature changes obtained for RCP 4.5 and presented in Table 5-6. The maximum temperature, minimum temperature and dew temperature Project time series were updated using the same net increase rates. Note that the model did not apply a climate change adjustment to solar radiation. Table 5-7 presents the monthly rates of change relative to the baseline lake evaporation.

Table 5-7: Monthly Lake Evaporation Percentual Variation from Baseline

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
$med_P med_E$													
2015-2040	0%	2%	-1%	3%	2%	5%	3%	2%	3%	1%	2%	-0%	**2%**
2041-2070	2%	-0%	2%	4%	1%	3%	6%	13%	6%	1%	1%	1%	**5%**
2071-2100	2%	3%	3%	7%	5%	6%	8%	9%	5%	2%	2%	2%	**6%**
$max_{(P-E)}$													
2015-2040	2%	3%	1%	-1%	2%	14%	16%	15%	6%	0%	4%	4%	**9%**
2041-2070	3%	3%	-0%	1%	3%	15%	21%	15%	12%	3%	4%	4%	**11%**
2071-2100	9%	13%	4%	9%	22%	25%	30%	34%	30%	39%	4%	6%	**24%**
$min_{(P-E)}$													
2015-2040	2%	4%	-1%	2%	1%	18%	19%	15%	9%	2%	5%	4%	**10%**
2041-2070	3%	6%	10%	7%	8%	18%	24%	22%	14%	3%	7%	3%	**15%**
2071-2100	10%	13%	6%	10%	14%	18%	32%	25%	24%	9%	4%	9%	**19%**
min_P													
2015-2040	1%	2%	6%	1%	4%	2%	4%	5%	6%	3%	2%	2%	**3%**

2041-2070[2]	3%	3%	4%	2%	5%	6%	8%	7%	9%	0%	2%	3%	**6%**
2071-2100	1%	3%	1%	1%	4%	7%	5%	7%	9%	1%	2%	2%	**5%**

Source: Compiled in text from R code \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\Climate Change Update\report\climate_change_rev0.html

Notes:

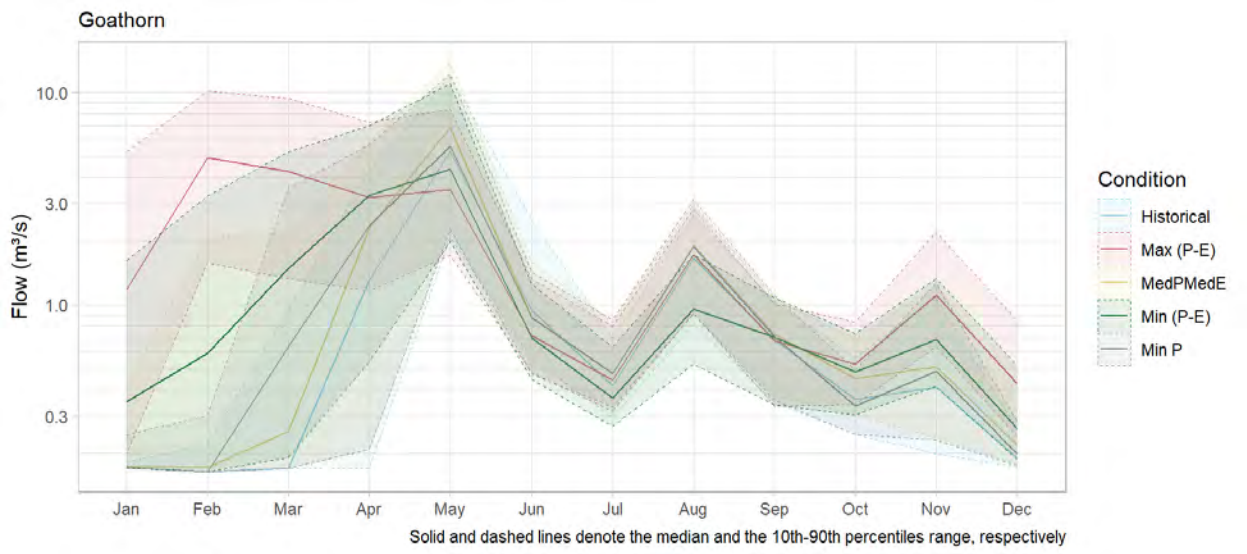
1. Not able to calculate lake evaporation with the selected model. Replaced by the model with second lowest precipitation – CMCC-ESM2 (SSP5-8.5)
2. Not able to calculate lake evaporation with the selected model. Replaced by the model with second lowest precipitation – ACCESS-ESM1-5 (SSP126)

5.7 Climate Change Effects to Streamflow

The calibrated rainfall-runoff model was updated to include the projected rates of change to temperature and precipitation. Calibrated monthly runoff coefficients and baseflow values were incorporated for each major stream. Monthly flows from historic climate were compared against monthly flows projected in 2100 based on the monthly climate change variability.

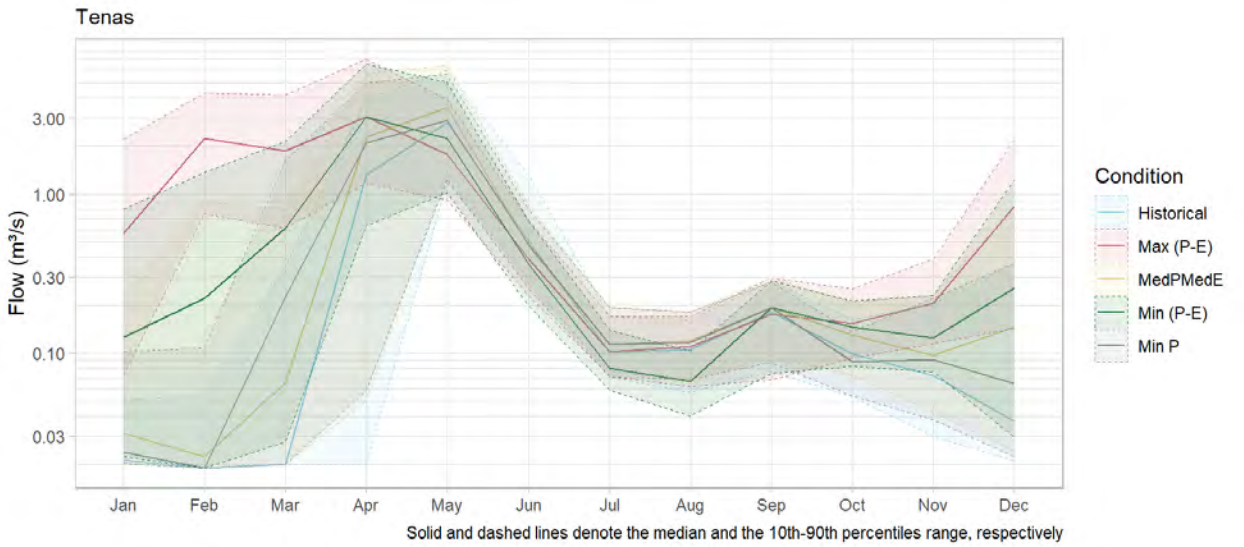
The runoff model was simulated for 100 realizations under historic conditions and projected climate change conditions (year 2100). The 50th percentile (median), 10th percentile (low flow) and 90th percentile (high flow) statistics were extracted from the realization record, and are compared in each creek for historic conditions versus 2100 climate change conditions.

Historic monthly streamflow for each percentile and both historic and climate change conditions are presented in Figure 5-5 for Goathorn Creek, Figure 5-6 for Tenas Creek, Figure 5-7 for Telkwa River, Figure 5-8 for Bulkley River and Figure 5-9 for Four Creek, where the solid lines represent the median results and dashed lines the 10th and 90th percentiles.



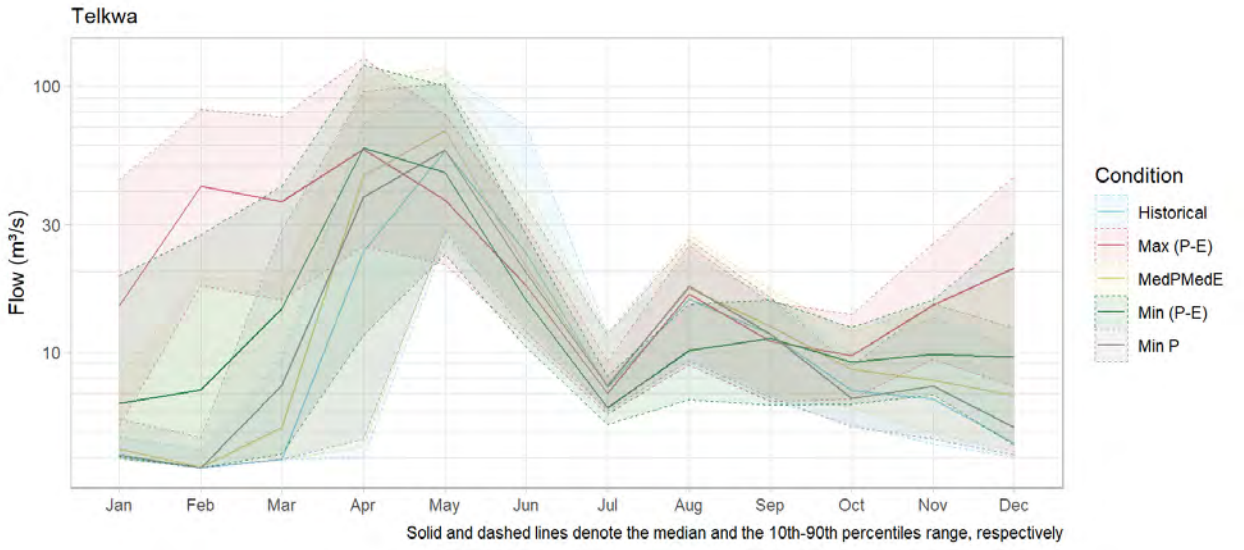
Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 5-5: Goathorn Creek Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100



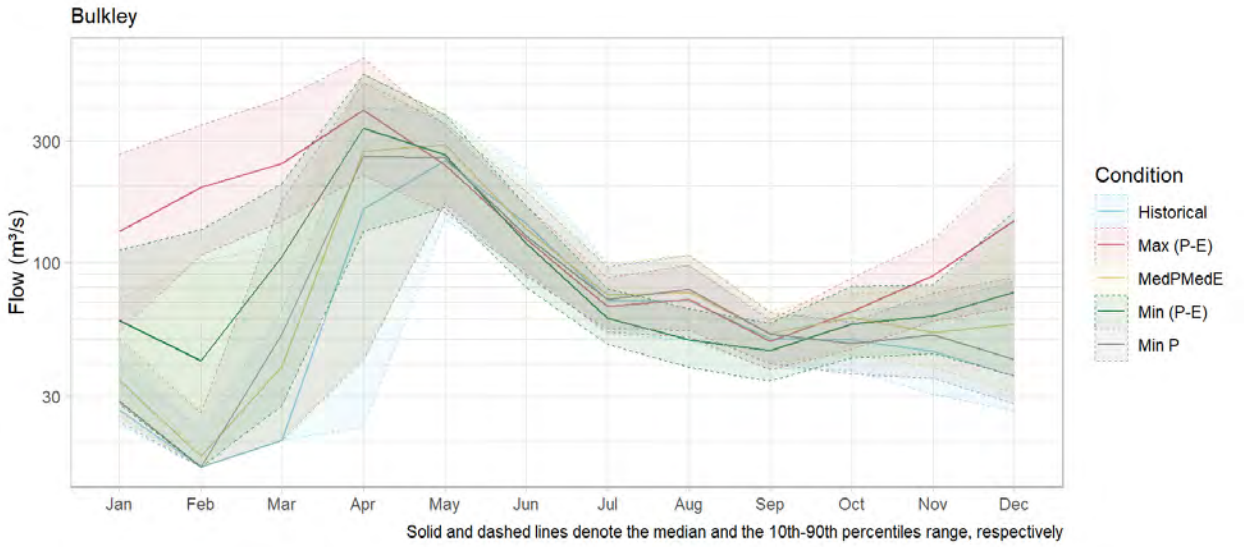
Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 5-6: Tenas Creek Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100



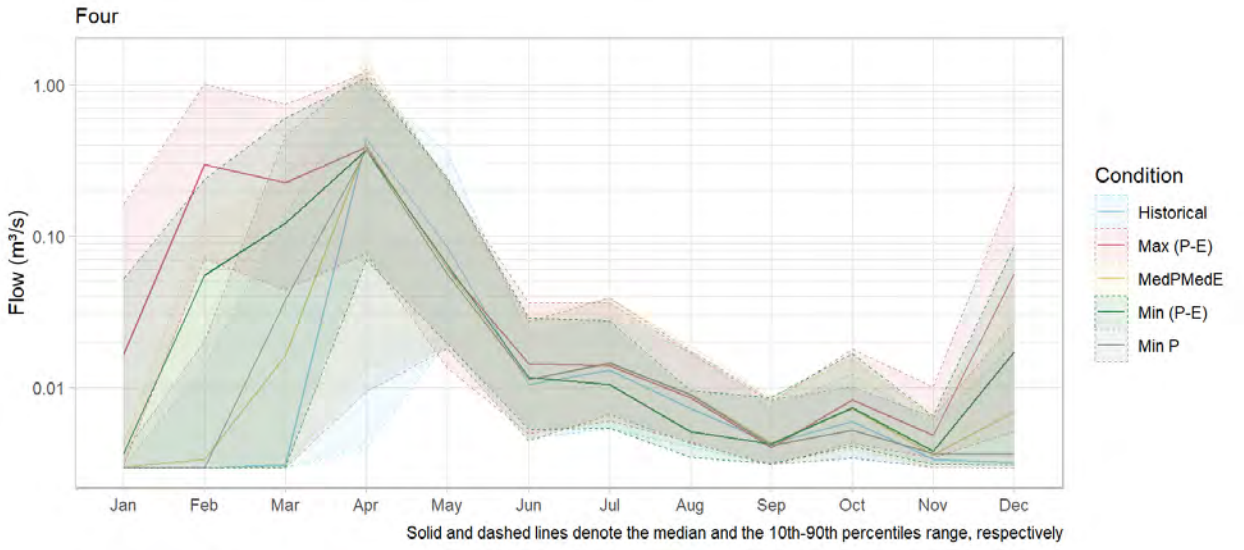
Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 5-7: Telkwa River Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100



Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 5-8: Bulkley River Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100



Source: \SRK Consulting\NA CAPR002055 Telkwa Project General EA Support - Internal\200_Review New Climate and Streamflow Data\R_work\reports\01 - Flow Review.html

Figure 5-9: Four Creek Monthly Streamflow Summary for Historical Conditions and Climate Change Conditions in 2100

The general tendency when comparing historic and climate change monthly streamflow is an overall increase in flow magnitude and a shift to an earlier spring freshet. These observations coincide with the climate change projections in Table 5-5, showing even a 2% in annual precipitation by 2100, and a 23% increase in precipitation in May under the model with lowest precipitation increase.

Note that the runoff model relies on a constant unit baseflow value for each river, which was not adjusted for climate change in these predictions. Precipitation is anticipated to decrease during the drier summer months (namely July), which, in combination with the higher evaporation rates in Table 5-7, would be expected to decrease streamflow during the low-flow summer period.

In addition, the changes to seasonality and snowmelt timing would also affect the runoff coefficients. The calibrated runoff coefficients were based on the historical flow regime, which coincides with a spring freshet in May, or April in the case of the Four Creek model for 2020 data. The monthly runoff coefficients could also be affected by climate change and are an additional limitation of this evaluation approach.

5.7.1 Peak Flow Trends

A trend analysis was carried out by SRK to identify trends and significance of trends for the peak flows from historical records. Ordinary least squares method, and quantile regression method were employed for statistical evaluation of the data. The non-parametric Mann-Kendall (MK) (1945) and Theil-Sen (Thiel 1950, Sen 1968) methods, the Prewhitening MK (Zhang 2001) method, and the Prewhitening MK (Yue et al. 2002) method were used for trend analysis. Where a trend was observed (upward or downward), its significance was evaluated. Trends with a significance greater than 95% are accepted as significant.

Goathorn Creek Peak Flow Historical Trend Analysis

Figure 5-10 represents yearly peak flows at the Goathorn WSC station from the extended timeseries, and its linear approximation equation obtained with the ordinary least squares method. Table 5-8 summarizes the results of the Goathorn peak flow trend statistical significance Mann-Kendall tests. No significant trend is observed for all three tests.

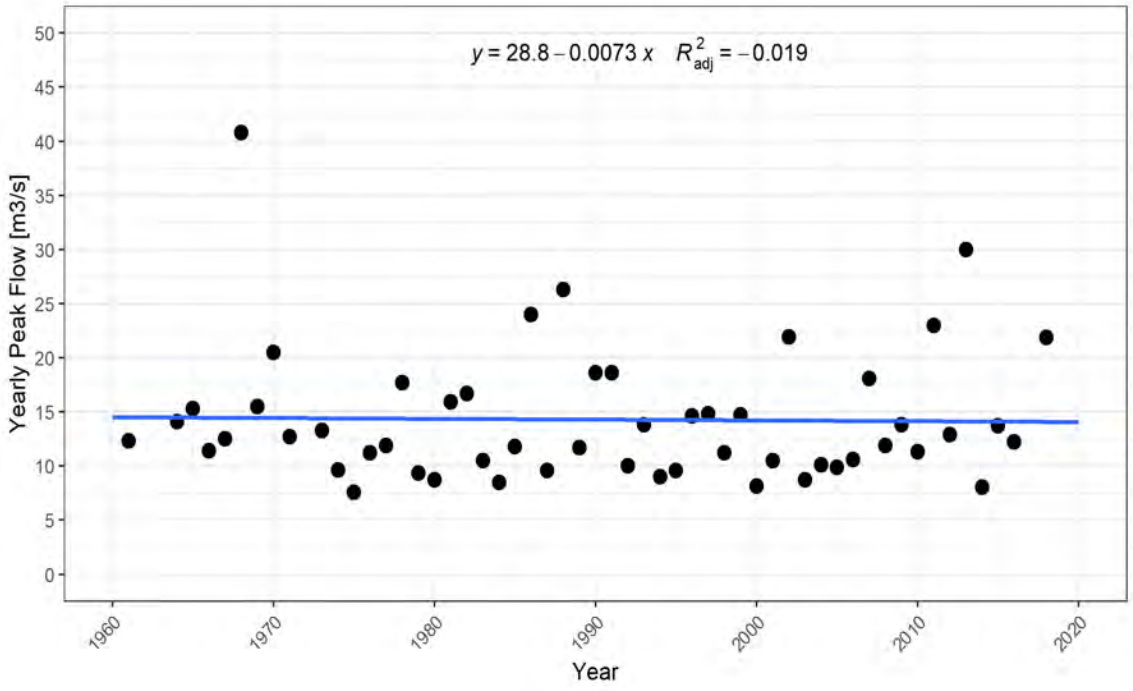


Figure 5-10: Goathorn Peak Flows Trend from 1960 to 2018

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Table 5-8: Mann-Kendall Significance test results for Goathorn Peak Flows

Method	Comment	Significance (%)
MK & Theil-Sen	No Significant Trend	53.3
Prewhit. MK, Zhang	No Significant Trend	53.3
Prewhit. MK, Yue & Pilon	No Significant Trend	59.9

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Telkwa River Peak Flow Historical Trend Analysis

Figure 5-10 represents yearly peak flows at the Telkwa WSC station from the extended timeseries, and its linear approximation equation obtained with the ordinary least squares method. Table 5-9 summarizes the results of the Telkwa peak flow trend statistical significance Mann-Kendall tests. No significant trend is observed for all three tests.

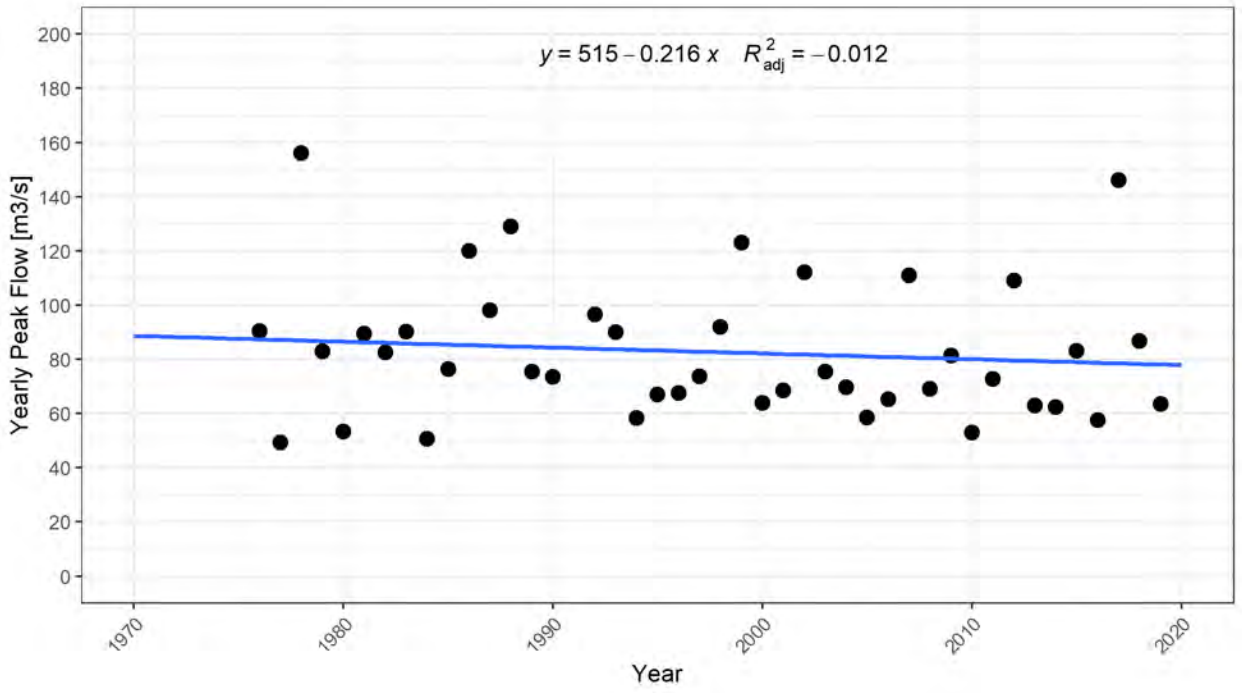


Figure 5-11: Telkwa Peak Flows Trend from 1976 to 2019

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Table 5-9: Mann-Kendall Significance test results for Telkwa Peak Flows

Method	Comment	Significance (%)
MK & Theil-Sen	No Significant Trend	88.4
Prewhit. MK, Zhang	No Significant Trend	88.4
Prewhit. MK, Yue & Pilon	No Significant Trend	83.7

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Bulkley River Creek Peak Flow Historical Trend Analysis

Figure 5-10 represents yearly peak flows at the Bulkley River at Quick WSC station from the extended timeseries, and its linear approximation equation obtained with the ordinary least squares method. Table 5-10 summarizes the results of the Bulkley River peak flow trend statistical significance Mann-Kendall tests. No significant trend is observed for all three tests.

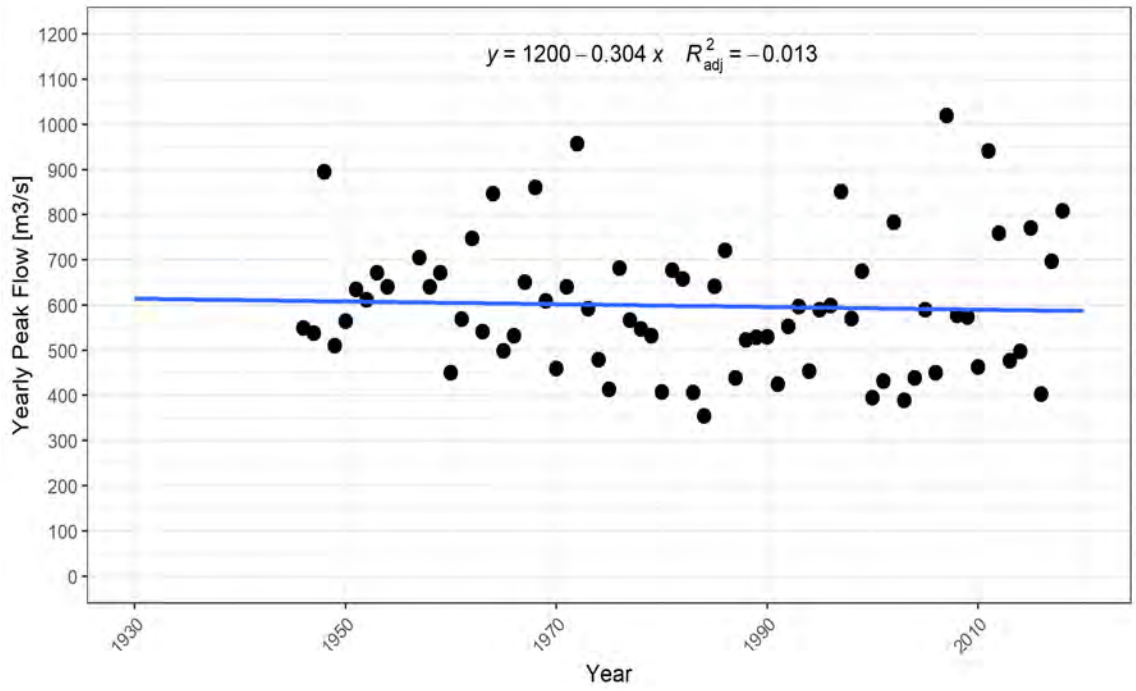


Figure 5-12: Bulkley River Peak Flows Trend from 1976 to 2019

Source: from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

Table 5-10: Mann-Kendall Significance test results for Bulkley River Peak Flows

Method	Comment	Significance (%)
MK & Theil-Sen	No Significant Trend	77.5
Prewhit. MK, Zhang	No Significant Trend	77.5
Prewhit. MK, Yue & Pilon	No Significant Trend	78.6

Source: compiled in text from R code \\srk.ad\dfs\na\van\Projects\01_SITES\Telkwa Coal\1CT027.003_2020 EA Water Management\200_Meteorology_Update\R work\Telkwa_EA_Flows_Climate_Change.html"

In all streams evaluated, no significant change in peak flow magnitude has been observed historically. This is not to say that a change in peak flows may not occur with projected climate change. Variations with respect to snowmelt timing and rainfall depth may result in higher peaks in the future, however the effects of a thinner snowpack should also be considered. Peak flow models for the purpose of engineering design should incorporate both snowmelt events and climate change depth-duration-frequency rainfall tables presented in Table 5-6.

6 Conclusions and Limitations

Regional analyses coupled with a compilation of Project-specific meteorological and hydrometric datasets were used to develop Project specific hydrometeorological baseline parameters, including long-term temperature and precipitation records. Climate change analysis was updated with CMIP6 data. Climate change effects on temperature, precipitation, evaporation and streamflow are presented as monthly and annual rates of change for three future periods. Results from this study may be used to further advance Project designs and update EA modeling, including the water and load balance model, groundwater model, and design of water management infrastructure.

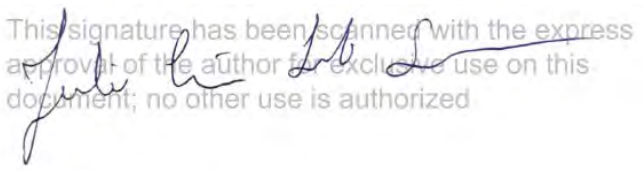
Provisional Water Survey of Canada flow records were used for Goathorn Creek, Telkwa River and Bulkley River in the development of calibrated rainfall-runoff models. Provisional records may change when officially published.

Available Four Hydro data for 2020 were analysed, along with data collected as part of baseline monitoring in 1997 and 1998. Due to the limited period of record, there is still significant uncertainty regarding Four Creek hydrology. Ongoing monitoring and validation of presented hydrologic indices is required.

The calibrated rainfall runoff model established to support the water and load balance model and runoff estimates for the hydrometric stations underestimates flows in Tenas Creek. This model should be revisited once more flow data is available at Tenas Hydro. However for the purpose of the EA, an underestimated runoff result is more conservative in terms of dilution capacity. Review of the Four-Hydro regressions with Goathorn Creek (08EE008) and calibration model should be performed after an additional year of monitoring data become available.

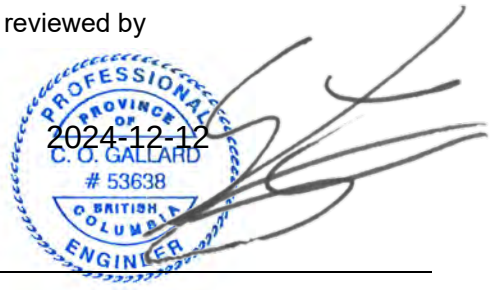
It is strongly suggested that this study be revisited and that the model be recalibrated when longer Project data records are available from the meteorological station as well as the hydrometric stations, and when all WSC flow data are published (*i.e.,* not provisional). The correlations between meteorological parameters measured at the Tenas Deposit Station and the regional stations should be improved by assessing a longer period of Project record from the Tenas Deposit Station. An initial analysis of the precipitation record showed that recent years (2017 to 2019) were drier than average, which may create bias in the extended Project precipitation record. Complete water years (from October to September of the following year) are critical in any assessment of the hydrological regime and longer flow data series will improve streamflow regressions and provde a robust calibration dataset.

This report, Tenas Project – Hydrometeorological Baseline and Model Development Report (update 2024), was prepared by



Julio Lobo,
Consultant

and reviewed by



Camilo Gallard, PEng
Senior Consultant

EGBC Permit to Practice Reg. No.: EGBC 1003655

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Disclaimer—SRK Consulting (Canada) Inc. has prepared this document for Telkwa Mining Ltd. Any use or decisions by which a third party makes of this document are the responsibility of such third parties. In no circumstance does SRK accept any consequential liability arising from commercial decisions or actions resulting from the use of this report by a third party.

The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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Attachment A AGRA 1999 Report

received April 5/2000

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
Box 3966
#3, 3167 Tatlow Road
Smithers, BC
Canada V0J 2N0
Tel (250) 847-8783
Fax (250) 847-9049

March 28, 2000
KS00076

Luscar Ltd.
1600 Oxford Tower
10235 – 101 Street
Edmonton, A.B. T2P 3V4

Attention: Mr. Allan Flemming

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE SURFACE FLOW AND WATER QUALITY FINAL DATA REPORT

AGRA Earth & Environmental Limited (AGRA) is pleased to submit two copies of the *Telkwa Coal Project 1999 Baseline Surface Flow and Water Quality Final Data Report*. The report presents the results of the 1999 field monitoring program conducted by AGRA for Luscar Ltd. on the proposed Telkwa Coal Project.

AGRA understands that the recent state of the coal industry has put the proposed Telkwa Coal Project on hold. AGRA looks forward to working with Luscar Ltd. on the proposed Telkwa Coal Project when the decision to proceed with the project is made. Should you have any questions or comments regarding this report, or require any support on this, or other projects, please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully submitted,

AGRA Earth & Environmental Limited

Scott Davidson, P.Geo., M.Sc.
Geomorphologist

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
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Fax (250) 847-9049

March 27, 2000
KS00076

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (780) 420-5875

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE DATA REPORT

1.0 INTRODUCTION

AGRA Earth & Environmental Limited is pleased to present the 1999 Baseline Surface Water Flow and Water Quality Monitoring Report for the Telkwa Coal Project (TCP). The TCP is a proposed open pit coal mine located near Telkwa, B.C. and owned by Luscar Inc. (Luscar). The location of the mine is illustrated on Figure 1. This report contains the data collected during the 1999 baseline monitoring program and updates the rating curves for sites where discharge measurements were conducted.

2.0 SCHEDULE OF 1999 SITE VISITS

The schedule of site visits for the 1999 field monitoring program is contained in the March 3, 1999 AGRA proposal to conduct the TCP baseline monitoring. A copy of the AGRA proposal is contained in Appendix A for reference. The dates of actual site visits and a listing of the work conducted during the site visits is contained in Table 1.

TABLE 1: 1999 MONITORING SITE VISITS

Week of:	Feb 1	Aug 1	Sept 19	Nov 14
Telkwa River	WQ		WQ	
Upper Tenas Creek	No site access		SM, WQ, Q	S
Lower Tenas Creek	WQ, Q	S	SM, WQ, Q	S
Bulkley River	WQ		WQ	
Hubert Creek	WQ, S	S	WQ, S	S
Four Creek	WQ	S	WQ, Q	S
Upper Goathorn Creek	WQ, Q		SM, WQ, Q	S
Lower Goathorn Creek	WQ		WQ	

Q = Discharge and stage measurements conducted
S = Stage measurements conducted
WQ = Water quality sampling conducted
SM = Site Maintenance Visit

The purpose of the August field trips was to collect peak flow information from the crest gauges at each site.

3.0 SURFACE WATER MONITORING RESULTS

This section contains a summary of the five sites where surface water monitoring was conducted during the 1999 field season. Summary field data for the site visits is contained in Appendix B.

3.1 LOWER TENAS CREEK SITE

The Lower Tenas Creek site was visited four times as part of the 1999 monitoring program. The station was operated as a manual sampling with no installation of the automated equipment used in previous years.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.041 m^3/s and 0.163 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 2.

An initial crest gauge installed in late 1998 at the site was replaced during the 1999 sampling season. Level surveys conducted at the site during the 1999 field season did not show significant shift of the benchmarks or the staff gauge. There was evidence of sand deposition noted near the gauge during the November 1999 field visit.

3.2 UPPER TENAS CREEK SITE

The upper Tenas Creek was visited twice during the 1999 monitoring program. There was no site access during the February 1999 field trip. As the crest gauge for this site was not checked and reset during February, this site was not visited during the August field trip.

The crest gauge was checked during September and the maximum stage was observed to be 0.70 m. This value would translate to a discharge of 8.43 m^3/s and is expected to be due to the spring freshet which consistently produces greater discharges than the fall peak flows. The low flow measurement from September 20th was 0.134 m^3/s. An updated rating curve for this site is shown in Figure 3.

The September field visit to this site showed that the braces for the staff gauge had snapped but that the staff gauge did not appear to have shifted (based on a review of previous site photographs). Braces at the site were replaced and a third benchmark was added on the right bank side of the stream. Levelling checks showed that there was no significant shift of the benchmarks or the staff gauge during 1999. The breakage of the braces resulted in slight downstream leaning of the staff gauge mounting but this was corrected during the site maintenance visit.

3.3 UPPER GOATHORN CREEK SITE

The Upper Goathorn Creek site was visited four times during the 1999 monitoring program. The station was monitored as a manual station with a staff gauge and crest gauge.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.097 m^3/s and 0.337 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 4.

Maintenance of the gauge equipment was conducted during the September visit. The bracing for the staff gauge was reinforced and the staff gauge was lowered by a distance of 0.19 m. A second staff gauge was added to the top of the first staff gauge to allow for visual measurement of peak flow levels during the freshet period. The level check of benchmarks showed that there were no changes in the elevations of the benchmarks. The staff gauge did not show any significant shift during the 1999 season.

3.4 FOUR CREEK SITES

Two sampling locations were operated on Four Creek during the 1999 field season. The low flow discharge measurements were made at the lowest culvert crossing of Four Creek on the 120 Road. Other stage measurements and water quality sampling were conducted at the original stream flow sampling site located approximately 1,800 m upstream of the culvert crossing on Four Creek.

Discharges for the low flow periods were determined by calculation of the discharge through the culvert based on the known inlet water levels and the culvert characteristics. The February low flow measurement revealed that there was only a small quantity of baseflow (< 1L/min) during the sampling trip. The culvert was almost completely iced up. The September low flow discharge for the culvert was calculated to be 0.077 m^3/s.

3.5 HUBERT CREEK SITE

The Hubert Creek site was visited four times during the 1999 monitoring program. Readings for the staff gauge are available from two of the site visits. Visits conducted during September and November did not yield useful data on flow levels due to numerous partial blockages of the culvert inlet by debris.

The crest gauge at the site indicated that there was a recorded stage greater than 1.23 m during the spring 1999 freshet period. This high stage is believed to be partially due to beaver debris blockage of the inlet of the Hubert Creek culvert.

4.0 WATER QUALITY MONITORING RESULTS

In 1999, baseline water chemistry was sampled during the two low flow periods at ten sites in the proposed Telkwa Coal Project area. The data for the February 1999 water quality monitoring was forwarded directly to Luscar as previously arranged. The laboratory results for

the September water quality trip are included in Appendix C of this report. No analysis of the testing data, other than to identify specific stations where the BC Water Quality Criteria (Nagpal, 1995) were exceeded. A summary of metals and stations where exceedances occurred are summarized in Table 2. Due to operator error, no replicate sampling was conducted during the September water quality monitoring trip.

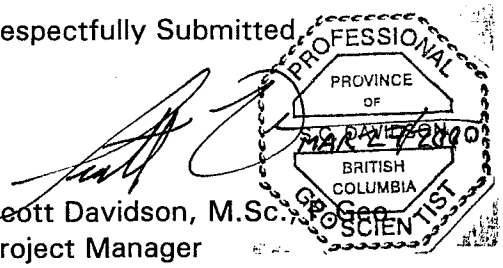
TABLE 2: B.C. WATER QUALITY CRITERIA EXCEEDANCE INFORMATION FOR THE SEPTEMBER 20, 1999 SAMPLING TRIP

METAL	B.C. WATER QUALITY CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS GREATER THAN THE B.C. CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS EQUAL TO THE B.C. CRITERIA
Cr	2.0 ug/L	Telkwa River (2.5)	Upper Goathorn Creek, Lower Goathorn Creek, Bulkley River, Hubert Creek, Lower Tenas, Four Creek
Cu	2.0 ug/L	Telkwa River (2.4)	
Fe	0.3 mg/L	Telkwa River (0.8), Hubert Creek (1.03), Bulkley River (0.33)	
Zn	3.0 ug/L	Telkwa River (3.5)	

5.0 CLOSURE

AGRA Earth Environmental Limited is pleased to present this 1999 data summary to Luscar Ltd. AGRA looks forward to continuing to work with Luscar on the Telkwa Coal project over the 2000 season. Should you have any questions concerning this project please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully Submitted,



Scott Davidson, M.Sc., Geo.
Project Manager

Reviewed by,

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

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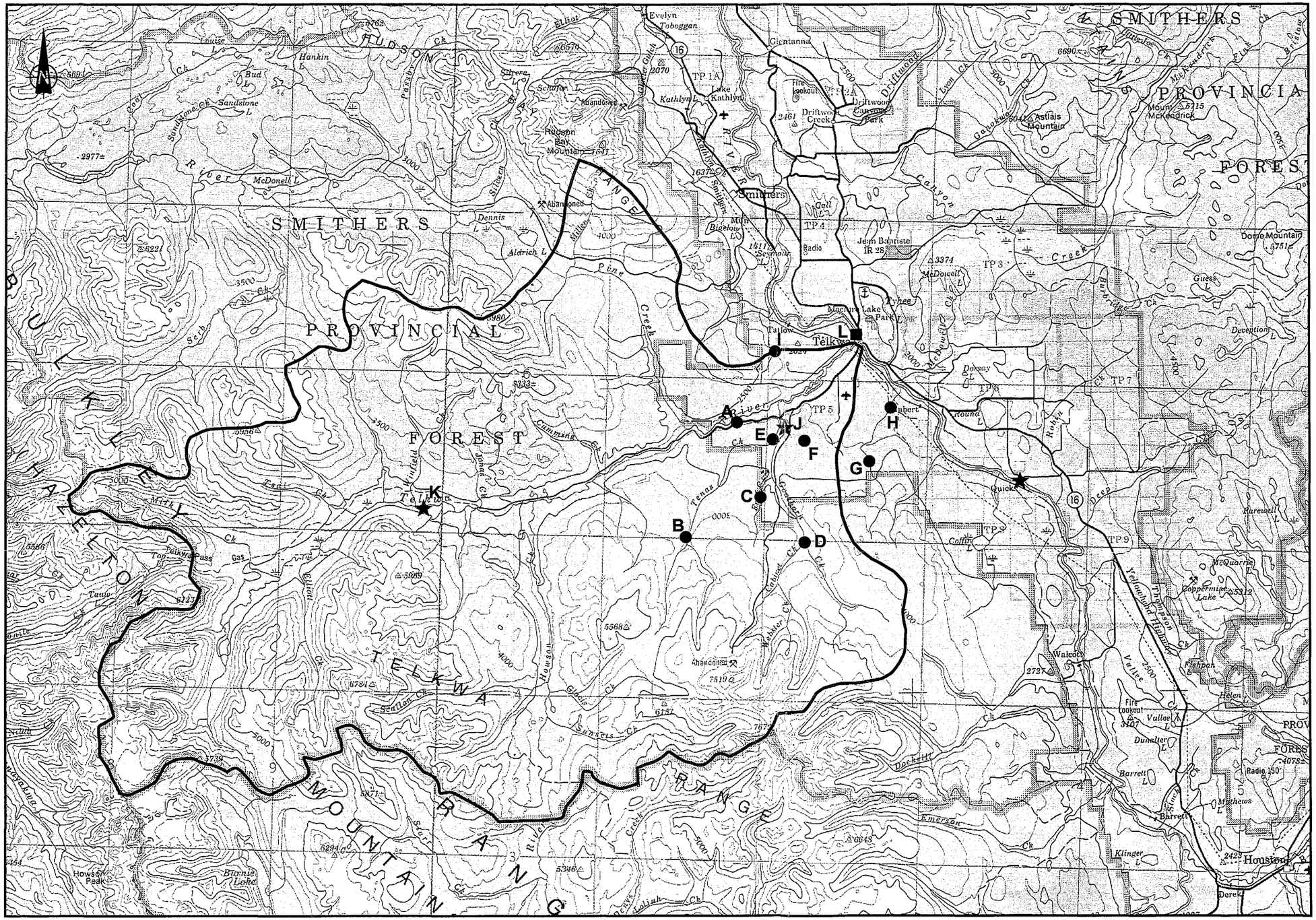

0 5 10 15 20 25 Kilometres

Scale 1 : 250 000

LEGEND

- Telkwa River Watershed
- ★ Existing WSC Station
- ■ Water Quality Station
- ● Hydrometric & Water Quality Site
  - A Lower Telkwa River
  - B Upper Tenas Creek
  - C Four Creek
  - D Upper Goathorn Creek
  - E Lower Tenas Creek
  - F Tailings Pond Drainage
  - G Helps Creek
  - H Hubert Creek
  - I North Site
  - J Lower Goathorn Creek
  - K Upper Telkwa River
  - L Bulkley River

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

CLIENT:	LUSCAR LTD.
PROJECT:	TELKWA COAL PROJECT

APPROXIMATE LOCATIONS HYDROMETRIC AND WATER QUALITY SITES

DATE:	MAR. 2000
JOB No.:	KS00076
COREL FILE:	N/A
FIGURE 1	REV. -

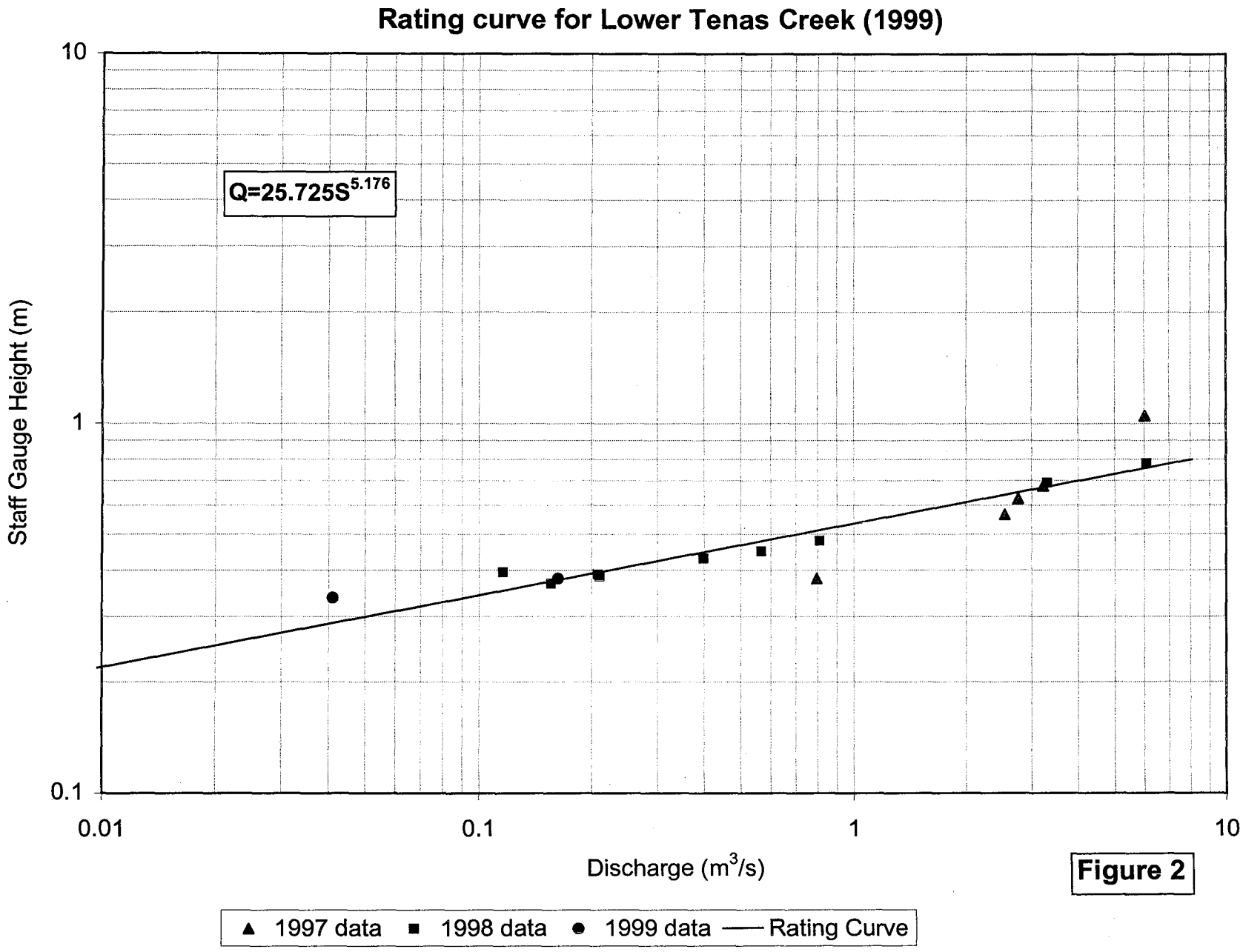
Rating curve for Lower Tenas Creek (1999)
Q=25.725S^5.176
Staff Gauge Height (m)
10
1
0.1
0.01
0.1
1
10
Discharge (m3/s)
1997 data
1998 data
1999 data
Rating Curve

Figure 2

Rating Curve for Upper Tenas Creek (1999)

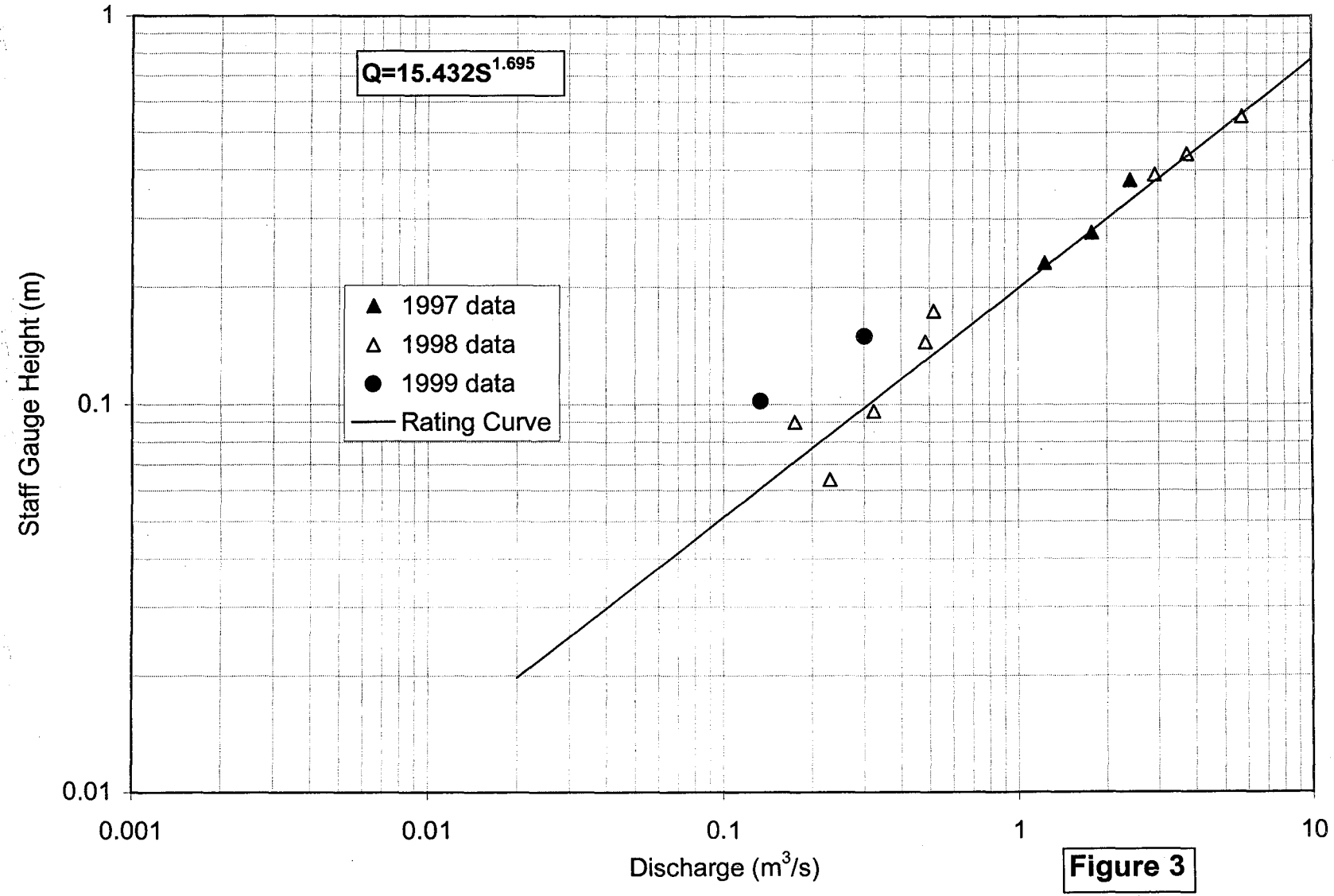

Figure 3

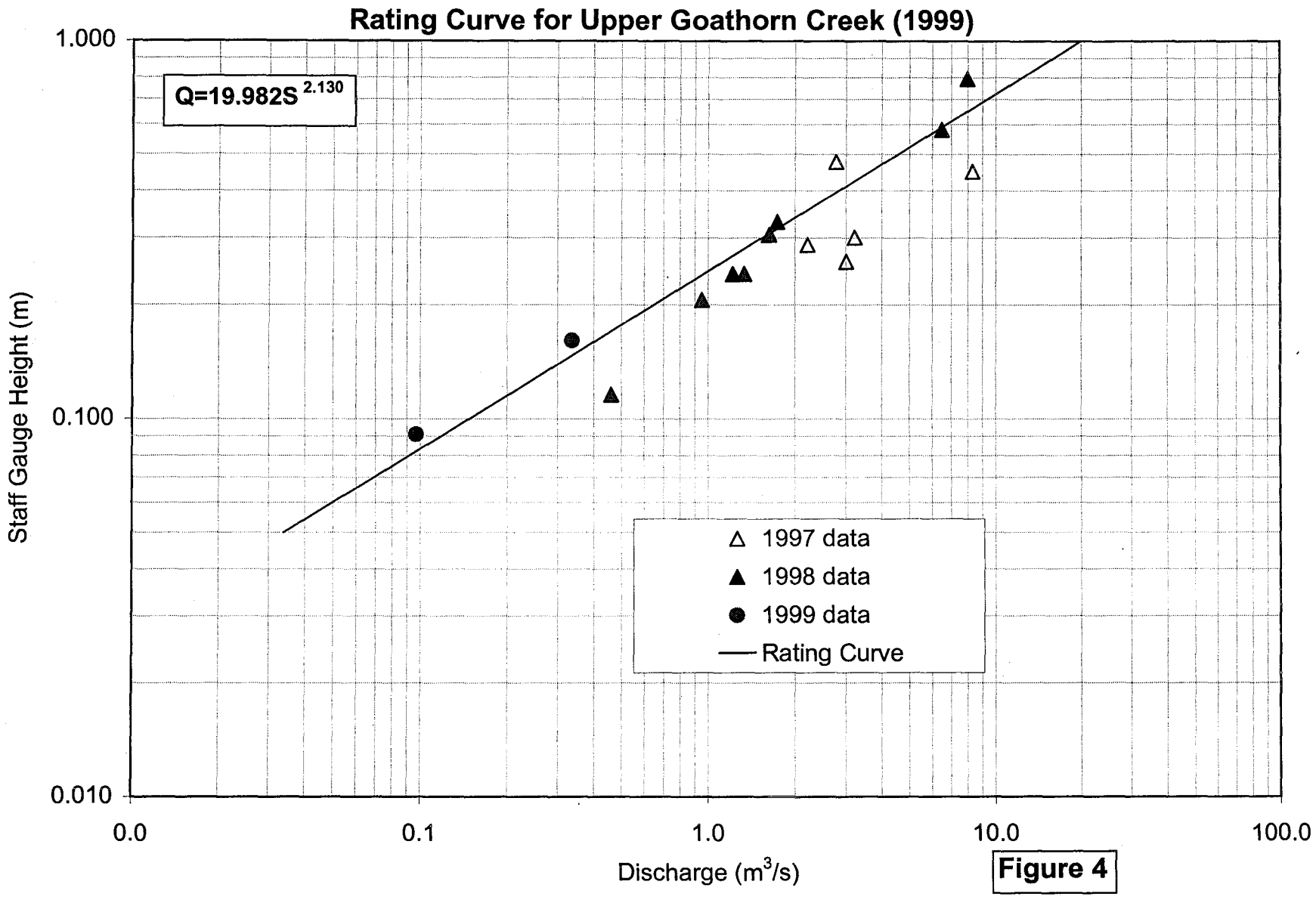

Figure 4

AGRA ENGINEERING GLOBAL SOLUTIONS

APPENDIX A

AGRA PROPOSAL FOR 1999
TELKWA COAL MONITORING PROGRAM

AGRA
ENGINEERING GLOBAL SOLUTIONS

March 2, 1999
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-5875

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE DATA REPORT

1.0 INTRODUCTION

AGRA Earth & Environmental Limited is pleased to present this proposal to conduct the 1999 Baseline Surface Water Flow and Water Quality Monitoring Report for the Telkwa Coal Project (TCP). The TCP is a proposed open pit coal mine located near Telkwa, B.C. and owned by Luscar Inc. (Luscar). This report contains the data collected during the 1999 baseline monitoring program and updates the rating curves for sites where discharge measurements were conducted.

2.0 SCHEDULE

SURFACE WATER MONITORING

AEE is pleased to present this revised budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program may need to be revised to meet the construction plan for the mine.

2.0 WORK PROGRAM AND BUDGET

The work program proposed for 1999 is as follows:

Surface Water Flow

- Concentration of the base program on the winter and summer low flow periods.
- Monitoring of low flows on Four Creek, Hubert Creek, Tenas Creek, Upper Goathorn Creek and Lower Goathorn Creek. No monitoring will be conducted on Helps Creek, Telkwa River, and the Bulkley River. Low flow monitoring will result in two site visits. To reduce cost to Luscar, AEE has scheduled the summer low flow period measurement trip to

coincide with site visit #3 described below.

- Monitoring of peak flows at the streams using crest gauges already installed at all of the existing sites. To conduct this portion of the required work, AEE will conduct a total of four sites visits planned as follows:

1. Pre-freshet to set up crest and staff gauges and survey to local bench marks (April),
2. Post freshet to record peak flow during period and survey to local bench marks (June),
3. Pre fall high flow period to re-survey benchmarks and survey to local bench marks (late August to early September),
4. Post fall high flow to record peak flow and survey to local bench marks (November).

Water Quality

- Sampling of baseline parameters for the two low flow periods only.

Data Analysis

AEE proposes to conduct data analysis and reporting for the 1999 sampling program following each monitoring trip. A data analysis period has been allowed following each of the five surface flow site visits (one low flow and four peak flow visits) described above. The information reports from each trip will assist Luscar in public meetings by providing the most up to date information on the project.

Project Management

Project management involves dealing with items such as cost control, client liaison, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. For the 1999 sampling program, AEE proposes to conduct project management on a cost plus basis. The totals for this item in the attached Table 1 represent estimates of the total budget required for project management. AEE will make every effort to ensure that it conducts stringent cost control on the project management for Luscar. Project management for the 1999 program will be conducted by Mr. Scott Davidson, M.Sc., P.Geo. of the Smithers office. Mr. Gary Beckstead, M.Sc., P.Eng. and Mr. Dennis Trotter will provide technical input and review to the project as required.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. If you have any questions or require further information concerning this project, please call Scott Davidson at (250) 847-8783 or Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Reviewed by

Scott Davidson, M.Sc., P.Geo.
Project Manager

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

C:\files\working\Luscar\1999\revised budget99.wpd
cc. Gary R.E. Beckstead, AEE - Calgary

APPENDIX B

SUMMARY OF 1999 FIELD DATA

Telkwa Coal Project Field Note Summary for 1999 Sampling Season

Hubert Creek

Date	Aug 3/99	12:47	Sept 21/99		Nov 18/99
SG	0.1		0.945		
Crest	>1.23				
		Diff to SG			
HI	1.65				
Top SG	2.463		Culvert Blocked by Beaver Debris		Culvert Blocked by Beaver Debris
Top Crest	2.464				
Telephone Pole	1.221	-1.242			
Top Box	0.5	-1.963			

Four Creek

			Site					
Date	Aug 3/99	13:25	Sep-20	11:40	Nov 18/99	12:15		
SG	0.18		0.182		0.185			
Crest	0.4		0.55		0.2			
		Diff to SG					Diff to SG	
HI	1.63				1.5621	1.5367		
Top SG	0.754				0.687	0.692		
Top Crest	0.506			Set up 1		0.444	Set up 2	
BM1	0.005	-0.749		-0.72	-0.033	0.038	-0.654	
BM2	0.215	-0.539		-0.54	0.147	0.151	-0.541	
			Culvert depth	0.08	Culvert depth	0.1		
			Sept 21/99	10:15	Nov 18/99	11:45		

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Lower Tenas Creek

	Aug 3/99	14:30	Sept 20/99	15:15		Nov 18/99	13:15	
SG	0.43		0.38			0.37		
Crest						0.25		
		Diff to SG		Diff to SG				Diff to SG
HI	1.6					1.6129		
Top SG	3.778		3.765			3.78	3.815	
Top Crest			3.275		Set up 1		3.325	Set up 2
BM1	1.18	-2.598	1.162	-2.603	-2.613	1.167	1.203	-2.612
BM2	1.227	-2.551	1.215	-2.55	-2.559	1.221	1.255	-2.56

Comments: Sand deposition near gauge

Upper Goathorn Cr.

	Sept 20/99	Sept 21/99	14:35		Nov 18/99	10:15	
SG	-0.03	0.12			0.075		
Crest					frozen shut		
			Diff to SG				Diff to SG
HI					1.6891	1.65735	
SG (to 1 m mark)		0.843			0.916	0.881	
Top Crest		1.546		Set up 1		1.585	Set up 2
BM1		0.185	-0.658	-0.659	0.257	0.221	-0.66
BM2		1.399	0.556	0.553	1.469	1.433	0.552

Comments: SG lowered 0.191 m
CG lowered 0.11 m

4" snow on ground
SG surveyed to 2 m mark

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Upper Tenas Cr.

		Sept 20/99				Nov 18/99		11:30	
SG		0.15				0.08			
Crest		0.18	0.7 read previous day			0.25			
			Diff to SG						Diff to SG
HI		1.71				1.651			
Top SG		1.035	1.035			0.972		1.022	
Top Crest	Set up 1	0.821		Set up 2	Set up 1			0.823	Set up 2
BM1	-0.969	0.066	0.066	-0.969	-0.967	0.005		0.071	-0.951
BM2	-0.97	0.065	0.065	-0.97	-0.967	0.005		0.07	-0.952
BM3	-0.755	0.28	0.28	-0.755	-0.737	0.235		0.285	-0.737

Site Maintenance Trip
Values for SG and Crest arer post-fix
BM3 added ~ 12m downstream of BM1 and BM2

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Discharge MeasurementDeterminations

Site: Lower Tenas 21-Sep-99 15:15
Staff Gauge: 0.38

LOC	REVS	SEC	VEL	DEPTH	Q
3.300	0	0		0.000	0.000
3.600	0	0		0.060	0.000
3.900	2	36.1		0.140	0.000
4.200	3	41.9	0.048	0.200	0.003
4.500	7	44.5	0.106	0.220	0.007
4.800	9	41.7	0.145	0.260	0.011
5.100	13	38.9	0.224	0.280	0.019
5.400	12	42	0.192	0.320	0.018
5.700	17	41.2	0.277	0.330	0.027
6.000	21	43.1	0.327	0.340	0.033
6.300	21	44.5	0.317	0.260	0.025
6.600	18	41.9	0.288	0.220	0.019
6.900	20	41.4	0.324	0.18	0.018
7.200	17	42.4	0.269	0.140	0.011
7.500	16	42.2	0.255	0.12	0.009
7.8	14	40.1	0.234	0.1	0.007
8.1	0	0		0.04	0
8.4	0	0		0.04	0
8.7	0	0		0.08	0
9	0	0		0.08	0
9.3	0	0		0.03	0
9.6	0	0		0	0
				Sum Q:	0.163

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Site: Upper Goathorn Cree 20-Sep-99 13:05
Staff Gaug -0.03

LOC	REVS	SEC	VEL	DEPTH	Q
8.700	0	0		0.000	0.000
9.000	0	0		0.030	0.000
9.300	0	0		0.070	0.000
9.600	0	0		0.100	0.000
9.900	12	40	0.201	0.190	0.011
10.200	27	42	0.432	0.220	0.028
10.500	23	45	0.343	0.280	0.029
10.800	35	45	0.522	0.380	0.060
11.100	32	40	0.537	0.320	0.052
11.400	19	42	0.304	0.420	0.038
11.700	29	40	0.487	0.370	0.054
12.000	33	40	0.554	0.390	0.065
12.300	21	41	0.344	0.39	0.040
12.600	38	40	0.638	0.330	0.063
12.900	35	40	0.588	0.35	0.062
13.2	52	41	0.852	0.31	0.079
13.5	48	40	0.806	0.29	0.070
13.8	40	40	0.672	0.24	0.048
14.1	26	42	0.416	0.26	0.032
14.4	23	40	0.386	0.3	0.035
14.7	49	40	0.823	0.24	0.059
15	12	40	0.201	0.26	0.016
15.3	0	0		0	0.000
15.6	0	0		0.07	0.000
15.9	11	40	0.185	0.09	0.005
16	0	0		0	0.000
				Sum Q:	0.337

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Site: Upper Tenas 20-Sep-99 11:30
Staff Gauge: 0.102

LOC	REVS	SEC	VEL	DEPTH	Q	
0.400	0	0		0.000	0.000	WW R/B
0.800	0	0		0.000	0.000	behind big rock
1.200	26	42	0.416	0.080	0.013	
1.600	21	42	0.336	0.100	0.013	
2.000	21	41	0.344	0.100	0.014	
2.400	22	42	0.352	0.120	0.017	
2.800	0	0		0.050	0.000	behind big rock
3.200	23	45	0.343	0.090	0.012	
3.600	0	0		0.140	0.000	back eddy behind roc
4.000	14	43	0.219	0.120	0.010	
4.400	41	40	0.688	0.120	0.033	
4.800	27	45	0.403	0.130	0.021	
5.200	28	44	0.427	0.15	0.026	
5.600	15	41	0.246	0.180	0.018	
6.000	16	40	0.269	0.18	0.019	
6.4	30	45	0.448	0.18	0.032	
6.8	22.5	43	0.351	0.14	0.020	
7.2	0	0		0.1	0.000	
7.6	0	0		0.02	0.000	
8	0	0		0		
8.1	0	0		0		L/B
				Sum Q:	0.134	

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Upper Tenas 21-Sep-99 11:30
0.15

LOC	REVS	SEC	VEL	DEPTH	Q	
3.500	0	0		0.000	0.000	WW L/B
3.900	0	0		0.070	0.000	Too Shallow to Measure
4.300	17	41		0.080	0.000	
4.700	24	43.9	0.367	0.130	0.019	
5.100	30	43	0.468	0.170	0.032	
5.500	24	40.2	0.401	0.190	0.030	
5.900	34	45.1	0.506	0.220	0.045	
6.300	30	43.4	0.464	0.170	0.032	
6.700	35	38.8	0.606	0.180	0.044	
7.100	35	36.6	0.642	0.180	0.046	
7.500	30	37.1	0.543	0.200	0.043	
7.900	12	41.5	0.194	0.140	0.011	
8.300	15	38.8	0.260	0.14	0.015	
8.700	0	0		0.070	0.000	Too Shallow to Measure
9.100	45	40.6	0.744	0.13	0.039	
9.5	31	41.7	0.499	0.14	0.028	
9.9	20	42.5		0.12	0.000	
10.3	0	0		0.08	0.000	
10.7	0	0		0	0.000	WW R/B
				Sum Q:	0.302	

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APPENDIX C

SEPTEMBER WATER QUALITY MONITORING TRIP RESULTS

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221 FAX: 604-984-0218

To: AGRA EARTH & ENVIRONMENTAL LIMITED ~*

BOX 3966, #3 - 3167 TATLOW ROAD
SMITHERS, BC
V0J 2N0

Project : KS00076
Comments: ATTN: SCOTT DAVIDSON

Certificate Date: 05-OCT-1999
Invoice No. : I9929585
P.O. Number :
Account : OXF

* PLEASE NOTE

CERTIFICATE OF ANALYSIS A9929585

PARAMETER DESCRIPTIONS	SAMPLE LOWER TENAS	SAMPLE TRIP BLANK	SAMPLE UPPER TENAS	SAMPLE FOUR CREEK	SAMPLE UPPER GOATHORN	SAMPLE LOWER GOATHORN	SAMPLE TELKWA RIVER	SAMPLE HUBERT CREEK	SAMPLE BULKLEY RIVER	
Sample preparation code	221	221	221	221	221	221	221	221	221	
Sample preparation code	---	---	---	---	---	---	---	---	---	
pH	8.0	7.9	7.7	8.0	7.9	7.8	7.8	7.3	7.7	
Conductivity (umhos/cm)	147	2	138	230	124	132	63	215	62	
Total Susp Solids (mg/L)	< 5	< 5	< 5	< 5	< 5	< 5	14	< 5	6	
SO4 mg/L - Ion Chrom.	2.9	< 0.1	2.5	1.5	27.4	26.6	4.8	0.5	4.6	
Alkalinity (mg/L CaCO3)	78	< 1	72	130	33	41	29	117	28	
Ammonia (mg/L N)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Nitrates (mg/L N)	< 0.05	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrites (mg/L N)	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Tot Organic Carbon(mg/L)	2.0	< 1.0	2.0	7.0	< 1.0	1.0	< 1.0	15.0	1.0	
Tot Hardness(mg/L CaCO3)	74.3	0.4	67.7	121.0	57.8	62.8	31.6	119.0	30.4	
Tot phosphates (mg/L P)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.05	0.04	0.03	
Chloride (mg/L)	0.2	< 0.1	0.1	0.4	0.1	0.2	0.1	0.7	0.2	

CERTIFICATION:

* pH ANALYSED SEPTEMBER 23, 1999, @ 14:15 HRS.

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221 FAX: 604-984-0218

To: AGRA EARTH & ENVIRONMENTAL LIMITED ~*

BOX 3966, #3 - 3167 TATLOW ROAD
SMITHERS, BC
V0J 2N0

Project : KS00076
Comments: ATTN: SCOTT DAVIDSON

Page Number : 1-A
Total Pages : 1
Certificate Date: 11-OCT-1999
Invoice No. : I9929588
P.O. Number :
Account : OXF

CERTIFICATE OF ANALYSIS A9929588

SAMPLE	PREP CODE	Ag ug/L	Al mg/L	As ug/L	Ba ug/L	Be ug/L	Bi ug/L	Ca mg/L	Cd ug/L	Co ug/L	Cr ug/L	Cu ug/L	Fe mg/L	Hg ug/L	K mg/L	Mg mg/L	Mn ug/L	Mo ug/L	Na mg/L	Ni ug/L
LOWER TENAS-TOT	221 2393	< 0.05	0.029	< 1	28.2	< 0.5	< 0.05	21.9	< 0.1	0.08	2.0	1.8	0.14	< 1	0.25	4.09	5.75	< 0.1	3.15	< 0.2
LOWER TENAS-DIS	221 --	< 0.05	0.006	< 1	27.2	< 0.5	< 0.05	21.7	< 0.1	0.08	3.0	2.0	0.10	< 1	0.25	4.04	3.65	< 0.1	3.10	< 0.2
TRIP BLANK-TOT	221 2393	< 0.05	0.027	< 1	< 0.05	< 0.5	< 0.05	0.05	< 0.1	< 0.02	2.0	0.6	0.04	< 1	< 0.05	< 0.001	0.15	< 0.1	< 0.05	< 0.2
TRIP BLANK-DIS	221 --	< 0.05	0.001	< 1	< 0.05	< 0.5	< 0.05	< 0.05	< 0.1	< 0.02	< 0.5	0.3	< 0.01	< 1	< 0.05	0.005	< 0.05	< 0.1	< 0.05	< 0.2
UPPER TENAS-TOT	221 2393	< 0.05	0.018	< 1	25.0	< 0.5	< 0.05	21.1	< 0.1	0.06	0.5	0.8	0.11	< 1	0.20	3.52	0.95	< 0.1	2.95	< 0.2
UPPER TENAS-DISS	221 --	< 0.05	0.009	< 1	23.4	< 0.5	< 0.05	19.45	< 0.1	0.06	0.5	2.0	0.11	< 1	0.20	3.25	0.80	0.1	2.95	< 0.2
FOUR CREEK-TOT	221 2393	< 0.05	0.061	< 1	79.5	< 0.5	< 0.05	25.6	< 0.1	0.10	2.0	1.2	0.16	< 1	0.50	11.85	0.95	0.1	5.95	0.4
FOUR CREEK-DISS	221 --	< 0.05	0.041	< 1	78.7	< 0.5	< 0.05	25.2	< 0.1	0.08	4.5	1.3	0.13	< 1	0.50	11.75	0.60	0.2	6.45	0.2
UPPER GOATHORN-T	221 2393	< 0.05	0.019	< 1	24.5	< 0.5	< 0.05	18.40	< 0.1	0.08	2.0	1.7	0.12	< 1	0.40	2.03	1.35	0.7	1.40	< 0.2
UPPER GOATHORN-D	221 --	< 0.05	0.010	< 1	23.5	< 0.5	< 0.05	17.80	< 0.1	0.06	0.5	1.8	0.10	< 1	0.35	2.01	1.10	0.7	1.40	0.2
LOWER GOATHORN-T	221 2393	< 0.05	0.018	< 1	50.3	< 0.5	< 0.05	17.75	< 0.1	0.18	2.0	1.1	0.13	< 1	0.40	2.83	2.85	0.5	1.65	< 0.2
LOWER GOATHORN-D	221 --	< 0.05	0.029	< 1	50.1	< 0.5	< 0.05	18.50	< 0.1	0.06	0.5	1.3	0.09	< 1	0.40	3.03	2.00	0.5	2.00	0.2
TELKWA RIVER-TOT	221 2393	< 0.05	0.583	< 1	41.2	< 0.5	< 0.05	9.50	< 0.1	0.40	2.5	2.4	0.80	< 1	0.40	1.490	35.7	0.5	1.00	0.6
TELKWA RIVER-DIS	221 --	< 0.05	0.048	< 1	26.9	< 0.5	< 0.05	9.35	< 0.1	0.04	< 0.5	0.9	0.08	< 1	0.30	1.215	11.60	0.5	0.95	< 0.2
HUBERT CREEK-TOT	221 2393	< 0.05	0.049	< 1	49.6	< 0.5	< 0.05	30.2	< 0.1	0.26	2.0	0.7	1.03	< 1	0.85	7.79	290	0.1	3.25	0.6
HUBERT CREEK-DIS	221 --	< 0.05	0.030	< 1	48.1	< 0.5	< 0.05	30.9	< 0.1	0.22	1.5	1.1	0.69	< 1	0.90	8.11	267	0.3	3.70	0.6
BULKLEY R.-TOT	221 2393	< 0.05	0.217	< 1	27.7	< 0.5	< 0.05	9.10	< 0.1	0.16	2.0	1.6	0.33	< 1	0.35	1.270	14.10	0.4	1.00	< 0.2
BULKLEY R.-DIS	221 --	< 0.05	0.048	< 1	22.7	< 0.5	< 0.05	9.50	< 0.1	0.02	< 0.5	1.6	0.08	< 1	0.35	1.300	5.55	0.6	1.70	< 0.2

CERTIFICATION:

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers

212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221 FAX: 604-984-0218

To: AGRA EARTH & ENVIRONMENTAL LIMITED ~*

BOX 3966, #3 - 3167 TATLOW ROAD
SMITHERS, BC
V0J 2N0

Project : KS00076
Comments: ATTN: SCOTT DAVIDSON

Certificate Date: 11-OCT-1999
Invoice No. :I9929588
P.O. Number :
Account :OXF

CERTIFICATE OF ANALYSIS A9929588

SAMPLE	PREP CODE	P mg/L	Pb ug/L	Sb ug/L	Se ug/L	Sn ug/L	Sr ug/L	Ti ug/L	Tl ug/L	U ug/L	V ug/L	Zn ug/L
LOWER TENAS-TOT	221 2393	0.4	< 2	0.20	< 1	< 0.5	89.4	< 1	< 0.05	0.05	< 1	< 0.5
LOWER TENAS-DIS	221 --	< 0.1	10	0.15	< 1	< 0.5	86.7	< 1	< 0.05	0.05	1	< 0.5
TRIP BLANK-TOT	221 2393	0.4	< 2	< 0.05	< 1	< 0.5	< 0.05	< 1	< 0.05	< 0.05	< 1	< 0.5
TRIP BLANK-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	< 0.05	< 1	< 0.05	< 0.05	< 1	< 0.5
UPPER TENAS-TOT	221 2393	0.3	< 2	0.15	< 1	< 0.5	85.6	< 1	< 0.05	0.05	1	< 0.5
UPPER TENAS-DISS	221 --	< 0.1	< 2	0.15	< 1	< 0.5	80.7	< 1	< 0.05	0.05	< 1	0.5
FOUR CREEK-TOT	221 2393	0.4	< 2	< 0.05	< 1	< 0.5	147.5	< 1	< 0.05	0.05	< 1	< 0.5
FOUR CREEK-DISS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	141.5	< 1	< 0.05	0.05	1	1.5
UPPER GOATHORN-T	221 2393	0.5	< 2	0.05	< 1	< 0.5	52.8	1	< 0.05	< 0.05	< 1	0.5
UPPER GOATHORN-D	221 --	< 0.1	< 2	0.05	< 1	< 0.5	51.4	< 1	< 0.05	< 0.05	< 1	1.0
LOWER GOATHORN-T	221 2393	0.4	< 2	0.05	< 1	< 0.5	56.4	1	< 0.05	< 0.05	< 1	< 0.5
LOWER GOATHORN-D	221 --	< 0.1	< 2	0.05	< 1	< 0.5	57.0	< 1	< 0.05	< 0.05	< 1	0.5
TELKWA RIVER-TOT	221 2393	0.5	< 2	< 0.05	< 1	< 0.5	44.2	20	< 0.05	0.05	< 1	3.5
TELKWA RIVER-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	41.3	< 1	< 0.05	< 0.05	< 1	< 0.5
HUBERT CREEK-TOT	221 2393	0.4	< 2	< 0.05	< 1	< 0.5	108.0	2	< 0.05	0.05	< 1	< 0.5
HUBERT CREEK-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	106.5	< 1	< 0.05	0.05	< 1	1.0
BULKLEY R.-TOT	221 2393	0.5	< 2	< 0.05	< 1	< 0.5	37.9	8	< 0.05	< 0.05	< 1	< 0.5
BULKLEY R.-DIS	221 --	< 0.1	< 2	< 0.05	< 1	< 0.5	37.5	< 1	< 0.05	< 0.05	< 1	1.0

CERTIFICATION:

I called Scott and requested edits. He will forward final copies + email electronic. No work in 2000.
ALLAN, 7 PAGES Feb 29/00. .ab
DRAFT 1999 REPORT
SORRY FOR THE DELAYS.
APP. A + FIELD DATA SUMMARY APPENDIX TO BE ADDED

February 15, 2000
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

780
Attention: **Mr. Allan Flemming, P.Eng.** Fax: ~~403~~ 420-5875

Dear Mr. Flemming:

RE: TELKWA COAL PROJECT 1999 BASELINE DATA REPORT

1.0 INTRODUCTION

AGRA Earth & Environmental Limited is pleased to present the 1999 Baseline Surface Water Flow and Water Quality Monitoring Report for the Telkwa Coal Project (TCP). The TCP is a proposed open pit coal mine located near Telkwa, B.C. and owned by Luscar Inc. (Luscar). The location of the mine is illustrated on Figure 1. This report contains the data collected during the 1999 baseline monitoring program and updates the rating curves for sites where discharge measurements were conducted.

2.0 SCHEDULE OF 1999 SITE VISITS

The schedule of site visits for the 1999 field monitoring program is contained in the March 3, 1999 AGRA proposal to conduct the TCP baseline monitoring. A copy of the AGRA proposal is contained in Appendix A for reference. The dates of actual site visits and a listing of the work conducted during the site visits is contained in Table 1. The discharge measurement focus was on the low flow periods.

TABLE 1
1999 Monitoring Site Visits

Week of:	Feb 1	Aug 1	Sept 19	Nov 14
Telkwa River	WQ		WQ	
Upper Tenas Creek	No site access		SM, WQ, Q	S
Lower Tenas Creek	WQ, Q	S	SM, WQ, Q	S
Bulkley River	WQ		WQ	
Hubert Creek	WQ, S	S	WQ, S	S
Four Creek	WQ	S	WQ, Q	S
Upper Goathorn Creek	WQ, Q		SM, WQ, Q	S
Lower Goathorn Creek	WQ		WQ	

Q = Discharge and stage measurements conducted
S = Stage measurements conducted
WQ = Water quality sampling conducted
SM = Site Maintenance Visit

The purpose of the August field trips was to collect peak flow information from the crest gauges at each site and to survey the equipment and benchmarks at each site for the low flow period.

3.0 SURFACE WATER MONITORING RESULTS

This section contains a summary of the five sites where surface water monitoring was conducted during the 1999 field season. Summary field data for the site visits is contained in Appendix B.

3.1 LOWER TENAS CREEK SITE

The lower Tenas Creek site was visited four times as part of the 1999 monitoring program. The station was operated as a manual sampling with no installation of the automated equipment used in previous years.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.041 m^3/s and 0.163 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 2.

An initial crest gauge installed in late 1998 at the site was replaced during the 1999 sampling season. Level surveys conducted at the site during the 1999 field season did not show significant shift of the benchmarks or the staff gauge. There was evidence of sand deposition noted near the gauge during the November 1999 field visit.

3.2 UPPER TENAS CREEK SITE

The upper Tenas Creek was visited twice during the 1999 monitoring program. There was no site access during the February 1999 field trip. As the crest gauge for this site was not checked and reset during February, this site was not visited during the August field trip.

The crest gauge was checked during September and the maximum stage was observed to be 0.70 m. This value would translate to a discharge of 8.43 m^3/s and is expected to be due to the spring freshet which consistently produces greater discharges than the fall peak flows. The low flow measurement from September 20th was 0.134 m^3/s. An updated rating curve for this site is shown in Figure 3. The two 1999 data points plot above the current stage-discharge relation. AGRA proposes that one high flow measurement be conducted at this site during the 2000 field season to determine whether the rating curve should be shifted upwards.

The September field visit to this site showed that the braces for the staff gauge had snapped but that the staff gauge did not appear to have shifted (based on a review of previous site photographs). Braces at the site were replaced and a third benchmark was added on the right bank side of the stream. Levelling checks showed that there was no significant shift of the benchmarks or the staff gauge during 1999. The breakage of the braces resulted in slight downstream leaning of the staff gauge mounting but this was corrected during the site

maintenance visit.

3.3 UPPER GOATHORN CREEK SITE

The upper Goathorn Creek site was visited four times during the 1999 monitoring program. The station was monitored as a manual station with a staff gauge and crest gauge.

The two low flow discharge measurements conducted during February and September yielded discharges of 0.097 m^3/s and 0.337 m^3/s respectively. These discharge measurements have been added to the rating curve and a revised rating curve for this site is shown in Figure 4.

Maintenance of the gauge equipment was conducted during the September visit . The bracing for the staff gauge was reinforced and the staff gauge was lowered by a distance of 0.19 m. A second staff gauge was added to the top of the first staff gauge to allow for visual measurement of peak flow levels during the freshet period. The level check of benchmarks showed that there were no changes in the elevations of the benchmarks. The staff gauge did not show any significant shift during the 1999 season.

problem with chart

3.4 FOUR CREEK SITES

Two sampling locations were operated on Four Creek during the 1999 field season. The low flow discharge measurements were made at the lowest road culvert crossing of Four Creek. Other stage measurements and water quality sampling were conducted at the original stream flow sampling site located approximately 1,800 m upstream of the culvert crossing on Four Creek.

Discharges for the low flow periods were determined by calculation of the discharge through the culvert based on the known inlet water levels and the culvert characteristics. The February low flow measurement revealed that there was only a small quantity of baseflow (< 1L/min) during the sampling trip. The culvert was almost completely iced up. The September low flow discharge for the culvert was calculated to be 0.077 m^3/s.

3.5 HUBERT CREEK SITE

The Hubert Creek site was visited four times during the 1999 monitoring program. Readings for the staff gauge are available from two of the site visits. Visits conducted during September and November did not yield useful data on flow levels due to numerous partial blockages of the culvert inlet by debris.

The crest gauge at the site indicated that there was a recorded stage greater than 1.23 m during the spring 1999 freshet period. This high stage is believed to be partially due to beaver debris blockage of the inlet of the Hubert Creek culvert.

4.0 WATER QUALITY MONITORING RESULTS

In 1999, baseline water chemistry was sampled during the two low flow periods at ten sites in the proposed Telkwa Coal Project area. The data for the February 1999 water quality monitoring was forwarded directly to Luscar as previously arranged. The laboratory results for the September water quality trip are included in Appendix C of this report. No analysis of the testing data, other than to identify specific stations where the BC Water Quality Criteria (Nagpal, 1995) were exceeded. A summary of metals and stations where exceedances occurred are summarized in Table 2. Due to operator error during the September 1999 water quality field trip, triplicate sampling was not conducted. A blank sample obtained from Chemex did not have any exceedances.

77
↖ QA/QC not done properly

TABLE 2: B.C. WATER QUALITY CRITERIA EXCEEDANCE INFORMATION FOR THE SEPTEMBER 20, 1999 SAMPLING TRIP

METAL	B.C. WATER QUALITY CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS GREATER THAN THE B.C. CRITERIA	STATIONS WITH TOTAL METALS CONCENTRATIONS EQUAL TO THE B.C. CRITERIA
Cr	2.0 ug/L	Telkwa River (2.5)	Upper Goathorn Creek, Lower Goathorn Creek, Bulkley River, Hubert Creek, Lower Tenas, Four Creek
Cu	2.0 ug/L	Telkwa River (2.4)	
Fe	0.3 mg/L	Telkwa River (0.8), Hubert Creek (1.03), Bulkley River (0.33)	
Zn	3.0 ug/L	Telkwa River (3.5)	

5.0 CLOSURE

AGRA Earth Environmental Limited is pleased to present this 1999 data summary to Luscar Ltd. AGRA looks forward to continuing to work with Luscar on the Telkwa Coal project over the 2000 season. Should you have any questions concerning this project please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully Submitted,

Reviewed by,

Scott Davidson, M.Sc., P.Geo.
Project Manager

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

Dennis Trotter
Senior Toxicologist

02/16/00 WED 11:55 FAX 250 847 9049 AGRA SMITHERS 009/009

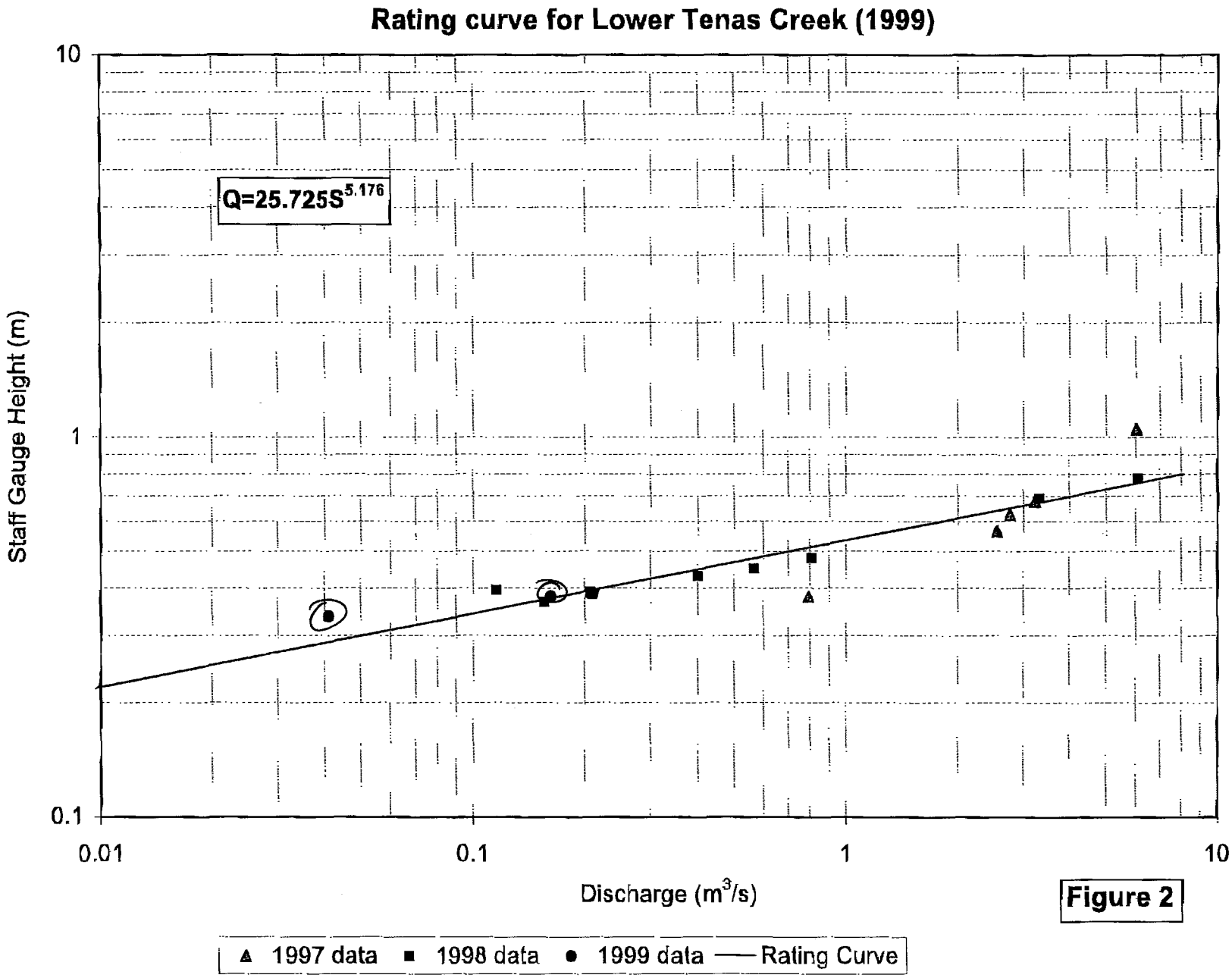

Figure 2

02/16/00 WED 11:55 FAX 250 847 9049 AGRA SMITHERS 005

Rating Curve for Upper Tenas Creek (1999)

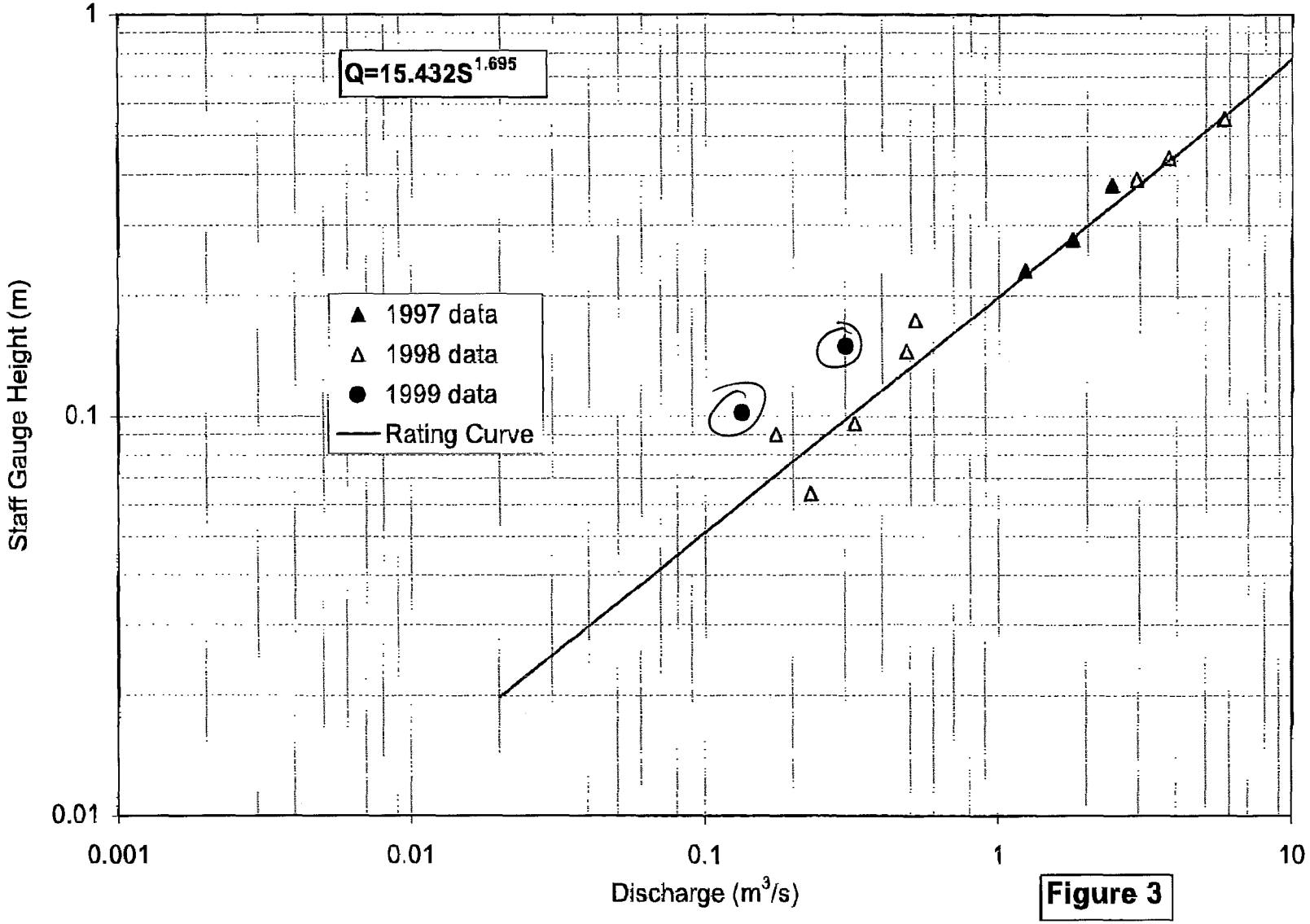

Figure 3

Graph. Did not change from 1998
(slope/intercept

rcurve-98.xls

15/02/2000

02/16/00 WED 11:56 FAX 250 847 9049 AGRA SMITHERS

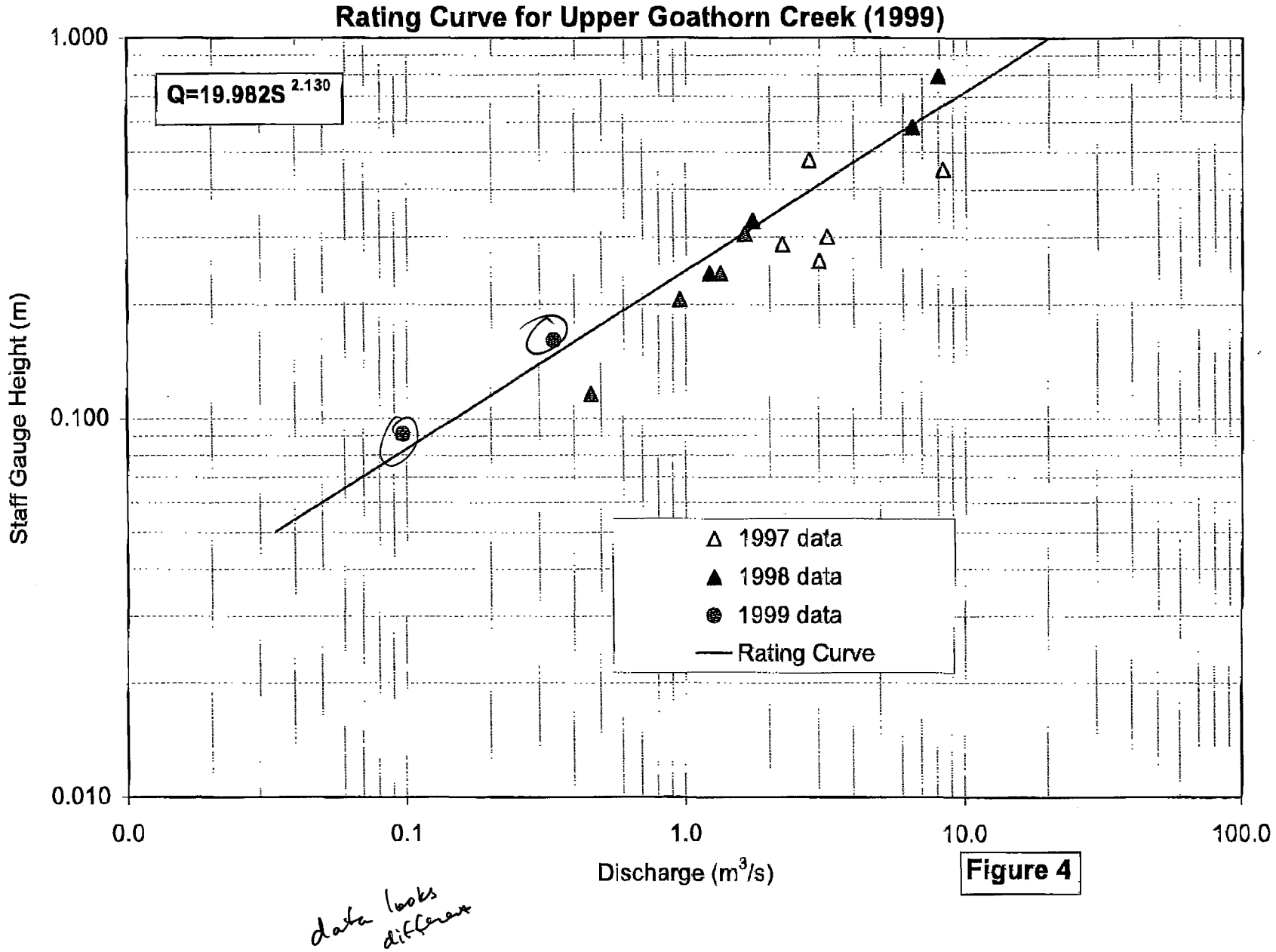

Figure 4

data looks different

AGRA
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
Box 3966
#3-3167 Tatlow Road
Smithers, B.C. V0J 2N0
Tel (250) 847-8783
Fax (250) 847-9049

June 8, 1999

KS00076

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton,AB. T5J 3G1

Attention: Allan Flemming, P.Eng.
Project Engineer

RE: 1999 DATA REPORT UPDATE

Dear Mr. Flemming,

AGRA Earth & Environmental Limited (AGRA) is pleased to present LuscarLtd. (Luscar) with this report containing data collected as part of the 1999 Telkwa Coal Surface Water and Water Quality Baseline Monitoring Program. The data presented in this report includes low flow data from February 1999 and the results of the site visits conducted during April and May to re-establish the crest gauges at selected sites.

LOW FLOW MONITORING TRIP

Low flow monitoring was conducted at sites on February 16th and 17th, 1999. During this trip water quality sampling was also completed; the data was directly forwarded from Chemex Labs to Luscar. The list of sites and the sampling completed is presented in Table 1.

Table 1. Low Flow Monitoring Trip Summary

SITE	FLOW CONDITIONS	WATER QUALITY SAMPLING
Telkwa River	Water level was 45 cm below the level of the main staff gauge located on the old bridge pilings.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Lower Goathorn Creek	There was some flow in the creek below approximately 30 cm of ice.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Four Creek	No evidence of flow at the lower culvert crossing.	No samples collected.
Upper Goathorn Creek	Water level was 0.1 m below the staff gauge. Discharge was measured to be 0.097 m^3/s.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Lower Tenas Creek	Staff gauge reading 0.337 m. Discharge was measured to be 0.041 m^3/s.	Samples for total metals, dissolved metals and general nutrient analysis were collected.
Hubert Creek	Staff gauge iced up; Unable to estimate water level. Discharge estimated from outlet velocity and depth to be 0.024 m^3/s.	Samples for total metals, dissolved metals and general nutrient analysis were collected.

RE-ESTABLISHMENT OF CREST GAUGES AND BENCHMARKS

The monitoring program was revised to meet Luscar's request to monitor peak flows at the study streams using only crest gauges. The crest gauges were visited at accessible sites to add cork and to check the relative elevations of staff gauges and crest gauges to site benchmarks. Table 2 contains a summary of the work completed in re-establishing the monitoring gauges.

As a result of weather conditions during April and May, the re-establishment of crest gauges required that multiple field trips be made. The two upper sites on Goathorn Creek and Tenas Creek were not accessable during May due to snow and road conditions. Therefore, AGRA did not re-establish these upper two sites, but chose instead to collect peak flow information from the lower sites on these streams. This was deemed to be the most effective use of available resources and budget given ground conditions. Peak flow levels will be determined during a field trip to be made to sites during July 1999. No crest stage readings for the Upper Goathorn and Upper Tenas sites until the july visit.

Table 2. Site Re-establishment for Peak Flow Determination

SITE	DATE VISITED	WORK COMPLETED
Telkwa River	April 14th, 1999	Water level was 45 cm below the level of the staff crest gauges at the site.
Hubert Creek	April 14th, 1999	Cork added to the crest gauge at the site. Staff gauges and benchmarks leveled for determining offsets.
Tailings Pond	April 16th, 1999	Cork added to the crest gauge at the site. Weir face, staff gauge and benchmarks leveled for determining offsets.
Four Creek	May 12th, 1999	Cork added to the crest gauge at the original site. Staff gauge and benchmarks leveled for determining offsets.
Lower Tenas Creek	May 12th, 1999	Cork added to the crest gauge at the site. Staff gauge and benchmarks leveled for determining offsets.
Lower Goathorn Creek	No work conducted at the site maintained by the WSC .	
Upper Tenas Creek	(May 12th, 1999)	No access to site because of snow and road conditions.
Upper Goathorn Creek	(May 12th, 1999)	No access to site because of snow and road conditions.

AGRA Earth & Environmental Limited is pleased to present this summary of data collection and work completed to date on the Telkwa Coal Project. Digital copies of the collected data will be forwarded to Luscar. Should you require any further information on this project please do not hesitate to contact the undersigned at (250) 847-8783.

Respectfully submitted,

AGRA Earth & Environmental Limited

Scott Davidson, M.Sc., P.Geo.
Project Manager

Reviewed by

Gary R.E. Beckstead, Msc., P.Eng.
Senior Project Manager

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
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Tel (250) 847-8783
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March 2, 1999
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-5875

Dear Mr. Flemming:

Re: Telkwa Coal Mine
Revised 1999 Budget

1.0 SURFACE WATER MONITORING

AEE is pleased to present this revised budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program may need to be revised to meet the construction plan for the mine.

2.0 WORK PROGRAM AND BUDGET

The work program proposed for 1999 is as follows:

<u>Surface Water Flow</u>

- Concentration of the base program on the winter and summer low flow periods.
- Monitoring of low flows on Four Creek, Hubert Creek, Tenas Creek, Upper Goathorn Creek and Lower Goathorn Creek. No monitoring will be conducted on Helps Creek, Telkwa River, and the Bulkley River. Low flow monitoring will result in two site visits. To reduce cost to Luscar, AEE has scheduled the summer low flow period measurement trip to coincide with site visit #3 described below.
- Monitoring of peak flows at the streams using crest gauges already installed at all of the existing sites. To conduct this portion of the required work, AEE will conduct a total of four sites visits planned as follows:

1. Pre-freshet to set up crest and staff gauges and survey to local bench marks (April),
2. Post freshet to record peak flow during period and survey to local bench marks (June),
3. Pre fall high flow period to re-survey benchmarks and survey to local bench marks (late August to early September),

4. Post fall high flow to record peak flow and survey to local bench marks (November).

Water Quality

- Sampling of baseline parameters for the two low flow periods only.

Data Analysis

AEE proposes to conduct data analysis and reporting for the 1999 sampling program following each monitoring trip. A data analysis period has been allowed following each of the five surface flow site visits (one low flow and four peak flow visits) described above. The information reports from each trip will assist Luscar in public meetings by providing the most up to date information on the project.

Project Management

Project management involves dealing with items such as cost control, client liaison, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. For the 1999 sampling program, AEE proposes to conduct project management on a cost plus basis. The totals for this item in the attached Table 1 represent estimates of the total budget required for project management. AEE will make every effort to ensure that it conducts stringent cost control on the project management for Luscar. Project management for the 1999 program will be conducted by Mr. Scott Davidson, M.Sc., P.Geo. of the Smithers office. Mr. Gary Beckstead, M.Sc., P.Eng. and Mr. Dennis Trotter will provide technical input and review to the project as required.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. If you have any questions or require further information concerning this project, please call Scott Davidson at (250) 847-8783 or Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Reviewed by

Scott Davidson, M.Sc., P.Geo.
Project Manager
C:\files\working\Luscar\1999\revised budget99.wpd
cc. Gary R.E. Beckstead, AEE - Calgary

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

Table 1
Budget Estimate for 1999 Hydrometric Monitoring and Water Quality Sampling
Telkwa Coal Project

Task	Assumptions	Month												Total
		Jan	Feb	Mar.	Apr.	May	June	Jul.	Aug	Sept.	Oct	Nov.	Dec.	
Surface Flow Monitoring	1,3,4,6													
Labour		$ -	$ 3,240.00	$ -	$1,350.00	$ -	$ 1,284.00	$ -	$1,284.00	$ -	$ -	$1,080.00	$ -	$ 6,238.00
Disbursements		$ -	$ 378.00	$ -	$ 189.00	$ -	$ 189.00	$ -	$ 189.00	$ -	$ -	$ 189.00	$ -	$ 1,134.00
Water Quality	1,5,6,7													
Sampling		$1,115.00	$ 2,838.00	$ -	$ -	$ -	$ -	$ -	$ 428.00	$ -	$ -	$ -	$ -	$ 4,381.00
Disbursements		$ 310.20	$ 645.00	$ -	$ -	$ -	$ -	$ -	$ 100.00	$ -	$ -	$ -	$ -	$ 1,055.20
Data Analysis	1													
Labour		$ -	$ -	$ 970.00	$ 970.00	$ -	$ 970.00	$ -	$ -	$ 970.00	$ -	$ 970.00	$ -	$ 4,850.00
Disbursements		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Project Management	1,2													
Labour		$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 150.00	$ 1,800.00
Disbursements		$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 25.00	$ 300.00
Total (Required Work)		$1,600.20	$ 7,276.00	$ 1,145.00	$2,684.00	$ 175.00	$ 2,616.00	$ 175.00	$2,176.00	$ 1,145.00	$ 175.00	$2,414.00	$ 175.00	$ 21,758.20

Assumptions:
1 The above budget is based on the Fw rate schedule
2 Project Management is quoted as an estimated maximum budget and will be billed on a cost plus basis.
3 The summer low flow period extends over August and September
4 The winter low flow period extends over February and March
5 The January water quality sampling costs represent the Selenium sampling
6 Disbursements listed under Water Flow and Water Quality are estimates for sampling equipment and vehicle expenses and do not include 10% handling charge
7 All Laboratory Analysis is to be directly billed to Luscar Ltd.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

Faxed to JED at NDM.
For your comment
al 2.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
Box 3966
#3, 3167 Tatlow Road
Smithers, BC
Canada V0J 2N0
Tel (250) 847-8783
Fax (250) 847-9049

January 29, 1999
CW1537.1

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-5875

Dear Mr. Flemming:

Re: Telkwa Coal Mine
Revised 1999 Budget

1.0 SURFACE WATER MONITORING

As per the January 26th, 1999 discussion between Gary Beckstead of AGRA Earth & Environmental Limited (AEE) and Allan Flemming of Luscar Ltd. (Luscar), AEE is pleased to present this revised budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program may need to be revised to meet the construction plan for the mine.

2.0 WORK PROGRAM AND BUDGET

The revised budget presented in Table 1 is based on the scope of services requested by Luscar at the January 26th, 1999 meeting. The work program proposed for 1999 is as follows:

Surface Water Flow

Up + L

- Concentration of the base program on the winter and summer low flow periods.
- Monitoring of low flows on Four Creek, Hubert Creek, ~~Holps Creek~~, Upper Goathorn Creek and Lower Goathorn Creek. No monitoring will be conducted on Tenas Creek, Telkwa River, and the Bulkley River.
- Monitoring of peak flows at the streams using crest gauges already installed at all of the existing sites. To conduct this portion of the required work, AEE must visit all sites during April to ensure that the sites are ready for the peak flow period (i.e. Checking of staff gauges and crest gauges). During November time has been allocated for conducting a final site visit to all sites to determine their condition prior to winter.
- A cost option has been prepared to operate the data loggers and pressure transducers at the continuous monitoring sites and to conduct a single high flow discharge measurement.

Water Quality

- Sampling of baseline parameters for the two low flow periods only.
- Sampling of metals for the two low flow periods.

Selenium sampling was requested to be deleted from the scope of work for 1999, however, the sampling for this was completed prior to receiving notification from Luscar. It is the expectation of AEE that the costs of this sampling will be paid by Luscar as the work was conducted at the request of Mr. Jerry Demchuck, the environmental coordinator for the Telkwa Coal Project. All future requests for increased sampling will not be initiated by AEE until a signed order to proceed with the work has been received from Luscar.

Not true.

Reporting

AEE proposes to conduct reporting for the 1999 sampling program following each monitoring trip. A data memo will be issued to Luscar presenting the results of the monitoring trip. This information will assist Luscar in public meetings by providing the most up to date information on the project. The costs of reporting for the optional water flow monitoring program are included in Table 1 as an additional cost of approximately $530.00 per monthly report.

Project Management

Project management involves dealing with items such as cost control, client liaison, responding to requests for extra work, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. For the 1999 sampling program, AEE proposes to conduct each portion of the project as separate tasks. On receiving a request for extra work, AEE will issue to Luscar for approval, a change of work order along with an expected budget to complete the extra work. Project management for the 1999 program will be conducted by Mr. Scott Davidson, M.Sc., P.Geo. of the Smithers office. Mr. Gary Beckstead and Mr. Dennis Trotter will provide technical input and review to the project as required.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. If you have any questions or require further information concerning this project, please call Scott Davidson at (250) 847-8783 or Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Scott Davidson, M.Sc., P.Geo.
Project Manager
C:\files\working\Luscar\1999\revised budget99.wpd

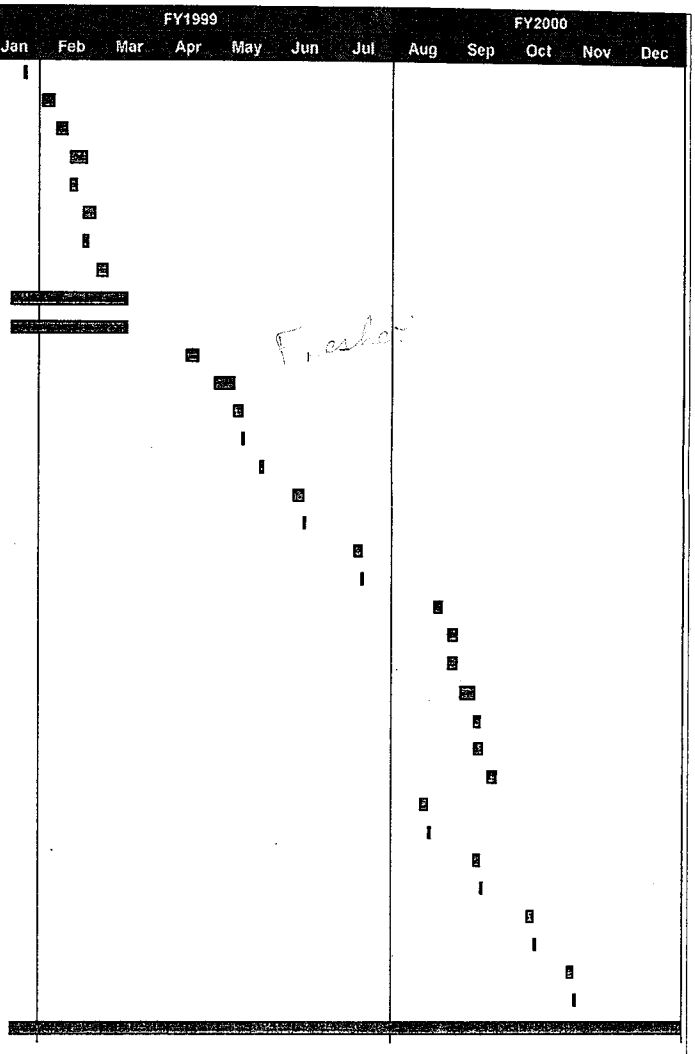
Reviewed by

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Water Resource Engineer

cc. Gary R.E. Beckstead, AEE - Calgary
Jerry Schmidt, AEE - Prince George

CW1537.00 Task 1999 Luscar Ltd.

Task Name	Start Date	Effort	End Date
Selenium Sampling Trip	1/21/99	2.00d	1/21/99
Winter Water Quality Trip	1/31/99	3.00d	2/5/99
Winter Revised Metals Sampling Trip	2/7/99	1.13d	2/12/99
Winter Revised Metals Sampling Trip	2/14/99	1.13d	2/22/99
Winter Low Flow Discharge Measurement	2/14/99	3.00d	2/17/99
Winter Revised Metals Sampling Trip	2/21/99	1.13d	2/26/99
Winter Low Flow Discharge Measurement	2/21/99	3.00d	2/23/99
Winter Revised Metals Sampling Trip	2/28/99	1.13d	3/5/99
Lab Calibration of Pressure Transducers	1/15/99	2.00d	3/15/99
Other Lab Prep Time Associated with Equipment Preparation	1/15/99	4.00d	3/15/99
All Sites Visit	4/15/99	4.00d	4/21/99
Installation of Automated Sites	4/30/99	2.00d	5/10/99
All Sites Visit, Data Download	5/10/99	3.00d	5/14/99
Data Analysis	5/14/99	1.00d	5/14/99
High Flow Discharge Measurement	5/24/99	4.00d	5/25/99
All Sites Visit and Data Download	6/10/99	3.00d	6/15/99
Data Analysis	6/15/99	1.00d	6/15/99
All Sites Visit and Data Download	7/12/99	3.00d	7/15/99
Data Analysis	7/16/99	1.00d	7/16/99
Summer Water Quality Trip	8/23/99	3.00d	8/26/99
Summer Revised Metals Sampling Trip	8/30/99	0.75d	9/3/99
Low Flow Discharge Measurement	8/30/99	3.00d	9/3/99
Summer Revised Metals Sampling Trip	9/6/99	0.75d	9/13/99
Summer Revised Metals Sampling Trip	9/13/99	0.75d	9/16/99
Low Flow Discharge Measurement	9/13/99	3.00d	9/17/99
Summer Revised Metals Sampling Trip	9/20/99	0.75d	9/24/99
All Sites Visit and Data Download	8/16/99	3.00d	8/19/99
Data Analysis	8/20/99	1.00d	8/20/99
All Sites Visit and Data Download	9/13/99	3.00d	9/16/99
Data Analysis	9/17/99	1.00d	9/17/99
All Sites Visit, Data Download	10/11/99	5.00d	10/14/99
Data Analysis	10/15/99	1.00d	10/15/99
Decommissioning of Sites/All Sites Visit	11/1/99	2.00d	11/4/99
Data Analysis	11/5/99	1.00d	11/5/99
Project Management	1/15/99	5.75d	12/31/99



Hobart
Four Creek (contd)
LT
UG
LG quality (WSC) did

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

Table 1
Budget Estimate for 1999 Hydrometric Monitoring and Water Quality Sampling
Telkwa Coal Project

Task	Assumptions	Month												Total
		Jan	Feb	Mar.	Apr.	May	June	Jul.	Aug	Sept.	Oct	Nov.	Dec.	
Required Flow Monitoring	1,2,3,4,8,9													
Labour		$ -	$ 3,240.00	$ -	$2,160.00	$ -	$ -	$ -	$1,284.00	$ 1,284.00	$ -	$ 856.00		$ 8,824.00
Disbursements		$ -	$ 378.00	$ -	$ 189.00	$ -	$ -	$ -	$ 189.00	$ 189.00	$ -	$ 69.30		$ 1,014.30
Optional Flow Monitoring	1,4,7,8,9													
Labour		$ -	$ -	$ -	$1,560.00	$ 3,974.00	$ 1,814.00	$ 1,814.00	$1,814.00	$ 1,814.00	$1,814.00	$1,376.00		$ 15,980.00
Disbursements		$ -	$ -	$ -	$ 300.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00	$ 249.00		$ 2,043.00
Water Quality	1,2,3,5,8,9,10													
Sampling		$1,115.00	$ 2,838.00	$ 493.00	$ -	$ -	$ -	$ -	$1,674.00	$ 1,545.00	$ -	$ -	$ -	$ 7,665.00
Disbursements		$ 310.20	$ 645.00	$ 169.00	$ -	$ -	$ -	$ -	$ 407.00	$ 407.00	$ -	$ -	$ -	$ 1,938.20
Reporting	1,6,7													
Labour		$ -	$ 785.00	$ 635.00	$ 472.50	$ -	$ -	$ -	$ 597.50	$ 1,232.50	$ -	$ 472.50	$ -	$ 4,195.00
Disbursements		$ -	$ 100.00	$ 100.00	$ 100.00	$ -	$ -	$ -	$ 100.00	$ 100.00	$ -	$ 100.00	$ -	$ 600.00
Project Management	1,8													
Labour		$ 780.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 405.00	$ 5,235.00
Disbursements		$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 100.00	$ 1,200.00
Total (Required Work)		$2,305.20	$ 8,491.00	$ 1,902.00	$3,426.50	$ 505.00	$ 505.00	$ 505.00	$4,756.50	$ 5,262.50	$ 505.00	$2,002.80	$ 505.00	$ 30,671.50
Total (Optional Work)		$ -	$ -	$ -	$1,860.00	$ 4,223.00	$ 2,063.00	$ 2,063.00	$2,063.00	$ 2,063.00	$2,063.00	$1,625.00	$ -	$ 18,023.00

Assumptions:

1 The above budget are based on the Fw rate schedule
2 The summer low flow period extends over August and September
3 The winter low flow period extends over February and March
4 The Optional Water Flow Sampling would result in 1 monthly monitoring visit per month and 1 discharge measurement during May 1999
5 The January water quality sampling costs represent the Selenium sampling
6 Reporting costs are for the preparation of summary reports following completion of required project tasks
7 Reporting Costs from the Optional Water Flow program would be approximately $530.00 per monthly update report
8 Internal Disbursements are to be billed at Cost Plus 10% with information on these disbursements provided to Luscar Ltd..
9 Disbursements listed under Water Flow and Water Quality are estimates for sampling equipment and vehicle expenses and do not include 10% handling charge.
10 All Laboratory Analysis is to be directly billed to Luscar Ltd.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

CC: JED for comment

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

January 21, 1999
CW1537.901.1

DRAFT

Way, way too much.

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng. Fax: (403) 420-4089

Dear Mr. Flemming:

Re: Telkwa Coal Mine
1999 Budget

1.0 SURFACE WATER MONITORING

As per the January 19th, 1999 discussion between Gary Beckstead of AGRA Earth & Environmental Limited (AEE) and Allan Flemming of Luscar Ltd. (Luscar), AEE is pleased to present this "**draft**" budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. This draft will be discussed with you at your office on January 26th, 1999. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program will need to be revised.

2.0 WORK PROGRAM AND BUDGET

AEE's proposed 1999 work program is intended to allow for revision of the program during the year. Table 1 presents the monthly budget breakdown for 1999.

The work program proposed for 1999 is as follows:

Surface Water Flow

- Three winter low flow discharge measurements on the Telkwa River;
- Five free flow period discharge measurements at all sites[1];
- An initial site visit during spring followed by an installation trip to sites; and
- Seven trips to perform routine maintenance and downloading of continuous sites.

---

[1] The Telkwa River will only be measured during three of the five free flow discharge measurement trips

Water Quality

- Four trips are scheduled for seasonal baseline water quality sampling;
- One sediment collection trip is included with the seasonal baseline trips; and
- High frequency revised metals sampling program started in 1998 is currently scheduled for continuation in 1999[2].

Reporting

AEE proposes to conduct reporting for the 1999 sampling program at approximately four month intervals. By separating the reporting into smaller pieces, AEE expects to be able to realize cost savings over the previous annual report preparation costs. The issuing of three data reports during 1999 will also allow for easier revision of the sampling program following submittal of the Final Project Report and project certification.

Project Management

Project management involves dealing with items such as cost control, client liaison, responding to requests for extra work, and interfacing with other consultants working for Luscar on the proposed Telkwa Coal Mine. AEE has found that the project management required for the proposed Telkwa Coal Mine exceeded the original budget estimate. Based on an analysis of previous work, AEE has revised its method of project management for the 1999 sampling program. AEE feels that the revisions made to project management will simplify tracking of costs for each phase of the project.

Previous requests for extra work conducted by AEE on the Telkwa Coal project were often accompanied by a directive to bill the work to the existing sampling program budget. For the 1999 sampling program, AEE proposes to conduct each portion of the project as separate tasks. On receiving a request for extra work, AEE will issue to Luscar for approval, a change of work order along with an expected budget to complete the extra work.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project and look forward to continuing to work with Luscar on the proposed Telkwa Coal Mine during 1999. It is the understanding that AEE and Luscar will discuss this draft budget during

---

[2] The revised sampling program is intended to determine the optimum sampling frequency for project. Following the winter and spring sampling trips, AEE should have sufficient data to determine the optimum sampling frequency allowing for modification of the water quality program.

a meeting scheduled for Tuesday, January 26th, 1999. Other items which I would like to discuss with you on Tuesday include:

- miscellaneous disbursement charge (% of fees); and
- possible shift of Project Manager to Scott Davidson in Smithers.

If you have any questions or require further information prior to this meeting, please call Gary Beckstead at (403)235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Scott Davidson, M.Sc., P.Geo.
Smithers Office Manager

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

GREB/km

attach.

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(Low (2)
① Four
② Hubert/Helps
③ Goathorn (2)

Staff guages for high flow
+ option for datalogger

low flow (2 times)
high flow (2 times)

Quality winter low flow

data reports after low flow
Not big reports

Purchase Order

Tenas
Telkwa
Bulkley

— no % of disbursements
itemize

DRAFT

Table 1
Budget Estimate for 1999 Hydrometric Monitoring and Water Quality Sampling
Telkwa Coal Project

Task	Personnel	Month												Total
		Jan	Feb	Mar.	Apr.	May	June	Jul.	Aug	Sept	Oct	Nov.	Dec.	
Flow Monitoring														
Labour		$ -	$ 4,425.00	$ 3,160.00	$ 2,160.00	$ 3,546.00	$ 4,036.00	$ 3,088.00	$ 3,088.00	$ 1,802.00	$ 2,660.00	$ 1,376.00		$ 29,341.00
Disbursements		$ -	$ 501.60	$ 165.00	$ 69.30	$ 396.00	$ 522.50	$ 737.00	$ 440.00	$ 69.30	$ 289.30	$ 69.30		$ 3,259.30
Water Quality														
Sampling		$ 1,115.00	$ 3,013.00	$ 743.00	$ -	$ 1,265.00	$ 2,160.00	$ 2,332.00	$ 835.00	$ 1,940.00	$ -	$ -	$ -	$ 13,403.00
Disbursements		$ 310.20	$ 4,442.90	$ 675.40	$ -	$ 5,183.20	$ 1,350.80	$ 4,901.60	$ 1,350.80	$ 5,989.50	$ -	$ -	$ -	$ 24,204.40
Reporting														
Labour		$ -	$ -	$ -	$ -	$ 1,350.00	$ -	$ -	$ -	$ 2,600.00	$ -	$ -	$ 3,620.00	$ 7,570.00
Disbursements		$ -	$ -	$ -	$ -	$ 120.00	$ -	$ -	$ -	$ 120.00	$ -	$ -	$ 120.00	$ 360.00
Project Management														
Labour		$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 780.00	$ 9,360.00
Disbursements		$ -	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$60.00	$ 660.00
Total		$ 2,205.20	$ 13,222.50	$ 5,583.40	$ 3,089.30	$ 12,700.20	$ 8,909.30	$ 11,898.60	$ 6,553.80	$ 13,360.80	$ 3,789.30	$ 2,285.30	$ 4,580.00	$ 88,157.70
Personnel		$ 1,895.00	$ 8,218.00	$ 4,683.00	$ 2,940.00	$ 6,941.00	$ 6,976.00	$ 6,200.00	$ 4,703.00	$ 7,122.00	$ 3,440.00	$ 2,156.00	$ 4,400.00	$ 59,674.00
Disbursements		$ 310.20	$ 5,004.50	$ 900.40	$ 129.30	$ 5,759.20	$ 1,933.30	$ 5,698.60	$ 1,850.80	$ 6,238.80	$ 349.30	$ 129.30	$ 180.00	$ 28,483.70

Assumptions:
The above budget is based on the Fw rate schedule
$60.00/month Unit 1292 taptop computer charge will be applied to this project from February to December
Project Management is based on an average of 3 hours per month for each of Scott Davidson, Jessy Harper, & Gary Beckstead
Water quality analysis costs following the Revised Metals Sampling Analysis are expected to drop in total costs to ~15K/year

Allan: For Your Info.:

Incidental Disbursements													
If 5% of fees	94.75	410.9	234.15	147	347.05	348.8	310	235.15	356.1	172	107.8	220	$ 2,983.70
If 3% of fees	56.85	246.54	140.49	88.2	208.23	209.28	186	141.09	213.66	103.2	64.68	132	$ 1,790.22

NOTE:
No. : OPERATION NUMBER 48 : 4800BPS SELECTED EC : ERROR CORRECT G2 : G2 COMMUNICATION
PD : POLLED BY REMOTE SF : STORE & FORWARD RI : RELAY INITIATE RS : RELAY STATION
MB : SEND TO MAILBOX PG : POLLING A REMOTE MP : MULTI-POLLING RM : RECEIVE TO MEMORY

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1	403 777 4150	1-26-99 8:59	1'58"	4/ 4		COMPLETED 9600

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TOTAL PAGES CONFIRMED : 4
TOTAL PAGES SCANNED : 4
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(REDUCED SAMPLE ABOVE - SEE DETAILS BELOW)

TRANSMISSION REPORT

cc: Jerry

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

January 21, 1999
CW1537.901.1

DRAFT

Way, way too much.

To: Jerry Demchuk

For Comment

Allan Z

Luscar Ltd.
1600 Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: Telkwa Coal Mine
1999 Budget

1.0 SURFACE WATER MONITORING

As per the January 19th, 1999 discussion between Gary Beckstead of AGRA Earth & Environmental Limited (AEE) and Allan Flemming of Luscar Ltd. (Luscar), AEE is pleased to present this "draft" budget for the 1999 baseline water flow and water quality program for the proposed Telkwa Coal Project. This draft will be discussed with you at your office on January 26th, 1999. It is the understanding of AEE that during 1999 Luscar should be submitting the Final Project Report to the B.C. Environmental Assessment Office. Following certification of the project, it is the understanding of AEE that the entire surface water and water quality program will need to be revised.

2.0 WORK PROGRAM AND BUDGET

AEE's proposed 1999 work program is intended to allow for revision of the program during the year. Table 1 presents the monthly budget breakdown for 1999.

The work program proposed for 1999 is as follows:

Surface Water Flow

- Three winter low flow discharge measurements on the Telkwa River;
- Five free flow period discharge measurements at all sites[1];
- An initial site visit during spring followed by an installation trip to sites; and
- Seven trips to perform routine maintenance and downloading of continuous sites.

---

[1] The Telkwa River will only be measured during three of the five free flow discharge measurement trips

cc: JED at Norecol, (403) 777-4150 FYI

6 pages

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

January 29, 1999
CW1537.101

FAXED 1/29/99

Luscar Ltd.
1600 Oxford Tower
Edmonton, AB T5J 3G1

Attention: **Mr. Allan Flemming, P.Eng.**
Manager, Special Projects

Dear Mr. Flemming:

Re: **Lakewood and Geneq Dataloggers in Relation to the Y2K Problem** (Telkwa)

We have recently been in contact with Lakewood Systems Ltd. and Geneq Inc. with regard to the problems which may occur as a result of the operation of their dataloggers into the year 2000. The status of each datalogger make is discussed below.

Lakewood has indicated that there will be no hardware modifications required. However, new software will be required to run the Lakewood dataloggers. The current LS-4 software will not allow the datalogger to be programmed correctly, nor will it allow the datalogger's time clock to be set correctly. All users must update their software to LS-4 Version 4.5 prior to the year 2000. This software will be posted on the Lakewood website (http://www.lakewood.com) in the near future and can be downloaded free of charge.

The Unidata Starloggers supplied by Geneq will not have a date problem with the year 2000 as the Starloggers calculate dates based on the number of scans from 1980. Therefore, the year will be calculated correctly. More specific information is available from the Unidata web site (http://www.unidata.com.au). Version 2 and 3 of the Starlog software are Y2K compliant. These programs are updated on a continual basis and are available on the website.

AEE will continue to monitor the progress made with the Y2K software at Lakewood. We will also ensure that the most current software is downloaded from each of these websites and used in future flow monitoring at Telkwa.

Should additional information be required with regard to this problem, you can contact Doug Calvert at Lakewood ((403)462-9110) or via e-mail at mail@lakewood.com or Steve Biduk at Geneq ((604)739-0889).

Sincerely,

AGRA Earth & Environmental Limited

Kristi McKay, M.Sc., P.Eng.
Water Resources Engineer

Reviewed by:

Gary R.E. Beckstead, M.Sc., P.Eng.
Reviewer

cc. Scott Davidson, AEE - Smithers

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AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

January 19, 1999
CW1537.901

Luscar Ltd.
1600, Oxford Tower
10235 - 101 Street
Edmonton, Alberta T2P 3V4

Attention: Mr. Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: Telkwa Coal Mine
Hydrological Analyses

Further to our letter of October 6, 1998, and our discussions, some additional costs have appeared which were not included in that letter. These costs are as follows:

1. Chemex Labs water quality analyses ($4,788.30, as per the subsequent October 30, 1998 invoice).

2. Fees for Westmacott, McKay, Dick, Beckstead ($823.75) for completion of the 200 year flood assessment that Jerry Demchuk had commissioned. This report was finalized on September 28, 1998, immediately prior to the October 6 letter.

3. A significant portion of the 36 hours of Dennis Trotter's time in the October 30, 1998 invoice concerned ongoing discussions and data analysis in response to requests from Steve Day.

These subsequent costs of $9,212.05 plus GST had not been included in the forecast total. We should not require the entire amount to complete the outstanding deliverable, namely the 1998 monitoring report. For preliminary budgeting purposes, let us say that the total budget be increased to $210,000 from $203,853.64.

The 1998 monitoring report is nearing completion. It will be ready for internal technical review by January 20. It should be ready for final issue by January 29, 1999.

Scott Davidson and I are preparing an outline of tasks and associated costs for the 1999 program, as discussed with you earlier. We hope to have a draft ready by January 22, 1999. We can discuss the draft when we meet in your office on January 26, 1999.

We thank you for the opportunity to provide engineering and environmental services to this project. If you have any questions or require further information, please call the undersigned at 235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

GREB/km

cc: Scott Davidson, AEE - Smithers

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AGRA Earth & Environmental

FACSIMILE TRANSMITTAL

#221 - 18 Street S.E.
CALGARY, ALBERTA, CANADA T2E 6J5
Phone NO. (403) 248-4331
FAX NO. (403) 248-1590
DIRECT 235-8118

TO: AL FLEMING
COMPANY: LUSCAR LTD.
FAX NO.: 1-403-420-5875
SENDER: GARY BECKSTEAD FILE NO.: 1537.101-3
FAX OPERATOR: GREB DATE: 98 1125
NO. OF PAGES: 5 (including this page)

This transmission is intended only for the Addressee. It may contain privileged or confidential information. Any unauthorized disclosure is strictly prohibited. If you have received this transmission in error, please notify us immediately (collect) so that we may correct our transmission. Please then destroy the original. Thank you.

AL:

(1) DRAFT RESPONSE LETTER TO OBEDKOFF re: 1997 MONITORING PROGRAM IS ATTACHED, FOR YOUR REVIEW & COMMENT.

(2) STATUS REPORT FROM OUR SMITHERS OFFICE ATTACHED, FYI.

(3) THAT INVOICE WAS PAID NOV. 23/98 THANKS!

REGARDS,

Gary

November 9, 1998
CW1537.101

DRAFT

Luscar Ltd./Manalta Coal Ltd.
7th Floor, 700 - 9th Avenue SW
Calgary, Alberta T2P 3V4

Attention: Mr. Al Fleming, P.Eng.

Dear Mr. Fleming:

Re: Response to BC Ministry of Environment Lands and Parks letter
July 23, 1998
Telkwa Coal Mine Surface Water Monitoring Program 1997

Further to our discussions with Jerry Demchuk, Environmental Advisor to Luscar/Manalta on November 5, 1998, AGRA Earth & Environmental Limited (AEE) is pleased to respond to the comments presented in the above-noted letter. We appreciate Mr. Obedkoff's comments and suggestions in the spirit of improving the quality of the surface water monitoring program where it is required. Many of his concerns relate to the volume of data available following the first year of the program. Where possible these comments will be considered in the analysis and assessment of the year 2 monitoring report, which will be prepared soon.

AEE has tried to purchase the Manual of Standard Operating Procedures for Hydrometric Surveys in British Columbia through our contacts in Prince George and Smiths over the past year; however the document has not been available until recently. We have now ordered copies and will use this publication for reference. Thanks to Mr. Obedkoff for the "heads up" that the publication is now available.

The responses to each of the individual comments for specific sections of the 1997 Surface Water Monitoring Report are presented below.

1.2 *Federal Water Survey of Canada (WSC) and Resources Inventory Branch (RIB) personnel should also be consulted for advice on hydrometric data collection procedures.*

AEE has established communications Ed Link of the WSC office in Terrace. We have discussed procedures with him and will continue to use him as a resource, when and if required.

It is our understanding that the RIB is located only in Victoria. Subject to your consent AEE will make contact with Mr. Obedkoff of the RIB.

2.1 *Include the WSC hydrometric station on Simpson Creek (08EE012). Is site C below the Tenas North Pit? If not, it should be below its outflow.*

DRAFT

AEE used data for Simpson Creek in the derivation of a regional flood frequency relationship. Otherwise, to date the data for this stream has not been used extensively as the Simpson Creek drainage basin lies outside the basin draining the Telkwa Project area. However, we will consider the use of the data further should the need arise.

Site C is located on Four Creek east of north tip of North Tenas pit. The location of the outflow point from the pit is unknown at this time. (get pit design from Al/Jerry and find out where outflow is.) Gaugung site locations will be reviewed critically to ensure location provides useful/reliable information once the project reaches the Certificate level.

3.1.3 *Stage-discharge curves must be based on measured points only.*

Only 7 months duration of data were available at the time the year one data report was prepared. IN the preparation of the 2nd year monitoring report, additional measurements from the 1998 field season will be available and used to confirm the results from the previous year. AS such it may prove necessary to evaluate and revise some of the data from the previous year based on the results from 1998. We appreciate the comment on this particular data plot, and will check the data again.

3.1.4 *The datalogger record is not coincident with staff gauge readings, except for three points; the calculated discharges are thus questionable. The datalogger must be calibrated at the site with hydrometric levelling of staff gauges and benchmarks. The datalogger and staff gauge level readings must be coincident, if not, an error must be applied to form corrected gauge heights before discharges are calculated.*

The data logger was tied in to local benchmarks. These surveys were conducted in 1997 and 1998. At this site there is a possibility that some stage readings may be relative to one staff gauge and some to another staff gauge. (Two staff gauges were established att he site to cover low and high stages. The data will be reviewed to ensure that the proper staff gauge was referenced and so that the transducer and staff gauge records correlate properly.

3.1.5 *Consult WSC or RIB personnel for a cost estimate of a cableway.*

WSC staff in Terrace have been consulted regarding the construction of a cableway across the Telkwa River. Cost estimates have been prepared, and were provided to MCL/LL on date. Long term site location needs to be determined relative to planned discharge (outfalll) points at which time a cableway will be considered. In the meantime the discharge data from the Telkwa River gauge can be added to the WSC Gaothorn Creek gauge data to give estimates of river discharges in the lower reach of the river.

3.3.4 *As per comments for 3.1.4*

DRAFT

AEE will take a second look at the data for Four Creek.

3.9.1 *What is the hydrologic purpose of an ephemeral stream hydrometric station for this project? If the gauge is for mines operations or water management, then it has a purpose.*

The Tailings Pond gauge was established on the ephemeral stream (called Tailings Pond Creek) below the proposed pond outlet and approximately 500 m downstream of present tailings disposal area. The intent of the data gathering for this station was to provide discharge data to facilitate the derivation of a water balance. for the proposed tailings pond. It should be noted that as the design of the facility has progressed, the size of the proposed tailings pond has shrunk from 100 ha to 30 ha

5.0 *Delete the last sentence of the third paragraph. The stage data collected may not lead to good quality discharge data.*

AEE will take under advisement the comments provided relative to sections 3.1.4 and 3.3.4. These items will be reviewed as discussed above. Also, as more discharge data is obtained, the rating curves will be improved. This will provide an opportunity to review previous estimates of discharge from the historical stream gauge height records.

We thank you for the opportunity to provide engineering and environmental services to this project. If you have any questions or require further information, please call the undersigned at 235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited

Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

Scott Davidson, M.Sc., P.Geo.
Geomorphologist

DRAFT

SCD/GREB/km

Attach.

cc: Jerry Demchuk, Norecol Dames & Moore

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Manalta Coal / Luscar mine site Fall 1998

Upper Goathorn - XS Nov 10. Staff gauge @ site

Upper Tenas - XS Nov 10 Staff gauge @ site

Four Creek - automated depth logger removed Nov 9
Staff gauge at site
no XS, waters level too low.

Lower Tenas - XS Nov 10. Staff gauge @ site
- automated depth logger removed Nov 10

Helps Cr - automated depth logger removed Nov 24
- Staff gauge @ site

Telkwa R - automated depth logger removed Nov 24
- staff gauge at site

North Site - logger downloaded Nov 9. Plans to remove Nov 25.

Tailings Pond - logger not re-installed after June 10 (dry).
Little/No fall flows at site

Water Chemistry at all sites Nov 9/10

Metals sampling at Lower Goathorn Lower Tenas + Telkwa R on Nov 9, Nov 16, Nov 24 with two weeks of metals sampling remaining.

Please call Jessy Harper 847-8783 (area code 250) if you have any questions.

AGRA
Earth & Environmental Limited
Box 3966
#3, 3167 Tatlow Road
Smithers, B.C. V0J 2N0

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

AGRA Earth & Environmental Limited
221 - 18th Street S.E.
Calgary, Alberta
Canada T2E 6J5
Tel (403) 248-4331
Fax (403) 248-1590

October 6, 1998
CW1537.901

Manalta Coal Ltd./Luscar Ltd.
7th Floor, 700 - 9th Avenue SW
Calgary, Alberta T2P 3V4

Attention: Mr. Al Fleming, P.Eng. Fax: 269-8075

Dear Mr. Fleming:

Re: Budget Update
Telkwa Coal Mine
Hydrological Analyses

Further to our telephone conference call on October 2, 1998 with you and Jerry Demchuk, AGRA Earth & Environmental Limited (AEE) is pleased to provide you with a summary of the hydrological work you requested for the remainder of the calendar year. It is understood that Manalta Coal Ltd. (MCL, and/or its present owner, Luscar Ltd.) wish to have a single amendment to the existing contract for the remainder of this year's work related to the Telkwa Coal Mine Project.

A total of $25,182 is required to complete activities presently authorized by MCL for 1998. Table 1, attached, summarizes the individual tasks.

This estimate reflects the present monitoring program and does not include provision for changes to stations or station locations that may be required following granting of the Project Certificate.

The present contract value is $170,697.05, as amended by Change Order #5 (Oct. 2, 1997). Billings under this contract have totalled $178,671.64. As discussed October 2, 1998, the project is therefore over-billed $7,974.59. The outstanding work presented in Table 1 totals $25,182.00. The required adjustment to the contract is therefore $33,156.59. The resultant contract value following the revision is therefore $203,853.64.

If the program is continued to February 1999, the following additional components would be required: metals sampling ($8,720), regular monitoring and water quality sampling and analysis ($4,622 or less, depending on access and whether streams are flowing or frozen solid) , low-flow discharge measurements on the Telkwa River (potentially 2 measurements at $1,200 per

measurement) and additional data analysis and reporting ($4,000). The total for extending the program to February, 1999 is estimated at $19,742 (on top of the 1998 budget discussed above).

2.0 SCHEDULE

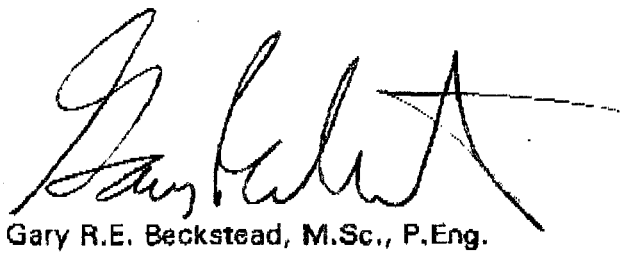
AEE will complete the work (i.e., reporting) by January 31, 1999. The actual field work will be completed by the end of November or the first week of December, 1998.

3.0 CLOSURE

We thank you for the opportunity to provide engineering and environmental services to this project. If you have any questions or require further information, please call the undersigned at 235-8118.

Yours sincerely,

AGRA Earth & Environmental Limited



Gary R.E. Beckstead, M.Sc., P.Eng.
Senior Project Manager

GREB/km

Attach.

cc: Scott Davidson, AEE - Smithers

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TABLE 1
Remaining Tasks and Costs for 1998
Surface Water Monitoring Program

Task	Description	Cost
1	Metals Sampling. Additional metals sampling program, scheduled for late October and early November, 1998[1], as per the June 16, 1998 letter.	$8720
2	Regular flow Monitoring. Flow measurement, water quality sampling and analysis and data download from dataloggers[1] at the end of October as per October 24, 1997 fax to J. Demchuk.	$4622
3	Regular flow Monitoring. Flow measurement data download from dataloggers and removal of water level transducers and dataloggers for the winter season at the end of November or the first week of December as per October 24, 1997 fax to J. Demchuk.	$1190
4	Reporting. Preparation of annual data report to the end of December, 1998 and incorporate the 1997 and 1998 data into a single summary report, as directed.	$10,000
5	Project Management. QA/QC and financial management of the work, as per October 24, 1997 fax to J. Demchuk..	$2190
Total		**$25,182**

1 The work for Tasks 1 and 2 will be scheduled at the same time to reduce travel and time expenditures. Special laboratory analyses of water quality samples are included in Tasks 1 and 2.

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

NOTICE OF TRANSMITTAL

221 - 18 Street SE
Calgary, Alberta T2E 6J5
Phone: (403) 235-8118
Fax: (403) 248-1590
E-mail: gbeckstead@agraee.com

TO: Luscar Ltd.
1600 Oxford Tower,
10235 - 101 St.
Edmonton , AB
T2P 3V4

DATE: February 11, 1999
OFFICE: Calgary
PROJECT NO.: CW1537
PROJECT NAME: Telkwa Coal Mine

ATTENTION: Mr. Al Fleming **PHONE:** (780) 420-4080

THE ENCLOSED DOCUMENTS AND/OR DRAWINGS ARE SUBMITTED:

☐ FOR YOUR APPROVAL ☑ AS REQUESTED ☐ FOR YOUR REVIEW AND COMMENT
☐ FOR YOUR INFORMATION ☐ FOR YOUR SIGNATURE ☐

DELIVERED BY: ☐ MAIL ☑ COURIER ☐ HAND

COPIES	DRAWING NO.	DESCRIPTION
2	Bound Copies	Reports entitled "Telkwa Coal Mine Surface Water Monitoring Program 1998"
1	Unbound Copy	Report entitled "Telkwa Coal Mine Surface Water Monitoring Program 1998"

REMARKS: Please find the above mentioned reports enclosed. A CD with the report and figures will be sent in tomorrow's courier. One copy of the report has been forwarded to Mr. Jerry Demchuk at his request.

SUBMITTED BY: for: Gary Beckstead, M.Sc., P.Eng.

P:\PROJECT\Cw\1537\tn021199.wpd

AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

NOTICE OF TRANSMITTAL

221 - 18 Street SE
Calgary, Alberta T2E 6J5
Phone: (403) 235-8118
Fax: (403) 248-1590
E-mail: gbeckstead@agraee.com

TO: Luscar Ltd.
1600 Oxford Tower,
10235 - 101 St.
Edmonton , AB
T2P 3V4

DATE: February 11, 1999
OFFICE: Calgary
PROJECT NO.: CW1537
PROJECT NAME: Telkwa Coal Mine

ATTENTION: Mr. Al Fleming **PHONE:** (780) 420-4080

THE ENCLOSED DOCUMENTS AND/OR DRAWINGS ARE SUBMITTED:

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☐ FOR YOUR INFORMATION ☐ FOR YOUR SIGNATURE ☐

DELIVERED BY: ☐ MAIL ☑ COURIER ☐ HAND

COPIES	DRAWING NO.	DESCRIPTION
1	CD	Report and Figures for Telkwa Surface Water Monitoring 1998

SUBMITTED BY: _____
for Gary Beckstead, M.Sc., P.Eng.

cc: Mr. Jerry Demchuk
1610, 734 - 7 Avenue SW
Calgary, AB T2P 3P8

P:\PROJECT\Cw\1537\tn021299.wpd

PITEAU ENGINEERING LTD.

HYDROGEOLOGICAL AND GEOTECHNICAL CONSULTANTS
Suite 100, 4500 - 16th Avenue NW
Calgary, Alberta, Canada T3B 0M6

Telephone: *(403) 286-2522*
Facsimile: *(403) 247-4811 / (403) 247-0779*
E-mail: *komex@komex.com*

TO FAX #: 269-8075
COMPANY: Manalta Coal Ltd.
ATTENTION: Al Vanderputten

Fleming

DATE: June 27, 1997
PROJ. #: 3773-13
FROM: Bob Clarkson
NO. OF PAGES: 10
(INCLUDING COVER PAGE)

Al,

Please find attached a draft copy of our proposed workplan/cost estimate for the 1997 geotechnical/hydrogeological program at Telkwa. Figure 1 has not been included, but the piezometer locations are the same as identified during the meeting.

Once you have had a chance to review, please give either Fred or myself a call to discuss.

Regards,

Bob Clarkson

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PITEAU ENGINEERING LTD.
HYDROGEOLOGICAL AND GEOTECHNICAL CONSULTANTS

SUITE 100, 4500 - 16TH AVENUE N.W.
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CANADA T3B 0M6
TELEPHONE (403) 286-2522
FAX (403) 247-4811 or 247-0779
e-mail: komex@komex.com

June 24 1997

OUR FILE: KI97-3773-13

Manalta Coal Ltd.
7th Floor, 700 - 9th Ave. SW
Calgary, Alberta
T2P 3V4

Attention: Mr. Allan Vanderputten, P.Eng.

Dear Sir:

Re: ***Work Plan for Geotechnical and Hydrogeological Services 1997 Program, Tenas Creek Area, British Columbia***

1.0 INTRODUCTION

Piteau Engineering Ltd. (Piteau) is pleased to present our draft proposal and workplan for the above project. This proposal addresses the 1997 geotechnical, hydrogeologic and hydrologic workplans for the Tenas Pit and Pit 3 areas, and was developed in consultation with Manalta Coal Ltd. (Manalta) based on our meeting of June 13, 1997. These workplans fulfill the groundwater and water quality information requirements outlined on the draft project specifications for the Telkwa Coal project provided to us by Manalta.

The purpose of the 1997 geotechnical work program is to assess geotechnical conditions in the area of the Pit 3 waste dumps, the coal processing plant, and at the proposed location of the bridge crossing of the Telkwa River. The overall objective of the 1997 hydrogeological work program is to improve the level of understanding of baseline groundwater conditions in the areas of Tenas Pit and particularly Pit 3. The hydrological work will focus on development of a water balance for the post mining condition at Tenas Pit and Pit 3.

Information and data from previous investigations (Klohn Leonoff, 1985, Piteau 1994a and 1994b, Piteau 1995, Piteau 1996a and 1996b, and Piteau 1997a, 1997b, and 1997c) shall be referenced as much as possible to assist in attaining these objectives.

2.0 PROPOSED FIELD INVESTIGATIONS

The field investigations proposed within each facility area are briefly discussed below. As in previous geotechnical/hydrogeological investigations completed for the Telkwa coal project, the rotary drill to be used by Manalta for their coal exploration program will be adapted for the deep borehole drilling and proposed monitoring well installations. Moreover, piezometers will be installed within coal exploration boreholes. A backhoe will be utilized for the geotechnical investigations at the Pit 3 waste dumps, plant site and bridge crossing, coupled with interpretation of general overburden type and depth to bedrock from exploration holes.

Proposed hydrogeological borehole/monitoring well locations are shown in Figure 1.

2.1 PIT 3

2.1.1 GEOTECHNICAL INVESTIGATION OF WASTE DUMPS

The objective of the geotechnical investigation is to determine the lithology and basic soil parameters of the dump foundation. The investigation shall consist of the following:

- reconnaissance of the dump sites to verify terrain conditions, map surface water and springs, and to examine soil and rock exposures;
- excavation of approximately 5 test pits, up to 5 m deep, along the existing road in the central area of the dump to log soil units and collect soil samples; and,
- laboratory testing of soil samples, including moisture content, Atterberg limits, grain size and penetrometer strengths.

Depth to bedrock will be determined from exploration drill holes.

A brief report will be prepared documenting the investigations, geotechnical conditions, overall suitability of the site, and any limitations on dump development.

2.1.2 HYDROGEOLOGICAL INVESTIGATION

In view of the fairly complex hydrogeological setting at Pit 3, and in particular the potential importance of faults and fractures on groundwater flow, it is proposed that the groundwater monitoring network be expanded with the installation of six double piezometer nests (site # 3, 10, 15, 24, 28, and 52, see Figure 1). If possible, at one or two piezometer nest locations, efforts will be made to install a piezometer(s) directly within or adjacent to an identified fault zone.

The deeper piezometer will be completed in coal seam 2 while the shallow piezometer will be installed in coal seam 4. However at sites # 28 and #52, it is anticipated the deeper piezometer will be installed in seam 1. Following piezometer development, hydraulic conductivity testing will be performed. The piezometers will be sampled to determine groundwater quality, as well as to assess horizontal groundwater flow patterns, and vertical hydraulic gradients between the two coal seams.

Groundwater quality monitoring will be also be completed at the other existing piezometers (5 in total) completed within the Pit 3 area (i.e., T96R series piezometers). Groundwater samples will be analyzed for the same suite of chemical parameters previously analyzed for, and as specified by the B.C. Ministry of Environment.

Results from the 1997 hydrogeological program, together with hydrogeological information gathered from the aquifer test (discussed below) will be used to develop a better conceptual understanding of groundwater flow and groundwater quality within Pit 3.

2.1.3 AQUIFER TESTING PROGRAM

One of the key hydrogeological issues pertaining to the Telkwa Coal project is the potential influence of regional faults and fractures on groundwater flow. Moreover, related to this is the potential for impact of mining activities on local water wells. To address these issues, it is recommended that an aquifer test be conducted at a test well located within a suitable area of Pit 3 (location to be finalized).

Although the final design of the test well will be determined in the field, based on hydrogeological conditions, it is recommended that the pilot hole be drilled to a diameter of 200 mm (8"). This borehole diameter will permit installation of 150 mm (6") diameter water well casing and use of a submersible pump (5 or 7 hp) sufficient to adequately stress the aquifer. The decision as to whether to install well screen (compared with open hole) will be assessed during the borehole drilling. It is our understanding the test well will be drilled using a local water well contractor and that Manalta will be responsible for overseeing drilling activities. Consequently, we have not included costs for supervision of the drilling of the test hole.

It is recommended that the aquifer test consist of a 48 hour constant rate drawdown component followed by a 48 hour recovery component. In the event aquifer boundary conditions are identified, the drawdown component of the test would be extended to at least 72 hours. The constant rate test should be preceded by a 4 hour step drawdown test to evaluate well efficiency and to determine a suitable rate for the constant yield test. During the aquifer test, groundwater levels will be monitored in selected observation wells in Pit 3 and if possible, in domestic wells located within 2 km of the test well. Groundwater levels will be monitored manually using electric water level tapes as well as using pressure transducers and data loggers. A turbine and digital flow meter would be used to monitor groundwater pumping rates.

policy! require

Results from the aquifer test will permit determination of the hydraulic properties (i.e., transmissivity and storativity) of coal seam 2. This information will be used to refine estimates of the groundwater flow velocity in the coal seams and may provide insight into the role and importance of fractures and faults within the Pit 3 area. Potential effects of mining activities on nearby domestic wells will also be assessed.

2.1.4 GEOTECHNICAL LOGGING OF ROCK CORE

There is an opportunity for collection of geotechnical information of rock core during exploration drilling operations. It is thus proposed that a geotechnical engineer from Piteau (Vancouver)

spend one day on-site with Manalta geologists to provide training for the collection of geotechnical data (as required) during their drilling and logging operations.

Tamas ✓ missing?

2.1.5 HYDROLOGICAL ASSESSMENT

Sect 2.4

A preliminary water balance will be developed for Pit 3. The pit water balance methodology will be based on the procedures previously developed for Pits 7 and 8 (Piteau, 1994a). Estimates of groundwater inflows will be combined with estimates of surface water runoff to establish filling rates. As was the case for Pits 7 and 8, a sensitivity analysis will be conducted to establish the range of possible filling rates, taking into account uncertainties in groundwater inflow rates and wet/dry year scenarios.

2.2 COAL PROCESSING PLANT - GEOTECHNICAL INVESTIGATION

The objective of the geotechnical investigation is to provide data for confirming the feasibility of two potential sites and to develop preliminary designs. The investigation will consist of the following:

- excavation of approximately 6 test pits, 5 m deep, to be located along the perimeter of the 43 m x 16 m plant site configuration - log soil units and collect soil samples; and,
- laboratory testing of soil samples, comprising moisture content, Atterberg limits, grain size and penetrometer strengths, and if softer clay soils are found unconsolidated undrained triaxial and consolidation tests.

Depth to bedrock will be determined from exploration drill holes.

A brief report will be prepared documenting geotechnical conditions, and discussing options and providing relevant design parameters for the plant foundation.

2.3 BRIDGE ON TELKWA RIVER - GEOTECHNICAL INVESTIGATION

The objective of the geotechnical investigation is to confirm the geotechnical feasibility of crossing the river and to provide data for preliminary foundation design. The investigation will consist of the following:

- excavation of approximately 6 tests pits, 5 m deep, at 2 or 3 locations on each side of the river crossing to log soil units and collect soil samples;
- drilling 2 boreholes with the exploration rig: one on each bank (to bedrock or to 30 m deep in gravel, or 50 m deep in clay), logging of drill cuttings to determine soil type (gravels vs. sand vs. silt/clay); and,
- laboratory testing of soil samples, comprising moisture content, Atterberg limits, grain size and penetrometer strengths, and if softer clay soils are found, perform unconsolidated undrained triaxial and consolidation tests.

A brief report will be prepared on the investigation and geotechnical conditions encountered, and providing relevant foundation design parameters.

2.4 TENAS PIT

2.4.1 HYDROGEOLOGICAL INVESTIGATION

It is proposed that the groundwater monitoring network be expanded with the installation of two double piezometer nests near the north end of Tenas Pit (Figure 1). The deeper piezometer will be completed in coal seam 1 while the shallow piezometer will be installed in coal seam "c". Following piezometer development, hydraulic conductivity testing will be performed. The piezometers will be sampled to determine groundwater quality, and to estimate horizontal groundwater flow patterns, and vertical hydraulic gradients between the two coal seams.

Groundwater quality monitoring shall also be completed at all other existing piezometers (19 in total) completed within the Tenas Pit area (i.e., T95R, T96R, and TOB96 series piezometers).

Information garnered from the 1997 hydrogeological program will augment the existing hydrogeological database that exists for the Tenas Pit.

2.4.2 HYDROLOGICAL ASSESSMENT

A preliminary water balance will be developed for the Tenas Pit. The approach for the water balance will be the same as described for Pit 3 in Section 2.1.5.

3.0 COST ESTIMATE

The estimated cost of the investigation program is $118,405, exclusive of the GST. A detailed cost breakdown is provided on Table 1.

In developing these costs the following assumptions were made:

- all survey work (i.e., ground surface and top of piezometer casing elevation) will be arranged by Manalta;
- costs for borehole drilling, piezometer construction materials and excavation of test pits are not included;
- contractor costs for the drilling/installation of the test well and aquifer testing are not included; and,
- Piteau only charges for costs actually incurred. Any cost savings generated through more rapid program completion would be passed onto Manalta; conversely any additional costs due to unexpected or difficult subsurface conditions or down time from poor weather, would be charged at extra cost at the units rate listed in Table 1.

Additional assumptions in the cost estimate are presented in Table 1.

4.0 SCHEDULE AND REPORTING

The schedule of the work will coincide with Manalta's exploration program, which is presently understood to consist of a 3 week on/3 week off rotation, beginning July 15, 1997. Therefore, it

is anticipated scheduling for the geotechnical/hydrogeological field work and reporting will be as follows:

- July 21 to August 2, - Borehole drilling and piezometer installations (Pit 3 area); geotechnical investigations;
- Late-August to mid-September, - borehole drilling and piezometer installations (Tenas Pit area); aquifer testing program; groundwater sampling; and,
- October 30, - submission of draft reports summarizing results from the hydrogeological and geotechnical programs completed in 1997.

It is our understanding that results from the hydrogeological/hydrological investigations will form the basis for a stand alone report summarizing baseline hydrogeological conditions at the Tenas Pit and Pit 3. The reports will essentially augment the previous detailed baseline report prepared by Piteau (1997a). Information from the geotechnical investigations will be presented under separate cover.

5.0 CLOSURE

We trust this cost proposal is suitable for your present needs. If you have any questions, please do not hesitate to contact either of the undersigned or Dr. Tad Dabrowski.

Respectfully,

PITEAU ENGINEERING LTD.

Frederic B. Claridge, M.S., P.Eng.

Robert S. Clarkson, M.Sc., P.Geol.

REFERENCES

Klohn Leonoff Consulting Engineers, 1985. *Crows Nest Resources Ltd., Telkwa Coal Project, Stage II Geotechnical, Hydrogeological & Hydrological Design Report.*

Piteau Engineering Ltd., 1997a. *Baseline Hydrogeological Investigations in the Tenas Pit, Waste Dumps, and Mine Pit 3, Telkwa Coal Project.* Unpublished report prepared for Manalta Coal Ltd. KI97-3773-12. January 1997.

Piteau Engineering Ltd., 1997b. *Geotechnical and Hydrogeological Assessment Proposed Tailings Pond Area, Telkwa Coal Project.* Unpublished report prepared for Manalta Coal Ltd. KI97-3773-12. January 1997.

Piteau Engineering Ltd., 1997c. *Engineering Geology and Geotechnical Assessment Tenas Pit and Waste Dumps, Telkwa Coal Project.* Unpublished report prepared for Manalta Coal Ltd. KI97-3773-12. January 1997.

Piteau Engineering Ltd., 1996a. *Preliminary Assessment of Potential Groundwater Inflows and Dewatering Requirements in the Tenas Creek Region, Telkwa Coal Project, British Columbia.* Unpublished report prepared for Manalta Coal Limited. KI93-3773-10. January, 1996.

Piteau Engineering Ltd., 1996b. *Surficial Geology Map of the Telkwa Property.* Unpublished Preliminary Map prepared for Manalta Coal Limited. KI93-3773-11. April, 1996.

Piteau Engineering Ltd., 1995. *Results of Groundwater Sampling Project Telkwa Coal Project, British Columbia.* Unpublished report prepared for Manalta Coal Limited. KI93-3773-8. November, 1995.

Piteau, 1994a. *Telkwa Coal Project: Water Management of Tailings Pond and Pits 7 and 8.* Prepared for Manalta Coal Ltd. Project # KI93-3773-3.

Piteau Engineering Ltd., 1994b. *Baseline Data Surface Water and Groundwater Telkwa Coal Project.* Unpublished report prepared for Manalta Coal Limited. KI93-3773-1. June, 1994.

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DRAFT

TABLE 1
COST ESTIMATE

FACILITY/WORK TASK	PRINCIPAL ENGINEERS		HYDROGEOLOGIST/ENGINEER			TECHNOLOGIST	DRAFTING/ CLERICAL	DISBURSEMENTS	TOTAL ($)
	F. Clarkdge $100.00/hr	T. Dabrowski $110.00/hr	B. Clarkson $80.00/hr	M. Fitch $77.50/hr	R. Armstrong $65.00/hr	$55.00/hr	$50.00/hr		
1. Pit #3 Waste Dumps									
Reconnaissance and Test Pits					12			350	1,130
Geotech. Lab Tests								600	600
Stability Analysis					8				520
Reporting	4				15		5	400	2,025
Vehicle Rental (assume 1 day)								150	150
Living Expenses (assume 1 day)								110	110
Travel Expense								1,200	1,200
Sub-total	4				35		5	2,610	5,735
2. Plant Site									
Test Pits					12			200	980
Lab Tests								600	600
Reporting	4				25		5	200	2,475
Vehicle Rental (assume 2 days)								300	300
Living Expenses (assume 2 days)								220	220
Sub-total	4				37		5	1,520	4,575
3. Bridge Crossing of Telkwa River									
Test Pits and Drilling					20				1,300
Lab Tests								600	600
Reporting	4				30		10	400	3,250
Vehicle Rental (assume 2 days)								300	300
Living Expenses (assume 2 days)								220	220
Sub-total	4				50		10	1,520	5,670
4. Geotechical Logging of Rock Core									
Training/on-site supervision						14			770
Vehicle Rental (1 day)								150	150
Living Expenses (1 day)								110	110
Travel Expense								1,000	1,000
Sub-total						14		1,260	2,030
5.1 Pit 3 - Hydrogeological/Hydrological Investigations									
Piezometer Installations (6 double piezometer nests; 12 piezometers in total)									
Supervision			72						5,760
K Tests (12 piezometers)			24			24		250	3,480
Groundwater Sampling/Analysis (1996 and 1997 piezometers; 23 in total)			20			20		10,925	13,625
Water Balance			10	30		6	4	100	1,540
Reporting		6	50			26	30	500	8,035
Vehicle Rental (14 days)								2,100	2,100
Living Expenses (16 man days)								1,760	1,760
Travel Expense (assume 1 person mob/demob in July; assume 2 persons mob/demob in August)								3,600	3,600
Sub-total		6	176	30		77	34	19,235	39,910
5.2 Pit 3 - Aquifer Test									
Stepdrawdown Test			6						480
Aquifer Test (assume 48 hour drawdown and 48 hour recovery)			40			40		2,000	7,400
Groundwater Sampling/Analysis (2 samples from test well)								900	900
Equipment Rentals(Pressure transducers, data loggers, field parameter kit, water level, etc.)									0
Reporting			40			10	6	200	4,250
Vehicle Rental (5 days)								750	750
Living Expenses (10 man days)								1,100	1,100
Travel Expense (NC, assume mob during August program)								2,400	2,400
Sub-total			84			50	6	7,350	17,280

DRAFT

TABLE 1
COST ESTIMATE

FACILITY/WORK TASK	PRINCIPAL ENGINEERS		HYDROGEOLOGIST/ENGINEER			TECHNOLOGIST	DRAFTING/ CLERICAL	DISBURSEMENTS	TOTAL ($)
	F. Claridge $100.00/hr	T. Dabrowski $110.00/hr	B. Clarkson $80.00/hr	M. Fitch $77.50/hr	R. Armstrong $65.00/hr	$55.00/hr	$50.00/hr		
5.3 Tenas Pit - Hydrogeological/Hydrological Investigations									
Piezometer Installations (2 double piezometer nests; 4 piezometers in total)									
Supervision			22						1,760
K Tests (4 piezometers)			8			8			1,080
Groundwater Sampling/Analysis (1995, 1996 and 1997 piezometers; 19 in total)			25			25		11,000	14,375
Water Balance			8	30		8	4	100	1,380
Reporting		2	30			10	12		3,770
Vehicle Rental (5 days)								750	750
Living Expenses (10 man days)								1,100	1,100
Travel Expense (NC, assume mob during August program)									
Sub-total		2	93	30		51	16	12,950	24,215
5. REPORTING AND MANAGEMENT									
Reporting (Final/Review)	16	16	35		10	8	20	500	8,750
Management/Coordination	16	4	16					200	3,520
Field Program Preparation			16						1,280
Meetings	8	6	16				4	300	3,240
Computer Usage								2,200	2,200
Sub-total	40	26	83		10	8	24	3,200	18,990
TOTAL	***52***	***34***	***438***	***60***	***132***	***200***	***100***	***49,845***	***118,405*** +GST

Notes:
1. Vehicle Expense = $150/day
2. Living Expense (accommodation and meals) = $110/day
3. Groundwater chemical analysis (as per B.C. Environment requirements) = $475/sample.
4. Geotechnical laboratory analysis moisture content = $4/sample; Atterberg limits = $65/sample; grain size and hydrometer = $160/sample; standard proctor density = $146/sample.
5. It is assumed the drilling rig for the coal exploration program will be available for deep borehole drilling, geotechnical sampling, and monitoring well installations in the Tenas Creek Pit area; therefore drilling costs have not been included.
6. Costs for the backhoe and drill rig required for Tasks 1, 2, and 3 are not included.
7. Piezometer installation assumes the boreholes have been drilled and a drill rig is available to install construction materials. Any delays in the piezometer installation outside of Komex's control will be charged at the unit rates listed.
8. It is assumed that all survey work (i.e., ground surface elevation, top of piezometer casing elevation, and piezometer stick-up will be the responsibility of Manalta.

(403)-420-4089

Attn: Allan Flemming

PITEAU ENGINEERING LTD.

HYDROGEOLOGICAL AND GEOTECHNICAL CONSULTANTS
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Website: www.komex.com

TO: Jerry Demchuk
COMPANY: Norecol
FAX #: 777-4150

FROM: Rob Armstrong
DATE: January 12, 1999
PROJ. #: 3773-17
NO. OF PAGES: 3
(Including Cover Page)

rarmstrong@calgary.komex.com

Re: Telkwa Coal Project: Remaining Issues

This fax is to describe the scope of work developed in our January 8, 1999, meeting. The scope of work for the three issues we discussed is as follows:

Hydrology of Four Creek
There is concern over diversions on the ecosystem (most importantly fish) on Four Creek. The hydrology component will examine the pre- and post-development flows in the creek. Discussions with Dave Bustard will be required to determine the sensitivity of the aquatic community to these flow changes.

The hydrology for the Telkwa project collected to date has largely ignored the hydrology data collected on-site, since this data was previously too sporadic and of insufficient duration to answer questions concerning long-term hydrology (such as 1:200 year low flow events). However, given that a question specific to Four Creek has been posed, it will be necessary to integrate the regional flow information and the Four Creek monitoring data provided by Agra. Using this information, estimated monthly average and low flows (pre- and post-development) will be calculated. ← Luscar to do stats.

If the proposed diversions are likely to cause problems for the fishery, it may be necessary to examine alternate filling scenarios for the Tenas pits. For example, a structure could be constructed which would divert water to the pit only when a minimum flow level was achieved. This will require recalculation of the filling times for the Tenas pits.

Residual Moisture Content of Haul Road Surface No. Cirrus consultants
An estimate of the residual moisture content of the Haul road surface (soil surface) is required for the dust fall modelling. At present the model has been performed for a moisture content range of 4 to 11%, and the predicted dust fall has proven to be sensitive within that range. A literature review is required, along with some preliminary analysis specific to the weather conditions at the Telkwa area, to refine the data input.

Weathering Characteristics of Waste Rock
There is empirical evidence that the waste rock that will be generated at Telkwa is susceptible to breakdown due to weathering. It has therefore been suggested that the waste rock dumps will be self sealing as the waste rock weathers, resulting in surface water running off the dumps, rather than infiltrating them. A review of all current data available on the waste rock is required, with the purpose

of predicting the breakdown of the waste rock dump faces, the resulting permeability of the dump surface, and the resistance of the dump face to erosion.

Closure

Since these issues are all significantly different, we suggest that three separate letter reports would be suitable. We propose to issue a draft of the reports by February 5, 1999. Final copies to be issued 1 week after comments are received back from yourself. The cost estimate to perform this work is attached. Since this scope of work is a bit loose we emphasize that it is only an estimate, and believe that the cost will range between $5,000 and $10,000.

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PITEAU ENGINEERING LTD.	ESTIMATE OF ENGINEERING COSTS	FILE: Telkwa
	Residual Moisture Content of Road Material and Weathering of Waste Rock Dump Desk Top Investigation	DATE: 12-Jan-99
CLIENT: Luscar		BY: RCA
PROJECT NO.: 3773-17		REV: A
LOCATION: Telkwa		

ITEM	DESCRIPTION	ENGINEERING QTY	UNITS	RATE	EXTENSION		
1	**RESIDUAL MOISUTRE CONTENT IN ROAD MATERIAL**						
	Literature Review	15	Hours	$60	$900 900		
	Report	8	Hours	$75	$600 600		
	Sr. Review	4	Hours	$110	$440 440		
	Client Support	8	Hours	$75	$600 600		
		0 35			SUB TOTAL	$2,540	2540 0
2	**WASTE ROCK WEATHERING**						
	Review Existing Data	10	Hours	$60	$600 600		
	Review Other Mine Experience	10	Hours	$60	$600 600		
	Report	8	Hours	$75	$600 600		
	Sr. Review	4	Hours	$110	$440 440		
		32 32			SUB TOTAL	$2,240	2240 2240
3	**HYDROLOGY OF FOUR CREEK (Junior Hydrologist: $60, Senior Hydrologist: $85, Principal Water Resources Engineer: $110)**						
	Review Existing Data	4 4	Hours	$85	$340 340		
		2 2	Hours	$60	$120 120		
	Integration of regional data and Agra data	4 8 8	Hours	$85	$680 680 340		
		4 4	Hours	$60	$240 240		
	Examine diversion alternatives (il fisheries problems	4 8 8	Hours	$85	$680 680 340		
		4 8 8	Hours	$60	$480 480 240		
	Report	8 8	Hours	$60	$480 480		
		4 4	Hours	$85	$340 340		
	Sr. Review	4 4	Hours	$110	$440 440		
		38 50			SUB TOTAL	$3,800	3800 2880
						$293	293 175
	COMPUTER OVERHEAD	70 117	Hours	$2.50		$429	429 256
	SECRETARY (5%)						5551
	Subtotals	117	Hours			$9,302	555
	Contingency (10%)					$930	
	GRAND TOTAL					$10,232	6106

JAN-12-1999 15:38 KOMEX INTERNATIONAL LTD. 403 247 4811 P.03/03
TOTAL P.03
1/12/99 - 11:58 AM J:\3773\3773-17\TABLES\Costest.xls - Costs

PITEAU ENGINEERING LTD.

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780.
TO FAX #: (403) 420-5878
COMPANY: Luscar
ATTENTION: Allan Flemming

DATE: Jan 26, 1999
PROJ. #: 3773-17
FROM: Murray Fitch
NO. OF PAGES: 18.
(INCLUDING COVER PAGE)

⇒ JED
(403) 777-4150

Re: ***Final Draft Letter - Four Creek Hydrology***

Allan,

Please find attached a final draft of the letter. It is basically complete – lacking only the unfaxable (because of size) Figure 1. If this meets your requirements, I can courier it out whenever you say the word. If not, please call me at (403)286-2522.

Murray

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⇒ Jerry).

PITEAU ENGINEERING LTD.
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February 26, 1999

OUR FILE: 3773-17

Luscar Coal Ltd.
10235 - 101 St.
Edmonton, AB
T5J 3G1

(fax) 780.420.5878
(tel) 780.420.4080

Attention: Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: Hydrology of Four Creek

INTRODUCTION

A previous report, *Water Management for the Telkwa Coal Project* (Piteau 1998, henceforward referred to as WMTCP), addressed the issue of hydrology in and around the proposed Telkwa Coal Project. In order to ensure the rapid filling of abandoned pits, the diversion of a number of creeks is anticipated. One of these, Four Creek, was identified by the British Columbia Ministry of Environment, Lands and Parks (MELP) as being of concern from a fisheries perspective. This letter addresses the issue of the hydrologic implications of the diversion of a portion of the upper drainage of Four Creek.

HYDROLOGY OF FOUR CREEK

Figure 1 shows the drainage sub-basins of Four Creek[1]. For analysis purposes, flows have been considered at the following locations:

---

[1] A discrepancy exists between the drainage area used in this report and that used in the WMTCP report. Previously, a drainage area of 13 km^2 was calculated using 1:50,000 topographical maps - 1:20,000 scale maps used in this report suggest a 10 km^2 drainage area.

1: the proposed diversion location into the Tenas Main Pit
2: two thirds of the drainage area
3: the mouth of Four Creek (confluence with Goathorn Creek)

Four Creek flow data was collected in 1997 (October-November) and 1998 (June-November). Of greatest hydrologic (and fisheries) concern are the relatively rare low flow events. The data record for Four Creek is not sufficiently long to permit the calculation of low-flow statistics, and thus the record must be supplemented by longer-term precipitation data and/or regional hydrologic data. These are discussed below.

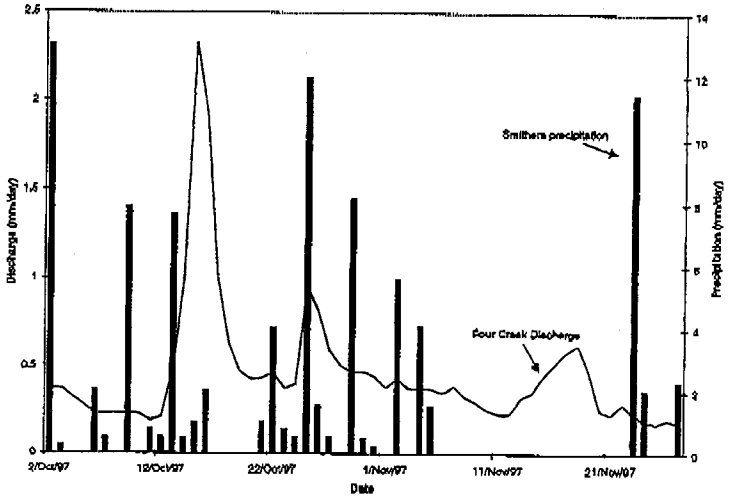

Figure 2: Four Creek discharge and Smithers Precipitation for 1997

CORRELATION OF TELKWA AREA RUNOFF AND SMITHERS PRECIPITATION

In general, the correlation between precipitation recorded at Smithers Airport and discharges in Simpson, Goathorn and Four Creeks is only fair. The discrepancy is more pronounced in the 1997 record than in 1998. Figure 2 and Figure 3 show the relationship between Four Creek discharges and Smithers precipitation for 1997 and 1998. Large precipitation events are not reflected in the discharge record, particularly after October 22. In addition, discharge in Four Creek increased in mid-November when no precipitation was recorded at Smithers.

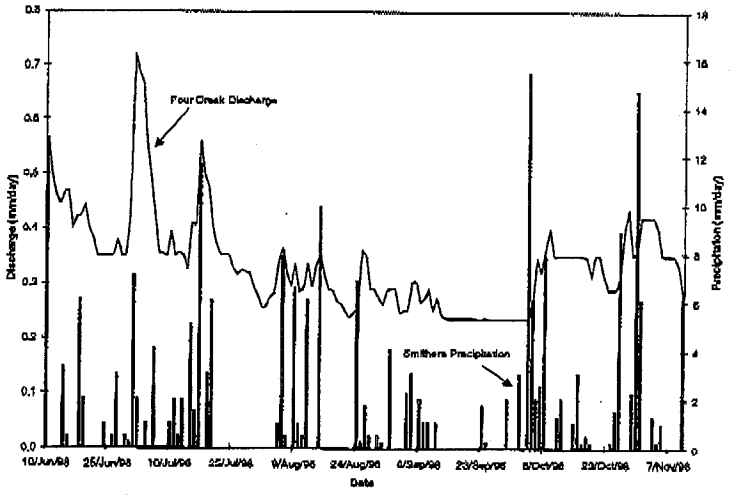

Figure 3: Four Creek Discharge and Smithers Precipitation for 1998

The timing of runoff and precipitation events for 1998 have a closer relationship than in 1997. Storm events in Smithers are generally reflected in the Four Creek discharge record. However, the magnitude of runoff response to precipitation is not well represented. Several large late-season precipitation events only result in minor increases in Four Creek discharge, as compared to early July where runoff is at its peak with only moderate precipitation recorded at Smithers. The record suggests that, at least on a daily time scale, precipitation recorded at Smithers is not representative of the precipitation received at Telkwa.

Over the longer-term (monthly or annually), however, the precipitation, however, the Smithers and Telkwa precipitation data appeared to correlate reasonably well. In the WMTCP report, precipitation recorded at Smithers (elevation 523 masl; 55 years of data) was compared to precipitation recorded at Telkwa (elevation 683 masl; 26 years of data) and Telkwa Coal Mine Road (elevation 670 masl; 3 years of data). Both Telkwa stations were discontinued over 10 years ago, however, the data suggests that the Telkwa area receives roughly 11% less precipitation than Smithers. Thus, the Smithers precipitation data was reduced by 11%, which was used to estimate precipitation, surface runoff and infiltration into the coal pits.

COMPARISON OF HYDROLOGY OF FOUR AND GOATHORN CREEKS

The WMTCP report identified four key gauged drainages in the Telkwa area:

- Canyon Creek Near Smithers (Environment Canada station #08EE014)
- Kathlyn Creek above Simpson Creek (08EE010)
- Simpson Creek at the Mouth (08EE012)
- Goathorn Creek near Telkwa (08EE008)

Two of Environment Canada's gauging stations, Canyon Creek and Kathlyn Creek, have been discontinued. Flow data for Goathorn, Simpson, and Four Creek are presented in Figure 4 and Figure 5. The data are presented as unit runoff (in mm). Thus, flows in the creeks have been corrected for drainage basin size.

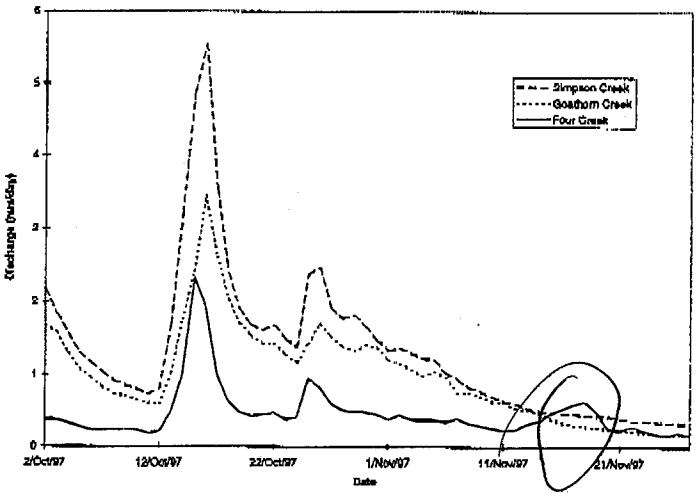

Figure 4: Comparison of Four, Simpson and Goathorn Creek average daily discharge for 1997

Data from Simpson Creek suggest that this basin is very "peaky" - a trait which was less marked in the Goathorn and Four Creek data. Thus, it appears that Goathorn Creek is a more appropriate comparison for Four Creek, and will be used in subsequent analyses.

Thus, to transform long-term Goathorn Creek data for use at the Four Creek site, a comparison of the 1997 data at the two sites was made[2]. The cumulative runoff at the Four Creek station was 23 mm, and at Goathorn Creek, 54 mm. This gives a ratio of 22.9/54.2 = 0.42. For 1998, the cumulative runoff for Four and Goathorn Creeks were 52 and 156 mm respectively, yielding a ratio of 0.33. The ratios for the 1997 and 1998 discharge records were averaged to produce a value of 0.38, which was applied to the Goathorn Creek data as a transformation.

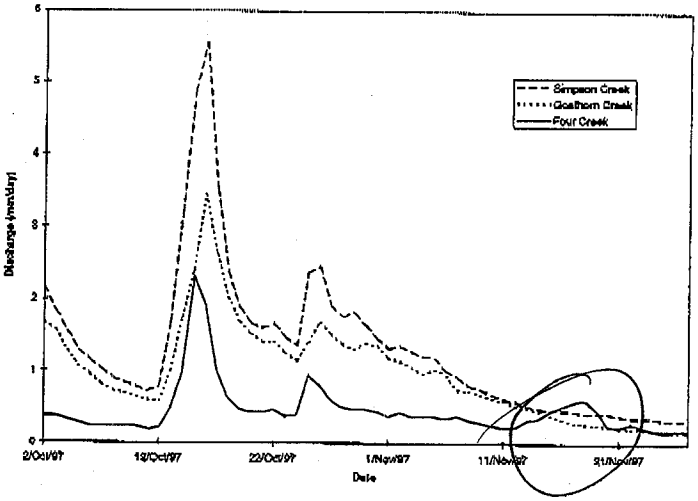

Figure 5: Comparison of Four, Simpson and Goathorn Creek average daily discharge for 1997

Table 1 shows the runoff coefficients for Goathorn and Four Creeks. These coefficients were calculated using Smithers precipitation data (decreased by 11% to account for differences between Smithers and Telkwa, as described previously). Runoff coefficients for Four Creek do not change from 1997 to 1998, remaining at 28%. In the WMTCP report, a runoff coefficient of 30% was adopted. This latter figure was challenged by the BC MELP, as 30% is a lower coefficient than has been determined in nearby gauged basins. However, the limited Four Creek flow data

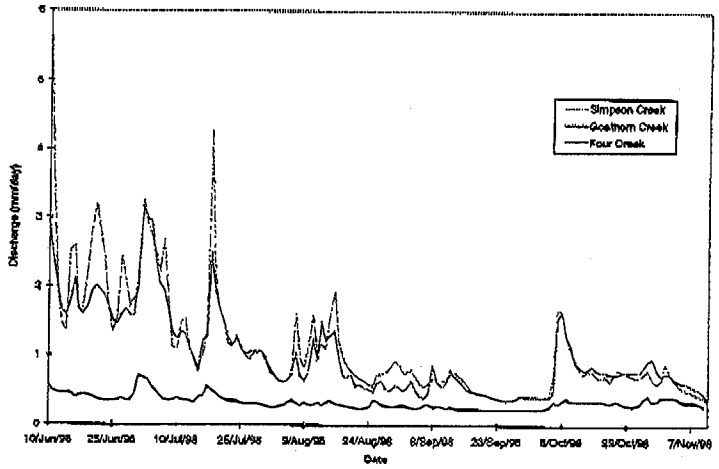

Figure 6: Comparison of Four, Goathorn and Simpson Creek Average Daily Discharge for 1998

Table 1 – Runoff coefficients for Four Creek and Goathorn Creek.

	1997			*1998*		
Basin	****Smithers Precipitation***	***Runoff***	***Runoff Coefficient***	****Smithers Precipitation***	***Runoff***	***Runoff Coefficient***
Four Creek	82 mm	23 mm	0.28	187 mm	52 mm	0.28
Goathorn Creek	82 mm	54 mm	0.65	187 mm	156 mm	0.83

Notes: Period of record for 1997 is October 2 to November 27.
Period of record for 1998 is June 10 to November 10.
* Decreased by 11% to transform to Telkwa area.

available suggest that a 30% runoff coefficient is indeed reasonable. The runoff coefficients for Goathorn Creek (relative to Smithers rainfall data) vary from 65% in 1997 to 83% in 1998. Our experience and knowledge of the area suggests that these figures are too high, since they imply that the Goathorn basin produces almost three times as much runoff (per square kilometre) as Four Creek. There are a number of potential sources for this discrepancy.

First, both basin aspect and elevation are expected to have a significant effect on discharge. The Goathorn Creek Basin has an altitude range of 1745 m (from 550 to 2295 masl) whereas the Four Creek basin has a range of only 670 m (from 700 to 1370 masl). If an orographic precipitation enhancement factor of roughly 40% per 1000 m is assumed (an average value for the Canadian Rocky Mountains, Quick and Pipes, 1996), then the Goathorn Creek watershed should receive significantly more precipitation. In addition, the Four Creek basin generally faces the northeast, where as the Goathorn Creek Basin faces both the northeast and the northwest. This variance in aspect will cause differences in snowpack accumulation and ablation.

Secondly, the influence of groundwater may be more pronounced in Goathorn Creek as it extends lower in the basin. Springs surfacing from fractures may augment flows in Goathorn Creek at elevations below the Goathorn/Four Creek confluence (700 masl).

Another factor is that Goathorn Creek is augmented by glacial runoff where as Four Creek is non-glaciated. Although the ice melt contribution during October and November is not expected to be great, there should be some water coming from glaciers due to pressure melting and perhaps internal storage.

TIMING OF RUNOFF

In general, the timing of the discharge record for Goathorn and Four Creeks compare favourably, as is illustrated in Figures 5 through 7. This suggests that the basins respond to meteorological events in a similar fashion, and thereby justifies the use of transformed Goathorn Creek discharge data as a surrogate for Four Creek data. Applying a time lag (at the daily scale) to the discharge does not improve this relationship.

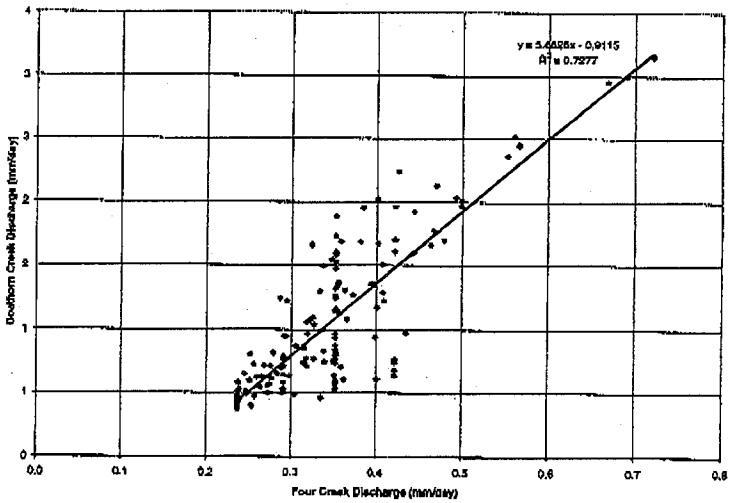

Figure 7: Relationship between Goathorn Creek and Four Creek average daily discharge

LOW FLOW ANALYSIS

Figure 8 shows the probabilities of mean annual low flows in Goathorn Creek. The data plotted are the lowest mean daily flows in Goathorn Creek (one mean daily flow for each year of record). For subsequent analysis purposes, the 1 in 10 year (10% probability) mean daily runoff of 0.045 mm/day was used as the reference. The runoff ratio of 0.38 was applied to estimate the 1 in 10 year low flow for Four Creek, giving a value of 0.017 mm/day. The average daily discharge for Goathorn Creek is 1.15 mm/day. Applying the ratio gives an estimated average daily runoff of 0.43 mm/day for Four Creek.

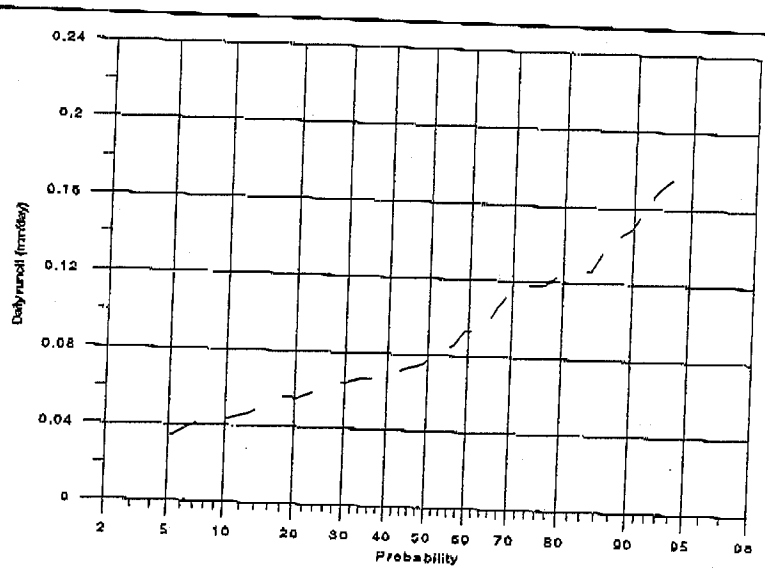

Figure 8: Mean daily low flow distribution in Goathorn Creek

The proposed diversion of the Four Creek tributary results in a reduction of roughly 18% of the total discharge area of Four Creek. Assuming that all areas of the basin behave in the same manner hydrologically, it can be assumed that the total discharge of Four Creek would also be reduced by 18%. Table 1 shows the estimated average daily and 1 in 10 year low flow for Four Creek at three stream locations assuming pre- and post-diversion scenarios. The influence of the proposed diversion on the flow of Four Creek is displayed graphically in the Appendix.

Table 2 - Estimated discharges for various locations along Four Creek.

Location	*% of original drainage area*	*Estimated Minimum 1 in 10 year Discharge (L/s)*		*Estimated Average Daily Discharge (L/s)*	
		with diversion	*without diversion*	*with diversion*	*without diversion*
At diversion	58	0.7	0.6	8.4	15
2/3 of basin length	74	0.9	1.3	22	30
At mouth	82	1.6	1.9	40	49

CONCLUSION

The use of Goathorn Creek data as a surrogate for Four Creek is reasonable provided that a transformation is applied (a value of 0.38 was used in this analysis). The two basins respond in a similar fashion in terms of timing, however, the Goathorn basin produces greater unit runoff. This may be a result of elevation, aspect, groundwater and/or icemelt.

The impact of the diversion on flows in Four Creek varies between the upper reaches and the mouth. At the mouth, only 18% of the original drainage is removed by diversion. At the point of diversion, however, 42% of the drainage (and hence flow) is removed. It is important to note that there is significant natural variability in the creek, ranging from a 1 in 10-year minimum of 1.9 L/s (assuming no diversion) to an average of 49 L/s.

It is possible to construct a diversion structure, which would guarantee a minimum flow in the creek. Only flows exceeding this minimum would be diverted into the pits. Withdrawals to the pits could therefore be restricted to higher flow periods, making the impact of the diversion relatively minor compared to natural creek variability.

Respectfully,

PITEAU ENGINEERING LTD.

Murray Fitch, M.A.Sc., P.Eng.
Senior Hydrologist

REFERENCES

Piteau, 1998. *Water Management for the Telkwa Coal Project.* Unpublished report prepared for Manalta Coal Ltd. Project #3773-16.

Quick, M.C, and Pipes, A.P., 1996. *U.B.C. Watershed Model Manual, Version 4.0,* Department of Civil Engineering, University of British Columbia.

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TO FAX #: 780.420.5878
COMPANY: Luscar
ATTENTION: Allan Flemming

DATE: Feb. 16, 1999
PROJ. #: 3773-17
FROM: Murray Fitch
NO. OF PAGES: 5
(INCLUDING COVER PAGE)

Allan,

Please find attached our first cut at a report on the effects of diversions of Four Creek. I recommend that the report be passed on to David Bustard for comments on potential fisheries impacts.

As I mentioned in our telephone conversation, there remains the issue of 1998 Four Creek monitoring data, which would give us a way to assess the relationship between low flows in Goathorn and Four Creeks. I believe that it is prudent that we wait for Agra to review this data prior to finalizing the report.

We have not included a map of the site, which is in production but was delayed due to problems in assessing drainage areas. Agra originally established the Four Creek gauge basin area using 1:50,000 topographic maps - the more recent maps provided by Manalta/Luscar have allowed us to more precisely define the drainage area. The upshot is some of the notes on the map are incorrect. I should also add that some of the numbers in the report will also change slightly, but I thought it more important to get you the report now despite the minor errors.

The major conclusion of the report should not change. In brief, the impact of the diversion will be relatively small in the lower watershed, and could be further minimized through the construction of a structure which would allow diversions only during higher flows. In the upper watershed, the effects of the diversion on flows are more substantial - it remains for the aquatics people to determine if these are changes would be significant for fish. Certainly, the natural variability of flows in the creek would appear to be a significant stressor for fish, particularly in the upper reaches.

If you have questions, please do not hesitate to call me or Alexi Zawadzki at (403)247-0200.

Murray Fitch

new release to come out by Feb 24/99

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February 16, 1999

OUR FILE: 3773-17

Luscar Coal Ltd.
10235 - 101 St.
Edmonton, AB
T5J 3G1
(fax) 780.420.5878 (tel) 780.420.4080

Attention: Allan Flemming, P.Eng.

Dear Mr. Flemming:

Re: Hydrology of Four Creek

Introduction

We have reviewed the hydrology of Four Creek, and have reached the following preliminary findings. The following is intended for your review. We would be happy to incorporate the findings into a letter which would be suitable for dissemination to other parties such as BC MELP.

Figure 1 shows the drainage sub-basins of Four Creek. For analysis purposes, we have considered flows at the following locations:

1: the proposed diversion location into the Tenas Main Pit
2: two thirds of the drainage area
3: the mouth of Four Creek (confluence with Goathorn Creek)

Hydrology of Four Creek

The Telkwa Report (official name) presented a detailed analysis of the hydrology of the Telkwa region. Four key watercourses were identified in this work:

- Canyon Creek Near Smithers - 08EE014
- Kathlyn Creek above Simpson Creek - 08EE010

- Simpson Creek at the Mouth - 08EE012
- Goathorn Creek near Telkwa - 08EE008

Piteau has subsequently received flow measurement data from Agra for 1997 (Oct. 2-Nov. 27) and 1998 (Jun. 9-Oct. 19). Ideally this short-term data could be used in conjunction with regional flow data to accurately characterize the hydrology of Four Creek. However, our analysis of the Four Creek data shows that the 1997 data appears generally plausible, but the 1998 discharges are too low to be credible[1].

thurs/Fri of last week revised rating curve. re-issue 4-Creek

Comparison of hydrology of Four and Goathorn Creeks (1997)

Two of the Environment Canada gauging stations, Canyon Creek and Kathlyn Creek, have been discontinued. Flow data for Goathorn, Simpson, and Four Creek are presented in Figure 1. The data are presented as unit runoff (in mm). Thus, flows in the creeks have been corrected for drainage basin size. Basins with identical runoff coefficients (the percentage of precipitation which runs off into a creek) would plot as identical lines, regardless of basin size.

Data from Simpson Creek suggest that this basin is very "peaky" - a trait which was less marked in the Goathorn and Four Creek data. Thus, it appears that Goathorn Creek is a more appropriate comparison for Four Creek, and will be used in subsequent analyses.

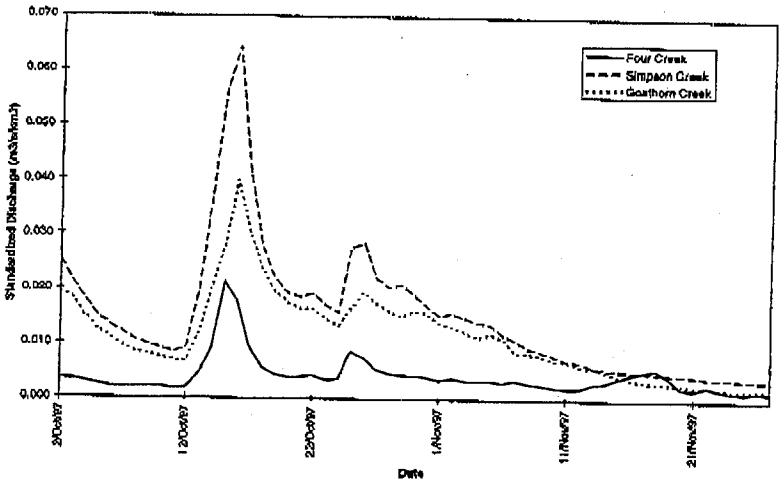

Figure 1: Comparison of Four Creek, Goathorn Creek and Simpson Creek Average Daily Discharge

Flow data for Goathorn Creek in 1997 was reported to be unreliable after November 15 due to ice conditions. Thus, to transform long-term Goathorn Creek data for use at the Four Creek site, a comparison of the 1997 data at the two sites was made. The cumulative runoff at the Four Creek station was 22.9 mm, and at Goathorn Creek, 54.2 mm. Thus, a ratio of 22.9/54.2 = 0.42 was applied to Goathorn data as a transformation. This implies that the Goathorn basin produces more than three times as much runoff (per square kilometre). There are a number of ~~potential sources of error~~ reasons for this discrepancy in this estimate.

First, Goathorn Creek is augmented by glacial runoff where as Four Creek is ice-free (termed *nival*). Although the ice melt contribution during October and November is not expected to be great, there will be some water coming from glaciers due to pressure melting and perhaps internal storage. A second source of error may be from the estimation of drainage area. Agra had

[1] Agra has indicated to us that the 1998 data had not been quality controlled (Kristi McKay, pers. comm.). This quality control is in process.

which is correct

estimated the drainage area of Four Creek as being 13 km^2 using 1:50,000 topographical maps. Komex had estimated the drainage area as being 10 km^2 using 1:20,000 maps provided by Manalta Coal Ltd/Luscar. The ramifications of an overestimation of drainage area are that discharge per unit area is underestimated. This may be the case as it is estimated that Four Creek produces three times less runoff than neighbouring Goat Creek. Goathorn.

Figure 2 shows the probabilities of mean annual low flows in Goathorn Creek. The data plotted are the lowest mean daily flows in Goathorn Creek (one mean daily flow for each year of record). For subsequent analysis purposes, the 1 in 10 year (10% probability) mean daily runoff of 0.045 mm/day was used as the reference. The runoff ratio of 0.32 was applied to estimate the 1 in 10 year low flow for Four Creek, giving a value of 0.012 mm/day. The average daily discharge for Goathorn Creek is 1.15 mm/day. Applying the ratio gives an estimated average daily discharge of 0.373 mm/day for Four Creek.

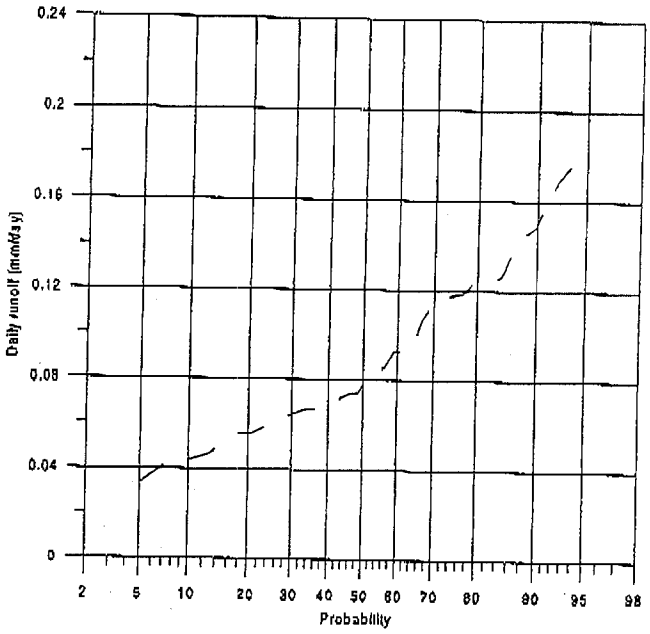

Figure 2: Mean Daily Low Flow Distribution in Goathorn Creek

The proposed diversion of the Four Creek tributary results in a reduction of roughly 18% of the total discharge area of Four Creek. Assuming that all areas of the basin behave in the same manner hydrologically, it can be assumed that the total discharge of Four Creek would also be reduced by 17%. Table 1 shows the estimated average daily and 1 in 10 year low flow for Four Creek at three stream locations assuming pre- and post-diversion scenarios.

or 18%

Table 1 - Estimated discharges for various locations along Four Creek.

Location	*% of original drainage area*	*Estimated Minimum 1 in 10 year Discharge (L/s)*		*Estimated Average Daily Discharge (L/s)*	
		with diversion	*without diversion*	*with diversion*	*without diversion*
At diversion	58	0.35	0.60	8.00	13.80
2/3 of basin length	74	0.89	1.20	21.20	28.65
At mouth	82	1.48	1.80	37.76	46.05

Conclusion

The impact of the diversion on flows in Four Creek varies between the upper reaches and the mouth. At the mouth, only 18% of the original drainage is removed by diversion. At the point of diversion, however, 42% of the drainage (and hence flow) is removed. It is important to note that there is significant natural variability in the creek, ranging from a 1 in 10 year minimum of 1.8 L/s (assuming no diversion) to an average of 46 L/s.

It is possible to construct a diversion structure which would guarantee a minimum flow in the creek. Only flows exceeding this minimum would be diverted into the pits. Withdrawals to the pits could therefore be restricted to higher flow periods, making the impact of the diversion relatively minor compared to natural creek variability.

Respectfully,

PITEAU ENGINEERING LTD.

Murray Fitch

Murray Fitch, M.A.Sc., P.Eng.
Senior Hydrologist

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Attachment B Baseflow Separation Results

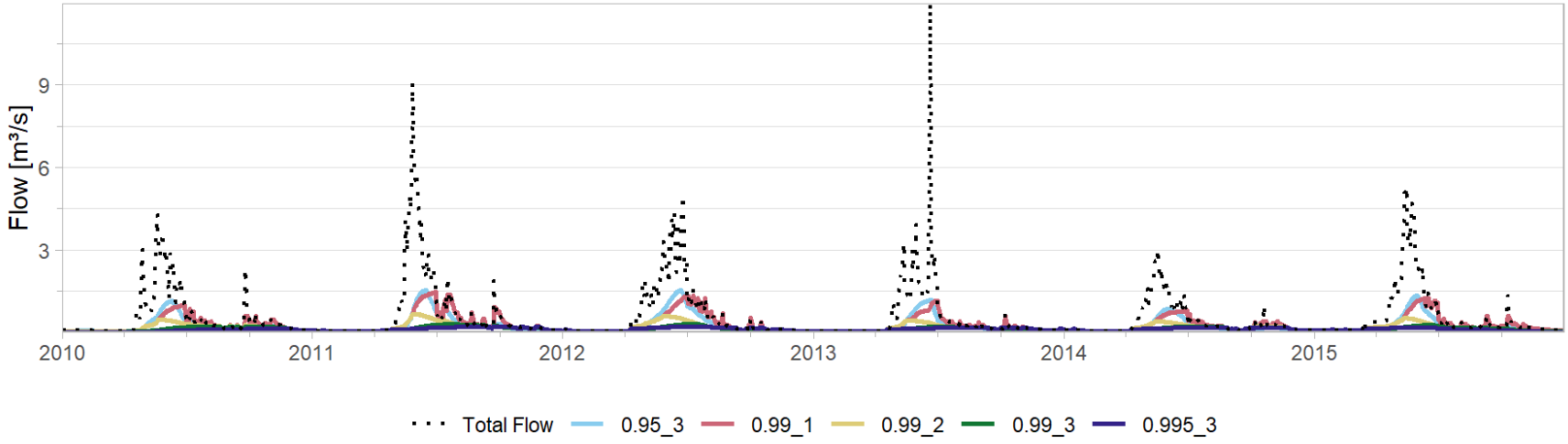


Figure A- 1: Tenas Creek Baseflow Separation results with varied Filter Parameter and Number of Passes

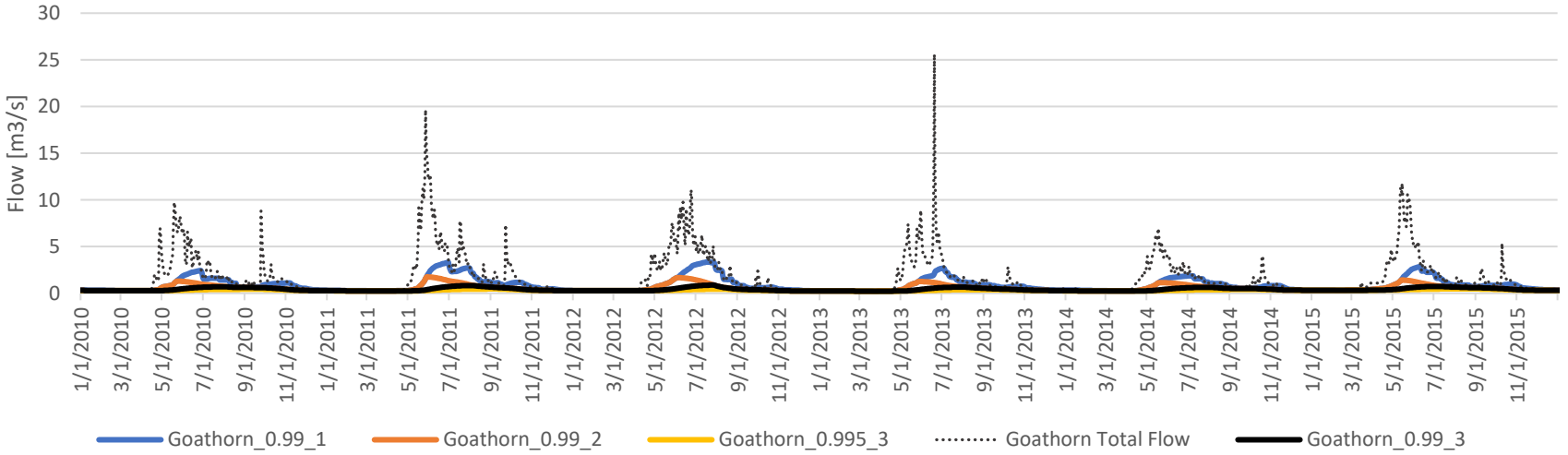


Figure A- 2: Goathorn Creek Baseflow Separation results with varied Filter Parameter and Number of Passes

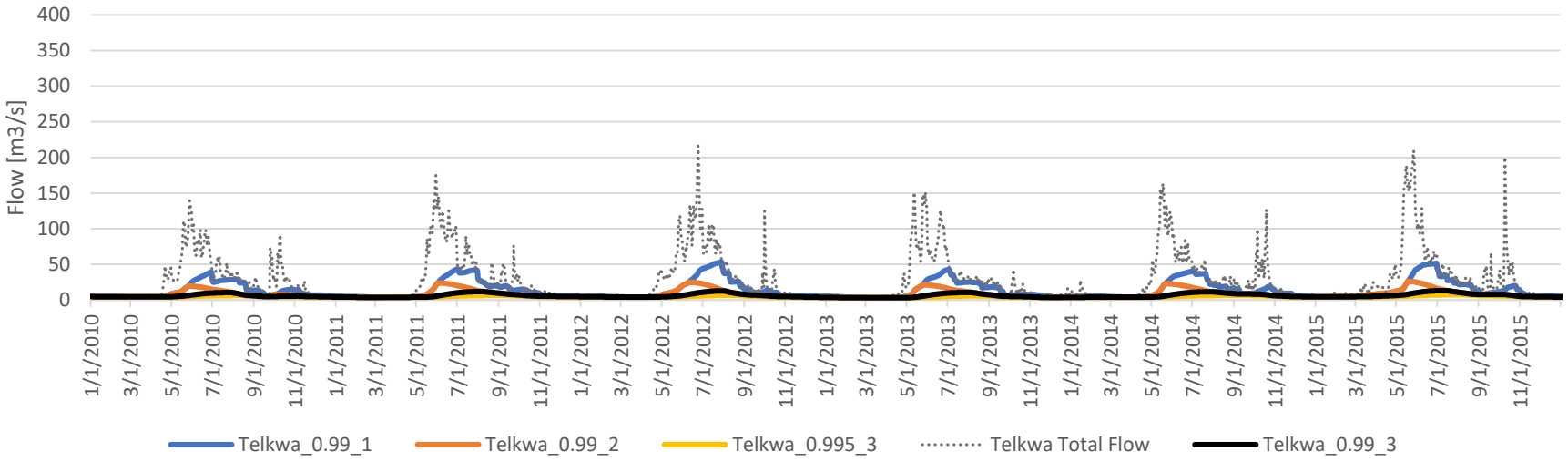


Figure A- 3: Telkwa River Baseflow Separation results with varied Filter Parameter and Number of Passes

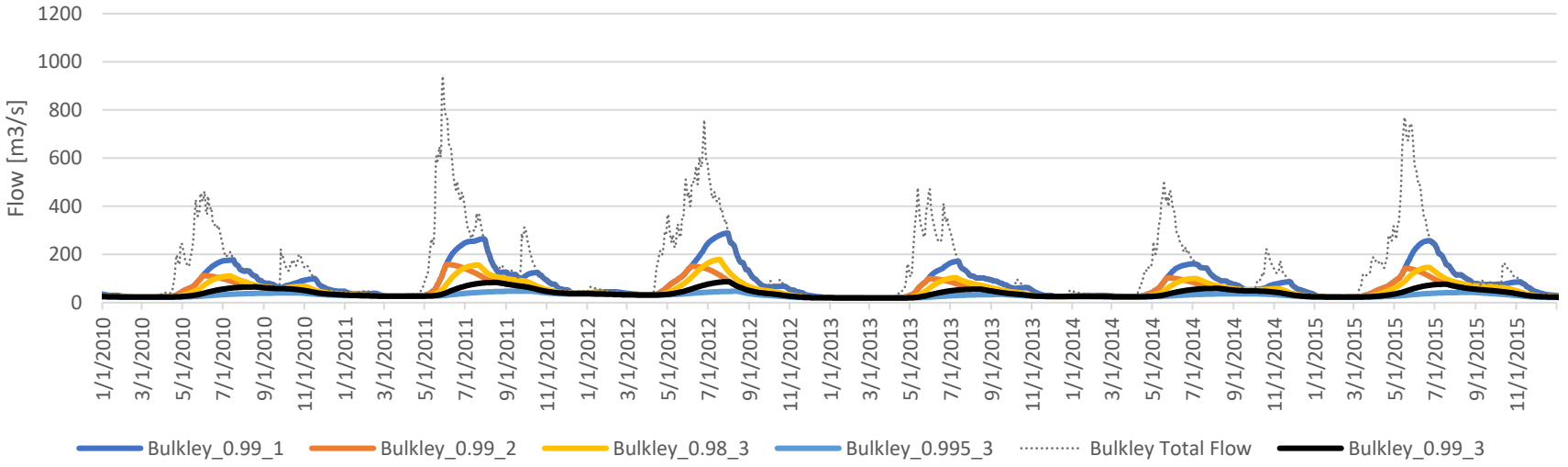


Figure A- 4: Bulkley River Baseflow Separation results with varied Filter Parameter and Number of Passes

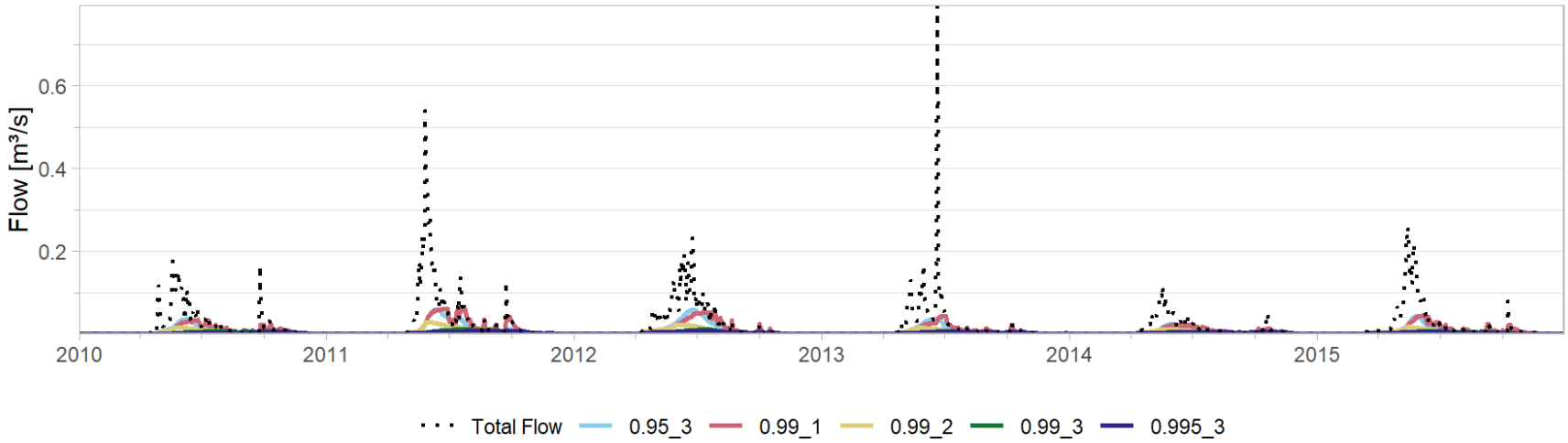


Figure A- 5: Four River Baseflow Separation results with varied Filter Parameter and Number of Passes

Attachment C AGRA 1999 Data Summaries

Table C-1. Tenas Creek Summary Sheet

Description: Lower Tenas Creek downstream of the Tenas Pit

Site ID:	Lower Tenas Ck	Start Date:	08-May-97
Operator:	TELKWA COAL	End Date:	10-Nov-98
Frequency:	DISCONTINUOUS	Discharge:	In Stream
Monitored:	YES	Water Level:	Level Survey

Comments:

The continuous discharge times series was calculated from 1-hour interval water level recordings.

1997 and 1998 Spot Measurement Summary

Date & Time	Discharge (m^3/s)	Staff Gauge (m)	Flow Measurement Method
08-May-1997	2.55	0.566	Current meter
16-May-1997	6.04	1.05	Current meter
22-May-1997	2.76	0.624	Current meter
13-Jun-1997	3.22	0.676	Current meter
24-Apr-1998	0.810	0.480	Current meter
14-May-1998	3.31	0.690	Current meter
27-May-1998	6.10	0.780	Current meter
23-Jun-1998	0.566	0.450	Current meter
21-Jul-1998	0.399	0.430	Current meter
19-Aug-1998	0.208	0.390	Current meter
09-Sep-1998	0.210	0.385	Current meter
25-Sep-1998	0.156	0.368	Current meter
10-Nov-1998	0.116	0.395	Current meter

ND: No Data

Figure: 1997 - 1998 Spot Discharge and Daily Discharge in Lower Tenas Creek

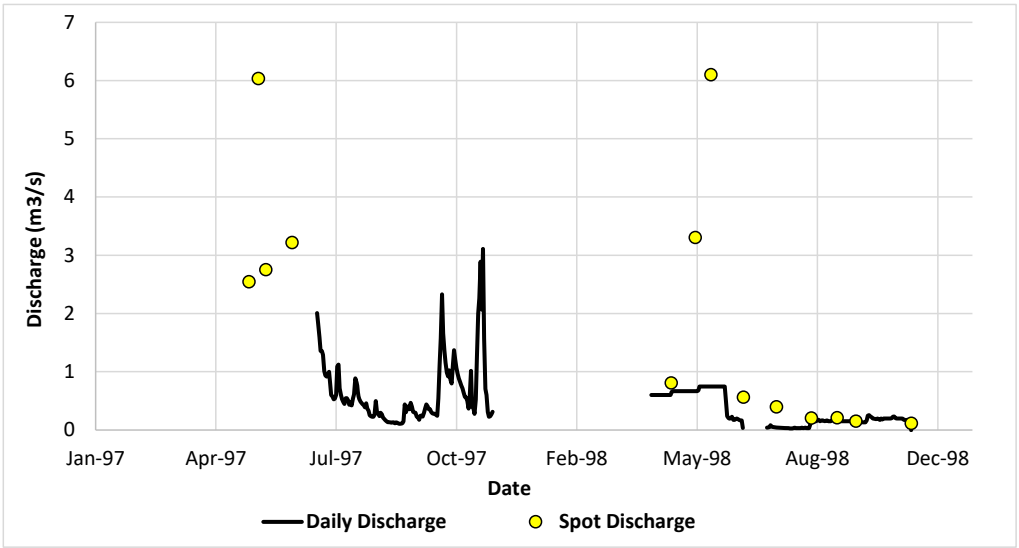


Table C-2. Four Creek Summary Sheet

Description: Four Creek above the confluence with Goathorn Creek

Site ID:	Lower Four Ck	Start Date:	09-May-97
Operator:	TELKWA COAL	End Date:	10-Nov-98
Frequency:	DISCONTINUOUS	Discharge:	In Stream
Monitored:	YES	Water Level:	Level Survey

Comments:

The continuous discharge times series was calculated from 1-hour interval datalogger recordings.

1997 and 1998 Spot Measurement Summary

Date & Time	Discharge (m^3/s)	Staff Gauge (m)	Flow Measurement Method
09-May-1997	0.384	0.336	Current meter
15-May-1997	0.786	0.421	Current meter
21-May-1997	0.269	0.268	Current meter
11-Jun-1997	0.0810	0.193	Current meter
28-Apr-1998	0.569	0.375	Current meter
30-Apr-1998	0.545	0.372	Current meter
13-May-1998	0.271	0.326	Current meter
26-May-1998	0.313	0.335	Current meter
10-Jun-1998	0.0117	0.180	Current meter
23-Jun-1998	0.00495	0.153	Current meter
24-Jun-1998	0.00739	0.165	Current meter
10-Jul-1998	0.00865	0.170	Current meter
22-Jul-1998	0.00813	0.168	Current meter
29-Jul-1998	0.00628	0.160	Current meter
18-Aug-1998	0.00628	0.160	Current meter
09-Sep-1998	0.00670	0.162	Current meter
10-Nov-1998	0.01474	0.188	Current meter

ND: No Data

Figure: 1997 - 1998 Spot Discharge and Daily Discharge in Lower Four Creek

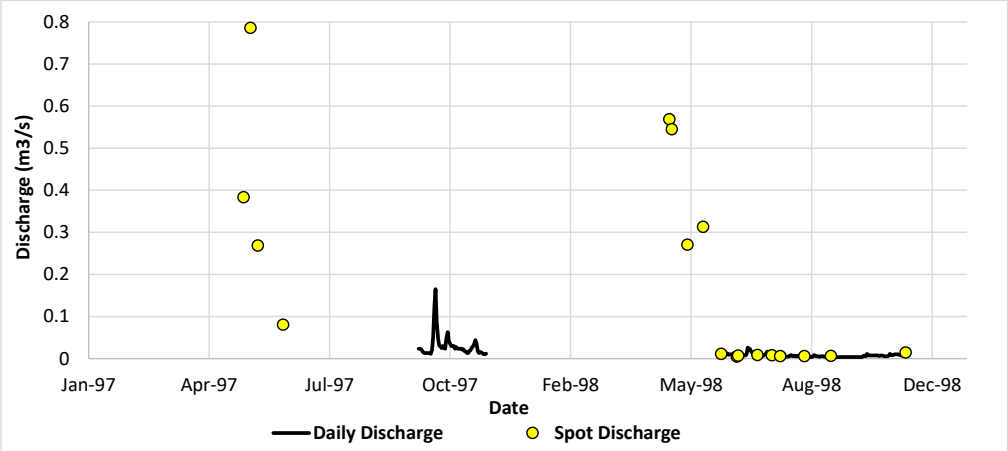


Table C-3. Goathorn Creek Summary Sheet

Description: Goathorn Creek near Telkwa

Site ID:	WSC 08EE008	Start Date:	01-Jan-97
Operator:	WATER SURVEY OF CANADA	End Date:	31-Dec-98
Frequency:	CONTINUOUS	Discharge:	In Stream
Monitored:	YES	Water Level:	Level Survey

Comments:

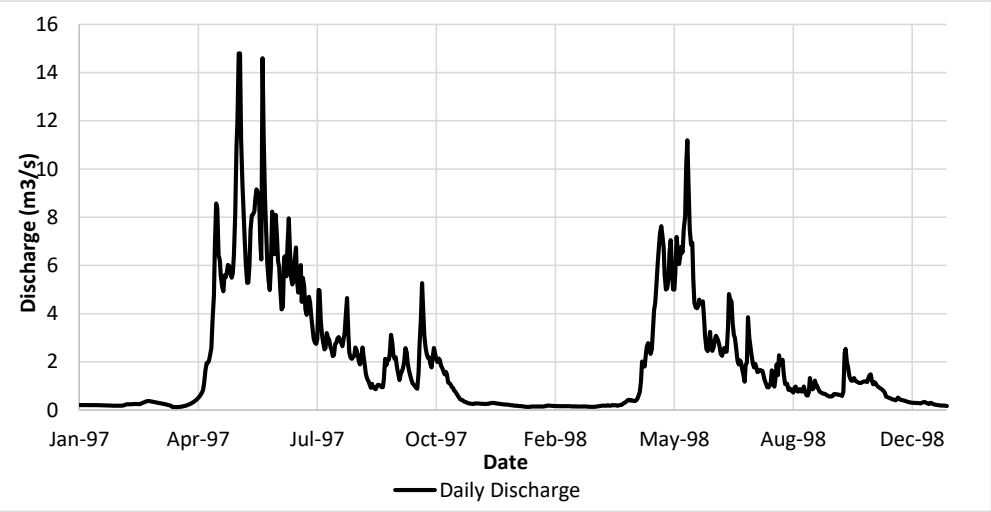
Continuous daily discharge time series generated by WSC.

1997 and 1998 Spot Measurement Summary

Date & Time	Discharge (m^3/s)	Staff Gauge (m)	Flow Measurement Method
ND	ND	ND	ND

ND: No Data (Data provided by Water Survey of Canada)

Figure: 1997 - 1998 Daily Discharge in Goathorn Creek (WSC 08EE008)



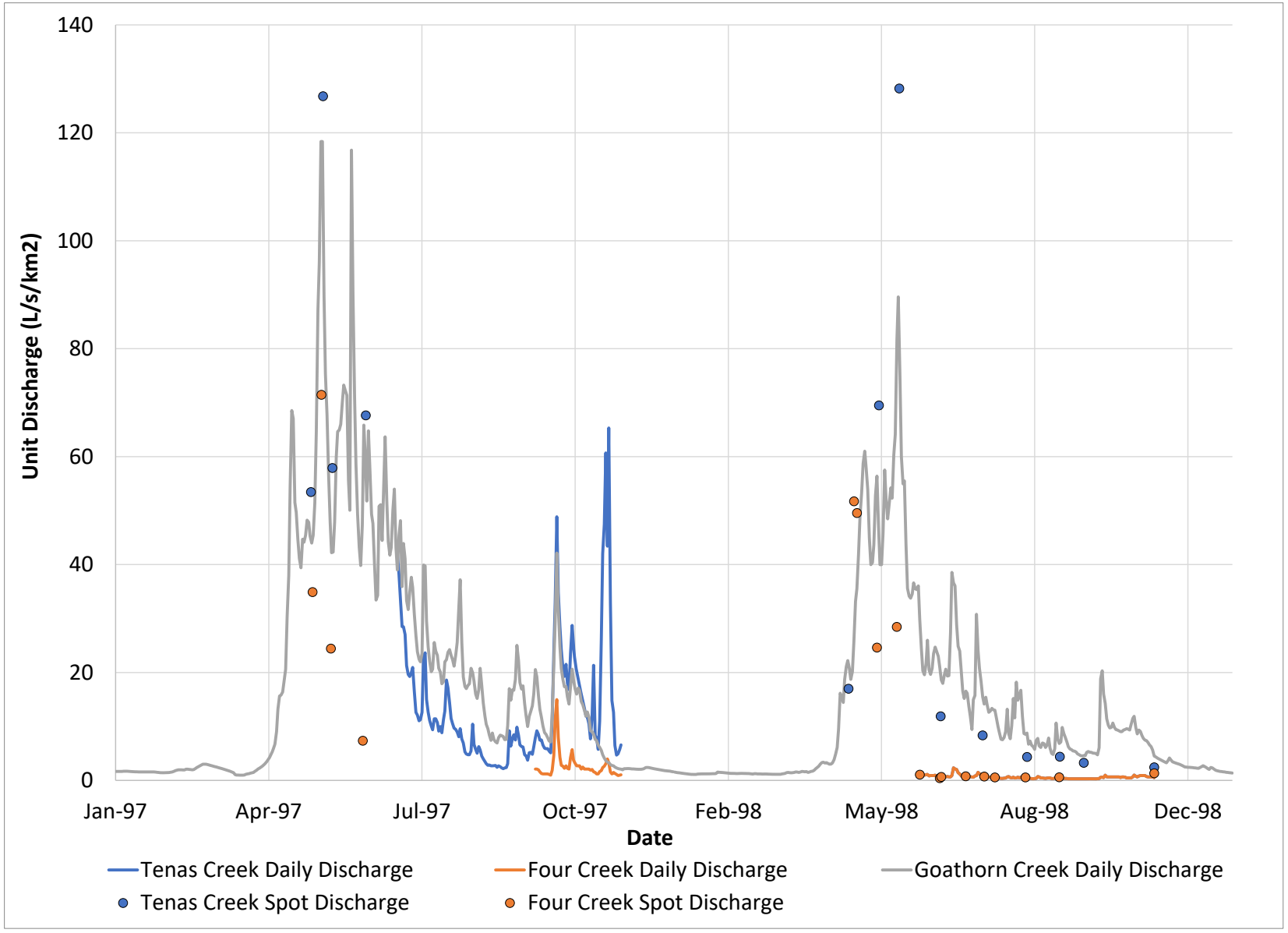


Figure C-1. Daily and Spot Unit Discharge at Each Station

Table C-4. Time Series of Daily Discharge at Each Station

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
01-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
02-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
03-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
04-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
05-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
06-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
07-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.71
08-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.72
09-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.73
10-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
11-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.67
12-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
13-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.64
14-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
15-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
16-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
17-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
18-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
19-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
20-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
21-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
22-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.61
23-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
24-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.59
25-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
26-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
27-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
28-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.54
29-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
30-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
31-Jan-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.45
01-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44
02-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.45
03-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
04-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
05-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
06-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.52
07-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
08-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
09-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.23	1.84
10-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.92
11-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
12-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.99
13-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.98
14-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.98
15-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.97
16-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
17-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
18-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.07
19-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.04
20-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
21-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.04
22-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
23-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
24-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.32	2.56
25-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.34	2.72
26-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.36	2.88
27-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.38	3.04
28-Feb-97	ND	ND	ND	ND	ND	ND	0.00	0.38	3.04
01-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.38	3.04
02-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.37	2.94
03-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.36	2.88
04-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.35	2.80
05-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.34	2.72
06-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.33	2.64
07-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.32	2.56
08-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.31	2.48
09-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
10-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.32
11-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
12-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
13-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
14-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.25	1.98
15-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.90
16-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.76
17-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.68
18-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
19-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
20-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.14	1.10
21-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.04
22-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.02
23-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.12	0.99
24-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.00
25-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.00
26-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.13	1.04
27-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.15	1.16
28-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
29-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
30-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.17	1.36
31-Mar-97	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44
01-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.19	1.48
02-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.72
03-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.88
04-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
05-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.32
06-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.31	2.48
07-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.34	2.72
08-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.37	2.96
09-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.41	3.28
10-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.45	3.60
11-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.51	4.08
12-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.56	4.48
13-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.65	5.20
14-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.74	5.92
15-Apr-97	ND	ND	ND	ND	ND	ND	0.00	0.84	6.74
16-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.13	9.04
17-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.65	13.20
18-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.96	15.68
19-Apr-97	ND	ND	ND	ND	ND	ND	0.00	1.98	15.84
20-Apr-97	ND	ND	ND	ND	ND	ND	0.00	2.05	16.40
21-Apr-97	ND	ND	ND	ND	ND	ND	0.00	2.29	18.32
22-Apr-97	ND	ND	ND	ND	ND	ND	0.00	2.58	20.64
23-Apr-97	ND	ND	ND	ND	ND	ND	0.00	3.80	30.40
24-Apr-97	ND	ND	ND	ND	ND	ND	0.00	4.75	38.00
25-Apr-97	ND	ND	ND	ND	ND	ND	0.00	6.81	54.48
26-Apr-97	ND	ND	ND	ND	ND	ND	0.00	8.57	68.56
27-Apr-97	ND	ND	ND	ND	ND	ND	0.00	8.38	67.04
28-Apr-97	ND	ND	ND	ND	ND	ND	0.00	6.44	51.52

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
29-Apr-97	ND	ND	ND	ND	ND	ND	0.00	6.21	49.68
30-Apr-97	ND	ND	ND	ND	ND	ND	0.00	5.58	44.64
01-May-97	ND	ND	ND	ND	ND	ND	0.00	5.14	41.12
02-May-97	ND	ND	ND	ND	ND	ND	0.00	4.93	39.44
03-May-97	ND	ND	ND	ND	ND	ND	0.00	5.59	44.72
04-May-97	ND	ND	ND	ND	ND	ND	0.00	5.52	44.16
05-May-97	ND	ND	ND	ND	ND	ND	0.00	5.68	45.44
06-May-97	ND	ND	ND	ND	ND	ND	0.00	6.03	48.24
07-May-97	ND	ND	ND	ND	ND	ND	0.00	5.98	47.84
08-May-97	ND	ND	ND	ND	ND	ND	0.00	5.66	45.28
09-May-97	ND	ND	ND	ND	ND	ND	0.00	5.50	44.00
10-May-97	ND	ND	ND	ND	ND	ND	0.00	5.68	45.44
11-May-97	ND	ND	ND	ND	ND	ND	0.00	6.43	51.44
12-May-97	ND	ND	ND	ND	ND	ND	0.00	8.09	64.72
13-May-97	ND	ND	ND	ND	ND	ND	0.00	10.90	87.20
14-May-97	ND	ND	ND	ND	ND	ND	0.00	12.00	96.00
15-May-97	ND	ND	ND	ND	ND	ND	0.00	14.80	118.40
16-May-97	ND	ND	ND	ND	ND	ND	0.00	14.80	118.40
17-May-97	ND	ND	ND	ND	ND	ND	0.00	11.20	89.60
18-May-97	ND	ND	ND	ND	ND	ND	0.00	9.42	75.36
19-May-97	ND	ND	ND	ND	ND	ND	0.00	8.46	67.68
20-May-97	ND	ND	ND	ND	ND	ND	0.00	7.13	57.04
21-May-97	ND	ND	ND	ND	ND	ND	0.00	5.99	47.92
22-May-97	ND	ND	ND	ND	ND	ND	0.00	5.28	42.24
23-May-97	ND	ND	ND	ND	ND	ND	0.00	5.29	42.32
24-May-97	ND	ND	ND	ND	ND	ND	0.00	5.99	47.92
25-May-97	ND	ND	ND	ND	ND	ND	0.00	7.49	59.92
26-May-97	ND	ND	ND	ND	ND	ND	0.00	8.08	64.64
27-May-97	ND	ND	ND	ND	ND	ND	0.00	8.12	64.96
28-May-97	ND	ND	ND	ND	ND	ND	0.00	8.25	66.00
29-May-97	ND	ND	ND	ND	ND	ND	0.00	8.77	70.16
30-May-97	ND	ND	ND	ND	ND	ND	0.00	9.16	73.28
31-May-97	ND	ND	ND	ND	ND	ND	0.00	9.03	72.24
01-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.92	71.36
02-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.95	55.60
03-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.26	50.08
04-Jun-97	ND	ND	ND	ND	ND	ND	0.00	14.60	116.80
05-Jun-97	ND	ND	ND	ND	ND	ND	0.00	11.30	90.40
06-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.87	70.96
07-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.33	58.64

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
08-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.17	49.36
09-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.41	43.28
10-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.98	39.84
11-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.92	47.36
12-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.23	65.84
13-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.43	59.44
14-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.47	51.76
15-Jun-97	ND	ND	ND	ND	ND	ND	0.00	8.10	64.80
16-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.20	57.60
17-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.17	49.36
18-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.95	47.60
19-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.99	39.92
20-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.18	33.44
21-Jun-97	ND	ND	ND	ND	ND	ND	0.00	4.29	34.32
22-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.35	50.80
23-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.39	51.12
24-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.56	44.48
25-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.86	54.88
26-Jun-97	ND	ND	ND	ND	ND	ND	0.00	7.96	63.68
27-Jun-97	ND	ND	ND	ND	ND	ND	0.00	6.51	52.08
28-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.53	44.24
29-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.22	41.76
30-Jun-97	ND	ND	ND	ND	ND	ND	0.00	5.40	43.20
01-Jul-97	ND	ND	ND	ND	ND	ND	0.00	6.26	50.08
02-Jul-97	ND	ND	ND	ND	ND	ND	0.00	6.75	54.00
03-Jul-97	ND	ND	ND	ND	ND	ND	0.00	5.39	43.12
04-Jul-97	0.58	2.01	42.22	ND	ND	ND	0.00	4.88	39.04
05-Jul-97	0.57	1.82	38.2	ND	ND	ND	0.00	5.67	45.36
06-Jul-97	0.56	1.59	33.47	ND	ND	ND	0.00	6.02	48.16
07-Jul-97	0.54	1.36	28.5	ND	ND	ND	0.00	4.49	35.92
08-Jul-97	0.54	1.36	28.49	ND	ND	ND	0.00	5.49	43.92
09-Jul-97	0.53	1.29	27.06	ND	ND	ND	0.00	5.14	41.12
10-Jul-97	0.51	1.01	21.29	ND	ND	ND	0.00	4.17	33.36
11-Jul-97	0.5	0.94	19.65	ND	ND	ND	0.00	3.96	31.68
12-Jul-97	0.5	0.92	19.25	ND	ND	ND	0.00	4.36	34.88
13-Jul-97	0.5	0.95	20	ND	ND	ND	0.00	4.71	37.68
14-Jul-97	0.51	1	20.98	ND	ND	ND	0.00	4.47	35.76
15-Jul-97	0.49	0.79	16.53	ND	ND	ND	0.00	3.86	30.88
16-Jul-97	0.46	0.6	12.63	ND	ND	ND	0.00	3.36	26.88
17-Jul-97	0.46	0.58	12.11	ND	ND	ND	0.00	2.98	23.84

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
18-Jul-97	0.45	0.53	11.08	ND	ND	ND	0.00	2.81	22.48
19-Jul-97	0.45	0.54	11.29	ND	ND	ND	0.00	2.75	22.00
20-Jul-97	0.46	0.6	12.65	ND	ND	ND	0.00	2.94	23.52
21-Jul-97	0.51	1.09	22.9	ND	ND	ND	0.00	4.99	39.92
22-Jul-97	0.52	1.13	23.65	ND	ND	ND	0.00	4.97	39.76
23-Jul-97	0.48	0.72	15.04	ND	ND	ND	0.00	3.70	29.60
24-Jul-97	0.46	0.6	12.69	ND	ND	ND	0.00	3.10	24.80
25-Jul-97	0.45	0.53	11.13	ND	ND	ND	0.00	2.77	22.16
26-Jul-97	0.44	0.48	10.1	ND	ND	ND	0.00	2.52	20.16
27-Jul-97	0.43	0.45	9.41	ND	ND	ND	0.00	2.58	20.64
28-Jul-97	0.45	0.55	11.46	ND	ND	ND	0.00	3.20	25.60
29-Jul-97	0.45	0.55	11.46	ND	ND	ND	0.00	3.00	24.00
30-Jul-97	0.45	0.51	10.74	ND	ND	ND	0.00	2.90	23.20
31-Jul-97	0.43	0.44	9.16	ND	ND	ND	0.00	2.60	20.80
01-Aug-97	0.44	0.48	10.02	ND	ND	ND	0.00	2.51	20.08
02-Aug-97	0.43	0.42	8.85	ND	ND	ND	0.00	2.24	17.92
03-Aug-97	0.45	0.54	11.3	ND	ND	ND	0.00	2.29	18.32
04-Aug-97	0.46	0.61	12.88	ND	ND	ND	0.00	2.75	22.00
05-Aug-97	0.5	0.89	18.64	ND	ND	ND	0.00	2.80	22.40
06-Aug-97	0.49	0.82	17.19	ND	ND	ND	0.00	2.97	23.76
07-Aug-97	0.47	0.69	14.4	ND	ND	ND	0.00	3.03	24.24
08-Aug-97	0.45	0.55	11.51	ND	ND	ND	0.00	2.90	23.20
09-Aug-97	0.44	0.5	10.54	ND	ND	ND	0.00	2.80	22.40
10-Aug-97	0.44	0.46	9.72	ND	ND	ND	0.00	2.65	21.20
11-Aug-97	0.43	0.45	9.49	ND	ND	ND	0.00	2.90	23.20
12-Aug-97	0.43	0.43	8.97	ND	ND	ND	0.00	3.20	25.60
13-Aug-97	0.42	0.39	8.13	ND	ND	ND	0.00	4.00	32.00
14-Aug-97	0.44	0.46	9.63	ND	ND	ND	0.00	4.65	37.20
15-Aug-97	0.42	0.37	7.7	ND	ND	ND	0.00	3.20	25.60
16-Aug-97	0.41	0.33	6.96	ND	ND	ND	0.00	2.40	19.20
17-Aug-97	0.39	0.25	5.32	ND	ND	ND	0.00	2.18	17.44
18-Aug-97	0.38	0.23	4.92	ND	ND	ND	0.00	2.13	17.04
19-Aug-97	0.38	0.23	4.8	ND	ND	ND	0.00	2.20	17.60
20-Aug-97	0.38	0.23	4.78	ND	ND	ND	0.00	2.24	17.92
21-Aug-97	0.39	0.26	5.48	ND	ND	ND	0.00	2.60	20.80
22-Aug-97	0.44	0.5	10.43	ND	ND	ND	0.00	2.50	20.00
23-Aug-97	0.41	0.32	6.69	ND	ND	ND	0.00	2.30	18.40
24-Aug-97	0.39	0.28	5.8	ND	ND	ND	0.00	2.00	16.00
25-Aug-97	0.38	0.24	5.06	ND	ND	ND	0.00	1.90	15.20
26-Aug-97	0.4	0.3	6.28	ND	ND	ND	0.00	2.10	16.80

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
27-Aug-97	0.39	0.27	5.68	ND	ND	ND	0.00	2.60	20.80
28-Aug-97	0.38	0.22	4.53	ND	ND	ND	0.00	2.20	17.60
29-Aug-97	0.37	0.19	4.02	ND	ND	ND	0.00	1.80	14.40
30-Aug-97	0.36	0.17	3.52	ND	ND	ND	0.00	1.50	12.00
31-Aug-97	0.35	0.15	3.12	ND	ND	ND	0.00	1.30	10.40
01-Sep-97	0.34	0.13	2.81	ND	ND	ND	0.00	1.20	9.60
02-Sep-97	0.34	0.14	2.88	ND	ND	ND	0.00	1.05	8.40
03-Sep-97	0.34	0.13	2.74	ND	ND	ND	0.00	0.93	7.44
04-Sep-97	0.34	0.13	2.72	ND	ND	ND	0.00	1.10	8.80
05-Sep-97	0.34	0.13	2.76	ND	ND	ND	0.00	0.95	7.60
06-Sep-97	0.34	0.13	2.78	ND	ND	ND	0.00	0.90	7.20
07-Sep-97	0.33	0.12	2.45	ND	ND	ND	0.00	0.87	6.96
08-Sep-97	0.34	0.13	2.73	ND	ND	ND	0.00	0.99	7.94
09-Sep-97	0.34	0.12	2.55	ND	ND	ND	0.00	1.05	8.40
10-Sep-97	0.33	0.11	2.36	ND	ND	ND	0.00	1.04	8.32
11-Sep-97	0.33	0.11	2.21	ND	ND	ND	0.00	1.02	8.16
12-Sep-97	0.33	0.11	2.34	ND	ND	ND	0.00	0.95	7.60
13-Sep-97	0.33	0.11	2.38	ND	ND	ND	0.00	0.95	7.62
14-Sep-97	0.35	0.15	3.14	ND	ND	ND	0.00	1.27	10.16
15-Sep-97	0.43	0.44	9.23	ND	ND	ND	0.00	2.13	17.04
16-Sep-97	0.4	0.3	6.38	ND	ND	ND	0.00	1.86	14.88
17-Sep-97	0.42	0.37	7.76	ND	ND	ND	0.00	2.10	16.80
18-Sep-97	0.43	0.4	8.48	ND	ND	ND	0.00	2.09	16.72
19-Sep-97	0.42	0.36	7.51	ND	ND	ND	0.00	2.34	18.72
20-Sep-97	0.44	0.47	9.87	ND	ND	ND	0.00	3.13	25.04
21-Sep-97	0.42	0.4	8.38	ND	ND	ND	0.00	2.78	22.24
22-Sep-97	0.4	0.31	6.6	ND	ND	ND	0.00	2.27	18.16
23-Sep-97	0.4	0.3	6.33	ND	ND	ND	0.00	2.12	16.96
24-Sep-97	0.4	0.3	6.23	ND	ND	ND	0.00	2.19	17.52
25-Sep-97	0.38	0.23	4.75	ND	ND	ND	0.00	1.78	14.24
26-Sep-97	0.38	0.22	4.6	ND	ND	ND	0.00	1.51	12.08
27-Sep-97	0.36	0.18	3.76	ND	ND	ND	0.00	1.25	10.00
28-Sep-97	0.38	0.24	5.14	ND	ND	ND	0.00	1.49	11.92
29-Sep-97	0.39	0.25	5.22	ND	ND	ND	0.00	1.60	12.80
30-Sep-97	0.38	0.23	4.86	ND	ND	ND	0.00	1.73	13.84
01-Oct-97	0.4	0.3	6.21	ND	ND	ND	0.00	2.00	16.00
02-Oct-97	0.42	0.38	7.94	0.21	0.02	2.12	0.00	2.57	20.56
03-Oct-97	0.43	0.44	9.21	0.21	0.02	2.12	0.00	2.40	19.20
04-Oct-97	0.43	0.41	8.56	0.2	0.02	1.99	0.00	1.96	15.68
05-Oct-97	0.41	0.36	7.48	0.2	0.02	1.63	0.00	1.65	13.20

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
06-Oct-97	0.42	0.36	7.51	0.19	0.01	1.28	0.00	1.46	11.68
07-Oct-97	0.4	0.31	6.55	0.19	0.01	1.23	0.00	1.26	10.08
08-Oct-97	0.4	0.29	5.99	0.19	0.01	1.23	0.00	1.11	8.88
09-Oct-97	0.4	0.28	5.9	0.19	0.01	1.23	0.00	1.07	8.56
10-Oct-97	0.4	0.28	5.92	0.19	0.01	1.23	0.00	0.99	7.92
11-Oct-97	0.39	0.26	5.49	0.18	0.01	1.11	0.00	0.92	7.34
12-Oct-97	0.38	0.24	5.12	0.18	0.01	1.01	0.00	0.89	7.15
13-Oct-97	0.44	0.54	11.38	0.2	0.02	1.89	0.00	1.55	12.40
14-Oct-97	0.52	1.13	23.72	0.24	0.05	4.67	0.00	2.68	21.44
15-Oct-97	0.55	1.57	33.06	0.28	0.13	11.39	0.00	3.69	29.52
16-Oct-97	0.6	2.33	48.89	0.3	0.16	14.99	0.00	5.27	42.16
17-Oct-97	0.56	1.66	34.87	0.26	0.09	7.99	0.00	4.00	32.00
18-Oct-97	0.54	1.36	28.52	0.23	0.05	4.31	0.00	3.10	24.80
19-Oct-97	0.52	1.15	24.21	0.22	0.03	2.82	0.00	2.59	20.72
20-Oct-97	0.51	0.99	20.74	0.21	0.03	2.65	0.00	2.34	18.72
21-Oct-97	0.5	0.92	19.31	0.21	0.02	2.27	0.00	2.17	17.36
22-Oct-97	0.51	1.03	21.54	0.22	0.03	2.72	0.00	2.18	17.44
23-Oct-97	0.49	0.86	18.05	0.21	0.02	2.27	0.00	1.94	15.52
24-Oct-97	0.49	0.8	16.85	0.21	0.02	2.12	0.00	1.77	14.16
25-Oct-97	0.52	1.12	23.57	0.23	0.05	4.26	0.00	2.17	17.36
26-Oct-97	0.54	1.37	28.73	0.25	0.06	5.73	0.00	2.58	20.64
27-Oct-97	0.53	1.19	25.1	0.23	0.04	3.76	0.00	2.33	18.64
28-Oct-97	0.52	1.06	22.33	0.22	0.04	3.19	0.00	2.12	16.96
29-Oct-97	0.5	0.96	20.14	0.22	0.03	2.72	0.00	2.00	16.00
30-Oct-97	0.5	0.88	18.52	0.22	0.03	2.72	0.00	2.14	17.12
31-Oct-97	0.49	0.83	17.35	0.22	0.03	2.72	0.00	2.08	16.64
01-Nov-97	0.48	0.77	16.14	0.21	0.02	2.14	0.00	1.83	14.64
02-Nov-97	0.48	0.71	14.98	0.21	0.03	2.5	0.00	1.76	14.08
03-Nov-97	0.47	0.64	13.46	0.21	0.02	2.12	0.00	1.63	13.04
04-Nov-97	0.46	0.57	11.95	0.21	0.02	2.12	0.00	1.49	11.92
05-Nov-97	0.45	0.56	11.73	0.21	0.02	2.12	0.00	1.59	12.72
06-Nov-97	0.44	0.5	10.49	0.21	0.02	2.12	0.00	1.47	11.76
07-Nov-97	0.42	0.37	7.72	0.2	0.02	1.93	0.00	1.15	9.20
08-Nov-97	0.45	0.57	11.93	0.2	0.02	2.06	0.00	1.13	9.04
09-Nov-97	0.51	1.02	21.37	0.2	0.02	1.63	0.00	1.07	8.56
10-Nov-97	0.42	0.4	8.35	0.19	0.02	1.51	0.00	0.95	7.62
11-Nov-97	0.42	0.37	7.87	0.19	0.01	1.23	0.00	0.92	7.39
12-Nov-97	0.39	0.28	5.79	0.19	0.01	1.23	0.00	0.82	6.56
13-Nov-97	0.44	0.52	11.01	0.2	0.02	1.66	0.00	0.77	6.16
14-Nov-97	0.53	1.25	26.19	0.2	0.02	1.81	0.00	0.70	5.60

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Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
15-Nov-97	0.58	2	42.02	0.21	0.03	2.38	0.00	0.60	4.80
16-Nov-97	0.6	2.26	47.52	0.21	0.03	2.67	0.00	0.52	4.16
17-Nov-97	0.63	2.89	60.68	0.22	0.03	3.13	0.00	0.46	3.68
18-Nov-97	0.59	2.07	43.43	0.23	0.04	4	0.00	0.43	3.44
19-Nov-97	0.64	3.11	65.32	0.22	0.04	3.26	0.00	0.42	3.32
20-Nov-97	0.55	1.57	32.98	0.19	0.02	1.6	0.00	0.37	2.96
21-Nov-97	0.47	0.71	14.83	0.19	0.01	1.23	0.00	0.35	2.80
22-Nov-97	0.46	0.6	12.66	0.19	0.02	1.48	0.00	0.34	2.72
23-Nov-97	0.4	0.31	6.49	0.19	0.01	1.31	0.00	0.31	2.48
24-Nov-97	0.38	0.23	4.73	0.18	0.01	1.13	0.00	0.29	2.32
25-Nov-97	0.38	0.24	4.95	0.18	0.01	0.92	0.00	0.28	2.24
26-Nov-97	0.39	0.27	5.71	0.18	0.01	1	0.00	0.27	2.16
27-Nov-97	0.96	0.32	6.63	0.18	0.01	1.05	0.00	0.26	2.08
28-Nov-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
29-Nov-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.20
30-Nov-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.20
01-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.22
02-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
03-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.20
04-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
05-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.16
06-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.14
07-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.10
08-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
09-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.07
10-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.10
11-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.14
12-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
13-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
14-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.31	2.44
15-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
16-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.34
17-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.29	2.30
18-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.28	2.24
19-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.27	2.17
20-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.08
21-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.26	2.06
22-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.25	2.00
23-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.94
24-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.92

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
25-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.24	1.90
26-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.23	1.84
27-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.78
28-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.76
29-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.22	1.74
30-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
31-Dec-97	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
01-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.55
02-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
03-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
04-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.42
05-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.38
06-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.35
07-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.31
08-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
09-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
10-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.19
11-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.16
12-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.15
13-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.14
14-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.14
15-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.14	1.14
16-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
17-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.21
18-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
19-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
20-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
21-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.25
22-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
23-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.25
24-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
25-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.24
26-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
27-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
28-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.28
29-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
30-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.54
31-Jan-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.52
01-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.48
02-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
03-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.42
04-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.39
05-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.38
06-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.36
07-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
08-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
09-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.32
10-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.31
11-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.30
12-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.30
13-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.31
14-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
15-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.36
16-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.34
17-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.30
18-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.28
19-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
20-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
21-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.21
22-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
23-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.25
24-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.23
25-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
26-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
27-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.21
28-Feb-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.20
01-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
02-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
03-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
04-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
05-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
06-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
07-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
08-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
09-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
10-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
11-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.18
12-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.15	1.22
13-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.16	1.26
14-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.17	1.33

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
15-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
16-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.49
17-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
18-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.42
19-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.46
20-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.50
21-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.60
22-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.55
23-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.48
24-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
25-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.69
26-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
27-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.63
28-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.65
29-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.49
30-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.56
31-Mar-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.68
01-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.22	1.74
02-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.24	1.89
03-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.27	2.19
04-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.41
05-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.33	2.65
06-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.38	3.02
07-Apr-98	ND	ND	ND	ND	ND	ND	0.00	0.42	3.33
08-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.42	3.39
09-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.40	3.22
10-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.42	3.32
11-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.39	3.15
12-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.38	3.03
13-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.38	3.05
14-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.41	3.27
15-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.48	3.86
16-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.61	4.87
17-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	0.77	6.13
18-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	1.19	9.52
19-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.02	16.16
20-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	1.94	15.52
21-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	1.81	14.48
22-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.34	18.72
23-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.64	21.12

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
24-Apr-98	0.46	0.6	12.61	ND	ND	ND	0.00	2.78	22.24
25-Apr-98	0.47	0.66	13.88	ND	ND	ND	0.00	2.59	20.72
26-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	2.34	18.72
27-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	2.52	20.16
28-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	3.22	25.76
29-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	4.15	33.20
30-Apr-98	0.47	0.67	14.06	ND	ND	ND	0.00	4.44	35.52
01-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.23	41.84
02-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.11	48.88
03-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.66	53.28
04-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.34	58.72
05-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.63	61.04
06-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.25	58.00
07-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.74	53.92
08-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.62	44.96
09-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.00	40.00
10-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.05	40.40
11-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.46	43.68
12-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	6.60	52.80
13-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	7.05	56.40
14-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.85	46.80
15-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.00	40.00
16-May-98	0.47	0.67	14.06	ND	ND	ND	0.00	5.00	40.00
17-May-98	0.47	0.68	14.26	ND	ND	ND	0.00	5.73	45.84
18-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	7.19	57.52
19-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.52	52.16
20-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.06	48.48
21-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.40	51.20
22-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.78	54.24
23-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.54	52.32
24-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	7.54	60.32
25-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	8.02	64.16
26-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	10.20	81.60
27-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	11.20	89.60
28-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	9.42	75.36
29-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	7.50	60.00
30-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.87	54.96
31-May-98	0.48	0.74	15.64	ND	ND	ND	0.00	6.94	55.52
01-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	5.46	43.68
02-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.45	35.60

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
03-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.27	34.16
04-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.22	33.76
05-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.32	34.56
06-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.58	36.64
07-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.44	35.52
08-Jun-98	0.48	0.74	15.64	ND	ND	ND	0.00	4.42	35.36
09-Jun-98	0.43	0.48	10.13	ND	ND	ND	0.00	4.51	36.08
10-Jun-98	0.38	0.24	5.06	0.19	0.02	1.54	0.00	3.74	29.92
11-Jun-98	0.37	0.2	4.3	0.19	0.01	1.23	0.00	3.07	24.56
12-Jun-98	0.37	0.19	4.04	0.18	0.01	1.09	0.00	2.54	20.32
13-Jun-98	0.37	0.21	4.33	0.18	0.01	1.01	0.00	2.45	19.60
14-Jun-98	0.38	0.23	4.75	0.18	0.01	1.1	0.00	2.71	21.68
15-Jun-98	0.36	0.18	3.75	0.18	0.01	1.11	0.00	3.25	26.00
16-Jun-98	0.36	0.17	3.66	0.17	0.01	0.85	0.00	2.56	20.48
17-Jun-98	0.36	0.18	3.88	0.18	0.01	0.92	0.00	2.46	19.68
18-Jun-98	0.37	0.2	4.2	0.18	0.01	0.92	0.00	2.60	20.80
19-Jun-98	0.36	0.19	3.91	0.18	0.01	0.92	0.00	2.94	23.52
20-Jun-98	0.36	0.17	3.66	0.18	0.01	1.01	0.00	3.09	24.72
21-Jun-98	0.36	0.16	3.45	0.17	0.01	0.85	0.00	2.99	23.92
22-Jun-98	0.36	0.16	3.45	0.17	0.01	0.78	0.00	2.88	23.04
23-Jun-98	0.26	0.04	0.78	0.17	0.01	0.67	0.00	2.64	21.12
24-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.33	18.64
25-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.25	18.00
26-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.45	19.60
27-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.58	20.64
28-Jun-98	ND	ND	ND	0.17	0.01	0.77	0.00	2.42	19.36
29-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.43	19.44
30-Jun-98	ND	ND	ND	0.17	0.01	0.67	0.00	3.42	27.36
01-Jul-98	ND	ND	ND	0.18	0.01	0.95	0.00	4.82	38.56
02-Jul-98	ND	ND	ND	0.21	0.03	2.36	0.00	4.58	36.64
03-Jul-98	ND	ND	ND	0.21	0.02	2.17	0.00	4.51	36.08
04-Jul-98	ND	ND	ND	0.2	0.02	2.06	0.00	3.61	28.88
05-Jul-98	ND	ND	ND	0.19	0.02	1.48	0.00	3.11	24.88
06-Jul-98	ND	ND	ND	0.18	0.01	1.2	0.00	3.00	24.00
07-Jul-98	ND	ND	ND	0.18	0.01	0.92	0.00	2.58	20.64
08-Jul-98	ND	ND	ND	0.17	0.01	0.69	0.00	2.07	16.56
09-Jul-98	ND	ND	ND	0.17	0.01	0.68	0.00	1.90	15.20
10-Jul-98	ND	ND	ND	0.17	0.01	0.67	0.00	2.07	16.56
11-Jul-98	ND	ND	ND	0.17	0.01	0.82	0.00	2.02	16.16
12-Jul-98	ND	ND	ND	0.16	0.01	0.67	0.00	1.72	13.76

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
13-Jul-98	0.27	0.04	0.86	0.17	0.01	0.69	0.00	1.48	11.84
14-Jul-98	0.28	0.04	0.94	0.16	0.01	0.67	0.00	1.18	9.44
15-Jul-98	0.28	0.05	0.98	0.16	0.01	0.59	0.00	1.87	14.96
16-Jul-98	0.31	0.08	1.72	0.17	0.01	0.87	0.00	1.97	15.76
17-Jul-98	0.29	0.06	1.21	0.17	0.01	0.89	0.00	3.85	30.80
18-Jul-98	0.28	0.05	1.08	0.19	0.02	1.52	0.00	3.01	24.08
19-Jul-98	0.28	0.05	1.01	0.19	0.01	1.23	0.00	2.60	20.80
20-Jul-98	0.27	0.04	0.91	0.18	0.01	1.15	0.00	2.30	18.40
21-Jul-98	0.27	0.04	0.86	0.17	0.01	0.86	0.00	1.94	15.52
22-Jul-98	0.27	0.04	0.87	0.17	0.01	0.74	0.00	1.77	14.16
23-Jul-98	0.27	0.04	0.84	0.17	0.01	0.67	0.00	1.93	15.44
24-Jul-98	0.27	0.04	0.81	0.16	0.01	0.67	0.00	1.75	14.00
25-Jul-98	0.27	0.04	0.79	0.16	0.01	0.67	0.00	1.58	12.64
26-Jul-98	0.26	0.04	0.76	0.16	0.01	0.59	0.00	1.61	12.88
27-Jul-98	0.26	0.03	0.72	0.16	0.01	0.57	0.00	1.67	13.36
28-Jul-98	0.26	0.03	0.71	0.16	0.01	0.59	0.00	1.64	13.12
29-Jul-98	0.26	0.03	0.7	0.16	0.01	0.58	0.00	1.63	13.04
30-Jul-98	0.26	0.03	0.66	0.16	0.01	0.57	0.00	1.45	11.60
31-Jul-98	0.26	0.03	0.65	0.16	0.01	0.49	0.00	1.25	10.00
01-Aug-98	0.25	0.03	0.62	0.15	0	0.45	0.00	1.11	8.88
02-Aug-98	0.25	0.03	0.62	0.15	0	0.39	0.00	0.96	7.66
03-Aug-98	0.25	0.03	0.6	0.15	0	0.4	0.00	0.94	7.55
04-Aug-98	0.26	0.03	0.64	0.15	0	0.45	0.00	1.00	7.99
05-Aug-98	0.27	0.04	0.82	0.15	0.01	0.46	0.00	1.14	9.12
06-Aug-98	0.26	0.03	0.7	0.16	0.01	0.65	0.00	1.65	13.20
07-Aug-98	0.26	0.03	0.69	0.17	0.01	0.72	0.00	1.09	8.72
08-Aug-98	0.26	0.03	0.71	0.16	0.01	0.57	0.00	0.97	7.75
09-Aug-98	0.26	0.03	0.69	0.16	0.01	0.5	0.00	1.27	10.16
10-Aug-98	0.25	0.03	0.64	0.16	0.01	0.63	0.00	1.90	15.20
11-Aug-98	0.27	0.04	0.84	0.15	0.01	0.47	0.00	1.45	11.60
12-Aug-98	0.26	0.03	0.71	0.15	0.01	0.49	0.00	2.28	18.24
13-Aug-98	0.26	0.04	0.77	0.16	0.01	0.62	0.00	1.86	14.88
14-Aug-98	0.27	0.04	0.8	0.16	0.01	0.49	0.00	1.98	15.84
15-Aug-98	0.26	0.03	0.71	0.16	0.01	0.62	0.00	2.09	16.72
16-Aug-98	0.26	0.03	0.71	0.17	0.01	0.68	0.00	1.48	11.84
17-Aug-98	0.26	0.03	0.7	0.16	0.01	0.57	0.00	1.09	8.72
18-Aug-98	0.31	0.1	2.13	0.16	0.01	0.48	0.00	1.07	8.56
19-Aug-98	0.35	0.15	3.23	0.15	0.01	0.48	0.00	1.10	8.80
20-Aug-98	0.35	0.16	3.29	0.15	0	0.42	0.00	0.84	6.72
21-Aug-98	0.35	0.15	3.17	0.15	0	0.41	0.00	0.92	7.33

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
22-Aug-98	0.35	0.15	3.17	0.15	0	0.37	0.00	0.81	6.50
23-Aug-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.79	6.31
24-Aug-98	0.36	0.17	3.62	0.15	0	0.36	0.00	0.73	5.80
25-Aug-98	0.36	0.18	3.73	0.15	0	0.39	0.00	0.93	7.43
26-Aug-98	0.35	0.15	3.17	0.17	0.01	0.72	0.00	0.98	7.82
27-Aug-98	0.35	0.16	3.37	0.16	0.01	0.67	0.00	0.80	6.42
28-Aug-98	0.36	0.17	3.54	0.16	0.01	0.48	0.00	0.77	6.14
29-Aug-98	0.35	0.16	3.33	0.16	0.01	0.48	0.00	0.87	6.96
30-Aug-98	0.35	0.15	3.23	0.15	0	0.44	0.00	0.86	6.86
31-Aug-98	0.35	0.16	3.35	0.15	0	0.41	0.00	0.76	6.11
01-Sep-98	0.36	0.17	3.47	0.15	0.01	0.48	0.00	0.82	6.56
02-Sep-98	0.35	0.15	3.17	0.15	0.01	0.48	0.00	0.99	7.90
03-Sep-98	0.35	0.15	3.17	0.15	0.01	0.48	0.00	0.75	6.02
04-Sep-98	0.35	0.15	3.17	0.15	0	0.37	0.00	0.63	5.02
05-Sep-98	0.36	0.16	3.47	0.15	0	0.38	0.00	0.60	4.82
06-Sep-98	0.36	0.18	3.69	0.15	0	0.42	0.00	0.74	5.90
07-Sep-98	0.36	0.16	3.43	0.16	0.01	0.57	0.00	1.33	10.64
08-Sep-98	0.35	0.15	3.19	0.15	0	0.42	0.00	0.97	7.73
09-Sep-98	0.36	0.17	3.66	0.15	0	0.43	0.00	0.86	6.84
10-Sep-98	0.36	0.18	3.72	0.15	0.01	0.48	0.00	0.90	7.17
11-Sep-98	0.36	0.17	3.66	0.15	0	0.45	0.00	1.23	9.84
12-Sep-98	0.36	0.17	3.6	0.15	0	0.38	0.00	1.09	8.72
13-Sep-98	0.35	0.15	3.23	0.15	0	0.4	0.00	1.00	8.00
14-Sep-98	0.35	0.15	3.17	0.15	0	0.36	0.00	0.89	7.12
15-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.78	6.26
16-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.73	5.86
17-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.72	5.72
18-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.69	5.50
19-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.68	5.46
20-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.66	5.30
21-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.62	4.97
22-Sep-98	0.35	0.15	3.17	0.15	0	0.34	0.00	0.60	4.79
23-Sep-98	0.35	0.15	3.17	0.14	0	0.34	0.00	0.58	4.61
24-Sep-98	0.35	0.14	2.96	0.15	0	0.34	0.00	0.57	4.56
25-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.58	4.62
26-Sep-98	0.34	0.14	2.85	0.15	0	0.34	0.00	0.58	4.63
27-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.65	5.21
28-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.68	5.40
29-Sep-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.66	5.27
30-Sep-98	0.34	0.14	2.87	0.15	0	0.34	0.00	0.65	5.21

Attachment C: AGRA Data Analysis
Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
01-Oct-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.64	5.08
02-Oct-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.63	5.06
03-Oct-98	0.34	0.13	2.74	0.15	0	0.34	0.00	0.63	5.02
04-Oct-98	0.36	0.17	3.48	0.15	0	0.34	0.00	0.59	4.75
05-Oct-98	0.39	0.25	5.2	0.15	0	0.36	0.00	0.76	6.09
06-Oct-98	0.39	0.26	5.38	0.16	0.01	0.58	0.00	2.36	18.88
07-Oct-98	0.38	0.23	4.92	0.16	0.01	0.63	0.00	2.54	20.32
08-Oct-98	0.38	0.22	4.65	0.16	0.01	0.52	0.00	2.00	16.00
09-Oct-98	0.37	0.2	4.2	0.18	0.01	1	0.00	1.79	14.32
10-Oct-98	0.37	0.2	4.18	0.16	0.01	0.67	0.00	1.43	11.44
11-Oct-98	0.37	0.19	3.97	0.16	0.01	0.67	0.00	1.28	10.24
12-Oct-98	0.37	0.19	3.93	0.16	0.01	0.67	0.00	1.22	9.76
13-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.23	9.84
14-Oct-98	0.36	0.18	3.86	0.16	0.01	0.67	0.00	1.33	10.64
15-Oct-98	0.36	0.17	3.66	0.16	0.01	0.67	0.00	1.23	9.84
16-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.18	9.44
17-Oct-98	0.36	0.18	3.84	0.16	0.01	0.67	0.00	1.17	9.36
18-Oct-98	0.37	0.2	4.13	0.16	0.01	0.67	0.00	1.15	9.20
19-Oct-98	0.37	0.2	4.2	0.16	0.01	0.57	0.00	1.13	9.04
20-Oct-98	0.37	0.2	4.2	0.16	0.01	0.65	0.00	1.13	9.04
21-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.17	9.36
22-Oct-98	0.37	0.2	4.2	0.16	0.01	0.64	0.00	1.18	9.44
23-Oct-98	0.37	0.2	4.2	0.16	0.01	0.5	0.00	1.20	9.60
24-Oct-98	0.37	0.2	4.2	0.16	0.01	0.48	0.00	1.19	9.52
25-Oct-98	0.37	0.21	4.35	0.16	0.01	0.48	0.00	1.17	9.36
26-Oct-98	0.38	0.23	4.87	0.16	0.01	0.48	0.00	1.30	10.40
27-Oct-98	0.38	0.23	4.89	0.16	0.01	0.65	0.00	1.44	11.52
28-Oct-98	0.37	0.2	4.22	0.18	0.01	1.03	0.00	1.49	11.92
29-Oct-98	0.37	0.2	4.2	0.17	0.01	0.79	0.00	1.23	9.84
30-Oct-98	0.37	0.2	4.2	0.16	0.01	0.67	0.00	1.08	8.64
31-Oct-98	0.37	0.2	4.2	0.17	0.01	0.82	0.00	1.17	9.36
01-Nov-98	0.37	0.2	4.2	0.18	0.01	0.92	0.00	1.14	9.12
02-Nov-98	0.37	0.2	4.2	0.18	0.01	0.92	0.00	1.04	8.32
03-Nov-98	0.37	0.19	4.09	0.18	0.01	0.92	0.00	0.98	7.82
04-Nov-98	0.36	0.17	3.66	0.18	0.01	0.92	0.00	0.94	7.50
05-Nov-98	0.36	0.17	3.66	0.17	0.01	0.72	0.00	0.92	7.38
06-Nov-98	0.36	0.17	3.66	0.16	0.01	0.67	0.00	0.88	7.03
07-Nov-98	0.36	0.17	3.66	0.16	0.01	0.67	0.00	0.83	6.62
08-Nov-98	0.36	0.16	3.45	0.16	0.01	0.67	0.00	0.79	6.29
09-Nov-98	0.35	0.18	3.79	0.16	0.01	0.67	0.00	0.71	5.66

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Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
10-Nov-98	ND	ND	ND	0.16	0.01	0.52	0.00	0.57	4.52
11-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.55	4.36
12-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.52	4.19
13-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.50	4.02
14-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.48	3.86
15-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.46	3.71
16-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.44	3.55
17-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.43	3.42
18-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.41	3.29
19-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.46	3.70
20-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.52	4.18
21-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.48	3.81
22-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.43	3.46
23-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.42	3.32
24-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.41	3.24
25-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.40	3.17
26-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.39	3.10
27-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.37	2.96
28-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.35	2.80
29-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.33	2.66
30-Nov-98	ND	ND	ND	ND	ND	ND	0.00	0.32	2.52
01-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.31	2.50
02-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.31	2.47
03-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.31	2.45
04-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.42
05-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.40
06-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.38
07-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.29	2.34
08-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.29	2.30
09-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.28	2.27
10-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.42
11-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.32	2.58
12-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.34	2.75
13-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.32	2.58
14-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.42
15-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.27	2.18
16-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.26	2.06
17-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.30	2.43
18-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.29	2.34
19-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.27	2.12

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Tenas Hydrometeorological Baseline Report

Date	Tenas Creek			Four Creek			Goathorn Creek		
	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]	Water Level [m]	Discharge [m3/s]	Discharge [L/s/km2]
20-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.24	1.92
21-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.23	1.84
22-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.22	1.77
23-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.70
24-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.21	1.66
25-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.62
26-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.20	1.58
27-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.54
28-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.19	1.51
29-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.47
30-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.44
31-Dec-98	ND	ND	ND	ND	ND	ND	0.00	0.18	1.41

Appendix D Stream Water Quality Exceedances for the Updated EAC Project Case (2024)

TELKWA COAL
LIMITED

Tenas Project, Hydrogeology Technical Report

Prepared for

Telkwa Mining Ltd

Prepared by

srk consulting

SRK Consulting (Canada) Inc.
CAPR002055
October 2024

Tenas Project, Hydrogeology Technical Report

October 2024

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Project No: CAPR002055
File Name: Telkwa_HydrogeolTechnicalReport_CAPR002055_20241021.docx

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srk consulting

Executive Summary

Telkwa Mining Ltd (TML) is proposing to develop the Tenas Project (the Project), a surface coal mine designed to produce metallurgical coal. The proposed mine site is in northwestern British Columbia (BC), approximately 25 kilometres south of Smithers and seven kilometres southwest of Telkwa, within the Wet'suwet'en Nation's traditional territory. This report presents the results of a groundwater study prepared by SRK Consulting (Canada) Inc. (SRK) on behalf of TML in support of a Joint Application for a Mines Act permit, and an effluent discharge permit. The objectives were to establish baseline conditions and to quantify the potential changes to the groundwater system that could occur because of the Project.

Project Background

The climate and hydrological conditions were characterized by SRK (2020). The average total precipitation between 2018 and 2019 was 587 mm/y, with snow comprising 71% and 31% in 2018 and 2019, respectively. The streamflow regime is nival (snowmelt) with the majority of runoff (MAR 367 mm/year) occurring in the spring and early summer.

The deposit is hosted in a coal-bearing sedimentary rock sequence, associated with the Lower Cretaceous age Skeena Group (marine and continental sediments interbedded with coal seams), and overlies unconformably the Jurassic-age Hazelton volcanic group (andesite, trachyte, and basalt with associated tuffs and breccias). The sedimentary sequence in the open pit area is folded into a syncline. Faulting is generally near-vertical, and can be subdivided into two main groups, one which strikes approximately northwest/southeast, and the other northeast/southwest.

The surficial geology consists of glacial clay- silt-rich till, and glaciofluvial sand-gravel-rich till. South of the proposed open pit, the bedrock outcrops are close to ground surface; North of the proposed open pit and towards Tenas Creek and Goathorn Creek, the till deepens and exceed 100 m. Other deposits are present locally; patches of glaciolacustrine deposits scattered throughout the morainal landscape in low ridges and depressions; and fluvial deposits found in the narrow-incised floodplains of Goathorn and Tenas Creek, and the wide floodplains of the Telkwa and Bulkley River.

The estimated total area disturbed by the Project is 840 ha, including the open pit (289 ha), the coal processing plant (10 ha), material storage facilities (137 ha), sediment ponds (40 ha), and management ponds (227 ha). The Projected mine life is approximately 25 years, including construction, operations, and reclamation phases.

In terms of materials at the Project Site, TML identified several types of material that will need to be managed. Surface Soils (i.e., top organic soil,) will be salvaged and stockpiled for future reclamation requirements. The overburden will be placed into the compaction zones and/or buttress components of the dams for the management and control ponds, or otherwise placed as backfill within the open pit. The low sulfur rock will be placed within the buttress region of the dams for the management ponds, or otherwise backfilled within the open pit. The high sulfur and processed rocks will be placed into external flooded management ponds or within flooded portions of the open pit.

In terms of water management, the facilities will include ditches, sedimentation ponds, control ponds, and management ponds. Three storage management ponds will collect the groundwater and surface water pumped from the open pit during operation. These ponds are designed for underwater permanent storage of potentially acid generating material. A fourth pond(Tenas Control Pond) will collect surface runoff from the mine infrastructure and overflows from the management ponds. This pond is designed to ensure that no water discharge occurs during operations between October 31 and March 31 period and to control the sedimentation for the overall site. It also provides contingency water to ensure PAG material is submerged, and a location for water displaced during management pond operations. All the ponds will be lined with the management ponds lined with an engineered soil-bentonite compacted layer, and the Tenas Control Pond with a bituminous geomembrane or equivalent.

Make-up water for the Coal Processing Plant and make-up water for the mine infrastructure complex will be sourced from precipitation and melting snow collected onsite. Potable water for domestic facilities will be sourced from surface runoff and/or groundwater. A potable water treatment plant will be onsite to ensure that drinking water standards are met. Another 1.5 million m^3/year of make-up water is assumed for additional contingency and robustness to the water balance. This water would be sourced from Goathorn Creek (i.e., approx. 2.5% of Goathorn's Creek and less than 1% of the Telkwa River's annual flow respectively) via water supply wells located along the edge of Goathorn Creek.

Groundwater Baseline Studies

To assess the potential effects of the Project to groundwater, two spatial boundaries were considered: The Local Study Area (LSA) and the Regional Study Area (RSA). The LSA was defined where the Project may have a direct influence on the groundwater system and/or groundwater users, and the RSA by the fish habitat present in the Telkwa River watershed and in the tributaries to the Bulkley River. The time-steps considered for the evaluation included 2020 (construction), 2023 (End-of-Year 1, End of North Management Pond), 2029 (End-of-Year 7, End of East Management Pond), End of Mining, and post-closure (post-2043).

SRK consulted the BC regulations and guidelines relevant to groundwater and reviewed the Project desktop information and the groundwater site data collected between 1983 and 2016. The level of details, methods, and quality of the information were considered adequate for a Joint Application for a Mines Act permit, and for an effluent discharge permit.

Groundwater Baseline Data

The bedrock is characterized by a low to moderate hydraulic conductivity (i.e., K geomean of $2x10^{-7}$m/s). K geomean values sorted by lithological types, from the least permeable to the most permeable, are conglomerate ($2x10^{-8}$ m/s), mudstone/siltstone ($7x10^{-8}$ m/s), volcanic rock ($1x10^{-7}$ m/s), sandstone ($2x10^{-7}$ m/s), and coal ($5x10^{-7}$ m/s). For the overburden, K in the clay-silt-rich till is relatively low ($9x10^{-9}$ m/s), and in the sand-gravel-rich till moderately high ($1x10^{-6}$ m/s). There is no site measurement for specific storage or specific yield.

The groundwater in both systems flows towards the valleys, moving away from the Tenas open pit towards Tenas Creek, the Telkwa River, and Goathorn Creek. Static water levels are generally less than 2 mbgs (meters below ground surface) in the south Tenas Area, to more than 20 mbgs in the north, where overburden changes to a thick sequence of sand-gravel-rich till deposits. The overburden well showed water level highs in spring following freshet and lows in winter. The seasonal observations in bedrock wells were divided in two groups. One group showed seasonal variations like overburden, with highs in spring, lows in fall/winter, suggesting it has a connection with overburden. The other group showed highs in winter, lows in summer/fall, implying recharge is delayed by several months, potentially by the low permeability of the silt-clay-rich till.

The groundwater chemistry in overburden wells is classified as a calcium-magnesium-bicarbonate type; while groundwater in bedrock wells is sodium-bicarbonate type. The groundwater quality statistics, the exceedances, and the baseline average groundwater quality are presented in the report. Exceedances above the BC water quality guidelines for freshwater aquatic life (approved or working) were observed for fluoride, ammonia, total arsenic, total copper, total chromium, total and dissolved iron, total zinc, and selenium. The differences observed in historical wells over time, and the correlations between turbidity and total/dissolved metals concentrations suggest exceedances of total metals were likely caused by suspended particles generated by disturbances (i.e., drilling and well installation). Exceedances above the BC water quality guidelines for drinking water sources were observed for fluoride, and dissolved metals (i.e., arsenic, iron, cobalt, manganese, antimony, mercury, lead, and uranium – the last four parameters exceeded the guideline values only once).

The aquifer database of the ministry of Environment reports six aquifers of limited extent with low to moderate productivity, all located near the town of Telkwa, where the Telkwa River joins the Bulkley River, about 8 to 10 km northeast from the Project. The closest private wells, located along the expected flow paths between the Project and the Telkwa River, are about 3.8 km north of the Project. In terms of human activities, small-scale underground and surface mining occurred sporadically about 3.6 km north and northeast from the Project between 1918 and 1985; nowadays there are no significant human activities other than mining exploration and forestry.

Conceptual Groundwater Model

Conceptually, the groundwater system is divided into two sub-systems: deep bedrock and shallow overburden. The deep bedrock is composed of the Skeena sedimentary rock group, the volcanic group, fractures, and faults. At the scale of the Telkwa watershed, the fractured rock is assumed to act as an equivalent porous medium, a hydrogeological term that refers to a simplified representation of a heterogeneous aquifer as if it were a homogeneous material. In this approach, the complex variations in the properties of fractured rock are averaged out, treating it as a single, uniform medium with consistent properties. The hydrogeology of the bedrock is assumed to be represented as a single unit characterized by an anisotropy ratio perpendicular to sedimentary bedding planes (i.e. K parallel to beddings higher than K perpendicular to beddings). Data collected does not indicate influences from known faults (i.e., preferential flow pathways and/or barriers), and there is no mapped structure directly connecting the Project and the private well locations.

The lateral extent of bedrock is characterized by confined flow, relatively long residence times in the subsurface, and higher concentrations of dissolved solids. Groundwater levels indicate generally north-oriented flow lines, from upland areas to streams, namely the Telkwa River and its tributaries, Tenas Creek, and Goathorn Creek.

Shallow overburden is composed of two units: silt-clay–rich glacial till and glaciofluvial sand-gravel-rich till. Its hydraulic characteristics are controlled by the distribution of fine materials, with silt-clay-rich till acting as an aquitard, and impeding flow between the higher permeability sand-gravel-rich layers. The 3D geometries of the hydrostratigraphic units were generated from the analyses of drillhole intercepts (TML's database), geological maps (surface and bedrock geology, regional and local maps, 2D cross sections; Clague 1984, MEMPR 1993, BCGS 2005, TML 2018), and considerations on the ability of a unit to convey groundwater.

The shallow overburden is characterized as a local unconfined system with relatively short residence times and low concentrations of dissolved solids. Groundwater flows in a north-easterly direction towards Four Creek and in a north-westerly direction towards Tenas Creek, moving from topographic highs to adjacent lows. Discharge from overburden is expected to occur in the valleys of Tenas, Four and Goathorn Creeks.

Groundwater Effect Predictions

Numerical groundwater modeling was completed to predict open pit inflows and evaluate the potential groundwater effects from the Project. This included potential changes to baseflows, and contributions/travel times of mine-affected groundwater to creeks and private wells. The calibrated achieved the best fit to field data, with a final Normalized Root Mean Square Error (NRMSE) of 3.2% for hydraulic heads and 3.6% for baseflows.

Modeling was based on pseudo steady-state conditions for both calibration and forward predictions. Model uncertainties were assessed through a sensitivity analysis. Details on the modeling assumptions, model designs, and calibration are included in the report.

The model may be classified as moderate complexity (Wels et al., 2012), defined as follows: "These (…) are based on a reasonable, though limited, dataset and having limited calibration. These models may be used to determine the potential range of change or to "bracket" potential effects that may occur due to a given stress." The model is based on a unique conceptualisation of the 3D geology; detailed characterization of aquitards or aquicludes are not well characterized; baseflows are estimated from historical stream flow records; the model was calibrated to steady state conditions, and the results have highest confidence in the vicinity of the mine area where there are relatively more data.

The key conclusions for EOM conditions were as follows:

- The open pit inflows ranged between 320 and 890 m^3/d. Under groundwater conditions alone, inflows of these magnitudes are typically managed with open pit sumps and do not require active dewatering systems.
- The seepage rate underneath the Tenas Control Pond was 140 m^3/d.
- The total seepage rate underneath the management ponds at end-of mine was 1,490 m^3/d.
- Neither the drawdown cone nor groundwater mound are predicted to reach private well locations.
  - The drawdown induced by dewatering extended up to a maximum of extent of 18 km^2.
  - The management ponds and the control pond influence the progression of the drawdown to the north; in this area the model predicted a groundwater mound of about 14 km^2.
  - Sensitivity analysis evaluated the worst-case drawdown extents (i.e., open pit fully excavated, dewatering active, but no ponds). The predicted drawdown extended to a surface of approximately 34 km^2 but did not reach private well locations.
- The maximum reductions in baseflows are expected to occur before the construction and completion of the management ponds. Predicted reductions to the entire creeks are approximately 6% for Tenas Creek, 5% for Four Creek, and 2% for both Goathorn Creek and the Telkwa River.
- The first particle of mine-affected groundwater was predicted to discharge into Tenas Creek after 16 years. No particles were predicted to discharge in the first 25 years into Four Creek, Goathorn Creek, Telkwa River, or near private wells.
- The forecasts of potential contributions of mine affected groundwater to baseflows, after 25 years of operations, were 0.8% for Tenas Creek, less than 0.3% for Goathorn Creek, and less than 0.2% for the Telkwa River. The model predicted no contribution to Four Creek.

The key conclusions based on the modeling of post-closure conditions were as follows:

- The seepage rate (i.e., outflow) underneath the saturated mine rock and open pit lake was 10 m^3/d; these features predominantly act as a sink, with an inflow of 380 m^3/d.
- The total seepage rate underneath the management ponds was 1,480 m^3/d at the end of mining.
- The long-term drawdown induced by the Project is projected to extend up to a maximum of 15 km^2 and the mound to about 13 km^2. Neither the drawdown nor mounding is predicted to reach the private wells.
- Modeling suggests that baseflows to the entire creeks will either remain unchanged or slightly increase due to the influence of the management ponds on groundwater levels, with a 3% increase at Tenas Creek, 4% at Four Creek, 2% at the Goathorn Creek, and 1% at the Telkwa River.

- In terms of effect to private groundwater users, the model predicted particles would travel for more than 400 years before reaching the private wells.
- The predicted long-term contributions of mine affected groundwater to baseflows were less than 9.3% for Tenas Creek, less than 4.6% for Goathorn Creek, and less than 0.8% for the Telkwa River.
- The average time for a particle to reach the creeks was predicted to be 65 years for Tenas creek, 320 years for Goathorn Creek, and over 400 years for the Telkwa River.
  - The WBLM assumed conservatively that 100% of the potential waste and water management pond loads discharged into creeks via groundwater paths after 25 years.
- Three private wells (Goalder, Mapletoft, and Baker) located in the Telkwa River valley are potentially within the path of mine affected groundwater. No constituent is predicted to exceed the BC-DWG. The processes of diffusion, dispersion, or natural attenuation and the predicted travel times (i.e., > 400 years) between the Project and the Telkwa alluvial floodplain were not considered in the analysis. These are expected to reduce constituent levels below what has been modelled.
- The sensitivity analysis showed that the model was most sensitive to recharge and the hydraulic conductivity of the tills and Skeena group units. The parameters impacted the predictions as follow:
  - The highest sensitivity open pit inflow was 1,550 m^3/d.
  - None of the sensitivity models predicted drawdown or mounding to reach the private wells.
  - The maximum sensitivity reduction to baseflows was about 14% for the Tenas Creek, and 3% for the Goathorn Creek.
  - The travel time in all sensitivity runs to private wells was more than 170 years.
  - The maximum sensitivity contribution of mine affected groundwater to baseflows was 11% in Tenas Creek, and 1% in the Goathorn Creek.

The modeling presented herein provides forecasts of the expected Project behavior, derived from the available hydrogeological information. Upgrades to the model should be considered as additional information becomes available. Additional modeling should be completed if there are changes to the design basis or if any new information alters the parameters used in the modeling.

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Appendix E - Liner Seepage Assessment and Preliminary Cost Estimate for Tenas Management Ponds

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Appendix H – Analysis of the Potential Groundwater Quality at Post-closure in the Private Wells Area

List of Abbreviations

°	Degree
°C	Degree Celsius
3D	Three dimensional
ARD	Acid Rock Drainage
BC	British Columbia
BDR	Bedrock
CPP	Coal preparation plant
CUB	Calibrated unit baseflow
d	Day
DEM	Digital Elevation Model
DWS	Drinking water sources
EA	Environmental Assessment
EMP	East management pond
EOM	End-of-mine
EoY	End-of-year
FAL	Freshwater aquatic life
Ha	Hectare
K	Hydraulic conductivity
km	Kilometer
km^2	Kilometer square
kV	Kilovolt
LIDAR	Light detection and ranging
LSA	Local study area
L/s	Litre per second
m	Meter
m^2	meter square
m^3/day	meter cube per day
m/s	meter per second
MAP	Mean annual precipitation
MAR	Mean annual runoff
masl	Meters above sea level
mbgs	Meters below ground surface
MEMPR	Ministry of Energy, Mines and Petroleum Resources
mg/l	milligram per litre
ML/ARD	Metal leaching / acid rock drainage
mm/yr	Millimetre per year
Mt	Million tons
MW	Monitoring well
Non-PAG	Non-Potentially acid generating
NMP	North management pond
NRMSE	Normalized root mean square error
NTU	Nephelometric turbidity unit
OVB	Overburden
PAG	Potentially Acid-Generating
Project	Tenas Project
PSD	Particle size distribution
QA	Quality assurance
QC	Quality control
R	Recharge
ROM	Run-of-mine
RPD	Relative Percent Difference
RSA	Regional study area
s	Second
SRK	SRK Consulting (Canada) Inc.
S_s	Specific storage
S_y	Specific yield
TML	Telkwa Mining Ltd
TDS	Total dissolved solids
TSS	Total suspended solids
WBLM	Water balance and load model
WMP	West management pond
WQG	Water quality guidelines
WSC	Water survey of Canada

1 Introduction

Telkwa Mining Ltd (TML) is proposing to develop the Tenas Coal Project (the Project), a surface coal mine designed to produce metallurgical coal at a planned annual production rate of between 775,000 and 825,000 tonnes. The mine life of the Project will be approximately 25 years, including construction, operations, decommissioning, and reclamation phases.

This report presents the results of hydrogeological studies in support of a Joint Application for a Mines Act permit issued by the Ministry of Energy, Mines and Petroleum Resources, and an effluent discharge permit issued under the Environmental Management Act by the Ministry of Environment. It was prepared by SRK Consulting (Canada) Inc. (SRK), on behalf of TML.

1.1 Objectives

The objectives of the work presented here are to establish the baseline groundwater conditions and to quantify the potential changes to the groundwater system that could occur because of the Project. The baseline information was used to construct and calibrate a three-dimensional (3D) numerical model, which was then utilized to predict the Project's potential effect on groundwater during mining and long-term closure (post-closure) phases, and to inform the waste and water management system designs (Part A, Section 1 of the EAC Application) and the surface water and load balance model (WBLM, Section 4, Chapter 3 of the EAC Application). The WBLM was used to evaluate the overall effects of the Project on the hydrology and surface water quality at both local and regional scales.

1.2 Report Layout

The report is organized as follows:

- Section 2 presents background information relevant to hydrogeological studies.
- Section 3 defines the groundwater assessment boundaries, and presents the regulatory guidelines relevant to the study, the sources of desktop and field information, and the methodologies for the field data collection, data management, and QA/QC methods.
- Section 4 reviews the hydrogeological data supporting the characterization of the groundwater flow system and groundwater quality.
- Section 5 presents the groundwater conceptual model of the Project area for baseline, mining, and post-closure conditions.
- Section 6 describes a numerical groundwater modelling assessment and presents the predictions of the potential changes to the groundwater system.
- Section 7 presents the conclusions of the study.

2 Project Background

2.1 Location

The proposed mine site is in the Regional District of Bulkley-Nechako in northwestern British Columbia (BC), approximately 25 kilometres south of Smithers and seven kilometres southwest of Telkwa, within the Wet'suwet'en Nation's traditional territory, which includes the majority of the Bulkley River drainage. The Telkwa River, the Tenas Creek and the Goathorn Creek run through the coalfield, dissecting it into three coal exploration areas known locally as Tenas, Goathorn, and North. The proposed open pit and the waste and water management facilities are in the Tenas Area, approximately 54°36'48" north latitude and 127°09'32" west longitude. Figure 1 and Figure 2 shows the Project locations.

2.2 Topography

The Project is located within the Coast Mountains (Bulkley Ranges) of the Cordillera Region. The Project is centered on a remnant glacial terrace; upland areas are characterized by moderate to steeply incised valleys separated by moderately undulating terrain; and lowland areas are characterized by relatively flat to moderately rolling topography.

2.3 Climate

The climate conditions were characterized in the Hydrometeorological Baseline and Model Development Report (SRK 2020). Observations for years 2017, 2018, and 2019 are compiled in Table 2-1 and shown in Figure 3. The average total precipitation was 587 mm/y between 2018 and 2019, with snow comprising 71% and 31% in 2018 and 2019, respectively.

Table 2-1: Mean and Annual Precipitation, and Temperature at the Telkwa Project

Year	Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Total
2017	Total Precipitation [mm]										147	134	10	-
	Rainfall [mm]										114	0	0	-
	Snowfall [mm SWE]										33	134	10	-
	Average Snow Depth [cm]										4	28	47	-
	Mean temperature [°C]										1.9	-5.6	-8.9	-
2018	Total Precipitation [mm]	50	150	81	14	14	42	50	2	50	54	51	113	672
	Rainfall [mm]	0	0	1	3	14	42	50	2	30	42	9	0	195
	Snowfall [mm SWE]	50	150	80	10	0	0	0	0	20	11	42	113	477
	Average Snow Depth [cm]	63	101	119	110	12	0	0	0	1	0	9	38	-
	Mean temperature [°C]	-7.6	-9.8	-3.3	1.1	9.4	10.6	15.5	15.3	5.9	3.0	-1.0	-6.1	-
2019	Total Precipitation [mm]	60	19	8	13	26	57	83	21	47	93	73	2	502
	Rainfall [mm]	5	0	0	7	26	57	83	21	46.5	69	32	0	346
	Snowfall [mm SWE]	55	19	8	6	0	0	0	0	0.5	24	41	2	156
	Average Snow Depth [cm]	66	75	74	32	0	0	0	0	0	5	5	14	-
	Mean temperature [°C]	-3.8	-12.7	-1.3	2.4	10.5	10.9	12.9	12.9	8.2	0.7	-1.9	-7.9	-

Source: SRK report Oct 2020: Tenas Project – Hydrometeorological Baseline and Model Development Report.

Note:

Na, not available

2.4 Hydrology

The main drainages in the Project area are the Bulkley River, the Telkwa River, Goathorn Creek, Tenas Creek, Cabinet Creek, and Four Creek. Figure 4 shows a map of the drainages, surface water monitoring stations, and watershed boundaries. Table 2-2 provides a short description of the main drainages.

The streamflow regime in the Project area is nival (snowmelt) with the majority of runoff (MAR 367 mm/year) occurring in the spring and early summer due to the melting winter snowpack. After the snowmelt-driven high flow, there is typically a period of low flow throughout the late summer and early fall, although high intensity rain during the fall period can produce substantial peak events. Annual low flows occur during the winter when the air temperatures remain below freezing; precipitations fall as snow and are stored in the snowpack. During the winter low flow period, the streams are mostly supplied by groundwater discharge; some streams in the region have glacial inputs but this is less prominent in the Project area.

Table 2-2: Description of the Main Rivers and Creeks

River/Creek Name	Description
Bulkley River	The Bulkley River is a tributary of the Skeena River. It originates southeast of the project and flows in a north-south trending valley approximately 6 km east of the Project area. Discharge into the Skeena is approximately 100 km downstream from its confluence with the Telkwa River. The size of the watershed is about 12,400 km^2. The Bulkley River is a known fish-bearing stream.
Telkwa River	The Telkwa River is a substantial tributary to the Bulkley River. It originates west of the Project and flows east, discharging into the Bulkley River approximately 6 km east of the confluence with Goathorn Creek. The size of the watershed is about 830 km^2. The Telkwa River is a known fish-bearing stream.
Goathorn Creek	Goathorn Creek is a tributary to the Telkwa River. It is a moderately wide and extensively braided creek, with a floodplain approximately 20 to 100 m wide. It flows north along the east side of the Project then discharges into the Telkwa River approximately 8 km downstream of the proposed open pit. The size of the watershed is about 130 km^2. The Goathorn Creek is a known fish-bearing stream.
Tenas Creek	Tenas Creek is a tributary to Goathorn Creek. It is a small watercourse that flows north and northwest, along the northwest side of the Project, then discharges into Goathorn Creek approximately 8 km downstream of the proposed open pit. The size of the watershed is about 60 km^2. The Tenas Creek is a known fish-bearing stream.
Cabinet Creek	Cabinet Creek is a small tributary to Goathorn Creek. It is a small watercourse that flows north of the Project, then discharges into Goathorn Creek approximately 6 km east of the proposed open pit. The size of the watershed is about 54 km^2
Four Creek	Four Creek is a small tributary to Goathorn Creek. It drains northeast, bordering the Project to the east before discharging into Goathorn Creek in the immediate vicinity of the Project. The size of the watershed is about 14 km^2

Baseflow is defined as the groundwater discharges into surface streams (i.e., water seeping into the creeks and rivers from groundwater). The rate at which groundwater discharges into surface streams was characterized based on the historical data recorded at the WSC Goathorn station using a recursive digital filter to separate baseflow from surface runoff (SRK 2020). A single filter parameter, typically ranging from 0.90 to 0.99, is used to separate total streamflow into a baseflow and surface runoff component (Nathan and McMahon 1990). The filter parameter was selected based on parsing flow records from 2000 to 2019. A filter parameter of 0.99 was found to best fit the data after three passes (n=3). The unit baseflows and monthly baseflows estimated are provided Table 2-3 and plotted in Figure 5.

Table 2-3: Estimated average unit and monthly baseflows

Month	Unit Baseflow (L/s/km^2)	Baseflows (L/s)					
		Cabinet Ck at Goathorn (54 km^2)	Four Ck at Goathorn (14.2 km^2)	Goathorn Ck at Cabinet (50.3 km^2)	Goathorn Ck at Four (116.7 km^2)	Goathorn Ck at 08EE008 (133.5 km^2)	Tenas Ck at Goathorn (58.6 km^2)
Jan	2.03	109.9	28.7	102.2	237	271	119
Feb	1.96	106	27.7	98.6	228.6	261	114.8
Mar	1.93	104.3	27.3	97.1	225	257	113
Apr	1.98	106.9	28	99.5	230.6	264	115.8
May	2.60	140.5	36.7	130.7	303	347	152.1
Jun	4.05	219.1	57.3	203.9	472.7	541	237.3
Jul	4.91	265.5	69.4	247	572.7	655	287.5
Aug	4.49	243.2	63.6	226.2	524.5	600	263.4
Sep	3.76	203.3	53.2	189.1	438.5	502	220.2
Oct	3.17	171.7	44.9	159.7	370.3	424	185.9
Nov	2.51	135.8	35.5	126.3	292.9	335	147.1
Dec	2.09	113	29.5	105.1	243.6	279	122.3

Source: SRK report Oct 2020: Tenas Project – Hydrometeorological Baseline and Model Development Report.

Note:

Calibrated Unit Baseflow (CUB) = 1.81 L/s/km^2

2.5 Bedrock Geology

The project is located within the northeast/southwest trending Skeena Arch, which separates Jurassic-age sedimentary rocks of the Bowser Basin in the north from the Jurassic to Cretaceous-age sedimentary rocks of the Nechako Basin to the south. The coal-bearing sedimentary rock sequence is associated with the Lower Cretaceous age Skeena Group and overlies unconformably the Jurassic-age Hazelton volcanic group. Figure 6 presents a simplified stratigraphic column of the Tenas, Goathorn, and North regions.

Figure 7 shows the geological map of the Telkwa Coal field based on the MEMPR geological map (B.D. Ryan, 1993-21) and modified by TML (2018), and Figure 8 three cross-sections associated with the MEMPR geological map. Figure 9 presents the local geological map of the Tenas Area from TML, and Figure 10 to 13 four cross sections associated with the local geology map.

2.5.1 Jurassic Hazelton Volcanic Group

The volcanic rocks (i.e., Figure 7: Telkwa formation - volcanic rocks) include andesite, trachyte, and basalt with associated tuffs and breccias. Figure 14 shows samples of the volcanic rock collected from a diamond core drilling rig in the Tenas Area.

2.5.2 Lower Cretaceous Skeena Group

The Lower Cretaceous Skeena Group includes marine and continental sediments interbedded with coal seams, often correlated over long lateral distances. It is subdivided into four units (Units I through IV) and a unit of undivided sediments overlying the four units (Figure 6). The economic coal seams in the Tenas Area (coal zone 1, Lower and Upper) are located within Unit I; Unit III is absent from the Tenas Area but present in the Goathorn and North areas.

- Unit I consist of more than 100 m of fine to coarse-grained cross-bedded sandstone, conglomerate, siltstone, mudstone and coal (coal zone 1). Overall, Unit I fines upward, from primarily conglomerate and sandstone to almost entirely carbonaceous mudstone, seatearth and coal (1A to 1G). The conglomerate and sandstone were deposited in braided channels and bars, and mudstone accumulated in floodplains. Thin coal seams formed in poorly drained, peat-forming backswamps, and seatearths formed under leaching conditions in less submerged areas. With denudation of the volcanic source area, braid plains were abandoned and extensive low-energy, peat-forming swamps were established, resulting in the formation of thick coal seams in the upper part of the Unit.
- Unit II separates coal zone 1 and coal zone 2. It consists of up to 140 m of primarily of a monotonous silty mudstone, occasionally interbedded with beds of chert-rich, micaceous, bioturbated or cross-bedded sandstone. The sediments were deposited in a deltaic/shallow marine environment following a regional marine transgression. The mudstone accumulated in bays, and the sandstones in distributary channels and mouthbars. Locally, thin discontinuous peat beds formed in salt marshes.
- Unit III comprises about 90 m of chert-rich, micaceous sandstone, siltstone and mudstone, and up to nine coal zones (coal zones 2 through 10). The sandstone and mudstone were deposited and biogenically reworked in a tidal flat environment; siltstone accumulated in a restricted, nearshore marine environment. Peat accumulated in freshwater coastal marshes which periodically prograded over tidal flats.
- Unit IV consists of approximately 150 m of a laterally extensive, bright green, chert-rich, chloritic sandstone or siltstone bed at the base, overlain by massive grey silty mudstone like that of Unit II. The basal sandstone is a transgressive lag deposit, and silty mudstone, the predominant lithofacies, was deposited in a quiet, nearshore, shallow marine environment.

Figure 15 shows samples of the Skeena Group sediment rocks collected from a diamond core drilling rig in the Tenas Area.

2.5.3 Intrusions

Tertiary and Cretaceous-age porphyritic dykes and sills (i.e., Figure 7: Bulkley plutonic suite – intrusive rocks) are present, the most notable of which includes a large Tertiary granodiorite plug located on the north side of the Telkwa River.

2.5.4 Geological Structures

Figure 7 and Figure 9 show the geological structures at the scale of the Telkwa Coal Field and Tenas Area respectively.

The sedimentary sequence in the Tenas Area is folded into an upright syncline in which the gently (typically 10 to 20°) northeast-dipping western limb of the syncline subcrops on the western side of the open pit area, while the moderately (40 to 45°) southwest-dipping eastern limb subcrops on the eastern side of the open pit. Faulting is generally near-vertical, and can be subdivided into two main groups, one which strikes approximately northwest/southeast and the other northeast/southwest. A few east/west striking faults have also been interpreted.

The Goathorn area is located within an outlier of the Lower Cretaceous Skeena Group. The structural geology is somewhat more complex than the Tenas Area and is characterized by a complex series of sub-parallel north-south trending reverse faults, and to a lesser extent east-west, trending normal faults.

Northeast striking faults are related to emplacement of the Bulkley intrusions in the Late Cretaceous.

2.6 Surficial Geology

The surficial geology consists primarily of glacial clay- silt-rich till, and glaciofluvial sand-gravel-rich till (Figure 16). The 2018 and 2019 drilling investigations showed the till was generally a sandy lean clay with gravel. The clay-silt-rich till typically contained silt and fine sand with some gravel, was commonly very-stiff to hard in consistency with low to medium plasticity, and well graded. Sand, silt and gravel lenses were commonly encountered within the till at depth across the north of the project site. The sand-gravel rich till was dense to very dense as assessed by standard penetration testing during the sonic drilling. Figure 17 shows typical samples of overburden collected with a diamond core or a sonic core drilling rig, and Figure 18 shows particle distribution curves (PSD) of samples classified as clay-silt-rich tills, and sand-gravel-rich tills. At upper elevations and south of the proposed open pit, the bedrock outcrops are close to ground surface, with mantles of clay-silt-rich tills between 3 m and 10 m thick. North of the proposed open pit and towards Tenas Creek and Goathorn Creek, drillholes report thin mantles of clay- silt-rich tills deposits, between 3 m and 10 m thick, underlain by a thick sand-gravel-rich till that can exceed 100 m.

Other deposits are present locally. Patches of glaciolacustrine deposits are scattered throughout the morainal landscape in low ridges and in depressions, comprising bedded and laminated mud, and minor sand and gravel (Clague 1984). Recent fluvial deposits are present in the narrow floodplains of Goathorn Creek and Tenas Creek, which are 40 m to 80 m deep incised into the

subdued morainal landscape, and the wide floodplains of the two-wandering gravel-bed rivers, the Telkwa River and the Bulkley River. The fluvial deposits range from extremely coarse, poorly sorted gravel on steep alluvial fans to moderately to well-sorted sand and mud on low-gradient floodplains (Clague 1984).

2.7 Project Description

The following description consists of an overview of the proposed mine components, adapted from Section 1 of the main EA document.

2.7.1 Mine Plan

The Project configuration is shown on Figure 19. It will consist of a conventional shovel and truck coal extraction operation, like other rock quarry and surface mine operations in the region. The estimated total area disturbed by the Project is 840 ha, including the open pit (289 ha), the coal processing plant (10 ha), material storage facilities (137 ha), sediment ponds (40 ha), and management ponds (227 ha).

The Project will include the following major components:

- Open pit.
- Coal Processing Plant (CPP).
- Coal handling systems for run-of-mine (ROM) coal, processed rock, and processed coal (including plant conveyors, storage bins, and stockpiles).
- Storage piles and stockpiles for rock (non-PAG), overburden, growth media, and processed coal.
- Three management ponds for storage of potentially acid generating (PAG) rock: the North (NMP), the East (EMP), and the West Management Ponds (WMP).
- One control pond.
- Four sedimentation ponds: The Plant Sedimentation Pond, Rail Infrastructure Sedimentation Pond, Explosives Site Sedimentation Pond, and Explosives Magazine Sedimentation Pond.
- Surface water ditches.
- Water supply wells, storage, and distribution network.
- Fuel and lubricant storage facilities and distribution network.
- Explosive’s magazine, storage silos, and vehicle wash and maintenance facilities.
- Propane storage facilities and distribution network (no longer required).
- Solid waste management systems including landfill, recycling and composting facilities.

- Administration, first aid, maintenance/warehouse, mine dry, laboratory, light vehicle, mine rescue, and warehouse buildings.
- Haul roads and access roads within the minesite.
- Tenas Access Corridor which encompasses a 11 km newly constructed Bypass Road and improvements to approximately 5.0 km of an existing forestry service road.
- A 3.5 km long 25 kV powerline and a 25 to 600 kV substation adjacent to the CPP.
- A rail infrastructure consisting of processed coal stockpiles, scales, dust control facilities and a 2.5 km rail loop connected to the Canadian National Railway track.
- A permanent bridge over Goathorn Creek.

2.7.2 Material Management

TML has identified several types of material associated with coal extraction that will need to be managed:

- **Surface Soils (topsoil) (Non-PAG)** is the top 0.20 to 0.50 m of material and contains the bulk of organic material and material acceptable for the growth of vegetation. There is approximately 1.75 million m^3 of this material. This material will be stockpiled in designated locations for reclamation activities or direct placed on areas available for growth media placement.
- **Overburden (Non-PAG)** is the non-rock material between growth media material unit and the rock unit that consists of primarily till material with almost no organic material. There is approximately 24 million m^3 of this material. This material will be placed into the critical compaction zones and/or buttress components of the dams required for the management ponds, otherwise it will be placed as backfill within the open pit.
- **Low sulfur rock (Non-PAG)** is the rock present in the Project's open pit area that has sulfur levels with little potential to cause ARD. This material is also known as non-acid-generating (Non-PAG) rock. There is approximately 29 million m^3 of this material. This material will be placed within the buttress region of the dams for the management ponds otherwise it will be backfilled within the open pit.
- **High sulfur rock (PAG)** is the rock present in the Project's open pit area that has sulfur levels that are elevated and will have the potential to cause ARD. This material is also known as PAG rock. There is approximately 31 million m^3 of this material. All PAG material will be placed into external flooded management ponds or within flooded portions of the open pit.
- **Processed rock (PAG)** is the rock produced during coal processing to produce a processed coal suitable for the marketplace that will be separated from the coal through gravity separation methods, such as cyclones. This material is classified as PAG material. There is approximately 3.3 million m^3 of this material. All PAG material will be placed into external flooded management ponds or within flooded portions of the open pit.

- **Run-of-mine (ROM) coal (PAG)** is the coal that is recovered in the open pit from mining operations and then hauled to the CPP to be placed into one of two stockpiles. These stockpiles are expected to be constantly changing in response to open pit production sequence, marketing requirements, and plant production requirements. There is approximately 22.0 Mt of ROM coal recovered during the life of this Project.
- **Processed coal (PAG)** is the coal after it has been washed in the CPP removing unwanted rock from the coal so that it is suitable for the marketplace. Based on the work completed, there is approximately 16.0 Mt of processed coal.

2.7.3 Water Management

Surface water management features (i.e., ditches, sedimentation ponds, control ponds and management ponds) are illustrated in Figure 19.

Upslope diversion ditches will divert non-contact water away from the material storage piles and surface mine areas into existing natural watercourses. Downslope collection ditches will collect runoff from the material storage areas and divert it into sedimentation/control ponds for treatment with approved flocculants to reduce total suspended solid levels if required.

The management ponds (i.e., NMP, EMP, and WMP) will collect the groundwater and surface pumped from the open pit during operation. These ponds are designed for underwater long-term storage of potentially acid generating (PAG) material to limit its potential exposure to oxygen. The Tenas Control Pond will collect surface runoff from the mine infrastructure complex, run off from the management pond dams, contact water ditches, and overflows from the management ponds. It is designed to ensure that no water discharge will occur during operations between the October 31 and March 31 period and to control the sedimentation for the overall site. It provides contingency water to ensure PAG material is submerged, and a location for water displaced during management pond operations. The storage management ponds, EMP, NMP, and WMP will be lined with engineered soil-bentonite (S/B) compacted layers (i.e., 0.30 m thick), and the Tenas Control Pond with a bituminous geomembrane or equivalent. Only parts of the WMP will be lined: the portions outside the open pit (WMP Ex pit), and the portions inside the open pit (WMP In pit) that intercept overburden. The design details of the management ponds and control pond are documented in Part A, Section 1 of the EAC Application.

Water is required for CPP make-up water and for the mine infrastructure complex, i.e., heavy vehicle and explosive facility wash bays, workshop hoses, potable water requirements, and non-potable water requirements. Raw water is estimated at approximately 15,000 m^3 per month (180,000 m^3 per year) or about 20 m^3/h) and will be sourced from precipitation and melting snow collected onsite. Potable water for domestic facilities will be sourced from surface runoff and/or groundwater; a potable water treatment plant will be onsite to ensure that potable water standards are met.

Another 1.5 million m^3/year of make-up water is assumed for additional contingency and robustness to the water balance. This water would be sourced from Goathorn Creek (i.e., approx. 2.5% of Goathorn's Creek yearly flow and less than 1% of the Telkwa River's annual flow respectively) via water supply wells located along the edge of Goathorn Creek.

2.7.4 Project Phases and Scheduling

The Projected mine life is approximately 26.5 years, including approximately 1.5 years of construction, 21 years of operations, and 4 years of decommissioning and reclamation.

Major activities during construction will include site clearing, pre-stripping, building construction, road development, rail loop construction, bridge construction, and development of onsite utilities and services.

Mining operations are scheduled to commence in the north portion of the open pit to excavate overburden, and to construct the initial embankment structures for the Tenas Control Pond and the NMP. The Tenas Control Pond will be constructed first along with the Coal Processing Plant Sedimentation Pond, then the NMP will follow. Once the NMP reaches approximately 50% of its planned capacity, excavation of PAG rock will start to expose the first coal. Between 2023 and 2025 mining will continue west to produce overburden for the management ponds while for coal release, mining will move towards the south. In 2025 and continuing through to 2031 mining will start to construct the EMP and the initial phases of the open pit will be available for backfill. Mining will also continue working west producing overburden for the embankments associated with the management ponds. In 2032, mining will move to the far southern tip of the open pit and proceed towards the central area of the open pit through to the completion of mining in 2043.

Once mining is complete, decommissioning and reclamation activities will commence with the removal of all buildings and structures. Any material storage piles or open pit walls that have not been sloped will be sloped and have topsoil placed on them. Vegetation and monitoring activities will then complete the reclamation phase. Once water encountering the mine and flowing through the Tenas Control Pond meets acceptable turbidity values for several years, this structure will be allowed to drain, and a wetland will be established in the former bottom of this pond.

3 Groundwater Baseline Studies

This section summarizes important information for understanding how the baseline groundwater conditions were evaluated.

3.1 Spatial Boundaries

The spatial boundaries define the limits within which changes to the groundwater system will be evaluated. Two spatial boundaries were considered for the groundwater assessment: the Local Study Area (LSA) and the Regional Study Area (RSA).

The LSA is defined as where the Project may have a direct influence on the groundwater system and/or groundwater users. The area was delimited based on watersheds and to include the project footprint, and the private domestic wells located downgradient of the Project. The RSA is a larger area defined by the fish habitats in the Telkwa River watershed and in the tributaries to the Bulkley River crossed by the haul road; it is used to provide context for the assessment of potential Project effects and represents the cumulative effects assessment study area. The extent of the LSA and RSA are shown on Figure 20.

3.2 Temporal Boundaries

The temporal boundaries encompass the periods during which the Project is expected to have potential effects on the Hydrogeology. The relevant time-steps used for the assessment are presented in Table 3-1.

Table 3-1: Temporal Boundaries for Hydrogeology

Phase	Project Year	Description of Activities
Construction	2021	Site clearing, pre-stripping, construction of the buildings, roads, rail loop, bridge, and onsite utilities and services
End-of-Year 1 (EoY1)	2023	Excavation of the open pit and development of material storage piles. Coal processing. Dewatering of the open pit. The Control Pond and NMP are constructed.
End-of-Year 7 (EoY7)	2029	Excavation of the open pit and development of material storage piles. Coal processing. Dewatering of the open pit. The Control Pond, NMP, and EMP are constructed.
End-of-Mine (EOM)	2043	The mine is fully excavated. Dewatering of the open pit. The Control Pond and all the management ponds are constructed, and water levels are at their maximum.
Post-closure	To be determined from monitoring	No activities. All infrastructures removed and reclaimed except the storage ponds.

3.3 Regulations and Guidelines

The groundwater baseline studies for the Project were designed to meet the requirements of a Joint Application for *Mines Act and Environmental Management Act Permits* (BC MEM & BC MOE, 2016). Groundwater is a valued component of the biological and physical environment and is protected under the Groundwater Protection Regulation of the British Columbia (BC) *Water Sustainability Act* (2016).

The environmental guidelines listed below were consulted to help with the characterization of the groundwater baseline conditions and the assessment of potential Project influences on the groundwater system:

- *Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities*, prepared by BC MOE (2012).
- *Water and Air Baseline Monitoring Guidance Document for Mine Proponents and Operators,* prepared by the BC MOE (Version 2, 2016).
- *Draft Guidelines for the Preparation of an Environmental Impact Statement, December 2015*. Prepared by the Canadian Environmental Assessment Agency.

- Framework for a Hydrogeologic Study in support of an Application for an Environmental Assessment Certificate under the Environmental Assessment Act and Regulations (BC Ministry of Environment, Water Stewardship Division 2019).
- Information Sources
- SRK reviewed the information listed in the next two sections. The level of details, methods, and quality of the information were adequate for a Joint Application for a Mines Act permit, and for an effluent discharge permit.

3.3.1 Desktop Information

- TML 2018 drillhole database (dated 27 Nov. 2018)
- Technical reports from Klohn Leonoff Consulting Engineers (Klohn, 1985), Piteau Engineering Ltd (Piteau 1990, 1994, 1995, 1996a, 1996b, 1997a, 1997b, 1998), Stantec (Stantec 2016) and field and technical baseline memo/reports produced ERM (2017, 2020), Cassiar (2020ab), or SRK (2018, 2019) between 2018 and 2020.
- Groundwater baseline data – Hydrogeology and groundwater quality (ERM 2020).
- Digital Elevation Model (DEM) from a LIDAR survey conducted in August 2017 on behalf of TML.
- Geological publications and maps (Clague 1984, Plasgrove 1991, Massey 2005, BC Gov 2018).
- Digital maps and databases of aquifers, domestic and private wells, and water licences (BC Government 2018, BC MOE 2018abc).
- Monthly precipitation grids for Alaska, British Columbia, and Yukon (Stavros 2016).
- Raster grid of a global estimation of groundwater recharge (Jasechko 2014).

3.3.2 Field Investigations

Baseline studies were initiated between 1983 and 1998 by the former owners of the Project property, Crowsnest Resources and Manalta Coal Ltd. TML continued and expanded on these studies since 2016, after acquiring the property. Table 3-2 lists all the field programs related to groundwater and Table 3-3 compiles a summary of the available groundwater field data.

Table 3-2: List of the hydrogeological field investigation conducted for the project

Author	Date	Area	Description
Klohn Leonoff (1)	1982-1984	Open pit 3 (4)	Borehole drilling and installation of 20 piezometers within bedrock. Falling head permeability tests and packer tests in selected coal horizons. Groundwater sampling.
Piteau (2)	1989	Open pit 7&8 (4)	Borehole drilling and installation of 5 piezometers within bedrock. Rising head permeability tests. Measurements of groundwater levels in piezometers and open boreholes. Groundwater sampling.
	1993	Open pit 7&8 (4)	Borehole drilling and installation of 5 monitoring wells within bedrock and 1 within surficial till. Rising head permeability tests. Groundwater sampling.
	1995	Tenas Open pit	Borehole drilling and installation of 5 monitoring wells within bedrock. Rising head permeability tests. Groundwater sampling.
	1996	Tenas Open pit	Preliminary assessment of potential groundwater inflows and dewatering requirements for the Tenas Open pit. Borehole drilling and installation of 5 monitoring wells within bedrock and 6 within surficial sediments. Rising head permeability tests. Groundwater sampling.
	1996	Open pit 3 (4)	Borehole drilling and installation of 5 monitoring wells within bedrock and 6 within surficial sediments. Rising head permeability tests. Groundwater sampling.
	1996	Former Tailings Pond	Borehole drilling and installation of 6 monitoring wells within surficial sediments. Rising head permeability tests. Groundwater sampling. Mapping of the surficial geology based on air-photo interpretations.
	1997	Open pit 3, Tenas Open pit, Open pit 7 & 8 (4)	A 7h aquifer test in the northern portion of Open pit 3. Domestic well survey in area extending three to five km north of Open pit 3. Borehole drilling and installation of 27 piezometers in Reclamation Open pit (test open pit originally excavated in 1983). Groundwater sampling from nearby domestic wells and from all piezometers, where possible
Stantec (3)	2016	Tenas Area	Inspection of 6 monitoring wells around the northern portion of the Tenas Open pit. Of the 6 wells inspected, only 1 was not dry or damaged. Groundwater samples were taken from 3 wells.
ERM, Cassiar Geoscience, and SRK	2017-2019	Tenas Area, Access Road, Rail loadout	Hydrogeology baseline monitoring program: Inspection of 22 existing monitoring wells to determine their usability for the baseline program on July 25 and 26, 2017; Field reconnaissance of seeps along Tenas and Four Creek; Drilling of 26 boreholes, and installation of one pumping test well, 18 single screen and 2 nested monitoring wells (8 screens in bedrock and 15 in surficial sediments), and three vibrating wire piezometers. Development of all the new wells; One pumping test, 13 packer injection tests performed in 3 boreholes, 12 rising or falling head permeability tests completed in 11 monitoring wells, and 19 K values inferred from PSD analyses in overburden at 17 locations. Automatic measurements of continuous groundwater levels at 5 monitoring wells since Sep.2017, and 16 campaigns of manual measurements at the monitoring wells between Jul.2017 and Nov. 2019. Quarterly groundwater quality monitoring at 13 monitoring wells initiated in July 2017.

Notes:

1. Klohn Leonoff Consulting Engineers (1985).

   This original report could not be found, but the associated data is included in Piteau's technical report (1998).

2. Piteau (1990, 1994, 1995a, 1996a, 1996b, 1997a, 1997b).

3. Stantec (2016).

4. Open pit names have changed compared to the EA mine plan described by Manalta Coal Ltd. in 1998. The Tenas Area englobes the Tenas North Open pit and the Tenas West Open pit, the Goathorn Area englobes the Open pit 3 and Open pit 6, and the North Area englobes the Open pit 7 and Open pit 8.

Table 3-3: Summary of the available groundwater data

Parameter	Method/Type	Tenas Area (1)	Goathorn Area	North Area
Hydraulic conductivity tests (K)	Grain size analyses	19 (ovb)	-	-
	Rising head tests	10 (ovb), 19 (bdr)	2 (ovb), 19 (bdr)	8 (bdr)
	Packer injection tests	13 (bdr)	-	-
	Pumping tests	1 (bdr)	1 (bdr)	-
Monitoring wells (MW)	Screen within ovb.	26	6	1
	Screen within bdr.	19	22	7
	Multiple screen MW	6	7	2
Groundwater level observations	Manual	Up to 28 levels measured in ovb in a single event and 26 in bdr (i.e., Mar/Apr 2019). Period of records: Aug.94 to Nov.19.	6 levels measured in ovb, and 28 in bdr. Period of records: Sep.96 to Sep.97.	2 levels measured in ovb, and 22 in bdr. Period of records: Nov.89 to Sep.97.
	Automated	5 loggers (2 in ovb, 3 in bdr). Period of records: Sep.17 to Aug.20.	-	-
Groundwater samples (2)	3 in Oct.1995 (bedrock). 7 in Sep./Oct.1996 (4 bedrock / 3 overburden). 8 in Aug./Sep.1997 (4 bedrock / 4 overburden). 99 between Nov.2016 to Nov.2019 (50 from bedrock and 49 from overburden).			

Notes:
Ovb, Overburden; Bdr, Bedrock
1. Tenas Area includes the Tenas, access road, and rail loadout areas.
2. Samples collected in the Tena area.

3.4 Field Data Collection Methodology, QAQC, and Data Management

The methodologies, QA/QC procedures, and observations of the groundwater baseline monitoring program are detailed in Section 17 of the EAC Application. SRK reviewed the information and compiled the data into excel spreadsheets, and GIS databases (ArcMap and Leapfrog) for analyses and mapping. All monitoring locations (hydraulic conductivity (K) tests intervals, groundwater levels, and seep locations) were plotted in 3D space based on the high-resolution LIDAR or surveyed collar elevation, and Telkwa database of drillhole surveys.

4 Groundwater Baseline Data

This section summarizes the groundwater data collected to date, as of August 2020, that supports the characterization and understanding of the groundwater system at the Project.

4.1 Monitoring Network

Figures 21 to 23 shows the monitoring well locations. Table 1A in 7Appendix A provides detailed information on each well.

4.2 Hydraulic Conductivity

A total of 92 values of hydraulic conductivity (K) values were obtained since the exploration of the Telkwa coal field started. Table 4-1 compiles a statistical summary of the test results. Figure 25 shows a 3D perspective views of the K tests, Figure 26 and Figure 27 box plots and histograms of K frequencies by lithological unit, Figure 28 a plot of K values versus elevation, and Figure 29 a plot of K values versus depth. Additional details are provided for the individual tests in Table 1B, Appendix B.

Table 4-1: K statistics

SUB-CLASS		TENAS AREA						GOATHORN AREA						NORTH AREA					
		n	K min	K harm	K geo	K arith	K max	n	K min	K harm	K geo	K arith	K max	n	K min	K harm	K geo	K arith	K max
		#	m/s	m/s	m/s	m/s	m/s	#	m/s	m/s	m/s	m/s	m/s	#	m/s	m/s	m/s	m/s	m/s
ALL TESTS		62	$7x10^{-11}$	$2x10^{-9}$	$1x10^{-7}$	$2x10^{-6}$	$5x10^{-5}$	22	$8x10^{-12}$	$2x10^{-10}$	$1x10^{-8}$	$3x10^{-7}$	$4x10^{-6}$	8	$3x10^{-9}$	$1x10^{-8}$	$4x10^{-8}$	$1x10^{-7}$	$4x10^{-7}$
BEDROCK		33	$3x10^{-9}$	$3x10^{-8}$	$2x10^{-7}$	$7x10^{-7}$	$6x10^{-6}$	20	$8x10^{-12}$	$1x10^{-10}$	$1x10^{-8}$	$3x10^{-7}$	$4x10^{-6}$	8	$3x10^{-9}$	$1x10^{-8}$	$4x10^{-8}$	$1x10^{-7}$	$4x10^{-7}$
Bedrock Lithologies	Coal seams	12	$2x10^{-8}$	$1x10^{-7}$	$5x10^{-7}$	$1x10^{-6}$	$6x10^{-6}$	16	$2x10^{-10}$	$1x10^{-9}$	$2x10^{-8}$	$4X10^{-7}$	$4x10^{-6}$	8	$3x10^{-9}$	$1x10^{-8}$	$4x10^{-8}$	$1x10^{-7}$	$4x10^{-7}$
	Sandstone	3	$4x10^{-8}$	$9x10^{-8}$	$2x10^{-7}$	$3x10^{-7}$	$5x10^{-7}$	1	$1x10^{-6}$					0	n/a				
	Mudstone, Siltstone	9	$8x10^{-9}$	$3x10^{-8}$	$7x10^{-8}$	$7x10^{-7}$	$5x10^{-6}$	2	$8x10^{-12}$	$2x10^{-11}$	$1x10^{-10}$	$1x10^{-9}$	$3x10^{-9}$	0	n/a				
	Conglomerate	2	$7x10^{-9}$	$2x10^{-8}$	$2x10^{-8}$	$3x10^{-7}$	$6x10^{-8}$	0	n/a					0	n/a				
	Volcanic rock	7	$3x10^{-9}$	$1x10^{-8}$	$1x10^{-7}$	$4x10^{-8}$	$9x10^{-7}$	0	n/a					0	n/a				
	Not defined	0	n/a					1	$2x10^{-9}$					0	n/a				
OVERBURDEN		29	$7x10^{-11}$	$1x10^{-9}$	$6x10^{-8}$	$3x10^{-6}$	$5x10^{-5}$	2	$8x10^{-9}$	$1x10^{-8}$	$1x10^{-8}$	$1x10^{-8}$	$1x10^{-8}$	0	n/a				
Overburden Lithologies	Clay/Silt	17	$7x10^{-11}$	$7x10^{-10}$	$9x10^{-9}$	$1x10^{-7}$	$7x10^{-7}$	2	$8x10^{-9}$	$1x10^{-8}$	$1x10^{-8}$	$1x10^{-8}$	$1x10^{-8}$	0	n/a				
	Sand/Gravel	5	$6x10^{-8}$	$2x10^{-7}$	$1x10^{-6}$	$3x10^{-6}$	$1x10^{-5}$	0	n/a					0	n/a				
	Mixed grains	7	$7x10^{-9}$	$4x10^{-8}$	$7x10^{-7}$	$8x10^{-6}$	$5x10^{-5}$	0	n/a					0	n/a				

Note:

n	Number of tests.
K min	Minimum K value.
K harm	Harmonic mean
K geo	K geomean.
K arith	Arithmetic mean
K max	Maximum K value.
n/a	Not applicable.

4.2.1 Bedrock

- Bedrock has a low to moderate hydraulic conductivity. K values in the Tenas Area are generally higher than in the Goathorn and North areas, with a geomean of $2x10^{-7}$m/s, $1x10^{-8}$ m/s and $4x10^{-8}$ m/s respectively. The differences between Tenas, Goathorn, and North may result from the heterogeneity of the overall sedimentary sequence; the tested unit in the Tenas Area is the Unit I of the Skeena group, and in the Goathorn and North areas it is Unit III.
- Geomean K values sorted by lithology for the Tenas Area, from the least permeable to the most permeable, are conglomerate ($2x10^{-8}$ m/s), mudstone/siltstone ($7x10^{-8}$ m/s), volcanic rock ($1x10^{-7}$ m/s), sandstone ($2x10^{-7}$ m/s), and coal ($5x10^{-7}$ m/s).
- A progressive reduction of K values with depth (Figure 29) is interpreted to occur due to a reduction of fracture apertures with depth as lithostatic load increases.
- Piteau (1998) conducted a pump test in the Goathorn area as a mean to assess the potential role of faults. Pumping lasted seven hours at a constant rate of 15.8 m^3/day. The test did not conclusively confirm the hydraulic role of the faults in that area. The transmissivity of the bedrock (interval between coal seam #2 and top of bedrock) was determined to be relatively low, in the range of 0.02 and 0.24 m^2/day. The observations in nearby wells suggested limited lateral hydraulic connection within the coal seam #2, and between the seam and underlying mudstone. No measurable drawdown occurred in observations wells completed in coal, the closest of which was approximately 170 m away, nor in a well installed in the underlying mudstone, less than 10 m away from the pumping well.
- In March 2019, Cassiar Geoscience and SRK conducted a pump test in T18-01D (ARD2), in the Tenas Area, to estimate the physical properties of the sandstone aquifer and test if there was a hydraulic connection between the sandstone and the overlying coal seam units. Pumping lasted 20 hours at a constant average rate of 7.5 m^3/day. There was no drawdown observed in T95R-64, the closest well available, approximately 440 m away; therefore, the test did not confirm the hydraulic connection with the overlying coal seams. The interpretation of the drawdown and recovery curves indicated hydraulic conductivity of the sandstone was consistent with the other K measurements; Theis Recovery Analysis – $4x10^{-7}$ m/sec, and Theis Step Test (Drawdown and Recovery) – $1x10^{-7}$ m/sec. The test also showed a boundary started to influence drawdown after about five and half hours of pumping; the interpretation of the derivative drawdown curve indicated test was potentially influenced by a leaky aquifer (Cassiar 2020a).

4.2.2 Overburden

K in overburden varies according to lithologies. K in the clay-silt-rich till is relatively low, with a geomean of $9x10^{-9}$ m/s, and K in the sand-gravel-rich till is moderately high, with a geomean of $1x10^{-6}$ m/s.

4.3 Storage Properties

The specific storage (S_x) and specific yield (S_y) influence the volumetric water release in an aquifer induced per unit change of hydraulic head under saturated conditions, and the pressure response

of the material. A specific storage value of $1.2x10^{-4}$ in bedrock was estimated from the pump test analysis in T18-01D (Cassiar 2020a); however, this analysis was based on groundwater level observations from the pumping well, which are less reliable than analysis based on observation wells. According to lithology, scientific literature (Domenico 1990, Singhal 2010), and professional experience (Piteau 1997, SRK 2018), the expected ranges are:

- In Bedrock, S_x between $1x10^{-7}$ and $1x10^{-4}$ m^{-1} and S_y between 0.01 and 0.2.
- In clay/silt deposits, S_x between $1x10^{-5}$ and $1x10^{-2}$ m^{-1} and S_y between 0.05 and 0,15.
- In sand/gravel deposits, S_x between $5x10^{-5}$ and $1x10^{-3}$ m^{-1} and S_y between 0.1 and 0.3.

4.4 Groundwater Levels

Table 1C in Appendix C reports the number of available monitored wells by area and dates; Table 2C the groundwater level statistics for each location; Table 3C vertical gradients estimated from dual/nested wells; and Table 4C the raw manual level data.

Figure 30 shows a map of the Tenas Area with the inferred water tables associated with the overburden and bedrock units. The groundwater in both systems is interpreted to flow under an average horizontal hydraulic gradient of approximately 0.04 m/m in the overburden and 0.09 m/m in the bedrock, towards the valleys, moving away from the Tenas open pit towards Tenas Creek, the Telkwa River, and Goathorn Creek. Static water levels are generally less than 2 mbgs (meters below ground surface) in the south part of the Tenas Area, to more than 20 mbgs in the north part of the Tenas Area, where overburden changes to thick sequence of sand-gravel-rich till deposits. Six wells[1] screened in bedrock indicated flowing artesian conditions, at least on a seasonal basis, and are interpreted to be controlled by topography. Six wells[2] showed small upward gradients from bedrock to overburden: and four wells[3] downward gradients from overburden to bedrock or from bedrock upper layer to lower layers.

Figure 31 shows continuous groundwater level measurements recorded from Sep. 2018 to Aug. 2019, in TOB96-02-06 and TOB96-02-20 (screened in till, and sand and gravel respectively), and T95R64, T95R-15C, and T96R-16-19 (all screened in Coal unit 1). TOB96-02-20 is dry, the water levels dropped below the well screen bottom. The records at T95R-15C have a data gap between April and June.

The overburden well (TOB96-02-06) shows highs occur in spring with freshet and lows in winter; amplitude between highs and lows is about 3 m. The 2018 and 2019 records have differences; the peaks associated with freshet are offset (i.e., mid-May 2018 and mid-July 2019), and an increase of 1 m is observed between November 2017 and January 2018 but not in 2019. These differences correlate with the differences in precipitations (i.e., high rainfall in Oct. 2017, high snowfall in Feb. 2018, and a total precipitation of 672 and 502 mm/yr in 2018 and 2019 respectively with the snow equivalent to 70% of total precipitation in 2018 versus 30% in 2019).

[1] T18-04D#2 (W01#D), T95R-15C, T95R-39C, T96R-34-67, T96R-34-87, T96R-56C-83
[2] 18-04D, 96R-16 (0.001 to 0.03)
[3] 18-08D, 96R-34, OB96-02, OB96-11 (0.006 to 0.7, and >1 where groundwater perched in overburden)

The bedrock wells can be divided in two groups: one with T96R-16-19, the other with T95R-64 and T95R 15C. T96R-16-19 shows highs in spring with freshet, and lows in fall and winter; amplitude between highs and lows is about 1 m. The variations are like those observed in TOB96-02-06 which suggest the well is connected with overburden. Differences with overburden wells are noted but difficult to interpret: The winter 2017-2018 peak occurs earlier (Nov.17 versus Jan.18); level is low in August 2018 then increases gradually by a small amplitude, and contrary to the overburden well the 2018 and 2019 peak have similar magnitudes. T95R-64 and T95R 15C show a different trend: the highs are observed in winter and lows in summer and fall; amplitude is about 0.4 m. This implies recharge from precipitation is delayed by several months, potentially by the low permeability of the silt-clay-rich till. Differences between the two wells are noted but difficult to interpret: the highs and lows are offsets by about 1 to 2 months; and in the last three months of records the trends diverge (i.e., levels decline in T95R-15C, and increase in T95R-64).

4.5 Groundwater Seepages

In November and December 2018, ERM searched for seeps along the Tenas and Four creeks. The survey was completed via helicopter and during winter conditions to aid visual identification of seeps from the air. One seep was located and photographed on Tenas Creek. (Easting 617555 Northing, 6055416; Plate 17). The survey line, seep location and photo of the seep are shown on Figure 32. The geological control of this resurgence is uncertain. It could be linked to a perched system on top of clay. There is no mapped geological structure aligned with the seep.

4.6 Groundwater Quality

The baseline groundwater quality program and data (i.e., TML's MW and residential wells) are detailed in EA Chapter 6; the locations of the monitoring well screens are shown in Figure 33.

Statistics for groundwater quality constituents in the overburden and bedrock units are provided in Table 4-2, exceedances compared the British Columbia water quality guidelines – freshwater aquatic life (BC WQG FAL, MOE 2020d) and drinking water sources (BC WQG DWS, MOE 2020e) are mapped in Figure 34, and a summary of the groundwater quality is presented in Appendix D. Piper plots of the observed groundwater quality are shown in Figure 35. The analysis of the groundwater quality shows:

- The pH value for the bedrock and the overburden wells ranges from 7 to 9 except for T18-04 (W1D, W1S) and T18-08D (W3S). This is within the range of the British Columbia water quality guidelines – freshwater aquatic life (BC WQG FAL,) for pH of 6.5 to 9.0. The pH above 9 were observed in two opposite areas, to the west and south sides of the deposit respectively in W1D (9.1 to 9.6, seven out of eight events), W1S (9.1 to 9.6, three out of eight events), and W3S (7.8 to 9.2, one out eight events). They correlated with high turbidity values, which may indicate incomplete development within the holes.
- Turbidity was below the BC WQG – FAL value of 50 NTU (Nephelometric Turbidity Unit), except for 19 samples in 8 monitoring wells (T95R-40, T95R-15C, T96R-34-87, T18-04, TOB96-02-20, TOB96-01-05, and T18-06 D). Turbidity values were generally slightly higher in the

overburden wells in comparison to the bedrock wells due to the fine-grained nature of the glacially deposited material.

- Hardness ($CaCO_3$) - The bedrock groundwater is 'considered soft' and overburden groundwater 'hard'. Hardness in the bedrock wells ranged from 3.9 to 138.0 mg/L, with an average concentration of 51.3 mg/L, and in the overburden wells from 57.9 to 423.0 mg/L, with an average concentration of 222.8 mg/L.

- Anions and nutrients - Fluoride exceeded the BC WQG – FAL guideline of 0.4 to 2.0 mg/L (hardness dependent). In bedrock wells, fluoride ranged from 0.32 to 5.55 mg/L, with an average concentration of 1.68 mg/L; in the overburden wells from 0.086 to 0.383 mg/L, with an average concentration of 0.18 mg/L. Fluoride also exceeded the BC WQG - DWS guideline of 1.5 mg/L at T95R-64, T96R-34-87, T95R-15C, and T18-04D (W1D). Nitrate concentrations were below detection limits, except for two bedrock wells (T18-04D, T18-08D) and three overburden wells (TOB96-01-05, TOB96-02-06 and TOB-11-04). Low concentrations of nitrite were detected in one bedrock well (T18-08D) and four overburden wells (TOB96-02-06, TOB96-11-04, TOB96-02-20, and T18-08S). Ammonia concentrations exceeded the BC FWQ-FAL guidelines in two overburden wells (T18-08S March 2019, T18-06D September 2018, and April, June, August and November 2019).

- Exceedances of dissolved and total metals above BC WQG – FAL approved or working guidelines are summarized below; the complete dataset is provided in Section 17 of the EAC Application:
  - Exceedances of total arsenic (>0.005 mg/L): T95R-15C, T95R-40, T96R-34-87, TOB96-02-20, T18-08S (W3S) and T18-06D (W2).
  - Exceedances of total copper (>0.002 - 0.026 mg/L [hardness dependent]): T18-04D (W1D), and -04S (W1S), T18-08D (W3D), T95R-40, T95R-64, TOB96-02-20, TOB96-01-05, and T18-06D (W2).
  - Exceedances of total chromium (Cr^{III} >0.0089 mg/L; Cr^{IV} >0.001mg/L): T95R-15C, T95R-40, T95R-64, T96R-34-87, TOB96-02-20, and T18-06D (W2).
  - Exceedances of total iron (>1 mg/L): T95R-15C, T95R-40, T96R-34-87, T18-04D (W1D), and -04S (W1S), TOB96-02-20, TOB96-11-04, TOB96-01-05, and T18-06D (W2).
  - Exceedances of dissolved iron (>0.35 mg/L): T95R-40, T95R-64, and T96R-34-87.
  - Exceedances of selenium (>0.002 mg/L): TOB96-02-20.
  - Exceedances of total zinc (>0.033-0.265 mg/L, [hardness dependent]): T95R-15C, T95R-40, T95R-64, T96R-34-87, T18-08D (W3D), and T18-06D (W2).

  The wells installed before 2017 reported more exceedances for total and dissolved metals before 2017 than between 2017 to 2019, which suggest the historical exceedances were caused by suspended particles derived from the formation (i.e., drilling and well installation disturbances) rather than natural dissolved metals in groundwater. This is also likely the case for the wells recently installed (i.e., 2017 to 2019) that reported exceedances of total metals; for the same metals and during the same sampling event, dissolved metal concentrations were below guideline values and generally below detection limits.

- Exceedances of dissolved and total metals above BC WQG DWS guidelines are summarized below:
  - Exceedances of dissolved antimony (>0.006 mg/L): T95R-64, T95R-40, T95R-15C (noted in only one sampling event at each location).
  - Exceedances of dissolved arsenic (>0.01 mg/L): T18-06D (W2).
  - Exceedances of dissolved iron (>0.3 mg/L): T95R-64, T95R-40, T96R-34-87, and T95R-15C.
  - Exceedances of dissolved cobalt (>0.001 mg/L): T95R-64, T95R-40, T95R-15C, T0B96-02-06, T0B96-02-20, T0B96-11-04, and T0B96-01-05.
  - Exceedances of dissolved mercury (>0.001 mg/L): T95R-64, T95R-40, T96R-34-87, T95R-15C, T0B96-01-05 (noted in only one sampling event at each location).
  - Exceedances of dissolved lead (>0.005 mg/L): T95R-64, T95R-40, T95R-15C, and T0B96-02-20 (noted in only one sampling event at each location).
  - Exceedances of dissolved manganese (>0.12 mg/L): T0B96-01-05, T18-06D (W2), and T18-08D (W3D), and noted in only one sampling event at T95R-64, T95R-40, T96R-34-87, T95R-15C, and T0B96-11-04.
  - Exceedances of dissolved uranium (>0.02 mg/L): T95R-64, T95R-40 and T95R-15C (noted in only one sampling event at each location).
- The piper plots show there are distinct hydrochemical differences between the shallow overburden wells (TOB96-11-04, TOB96-01-05, and TOB96-02-06), the deep confined overburden wells (T18-06D and T18-08D#1), the bedrock wells (T95R-15C, T95R-40, T95R-64, T94R-34-87, T18-04D#1 and #2, T18-08D#2) These differences are indicative of different residence time.
  - Groundwater from shallow overburden wells is classified as a calcium-magnesium-bicarbonate (Ca-Mg-HCO3) type. TDS range: 167 to 427 mg/L. TOB96-02-20 and TOB96-01-05 show minor cation variability between sampling events/seasons, while TOB96-11-04 and TOB96-02-06 have very consistent hydrochemistry between sampling events/seasons.
  - Groundwater from the bedrock wells, and from one of the new deeper overburden wells (T18-06D), is classified as sodium-bicarbonate type with minor calcium, magnesium, sulphate and chloride. TDS range: 365 to 1,910 mg/L. There are minor ionic differences between the Skeena Group coal seam bedrock wells and the Hazelton Group volcanic bedrock wells, with the volcanic rocks having a slightly higher percentage of sulfate than the coal seam bedrock wells. All the coal seam bedrock wells have similar chemistry. The groundwater from deep overburden is interpreted to have interactions with the underlying volcanic rock unit.
  - Groundwater in the newly installed nested well T18-08 is also classified as a sodium-bicarbonate (Na-HCO3) water type, although percentage of calcium + magnesium and sulfate are higher. The similar chemistry between upper and lower well screen may imply a hydraulic connection between the two lithologic units; a strong downward vertical hydraulic gradient is observed between the two wells.

Table 4-2: Average groundwater quality in overburden and in bedrock

Parameter	Units	Overburden Water Quality				Bedrock Water Quality			
		Avg.	P50	P95	Count	Avg.	P50	P95	Count
TSS	mg/L	840	15	2000	48	55	13	230	69
TDS	mg/L	330	340	410	48	920	820	1800	69
pH (Field)	-	7.9	7.7	8.8	46	8	7.7	9.2	68
Alkalinity, total	mg CaCO3/L	290	290	400	48	800	760	1700	69
Hardness, total	mg CaCO3/L	220	190	390	48	51	44	120	69
Specific Conductance	µS/cm	530	540	700	48	1400	1300	2800	69
Bromide	mg/L	0.061	0.05	0.1	39	0.35	0.25	1	57
Chloride	mg/L	1.5	0.52	3.3	48	4.2	2.5	10	69
Fluoride	mg/L	0.17	0.13	0.35	41	1.7	1.5	5.1	61
Sulfate	mg/L	18	11	42	48	24	6	75	69
Ammonia,	mg-N/L	0.15	0.025	0.61	44	0.32	0.32	0.69	69
Nitrate	mg-N/L	0.04	0.005	0.17	41	0.07	0.025	0.16	58
Nitrite	mg-N/L	0.0016	0.001	0.005	41	0.0072	0.005	0.02	58
Nitrogen, total	mg/L	1.3	0.54	5.9	40	0.81	0.38	2.2	64
Aluminum, dissolved	mg/L	0.032	0.005	0.034	44	0.033	0.0086	0.1	69
Antimony, dissolved	mg/L	0.00052	0.0005	0.00054	37	0.022	0.0005	0.00097	61
Arsenic, dissolved	mg/L	0.0034	0.00081	0.011	44	0.0011	0.0006	0.002	69
Barium, dissolved	mg/L	0.12	0.093	0.25	45	0.85	0.33	3.6	69
Beryllium, dissolved	mg/L	0.00034	0.0001	0.0002	44	0.00079	0.0001	0.005	69
Boron, dissolved	mg/L	0.084	0.10	0.10	44	0.19	0.16	0.34	69
Cadmium, dissolved	mg/L	0.00012	0.000021	0.00027	45	0.00022	0.000012	0.0016	69
Calcium, dissolved	mg/L	51	50	86	46	16	14	35	68
Chromium, dissolved	mg/L	0.0015	0.001	0.001	44	0.0011	0.001	0.002	69
Cobalt, dissolved	mg/L	0.0009	0.0003	0.0041	44	0.00057	0.0003	0.0026	69
Copper, dissolved	mg/L	0.0016	0.001	0.005	45	0.0019	0.001	0.0039	69
Iron, dissolved	mg/L	0.043	0.03	0.099	44	0.2	0.065	0.59	69
Lead, dissolved	mg/L	0.0021	0.0005	0.00093	44	0.0014	0.0005	0.001	69
Lithium, dissolved	mg/L	0.0048	0.0028	0.0067	45	0.054	0.05	0.1	66
Magnesium, dissolved	mg/L	21	14	51	46	3	1.9	8.6	68
Manganese, dissolved	mg/L	0.13	0.052	0.57	45	0.061	0.017	0.25	69
Mercury, dissolved	mg/L	0.0012	0.000005	0.00018	44	0.0029	0.000005	0.03	69
Molybdenum, dissolved	mg/L	0.0053	0.001	0.015	45	0.0044	0.001	0.015	69
Nickel, dissolved	mg/L	0.0027	0.001	0.017	44	0.0021	0.001	0.005	69
Phosphorus, dissolved	mg/L	0.18	0.012	0.89	40	0.023	0.016	0.06	61
Potassium, dissolved	mg/L	1.8	2	2	44	2.2	2	3.5	68
Selenium, dissolved	mg/L	0.00032	0.0002	0.00096	45	0.00026	0.00014	0.001	69
Sodium, dissolved	mg/L	46	20	110	45	350	320	720	68
Silver, dissolved	mg/L	0.0001	0.00002	0.00027	44	0.059	0.00002	0.0001	68
Thallium, dissolved	mg/L	0.00019	0.0002	0.0002	37	0.0002	0.0002	0.0002	58
Tin, dissolved	mg/L	0.001	0.0005	0.0049	36	0.00061	0.0005	0.00053	51
Titanium, dissolved	mg/L	0.012	0.01	0.024	44	0.013	0.01	0.05	66
Uranium, dissolved	mg/L	0.0017	0.0011	0.0032	45	0.023	0.0004	0.0071	69
Vanadium, dissolved	mg/L	0.0027	0.001	0.005	45	0.0039	0.00053	0.03	69
Zinc, dissolved	mg/L	0.011	0.005	0.012	44	0.0067	0.005	0.011	69

Source: GWQuality_Summary_Stats_rev08_smh.xlsx, (2020/11/19)

Note:

Avg., average

P50, 50th percentile

P95, 95th percentile

4.7 Groundwater Resources

The MOE Aquifer Classification Database (BC MOE 2020a) reports six aquifers located near the town of Telkwa, where the Telkwa River joins the Bulkley River, about 8 to 10 km northeast from the Project. Each aquifer is described in Table 4-3. Their outlines are mapped in Figure 36.

Table 4-3: Description of the minor aquifers (BC MOE Well database)

Ref. Number	Class (1)	Rank (2)	Size (km^2)	Description	Productivity
569	IIC	7	2.4	Confined sand and gravel aquifers within undifferentiated sediment, overlain by fluvial and glaciomarine sediments (silt and clay).	Moderate. Well yields reported range between 0.23 and 3.0 L/s, median 0.95 L/s.
576	IIC	11	5	Confined sand and gravel aquifers within undifferentiated sediment, overlain by fluvial and glaciomarine sediments (silt and clay).	High. Well yields reported range between 0.30 and 1.5 L/s, median 0.83 L/s.
578	IIC	8	159.8	Confined bedrock aquifer. Predominately Middle Jurassic extrusive igneous rock. Minor sedimentary rocks are also noted (i.e., sandstone, conglomerate, and shale).	Low. Well yields reported range between 0.005 and 1.5 L/s, median 0.15 L/s.
581	IIIC	9	26.7	Confined sand and gravel aquifers within undifferentiated sediment, overlain by fluvial and glaciomarine sediments (silt and clay).	Moderate. Well yields reported range between 0.15 and 8.18 L/s, median 0.76 L/s.
582	IIB	9	0.83	Unconfined sand and gravel aquifer.	Moderate. Well yields reported range between 0.38 and 3.8 L/s, median 1.1 L/s.
583	IIA	10	2.47	Unconfined sand and gravel aquifer.	Moderate. Well yields reported range between 0.23 and 1.9 L/s, median 0.91 L/s.

Note:

1 Development subclass: the level of development of an aquifer is determined by assessing demand verses the aquifer's yield or productivity - high (I), moderate (II), or low (III); Vulnerability subclass: the vulnerability of an aquifer to contamination from surface sources is assessed based on: type, thickness and extent of geologic materials overlying the aquifer, depth to water (or top of confined aquifers), and the type of aquifer materials - high (A), moderate (B), or low (C)

2 A numerical measure of an aquifer's priority is provided by the aquifer's ranking value. The ranking value is determined by summing the point values for each of the following hydrogeologic and water use criteria: productivity, size, vulnerability, demand, type of use, quality concerns (that have health risk implications), and quantity concerns. Possible ranking scores range from a low of 5 to a high of 21; the higher the ranking score, the greater the aquifer's priority.

4.8 Groundwater Users

Figure 36 shows known locations of private wells within the LSA (Sources: BC MOE 2020b, and TML March and July 2020). The closest private domestic wells are located:

- About 3.8 km (i.e., Goalder, Baker, and Mapletoft wells) north of the Project, to the west of Goathorn Creek, along the expected groundwater flow paths towards the Telkwa River.
- About 3.1 km (i.e., Alain's well), and 4.5 to 5.4 km (i.e., Kerr, Schmike, Shearer, Beukema wells, etc.) northwest of the Project, to the east of Goathorn Creek; there are located downgradient of the Project but not along the expected groundwater flow paths towards the Goathorn Creek or the Telkwa River.

As part of the baseline program, one residential well (Kerr well) was sampled quarterly during the groundwater sampling events from June 2018 to April 2019. Four additional residential wells (Schmike, Shearer, Ragula, and Beukema) were each sampled once during winter 2019.

The groundwater type for each of the residential wells (Figure 35) is categorized as a Ca+Mg bicarbonate type with the Schmike well containing a higher relative abundance of sulfate in relation to the other tested residential wells. Total arsenic, iron, manganese, and dissolved iron exceeded BC WQG FAL and the maximum acceptable concentration for drinking water sources in the Kerr well. Total phosphorus and TOC also exceeded the BC WQG DWS guidelines. Total copper exceeded the BC WQG FAL approved guideline in both the Schmike and Shearer wells. The Shearer well also had an exceedance of BC WQG DWS for total organic carbon. Total iron and manganese exceed the BC WQG DWS in the Ragula well. There were no exceedances in the Beukema well.

4.9 Past and Current Human Activities

Coal was reportedly discovered in the Telkwa area around 1900. Small-scale underground and surface mining began in 1918 and continued sporadically until 1985, resulting in the recovery of over 400,000 tonnes of coal at about 3.6 km north and northwest from the Project (Figure 36). Modern exploration of the Project to delineate further exploitable coal reserves started in 1978. Nowadays there are no significant human activities other than mining exploration and forestry; current human activities (i.e., mostly agriculture and forestry) are concentrated in the village of Telkwa and along roads, trails, and rail tracks.

5 Conceptual Groundwater Model

Groundwater is a key component of the biophysical environment, based on linkages to other ecosystem components, including surface water quantity, surface water quality, human health, aquatic resources, and wetlands.

This section presents conceptual models of the groundwater system for baseline, mining, and post-closure conditions. These models are simplified representations of the essential features of the groundwater system.

The development of conceptual models is an iterative process; therefore, it should be updated as new data becomes available, as the understanding of the system is improved, or as questions and modelling objectives evolve (Wels 2012).

The baseline conceptual model was developed from the data presented in Section 3. The mining, and post-closure conceptual models were developed from a scoping exercise that identified the Project components and activities having a potential to interact with the groundwater flow system; the identification was based on professional experience with other mining projects in British Columbia and through multi-disciplinary consultation with TML and external consultants working on behalf of TML.

5.1 Baseline Conditions

5.1.1 Hydrostratigraphic Units

The groundwater system is divided into two sub-systems: a deep bedrock system, and a shallow overburden system. Figure 37 shows how the Project K data generally compares to published K values.

Deep Bedrock System

The deep bedrock groundwater system is interpreted to be controlled by the hydraulic properties of the Skeena sedimentary rock group, the volcanic group, fractures and faults. At the scale of the Telkwa watershed the fractured rock system is assumed to be equivalent to a porous medium. Table 5-1 presents the two conceptualized hydrostratigraphic units in bedrock.

Table 5-1: Hydrostratigraphic units conceptualized for the bedrock system

Unit	Type	Expected Permeability	K_{xy} range (m/s)	Extent
Skeena Group	Confined aquifer interbedded with aquitards/aquicludes	Moderate $K_{xy} > K_z$ (1)	K_{xy} 10^{-8} to 10^{-6} Anisotropy Ratio 2 to 4	Tenas and Goathorn synclines
Volcanic Group	Confined aquifer	Moderate $K_{xy} \approx K_z$	K_{xyz} 10^{-8} to 10^{-6}	Entire Project area

Note:

[1] K_{xy}, hydraulic conductivity parallel to beddings, and Kz, hydraulic conductivity perpendicular to beddings

The complex sedimentary sequence of the Skeena group is simplified and represented as a single unit characterized by an anisotropy ratio perpendicular to bedding planes (i.e., K parallel to beddings higher than K perpendicular to beddings). The rational for this simplification and the approach to estimate the ratio are described below:

- The hydraulic tests show that coal seams and sandstones tend to be characterized by a moderate K and mudstone and siltstones by a lower K; as a result, the coal seams and sandstone beds should act as preferential pathways to groundwater, and the mudstone and

siltstone beds as aquitards or aquicludes. This behavior is equivalent to a bedding-aligned anisotropy[1], with K perpendicular to bedding (K_z) lower than K parallel to bedding (K_x, K_y);

- The anisotropic ratio can be estimated based on TML drillhole logs and K measurements. The analysis is summarized in Table 5-2; the details of the analysis are provided in Table 2B in Appendix B.

It is also noted that the drillhole logs and the TML geological model generally indicate relatively thick layers of mudstone between the open pit floor and the top of the volcanic group, which could limit the transmission of groundwater to and from the open pit. This complexity is not accounted in the conceptual models because the current dataset does not guarantee the absence of connections between upper and lower sub-units separated by mudstone, for example along faults where displacements may have created connections between layers previously separated.

Table 5-2: Assumptions and summary of the Skeena group equivalent K analysis

Lithology	K_i (m/s)	B_i (m)	K_{xy} (m/s)	K_z (m/s)	Kxy/Kz ratio
Coal seams	$5x10^{-7}$ m/s	Drillhole logs	Min=$3x10^{-8}$ Max=$4x10^{-7}$ Geomean=$1x10^{-7}$	Min=$3x10^{-8}$ Max=$2x10^{-7}$ Geomean=$5x10^{-8}$	Min=1.0 Max=4.7 Average=3.0
Sandstone	$3x10^{-7}$ m/s				
Mudstone/Siltstone	$3x10^{-8}$ m/s				

Note:

The equivalent K parallel to bedding (K_{xy}) and equivalent K perpendicular to bedding (K_z) are calculated for each drillhole using the formula:

$K_{xy} = (\sum_{i=1}^{n} B_i \times K_i) \ / \ (\sum_{i=1}^{n} B_i)$ and $K_z = (\sum_{i=1}^{n} B_i) \ / \ (\sum_{i=1}^{n} \frac{B_i}{K_i})$. (Freeze and Cherry, 1979)

Where B_i and K_i are respectively the thickness and hydraulic conductivity of the layer i, and K_i corresponds to the K geomean of each lithology calculated from the TML K database (Section 4.2).

Two other conceptual simplifications are assumed:

1. No major geological structure is represented as preferential flow pathway and/or barrier. Data collected to date does not indicate influences on the flow system from known faults mapped in the Project area. There is no groundwater spring or seep identified along the projected interpreted fault lines, no significant change of hydraulic conductivity associated with fractures or faults, no apparent change in water levels or hydraulic gradients caused by faults, and no structure linking directly the Project and the private well locations.

2. The intrusions located at about 5 km east and 7 km northwest from the open pit are merged with the Volcanic Group. The intrusive rocks are located away from the potential flow paths where groundwater originating from the Project would potentially discharge at surface. They are not expected to influence the groundwater predictions.

[1] Based on the nature of the testing performed to date, the K data is interpreted as representative of the hydraulic conductivity parallel to bedding.

Shallow Overburden System

The shallow overburden system is influenced by the distribution of fine material within the till, which is conceptualized and simplified to have two main units: the silt- or clay–rich glacial till, and the glaciofluvial sand-gravel-rich till or outwash. Where present, the silt-clay-rich till act as an aquitard that limits the infiltration of precipitation and promotes runoff, whereas the sand-gravel-rich till act as an aquifer that connects the groundwater system to the stream valleys. The sand-gravel-rich till unit contains fines (Figure 17) and is characterized by moderate K ($1x10^{-6}$ m/s); it is not a clean sand and gravel unit with homogeneously high K. Lenses of sand and/or gravels interbedded in silt-clay-rich till may be present locally; these are expected to have limited influence on the system because of the low permeability material surrounding them. Table 5-3 presents the three conceptualized hydrostratigraphic units in overburden.

Table 5-3: Hydrostratigraphic units conceptualized for the overburden system

Unit	Type	Expected Permeability	K_{xy} range (m/s)	Extent
Fluvial sand/gravel	Unconfined aquifer	High $K_{xy} \approx K_z$	K_{xyz} 10^{-4} to 10^{-2}	Stream beds and alluvial valleys
Glaciofluvial sand-gravel rich till	Unconfined aquifer	High $K_{xy} \approx K_z$	K_{xyz} 10^{-7} to 10^{-3}	Bedrock depressions north of the open pit
Glaciofluvial silt-clay-rich till	Aquitard or aquiclude	Low $K_{xy} \approx K_z$	K_{xyz} 10^{-9} to 10^{-7}	Cover almost all the Project area

3D Geometries of the Hydrostratigraphic Units

The 3D geometries of the hydrostratigraphic units were generated with the software Leapfrog Geo v4.4.2 (i.e., a 3D geological modelling tool) from the analyses of drillhole intercepts (TML's database), geological maps (surface and bedrock geology, regional and local maps, 2D cross sections; Clague 1984, MEMPR 1993, BCGS 2005, TML 2018), and considerations on the ability of a unit to convey groundwater (i.e., permeability or hydraulic conductivity).

SRK generated the initial 3D solids of the sand-gravel-rich till and extended the 3D surface of the top Hazelton volcanic group contact based on the regional geology map (Figure 7). The fluvial sand/gravel deposits present in the creek/river valleys were not explicitly represented; they were merged with the sand-gravel-rich till on the basis that site data was not available and that groundwater flow to creeks is controlled by the lower K units (i.e., bedrock or fine-grained overburden) surrounding the fluvial deposits.

To control the quality of the interpolation, surfaces were verified visually in cross sections with respect to the reported borehole lithologies. Corrections and further interpretations of the hydrostratigraphic contacts were based on professional judgement, for example where density of borehole data is low. The extrapolation of the overburden geometries outside the Tenas Area, where drillhole information is limited or absent, was constrained by the following assumptions:

- In areas located downstream of the Project and flow paths expected to connect to the creeks, the potential connections between the mine area and the streams through thick permeable sand and gravel deposits are emphasized.
- Elsewhere overburden consists of fine textured glacial deposits with a relatively low thickness of about 5 to 10 m (i.e., based on TML drillhole database the median thickness is 7 m).

TML's chief geologist, Ron Parent, reviewed the initial SRK 3D solids and used TML's drillhole database (as of May 2019) to refine the distribution of silt-clay-rich till and sand-gravel-rich units. The update was provided to SRK as 3D surfaces (i.e., bedrock/overburden contact, upper silt-clay-rich till/sand-gravel-rich till contact, and sand-gravel-rich till/lower silt-clay-rich till contact). The distinction between upper and lower silt-clay-rich till is predicated on the presence of an intervening sand (or gravel) layer; so, although both sub-units are comprised of similar material, they are given this distinction to facilitate modeling. Figure 38 isopach thickness for the overburden, Figure 39 for the sand-gravel outwash deposits, and Figure 40 for the silt-clay-rich till cover. Figure 41 shows the isopach thickness (i.e., total thickness) map for the Skeena group.

5.1.2 Groundwater Flow

Conceptual cross-sections of the baseline groundwater flow system are presented in Figure 42 to 46. The deep bedrock groundwater system has a large lateral extent and is characterized by confined flow, relatively long residence times in the subsurface, and higher concentrations of dissolved solids. The bulk of recharge to the bedrock system occurs from the infiltration of precipitation and runoff in the upland area of the Tenas Creek and Goathorn Creek watersheds, where the silt-clay-rich till coverage is limited. Groundwater level measurements indicate that hydraulic gradients (and inferred groundwater flow) are from the upland areas in a northerly direction towards the major drainage features of the area, namely the Telkwa River and its tributaries, Tenas Creek and Goathorn Creek. Discharge from the bedrock system is expected to be dominant in these three drainages because of the difference of elevation between the valleys and the terraces. Infiltration from the creeks to the bedrock or overburden system may occur locally in floodplains but will be likely limited to shallow flow paths (i.e., water from the streams getting into bedrock, flowing subsurface superficially, and daylighting further downstream).

The shallow overburden system is characterized by local unconfined groundwater systems with relatively short residence times and lower concentrations of dissolved solids. Groundwater flows in a north-easterly direction towards Four Creek and in a north-westerly direction towards Tenas Creek, from topographic highs to adjacent topographic lows (Figure 30). A downward vertical gradient is observed between the upper and lower water-bearing surficial deposits, and between overburden units and bedrock units. Locally the groundwater can be disconnected (i.e., perched) above the bedrock groundwater system. Groundwater discharge from overburden is expected to occur in the valleys of Tenas Creek, in Four Creek and in Goathorn Creek, at least those portions known to be connected to the water table, as well as marshes and swamps.

Recharge from precipitation to groundwater is expected to range between 5 and 30% of MAP (Table 5-4).

Table 5-4: Estimated recharge and baseflows for the Tenas Creek, Goathorn Creek, and Telkwa River

Creek/River name	Estimated range of recharge (m^3/d)		Estimated baseflow [2] (m^3/d)
	Recharge = 5% MAP[1]	Recharge = 30% MAP [1]	
Tenas Creek (watershed 60 km^2)	5,823	34,940	9,383
Goathorn Creek (watershed 130 km^2)	19,049	114,294	20,330
Telkwa River (watershed 830 km^2)	82,315	493,892	129,799

Note:

[1] MAP = 721 mm/y (SRK 2020)

2 Based on estimated average unit baseflows in Table 2-3 (SRK, 2020).

5.2 Mining and Post-closure Conditions

During the pre-construction and construction phases, activities will modify the characteristics of the subsurface but their influence on the groundwater system is anticipated to be minor and localized to the immediate footprints of the respective infrastructures.

During mining and until closure, the development and dewatering of the open pit, and the construction and operation of the material and water management facilities will change the physical properties of the ground and subsurface, site drainage patterns, and groundwater flows at and around the mine (i.e., pore pressures behind slopes, drawdown cone). Dewatering activities will result in a drawdown of the water table that will gradually expand over time, and possibly induce a seasonal reduction of baseflow in the Tenas Creek and Goathorn Creek. Mining activities may impact the groundwater quality; mine-affected water (i.e., from PAG/NAG rocks, blasting, dust, potential spillage of chemicals, oils, and fuels, etc.) will infiltrate into the ground and migrate through the groundwater system into the valleys (i.e., Tenas River, Goathorn Creek, Telkwa River) or private domestic wells. The NMP, EMP, WMP, and Tenas Control Pond are designed with low permeability liners and ditches along their peripheries to minimize the infiltration of mine-affected water and intercept water discharges downgradient of the dams. The whole footprints of the NMP, EMP, and Tenas Control Pond, and 57% of the WMP's footprint will be lined (i.e., the natural ground located outside the open pit, and the open pit walls intercepting overburden; the open pit walls and open pit floors intercepting bedrock will not be lined). The storage management will be lined with engineered soil-bentonite compacted layers, and the Tenas Control Pond with a bituminous geomembrane or equivalent. The design details of the management ponds and Control Pond are documented in Part A, Section 1 of the EAC Application.

At closure, the total footprint of the Project will correspond respectively to about 5.5% and 2.2% of the Tenas Creek and Goathorn Creek watersheds; dewatering of the open pit will stop, and the groundwater system will progressively return to steady post-closure conditions. The management ponds will remain, and the Tenas Control Pond will be eventually decommissioned. The mine affected water that entered the groundwater system during operation will continue migrating while new post mine-affected water from weathering of open pit walls, open pit lakes and management ponds will enter and migrate through the groundwater system. Conceptual cross-sections of the groundwater flow system at post-closure are presented in Figure 47 to 51.

Table 5-5 summarizes the potential effects of the Project to the groundwater system. The key potential issues are the effects on groundwater discharges into nearby creeks, and the migration of mine-affected water to private domestic wells located immediately downstream of the Project.

Table 5-5: Potential Project Interactions with the Groundwater System

Project Component or Activity	Potential Effect / Pathway of Interaction with Hydrogeology
Construction Phase	
Site clearing, pre-stripping, building construction, road development, rail loop construction, bridge construction, and development of onsite utilities and services.	Changes to site drainage patterns and subsurface characteristics due to construction works. Changes to groundwater quality resulting from dust deposition or accidental spillage.
Mining Phase	
Excavate the open pit.	Changes to watercourses, site drainage patterns, subsurface characteristics and groundwater flow caused by mining and dewatering. Changes to groundwater quality because of metal leaching and acid rock drainage.
Establish and operate waste management facilities.	Changes to watercourses, site drainage patterns, subsurface characteristics and groundwater flow caused by construction, diversions, and infiltration underneath stockpiles or storage management ponds (NMP, EMP, and WMP). Changes to groundwater quality caused by infiltration of mine-affected water underneath waste management facilities.
Establish and operate water management facilities.	Changes to watercourses, site drainage patterns, subsurface characteristics and groundwater flow caused by construction, diversions, and infiltration underneath the Control Pond, sedimentation ponds, and ditches. Changes to groundwater quality caused by infiltration of mine-affected water underneath water management facilities.
Pump groundwater for domestic facilities.	Changes to groundwater flow at the vicinity of the well caused by pumping.
Temporarily store hazardous substances including fuel, explosives, and mine supplies	Changes to groundwater quality from the use of chemicals and fuel and the potential for spills
Contingency pumping of water from water supply wells along the edge of Goathorn Creek.	Changes to groundwater flows in the alluvial bed of Goathorn Creek caused by pumping.
Closure and Reclamation Phase	
Decommission and reclaim of all buildings and structures. Re-contour slopes and re-vegetate.	Changes to site drainage patterns due to decommissioning activities; changes to groundwater flow through changes to local scale flow or drainage pathways. Changes to groundwater quality because of erosion, sedimentation, and changes to infiltration rates.
Stop dewatering, open pit reflood, and formation of open pit lakes.	Changes to groundwater flows. Changes to groundwater quality caused by infiltration of mine-affected water underneath the open pit lakes.
Maintenance of the material management facilities.	Changes to groundwater quality caused by infiltration of mine-affected water underneath waste management facilities.

6 Groundwater Effects Predictions

This section presents the 3D-numerical model developed for the EA Application to assess the effects of the Project on the groundwater. The predictions include estimates of groundwater quantities intercepted by the mine, potential changes to groundwater baseflows in creeks, and potential contributions and average travel times of mine-affected groundwater to creeks and private wells.

6.1 Model Software

Numerical groundwater modeling was completed using the software, FEFLOW 7.4 (DHI, 2020). FEFLOW is a professional software package for modeling fluid flow and transport of dissolved constituents and/or heat transport processes in the subsurface. This program is used extensively for groundwater mining projects around the world. The code is based on a finite element solution of the partial differential equations for flow and transport.

6.2 Model Assumptions

The numerical model required several simplifying assumptions. These include:

- The groundwater system can be simulated using unconfined saturated flow equations.
- Groundwater flow can be approximated by an equivalent porous media model.
- Heterogeneity in the stratigraphic layering can be approximated using anisotropic conditions.
- Faulting does not have a significant influent on the regional scale flow system, with no major structures identified that act as significant conduits and/or barriers.
- Groundwater flow states can be approximated based on steady-state flow conditions.
- Material storage piles do not significantly alter the sub-surface flow conditions.

6.3 Groundwater Model Setup

6.3.1 Model Domain

The model domain (Figure 52) covers an area of approximately 20 x 15 km, with a total area of 280 km^2. The domain is set to encompass the Goathorn Creek watershed, and to be bounded by the Telkwa River and the Bulkley River.

The upper surface of the model is defined based on the DEM provided by TML (Email dated May 2019). The base of the model is set at a fixed depth of 400 mbgs projected downward from the surface topography, which is 3.3 times deeper than the proposed open pit (120 mbgs).

6.3.2 Model Mesh

The finite element mesh (Figure 52) is constructed with 30 layers. Each model layer has a constant thickness (Table 6-1) and comprises 85,595 prismatic elements. The top elevation corresponds to

the topographical surface. Horizontal spacing is refined in the Project area and along the creeks (i.e., an element length of approximately 30 m at the Project and along creeks and increasing to a maximum of 500 m).

Table 6-1: Thicknesses of the model layers

Layer #	Thickness (m)
1 and 2	0.5
4	3
5 to 23	5
24 and 25	25
26 to 30	50

6.3.3 Boundary Conditions

The boundary conditions are described below and illustrated in Figure 53.

In-Situ Boundaries

- No flow (i.e., zero-flux) boundaries are assigned to:
  - Model edges which correspond to the upper reaches of the surface water catchment divides,
  - The top surface of the model, except where creeks/rivers or mine workings are present,
  - The base of the model.
- Constant head (i.e., Dirichlet) boundaries are assigned to:
  - Lower reaches of the creeks/rivers.
    Head values were assigned based on ground surface elevations.
- Seepage (i.e., flux constrained Dirichlet) boundaries are assigned to:
  - Upper reaches of the creeks/rivers.
    Head values were assigned based on ground surface elevations and are constrained to only allow flow out of the model. For example, flow can discharge into the creeks when heads exceed the creek levels, but the reverse is not allowed (i.e., ingress into the model if heads drop below creek levels). This represents the fact that small streams have limited capacity and do not significantly contribute to the recharge when dry.
- Source/sink (i.e., modified Neuman) boundaries are assigned to:
  - Top layer of model to simulate vertical recharge into the model.

Mine Working Boundaries

- Seepage (i.e., flux constrained Dirichlet) boundaries are assigned to:
  - Open pit walls (e., EoY1, EoY7, EOM, and post-closure conditions).
    Head values were assigned based on open pit wall elevations.
- Constant head (i.e., Dirichlet) boundaries are assigned to:
  - Unlined portions of the WMP, saturated waste rock, and open pit lake during post-closure. Assigned head values correspond to maximum water level at the WMP and spill point elevations (Table 6-2).

Table 6-2: Head levels at WMP saturated waste rock, and open pit lake

Feature	Period	Head Elevation (masl)
Open pit lake	Post-closure	909
Saturated mine rock south end of open pit	Post-closure	901
WMP (not lined)	Operation, Post-closure	851

- Well (point-source fluid-flux) boundaries were assigned to lined water management facilities (i.e., management ponds and Control Pond). Seepage rates for the facilities were calculated using:
  - NMP, EMP, and WMP.
    Seepage rates were calculated from 2D Seep W modelling documented in 7Appendix E Results are presented in Table 6-3.
  - Control Pond.
    Seepage rates were calculated using the analytical solution presented in Giroud (1997) for the migration of liquid through composite liners with geomembrane defects. The analysis is documented in 7Appendix F; results are presented in Table 6-3.

Table 6-3: Estimated seepage rates through designed liners

Total seepage rate under liners (m^3/d)	**Control Pond** (bituminous geomembrane)	**EMP** (S/B0.30)	**NMP** (S/B0.30)	**WMP Ex pit** (S/B0.30)
	140	458	198	568

Sources: Appendix E, F, and surface areas from TML 2020.

6.3.4 Model Properties

Each model element was assigned with the property of one of the conceptual hydrostratigraphical units (i.e., sand-gravel rich till, silt-clay-rich till, Skeena group, or volcanic Group) based on the 3D geometries illustrated in Figure 40 to 41 (Section 5.1.1). Table 6-4 compiles the properties of the calibrated numerical model.

Table 6-4: Groundwater model properties

Hydrostratigraphic Unit	Parameter	Unit	Value
Sand-Gravel-rich till - Homogeneous and isotropic.	K_{xyz}	m/s	$2.9x10^{-6}$
	S_y	-	0.23
	S_x	1/m	$4x10^{-4}$
Silt- clay-rich Till - Homogeneous and isotropic.	K_{xyz}	m/s	$2.4x10^{-7}$
	S_y	-	0.11
	S_x	-	$2x10^{-5}$
Sedimentary rocks - Homogeneous and anisotropic. The highest conductivity (K_{xy}) is parallel to bedding dip and the lowest (K_z) is perpendicular; the bedding orientation matches the 3D surfaces of the Hazelton Volcanic Group contact (Section 5.1.1)	K_{xy}	m/s	$3.6x10^{-7}$
	K_z	m/s	$1.8x10^{-8}$
	S_y	-	0.09
	S_x	-	$5x10^{-6}$
Volcanic & Intrusive rocks - Homogeneous and isotropic.	K_{xyz}	m/s	$2.1x10^{-8}$
	S_y	-	0.05
	S_x	-	$5x10^{-6}$
Recharge (1) - Uniform and constant.	R	mm/yr	57.62

Note:

1 The modeled annual recharge is equivalent to about 8% of MAP.

6.4 Model Calibration

Calibration was conducted manually and based on steady-state conditions.

The calibrated model corresponds to the best fit to head observations between the 6th and 15th of September 2018 and average annual baseflows estimated from the historical WSC Goathorn station data. The fit was adjusted by varying the hydraulic conductivities (Kxyz), and the recharge. Calibration plots and a map of the residual errors are presented in Figure 55; full details on the calibration dataset provided in Table 1F of 7Appendix G.

The overall fit is considered reasonable for both heads and baseflows, with a Normalized Root Mean Square Error (NRMSE) of 3.2% for hydraulic heads and 3.6% for baseflows (Figure 55). A minor north-south trend is observed in the residual error structure, which may reflect a minor unaccounted-for geological control. The sensitivity of the model to the calibration is addressed in Section 6.8.

6.5 Model Scenarios and Applications

The modeling scenarios are presented in Table 6-5. The steady state groundwater predictions are used to support the evaluation of Project effects to groundwater users, for both quantity and quality. Particle tracks are used to estimate the flow paths of mine affected groundwater and their potential contribution to creeks, rivers, and private wells. The Water Balance and Load Model (WBLM, Section 4, Chapter 3 of the EAC Application) combines the groundwater predictions (flow rates, changes to baseflows, contributions of mine affected groundwater to creeks), the direct precipitation, the runoff, the surface flows of the waste and water management systems, and the loads to evaluate the effects of the Project to surface water, for both quantity and quality.

Table 6-5: Summary of the Model Simulations

Temporal Boundary	Assumptions	Objectives
Current conditions:	No mining activities. The system is driven by the recharge I at surface, and the discharges at drainages (rivers, creeks, swamps).	To estimate the calibrated properties of model and simulate the baseline conditions of the groundwater system.
Pre-construction and construction phases	These periods are not considered. The influences from site clearing; pre-stripping; construction of the buildings, road, rail loop, bridge, and onsite utilities and services on groundwater are expected to be minimal.	
Mining EoY1	The mine has been excavated for one year. Open pit dewatering is active (1). The Control Pond and NMP are constructed, and water levels are at their maximum.	To estimate open pit inflow rates, changes to groundwater baseflow in creeks, mine-affected infiltration rates, pathways, travel times, and potential contributions to creeks and domestic wells.
Mining EoY7	The mine has been excavated for seven years (1). Open pit dewatering is active. Rock storage piles are not explicitly modelled (2). The Control Pond, NMP, and EMP are constructed, and water levels are at their maximum.	
Mining EOM Y22	The mine is fully excavated (1) (i.e., 22 years). Open pit dewatering is active. Rock storage piles are not explicitly modelled (2). The Control Pond and all the management ponds are constructed, and water levels are at their maximum.	
Mining EOM hypothetical worst-case drawdown	The mine is fully excavated (1). The open pit dewatering is active. Rock storage piles are not explicitly modelled (2). There are no Tenas Control Pond or management ponds impeding the progression of groundwater drawdown.	To estimate worst case drawdown extent.

Temporal Boundary	Assumptions	Objectives
Post-closure: EoY30	The mine is fully excavated (1). Dewatering pumps are shut off and open pit is allowed to re-flood; the groundwater systems return to equilibrium. Rock storage piles are not explicitly modelled (2). The Tenas Control Pond has been decommissioned. The NMP, WMP, and EMP are constructed, and water levels are at their maximum.	To estimate the changes to groundwater baseflow in creeks, mine-affected infiltration rates, pathways, travel times, and potential contributions to creeks and domestic wells.

Note:

1 The progressive incremental excavation of the open pit is not simulated. At the start of a simulation (time, t = 0), the predictive scenarios assume excavations correspond to the open pit shell of the simulated year (EoY1, EoY7, EOM, and Post-closure). This is considered acceptable because the predictions of the effects of the Project to the groundwater flow system are expected to be overestimated because of bigger stresses.

2 The rock storage piles are expected to be characterized by hydraulic conductivities several magnitudes higher than overburden and bedrock due to high porosities between the rocks. The recharge over the rock storage piles is assumed to remain unaffected (i.e., reduced or increased compared to baseline) and transmitted quickly to the base of the piles.

6.6 Model Results for the Proposed Pond Designs

This section presents the model predictions for the proposed EA mine plan (i.e., EMP, NMP, and WMP lined with engineered 0.30 m thick soil-bentonite (S/B) compacted layers, and the Tenas Control Pond with a bituminous geomembrane or equivalent). Only parts of the WMP are lined: the portions outside the open pit (WMP Ex pit), and the portions inside the open pit (WMP In pit) that intercept overburden.

6.6.1 Current Conditions

The predictions of hydraulic heads are mapped in Figure 56.

6.6.2 Mining Conditions

Open pit inflows and seepages underneath the mine facilities

Table 6-6 compiles the groundwater inflow and outflow rates predicted at the open pit, the Tenas Control Pond, and the management ponds. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to design the water management system and evaluate the overall effects of the Project to surface water.

The open pit inflows range between 320 and 890 m^3/d. Under groundwater conditions alone, inflows of these magnitudes are typically managed with open pit sumps and do not require active dewatering systems. The seepage rate underneath the control pond is 140 m^3/d. The total seepage rate underneath the management ponds at end-of mine is 1,490 m^3/d.

Table 6-6: Forecasts of open pit inflows and seepages during operations

Feature		Groundwater flow rate (m^3/d)			
		EoY1	EoY7	EOM	*Worst case (1)*
Open pit inflows	IN	0	0	0	846
	OUT	0	0	0	na
Control Pond	IN	140	140	140	na
	OUT	0	0	0	na
NMP	IN	198	198	198	na
	OUT	0	0	0	na
EMP	IN	0	458	458	na
	OUT	0	0	0	na
WMP	IN	0	0	836	na
	OUT	0	0	139	Na
Total: Management ponds (NMP, EMP, WMP)	IN	198	656	1492	na
	OUT	0	0	139	846

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-01l-lc, 08-02l-lc, 08-03l-lc, 08-04-lc.

Notes:

[1] Worst case drawdown scenario: no MPs (i.e., no infiltration), only open pit dewatering
IN = flow into the model (i.e., seepage or infiltration)
OUT = flow out of the model (i.e., discharges into surface)
na, not applicable

Predicted levels and changes compared to baseline conditions

Figures 57 to 59 present the predicted hydraulic heads and changes to heads compared to baseline conditions for EoY1, EoY7, and EOM. The model predicts the drawdown induced by the open pit dewatering (i.e., long term, EOM conditions) could extend up to a maximum of 18 km^2. The influence of the management ponds and the control pond stop the progression of the drawdown to the north; in this area the model predicts a groundwater mound of about 14 km^2. Neither the drawdown cone nor the groundwater reaches private well locations.

Figure 60 shows the hypothetical worst-case drawdown extent, when the open pit is assumed to be fully excavated, open pit dewatering active, but no Control Pond or management ponds impede the progression of groundwater drawdown. These hypothetical models predicted a drawdown area of approximately 34 km^2; but did not reach private well locations.

Predicted changes to surface water baseflows

Table 6-7 compiles the predicted differences of groundwater baseflow between baseline and operations at surface water stations. Figure 4, and Figure 56 to 66 show the locations of the WQS stations. The results are expressed in relative percent differences (RPD). These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

Table 6-7: Forecasts of changes to creek baseflows during operations

Stations	Changes to net baseflows compared to baseline (%)			
	EoY1	EoY7	EOM	*Worst case* [(1)]
Tenas Creek stations				
WQS01	-0.1%	-0.2%	-0.4%	-0.4%
WQS02	-1.1%	-3.9%	1.7%	-5.2%
WQS22	-1.0%	-5.9%	3.4%	-9.2%
WQS04	-0.9%	-5.6%	3.3%	-8.7%
Tenas Creek U/S Goathorn Creek	-0.9%	-5.5%	3.2%	-8.6%
Four Creek stations				
WQS03	-0.7%	-20.5%	-29.8%	-29.7%
WQS21	-1.5%	-22.0%	-34.4%	-37.6%
WQS20	-2.6%	-21.3%	-32.8%	-38.3%
WQS03DS	-4.2%	-5.0%	-0.3%	-33.7%
Four Creek U/S Goathorn Creek	-4.1%	-4.9%	-0.2%	-33.0%
Goathorn Creek stations				
WQS13	0.0%	0.0%	0.0%	0.0%
WQS06US	0.0%	-0.2%	-0.2%	-0.1%
WQS06	-0.3%	-0.5%	-0.1%	-2.6%
WQS05	-0.5%	-1.9%	0.8%	-4.3%
Goathorn Creek U/S Telkwa River	-0.5%	-1.9%	0.8%	-4.2%
Telkwa River stations				
WQS09	-0.4%	-1.6%	0.7%	-3.7%
Telkwa River U/S Bulkley River	-0.4%	-1.5%	0.7%	-3.5%
Bulkley River stations				
WQS11	<0.1%	<-0.1%	<-0.1%	<0.1%
WQS12	<-0.1%	<-0.1%	<0.1%	<0.1%

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-01l-lc, 08-02l-lc, 08-03l-lc, 08-04-lc.

Notes:

[1] Worst case drawdown scenario: no MPs (i.e., no infiltration), only open pit dewatering

Potential migration of mine-affected water

Figures 62 to 66 show the predicted particle paths for EoY1 (one year of travel time), EoY7 (seven years of travel time), and EOM (25 years of travel time). No particles are predicted to discharge into creeks by the EoY1 or EOY7. The models predict mine-affected groundwater could potentially start discharging into Tenas Creek after about 16 years. In the first 25 years, no particle is predicted to discharge into Four Creek, Goathorn Creek, Telkwa River, or near the private wells downstream of the Project.

Table 6-8 compiles the EOM forecasts of the potential contributions of mine affected baseflows by sources after 25 years. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

Table 6-8: Forecasts of mine affected baseflow at EOM

ID	Potential contributions of mine affected groundwater after 25 years in % of baseflow under EOM conditions			
	NMP	EMP	WMP	Tenas Control Pond
Tenas Creek				
WQS02	-	-	0.5%	-
WQS22	0.2%	-	0.7%	-
WQS04	0.1%	-	0.7%	-
Four Creek				
WQS03	-	-	-	-
WQS21	-	-	-	-
WQS20	-	-	-	-
WQS03DS	-	-	-	-
Goathorn Creek				
WQS06US	-	-	-	-
WQS06	-	-	-	-
WQS05	<0.1%	-	0.2%	-
Telkwa Creek				
WQS09	<0.1%	-	<0.1%	-

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-03l-lc

Note:

-, no discharge predicted

6.6.3 Post-Closure Conditions

Open pit inflows and seepages underneath the mine facilities

Table 6-9 compiles the groundwater inflow and outflow rates predicted at the open pit and the management ponds. These predictions served as inputs to the Water Balance and Load Model (WBLM) to design the water management system and evaluate the overall effects of the Project to surface water.

Table 6-9: Forecasts of open pit inflows and seepages at Post-closure

Feature		Groundwater flow rate (m^3/d)
Open pit walls	IN	0
	OUT	120
Open pit Lake (909 masl)	IN	0
	OUT	213
Saturated waste rock (901 masl)	IN	7
	OUT	51
Total: open pit walls, open pit lake, and saturated waste rock	IN	7
	OUT	384
NMP	IN	198
	OUT	0
EMP	IN	458
	OUT	0
WMP	IN	819
	OUT	137
Total: Management ponds	IN	1475
	OUT	137

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-05l-lc

Notes:

IN = flow into the model (i.e., seepage or infiltration)
OUT = flow out of the model (i.e., discharges into surface)

Predicted levels and changes compared to baseline conditions

Figure 61 shows the predicted hydraulic heads and changes to heads compared to baseline conditions for post-closure. The model predicts a drawdown extending up to a maximum of 15 km^2 and a mound of about 13 km^2. The models predict neither the drawdown cone nor the groundwater mound reach private well locations.

Predicted changes to surface water baseflows

Table 6-10 compiles the predicted differences of groundwater baseflow between baseline conditions and post-closure conditions. The results are expressed in RPD. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

Table 6-10: Forecasts of changes to creek baseflows Post-closure

Station	Changes to net baseflows compared to baseline (%)
Tenas Creek stations	
WQS01	-0.3%
WQS02	1.9%
WQS22	3.1%
WQS04	3.0%
Tenas Creek U/S Goathorn Creek	2.9%
Four Creek stations	
WQS03	-22.7%
WQS21	-25.0%
WQS20	-22.3%
WQS03DS	4.0%
Four Creek U/S Goathorn Creek	4.0%
Goathorn Creek stations	
WQS13	0.0%
WQS06US	0.0%
WQS06	0.3%
WQS05	1.1%
Goathorn Creek U/S Telkwa River	1.1%
Telkwa River stations	
WQS09	1.0%
Telkwa River U/S Bulkley River	0.9%
Bulkley River stations	
WQS11	<0.1%
WQS12	<0.1%

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-05l-lc

Potential migration of mine-affected water

Figure 62 to 66 show the predicted post-closure particle paths at different times including long term paths; Table 6-11 and Figure 67 summarize the predicted travel times before particles discharge into creeks; and Table 6-12 compiles the predicted long term contribution of mine affected baseflows by sources. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

Three private wells (Goalder, Mapletoft, and Baker) are in the Telkwa River valley are shown to be potentially within the paths of mine affected groundwater. These wells pump groundwater from a fluvial aquifer at a relatively shallow depth (i.e., 15 to 30m deep according to MOE's database) in the Telkwa River valley bottom. The potential maximum effects from the Project on quality of the pumped well water was calculated using the following loading equation:

$$Q_w \times C_w = Q_b \times C_b + \Sigma (Q_i \times C_i)$$

Q_w, groundwater flow into the Telkwa River valley.
C_w, concentration of the groundwater into the Telkwa River valley.
Q_b, flow contribution from background groundwater.
C_b, concentration of background groundwater (baseline).
Q_i, flow contribution from mine feature i.
C_i, concentration of from mine feature I (source terms).

For a unit volume of Q_w, C_w can be expressed using percentage contributions relative to each source, as predicted by the particle path analyses.

$$C_w = P_b \times C_b + P_m \times \Sigma (P_i \times C_i)$$

P_b, percentage contribution of background groundwater into the Telkwa River valley.
P_m, percentage contribution of mine affected groundwater into the Telkwa River valley.
P_i, percentage contribution of from a mine feature I to the total mine affected groundwater.

Calculations assumed:

- The loads from the mine are permanent, and constituents migrated to the Telkwa River and constantly discharging into the fluvial aquifer (i.e., post-closure, pseudo -steady state conditions). The predicted travel times (i.e., > 400 years) are not considered in the analysis.
- The private wells pumps groundwater exclusively from the southern side of the Telkwa River valley, upstream of WQS09. The potential contributions from the northern side of the Telkwa River catchment, and from upstream of the project influence (i.e., western limit of the model domain) are not accounted.
- The mass of constituents in groundwater is conserved. The mine affected groundwater is transported by advection (i.e., no diffusion, dispersion, nor natural attenuation mechanisms).
- The parameter's concentrations can be calculated based on the post-closure predictions of mine affected baseflow contributions from the southern side of the Telkwa River valley, upstream of WQS09 (i.e., groundwater numerical model predictions), the average baseline groundwater quality (see Section 4.6), and the water quality at the open pit lake, open pit backfill, NMP, EMP, WMP, and Control Pond (average winter concentrations predicted by the WBLM).

The analysis is provided in Appendix H. The results show that no constituents are predicted to exceed the BC-DWG.

Table 6-11: Predicted travel times before discharges into creeks

Tenas Creek	First particle discharged into Tenas Creek after 15 years. 50% of particles discharged after 65 years, 72% after 400 years
Four Creek	First particle discharged into Four Creek after 38 years. 50% of particles discharged after 95 years, all particles discharged after 180 years.
Goathorn Creek	First particle discharged into Goathorn Creek after 184 years. 50% of particles discharged after 320 years, 62% after 400 years
Telkwa River	First particle discharged into Telkwa River after 400 years.

Table 6-12: Forecasts of mine affected baseflow at Post-closure

ID	Potential long-term contributions of mine affected groundwater under post-closure conditions				
	NMP	EMP	WMP	PL	SWr
Tenas Creek					
WQS02	-	-	4.3%	-	-
WQS22	1.5%	-	7.2%	-	<0.1%
WQS04	1.5%	0.3%	7.4%	-	<0.1%
Four Creek					
WQS03	-	-	-	-	-
WQS21	-	-	-	-	-
WQS20	-	-	-	-	-
WQS03DS	-	17.0%	-	-	-
Goathorn Creek					
WQS06US	-	-	-	-	-
WQS06	-	2.1%	0.2%	-	-
WQS05	0.5%	1.5%	2.5%	-	<0.1%
Telkwa River					
WQS09	0.1%	0.2%	0.4%	-	<0.1%

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-05l-lc

Note:

PL, post-closure open pit lake (909 masl)

SWr, post-closure saturated waste rock (901 masl)

-, no discharge predicted

6.7 Model Results For Modified Designs of the Ponds

This section presents mining and post-closure model predictions for two variations of the pond designs [1]:

- Mitigation design #1:
  - S/B0.56 for EMP, NMP, and WMP (excluding WMP End Wall rock);
  - B0.15 for the Tenas Control Pond.
- Mitigation design #2:
  - B0.30 for EMP;
  - S/B0.56 for NMP and WMP (excluding WMP End Wall rock);
  - B0.15 for the Tenas Control Pond.

Table 6-13 compiles the Well (point-source fluid-flux) boundary seepage flows calculated for these designs. Seepage rates through soil-bentonite liners calculated from 2D Seep W modelling documented in 7Appendix E. Seepage rates through bituminous geomembrane on top of soil-bentonite liners were calculated using the analytical solution presented in Giroud (1997) for the migration of liquid through composite liners with geomembrane defects. The analysis is documented in 7Appendix F.

Table 6-13: Mitigations - Estimated seepage rates through designed liners at the end of Mining

Case	Total seepage rate under liners (m^3/d)			
	Control Pond (B0.15)	**EMP** (S/B0.56)	**NMP** (S/B0.56)	**WMP** (S/B0.56)
Mitigation #1	8	277	87	373
Mitigation #2	8	63	87	373

Sources: Appendix E, F, and surface areas from TML 2020.

6.7.1 Mining Conditions

Open pit inflows and seepages underneath the mine facilities

Table 6-14 and Table 6-15 compile the groundwater inflow and outflow rates predicted at the open pit, the Control Pond, and the management ponds. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

For the Mitigation #1 scenario, the open pit inflows range between 240 and 700 m^3/d. The total seepage rate underneath the management ponds at end-of mine is 740 m^3/d.

[1] S/B signifies this is a soil-bentonite liner.
B signifies that a bituminous liner is placed on top of a soil-bentonite liner
The value indicates the thickness in meter of the soil-bentonite liner.

For the Mitigation #2 scenario, the open pit inflows range between 240 and 670 m^3/d. The total seepage rate underneath the management ponds at end-of mine is 520 m^3/d.

Table 6-14: Mitigation#1 - Forecasts of open pit inflows and seepages during operations

Feature		Groundwater flow rate (m^3/d)		
		EoY1	EoY7	EOM
Open pit inflows	IN	0	0	0
	OUT	237	699	381
Tenas Control Pond	IN	8	8	8
	OUT	0	0	0
NMP	IN	87	87	87
	OUT	0	0	0
EMP	IN	0	277	277
	OUT	0	0	0
WMP	IN	0	0	373
	OUT	0	0	0
Total: Management ponds (NMP, EMP, WMP)	IN	87	364	737
	OUT	0	0	0

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-01z-lc, 08-02z-lc, 08-03z-lc

Notes:

IN = flow into the model (i.e., seepage or infiltration)
OUT = flow out of the model (i.e., discharges into surface)

Table 6-15: Mitigation#2 - Forecasts of open pit inflows and seepages during operations

Feature		Groundwater flow rate (m^3/d)		
		EoY1	EoY7	EOM
Open pit inflows	IN	0	0	0
	OUT	237	675	377
Control Pond	IN	8	8	8
	OUT	0	0	0
NMP	IN	87	87	87
	OUT	0	0	0
EMP	IN	0	63	63
	OUT	0	0	0
WMP	IN	0	0	373
	OUT	0	0	560
Total: Management ponds (NMP, EMP, WMP)	IN	87	150	523
	OUT	0	0	560

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-01zb-lc, 08-02zb-lc, 08-03zb-lc

Notes:

IN = flow into the model (i.e., seepage or infiltration)
OUT = flow out of the model (i.e., discharges into surface)

Predicted levels and changes compared to baseline conditions

For the Mitigation #1 scenario, the models predict the drawdown induced by the open pit dewatering (i.e., long term, EOM conditions) could extend up to a maximum of 32 km^2. The models predict neither the drawdown cone nor the mound reach private well locations.

For the Mitigation #2 scenario, the models predict the drawdown induced by the open pit dewatering (i.e., long term, EOM conditions) could extend up to a maximum of 34 km^2. The models predict neither the drawdown cone nor the mound reach private well locations.

Predicted changes to surface water baseflows

Table 6-16 and Table 6-17 compile the predicted differences of groundwater baseflow between baseline and operations at surface water stations. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

Table 6-16: Mitigation #1 - Forecasts of changes to creek baseflows during operations

Stations	Changes to net baseflows compared to baseline (%)		
	EoY1	EoY7	EOM
Tenas Creek stations			
WQS01	-0.2%	-0.3%	-0.4%
WQS02	-3.3%	-5.1%	-3.6%
WQS22	-6.8%	-9.2%	-6.8%
WQS04	-6.5%	-8.8%	-6.4%
Tenas Creek U/S Goathorn Creek	-6.4%	-8.6%	-6.3%
Four Creek stations			
WQS03	-5.3%	-22.3%	-29.6%
WQS21	-8.3%	-26.4%	-37.1%
WQS20	-9.2%	-27.2%	-37.7%
WQS03DS	-20.8%	-21.5%	-26.7%
Four Creek U/S Goathorn Creek	-20.4%	-21.1%	-26.2%
Goathorn Creek stations			
WQS13	0.1%	0.0%	0.0%
WQS06US	0.0%	-0.1%	0.0%
WQS06	-1.6%	-1.7%	-2.0%
WQS05	-2.9%	-3.7%	-3.2%
Goathorn Creek U/S Telkwa River	-2.9%	-3.6%	-3.2%
Telkwa River stations			
WQS09	-2.5%	-3.2%	-2.8%
Telkwa River U/S Bulkley River	-2.4%	-3.0%	-2.7%
Bulkley River stations			
WQS11	0.0%	0.0%	0.0%
WQS12	0.0%	0.0%	0.0%

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-01z-lc, 08-02z-lc, 08-03z-lc

Table 6-17: Mitigation #2 - Forecasts of changes to creek baseflows during operations

Stations	Changes to net baseflows compared to baseline (%)		
	EoY1	EoY7	EOM
Tenas Creek stations			
WQS01	-0.2%	-0.3%	-0.4%
WQS02	-3.3%	-5.2%	-3.7%
WQS22	-6.8%	-9.6%	-7.1%
WQS04	-6.5%	-9.1%	-6.8%
Tenas Creek U/S Goathorn Creek	-6.4%	-9.0%	-6.7%
Four Creek stations			
WQS03	-5.3%	-22.4%	-29.7%
WQS21	-8.3%	-27.5%	-37.8%
WQS20	-9.2%	-28.3%	-38.4%
WQS03DS	-20.8%	-31.7%	-36.7%
Four Creek U/S Goathorn Creek	-20.4%	-31.1%	-36.0%
Goathorn Creek stations			
WQS13	0.1%	0.0%	0.0%
WQS06US	0.0%	-0.1%	-0.1%
WQS06	-1.6%	-2.4%	-2.8%
WQS05	-2.9%	-4.3%	-3.9%
Goathorn Creek U/S Telkwa River	-2.9%	-4.3%	-3.9%
Telkwa River stations			
WQS09	-2.5%	-3.7%	-3.4%
Telkwa River U/S Bulkley River	-2.4%	-3.5%	-3.2%
Bulkley River stations			
WQS11	0.0%	0.0%	0.0%
WQS12	0.0%	-0.1%	0.0%

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-01zb-lc, 08-02zb-lc, 08-03zb-lc

Potential migration of mine-affected water

In the first 25 years, there is no particle predicted to discharge into Tenas Creek, Goathorn Creek, Telkwa River, or private wells downstream of the project. The models predict mine-affected groundwater could potentially start discharging into Tenas Creek after about 40 years for the Mitigation #1 scenario, and after about 43 years for the Mitigation #2 scenario.

6.7.2 Post-Closure conditions

Open pit Inflows and seepages underneath the mine facilities

Table 6-18 compiles the groundwater inflow and outflow rates predicted at the open pit and the management ponds. These predictions served as inputs to the Water Balance and Load Model (WBLM) to design the water management system and evaluate the overall effects of the Project to surface water.

Table 6-18: Mitigations - Forecasts of open pit inflows and seepages at Post-closure

Feature		Groundwater flow rate (m^3/d)	
		Mitigation #1	Mitigation #2
Open pit walls	IN	0	0
	OUT	91	94
Open pit Lake (909 masl)	IN	0	0
	OUT	212	214
Saturated waste rock (901 masl)	IN	11	9
	OUT	47	48
Total: open pit walls, open pit lake, and saturated waste rock	IN	11	9
	OUT	350	356
NMP	IN	87	87
	OUT	0	0
EMP	IN	63	277
	OUT	0	0
WMP	IN	709	692
	OUT	119	129
Total: Management ponds	IN	859	1056
	OUT	119	129

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-05z-lc, 08-05zb-lc

Notes:

IN = flow into the model (i.e., seepage or infiltration)

OUT = flow out of the model (i.e., discharges into surface)

Predicted levels and changes compared to baseline conditions

For the Mitigation #1 scenario, the model predicts a drawdown extending up to a maximum of 17 km^2 and a mound of about 5 km^2. The models predict neither the drawdown cone nor the groundwater mound reach private well locations.

For the Mitigation #2 scenario, the model predicts a drawdown extending up to a maximum of 26 km^2 and a mound of about 2 km^2. The models predict neither the drawdown cone nor the mound reach private well locations.

Predicted changes to surface water baseflow

Table 6-19 compiles the predicted differences of groundwater baseflow between baseline conditions and post-closure conditions. The results are expressed in RPD. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

Table 6-19: Mitigation #1 - Forecasts of changes to creek baseflows at Post-closure

Station	Changes to net baseflows compared to baseline (%)	
	Mitigation #1	Mitigation #2
Tenas Creek stations		
WQS01	-0.3%	-0.3%
WQS02	0.8%	0.8%
WQS22	0.0%	0.0%
WQS04	0.0%	0.0%
Tenas Creek U/S Goathorn Creek	0.0%	0.0%
Four Creek stations		
WQS03	-22.7%	-22.7%
WQS21	-25.8%	-25.8%
WQS20	-26.2%	-26.2%
WQS03DS	-8.4%	-8.4%
Four Creek U/S Goathorn Creek	-8.2%	-8.2%
Goathorn Creek stations		
WQS13	0.0%	0.0%
WQS06US	0.0%	0.0%
WQS06	-0.6%	-0.6%
WQS05	-0.4%	-0.4%
Goathorn Creek U/S Telkwa River	-0.4%	-0.4%
Telkwa River stations		
WQS09	-0.4%	-0.4%
Telkwa River U/S Bulkley River	0.0%	0.0%
Bulkley River stations		
WQS11	0.0%	0.0%
WQS12	0.0%	0.0%

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-05z-lc, 08-05zb-lc

Potential migration of mine-affected water

Table 6-20 and Table 6-21 compile the predicted long-term contribution of mine affected baseflow by source. These predictions served as inputs to the WBLM (Section 4, Chapter 3 of the EAC Application) to evaluate the overall effects of the Project to surface water.

At the three private wells (Goalder, Mapletoft, and Baker), located in the Telkwa River valley and potentially within the long-term paths of mine affected groundwater, no constituents are predicted to exceed the BC-DWG.

Table 6-20: Mitigation #1 - Forecasts of mine affected baseflow at Post-closure

ID	Potential long-term contributions of mine affected groundwater under post-closure conditions				
	NMP	EMP	WMP	PL	SWr
Tenas Creek					
WQS02	-	-	2.6%	-	-
WQS22	0.5%	-	7.9%	-	-
WQS04	0.5%	<0.1%	7.8%	-	-
Four Creek					
WQS03	-	-	-	-	-
WQS21	-	-	-	-	-
WQS20	-	-	-	-	-
WQS03DS	-	2.9%	-	-	-
Goathorn Creek					
WQS06US	-	-	-	-	-
WQS06	-	0.3%	0.1%	-	-
WQS05	0.1%	0.2%	2.3%	-	-
Telkwa River					
WQS09	<0.1%	<0.1%	0.4%	-	-

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-05z-lc

Note:
PL, post-closure open pit lake (909 masl)
SWr, post-closure saturated waste rock (901 masl)
-, no discharge predicted

Table 6-21: Mitigation #2 - Forecasts of mine affected baseflow at Post-closure

ID	Potential long-term contributions of mine affected groundwater under post-closure conditions				
	NMP	EMP	WMP	PL	SWr
Tenas Creek					
WQS02	-	-	2.7%	-	-
WQS22	0.5%	-	7.5%	-	<0.1%
WQS04	0.4%	<0.1%	7.6%	-	<0.1%
Four Creek					
WQS03	-	-	-	-	-
WQS21	-	-	-	-	-
WQS20	-	-	-	-	-
WQS03DS	-	2.9%	-	-	-
Goathorn Creek					
WQS06US	-	-	-	-	-
WQS06	-	0.3%	0.2%	-	<0.1%
WQS05	0.1%	0.2%	2.3%	-	<0.1%
Telkwa River					
WQS09	<0.1%	<0.1%	0.4%	-	<0.1%

Source: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx; model: 08-05zb-lc

Note:
PL, post-closure open pit lake (909 masl)
SWr, post-closure saturated waste rock (901 masl)
-, no discharge predicted

6.8 Model Sensitivity

The sensitivity analysis consisted of a comparison between the model outputs of the calibrated model and the sensitivity models listed in Table 6-22. The outputs included, for baseline conditions, the NRMSE of observed versus predicted heads and estimated versus predicted baseflows, and for EOM and post-closure conditions, the predictions of drawdown extent, changes to creek baseflows, travel times from Project to creeks, and contributions of mine affected water to creeks. The sensitivity models corresponded to scenarios where properties were varied without recalibration of the model (i.e., sensitivity simulations do not represent alternative conceptualisations of the site). They included variations to hydraulic conductivities and specific yields; storage compressibility was excluded because this parameter influences the release of groundwater from storage, which is negligible under steady state conditions. Alike storage compressibility, specific yield controls the release of storage hence has negligible influence on steady state heads and baseflows; it influences however the predicted travel times of mine affected groundwater to creeks. Feflow uses specific yield as a proxy for the effective porosity (i.e., drainable porosity) to calculate the groundwater velocity (i.e., $q = K/n_e$ with q, velocity of groundwater, K, hydraulic conductivity, and n_e effective porosity).

Table 6-22: Sensitivity scenarios

Parameter	Description	ID
K All Units	Outlier condition where K maximized (2.7 x $K_{calibrated\ model}$) while calibration held near 10% NRMSE)	HighK
Recharge	R= 30% MAP (R baseline x3.50)	R+
	R= 5% MAP (R baseline x0.58)	R-
K sand-gravel-rich till	plus one standard deviation (Kxyz baseline x11.5)	Kst+
	minus one standard deviation (Kxyz baseline x0.09)	Kst-
	Lower effective porosity value of 0.3	Nst+
	Higher effective porosity of 0.1	Nst-
K silt-clay-rich till	plus one standard deviation (Kxyz baseline x10.71)	Kct+
	minus one standard deviation (Kxyz baseline x0.09)	Kct-
	Lower effective porosity value of 0.2	Nct+
	Higher effective porosity of 0.05	Nct-
K Skeena group	plus one standard deviation (Kxyz baseline x17.26)	Ksk+
	minus one standard deviation (Kxyz baseline x0.06)	Ksk-
	Ratio Kxy/Kz=10	Anisk+
	Ratio Kxy=Kz (no anisotropy)	Anisk-
	Lower effective porosity value of 0.25	Nsk+
	Higher effective porosity of 0.05	Nsk-
K Volcanic rocks	plus one standard deviation (Kxyz baseline x7.1)	Kvl+
	minus one standard deviation (Kxyz baseline x0.14)	Kvl-
	Lower effective porosity value of 0.1	Nvl+
	Higher effective porosity of 0.02	Nvl-

Note: The standard deviations of K respective to each hydrostratigraphic unit were calculated using the site-specific K measurements distributed on a log scale (i.e., Table 4-1).

The specific yield values correspond to the lower and higher ranges for sand, silt, sandstone, and basalt, as reported in *Singhal BBS, and RP Gupta. 2010. Applied hydrogeology of fractured rocks: second edition. Springer, New York, USA. 408 p.*

'xyx' refers to the principal directions of the hydraulic conductivity tensor; x and y correspond to the horizontal plane or directions parallel to beddings, and z corresponds to the vertical plane or directions perpendicular to the bedding planes.

The relative percent differences (RPD) between the calibrated model scenarios and the sensitivity scenarios were rated according to the definitions listed in Table 6-23. The ratings of the calibration outputs took into consideration that a difference of about less than 6% with the calibrated heads or baseflows NRMSE implied the calibration target would remain close to the minimum 10% threshold generally accepted in BC. The ratings for prediction outputs were based on differences of less than 10% with predicted values. A ten percent difference compared to EOM or post-closure predictions corresponds to a maximum open pit inflow of 605 m^3/d, a maximum drawdown and mound extent of 34 km^2, a maximum of 13% change to baseflow at Tenas Creek upstream of Goathorn Creek and 11% at Goathorn Creek upstream of Telkwa River, a minimum travel time of 14 years before the first particle discharges at Tenas Creek upstream of WQS04, and a maximum contribution of mine affected groundwater of 15% at Tenas Creek upstream of WQS04m and 10% at Goathorn Creek at WQS06).

Table 6-23: Ratings of sensitivity model calibration and prediction

Significance	Calibration	Prediction
Null	<1% difference with calibrated NRMS.	<5% RPD of predicted value.
Low	1 to 3% difference with calibrated NRMS.	5–10% RPD of the predicted value.
Medium	3 to 6% difference with calibrated NRMS.	10–30% RPD to the predicted value.
High	>6% difference with calibrated NRMS.	>30% RPD of the predicted value.

Parameters were classified into sensitivity types as defined by Brown (1996):

- **Type I:** There are insignificant effects for both model calibration residuals and predictive model results (relative to modelling objectives). In other words, within a reasonable range of parameter values, the model outcomes are not significantly affected. This parameter type does not need further data collection or monitoring. Type I sensitivities are of little concern because the impact on predictions is insignificant.
- **Type II:** There is a significant effect on model calibration, but an insignificant effect on predictive model results (relative to modelling objectives). The model calibration is affected (residuals increase for some part of the parameter range being tested) so the parameter influences the calibration goodness of fit. However, the results of the predictive model are still insensitive to this parameter. Type II sensitivities are of little concern because the impact on predictions is insignificant.
- **Type III:** There are significant effects on both model calibration and model prediction results (relative to modelling objectives). The parameter influences the calibration goodness of fit and a corresponding effect on the predictive model results. Type III sensitivity is of concern only for an uncalibrated model, or where a wide range of calibrations are possible, and proper calibration of this parameter is the solution. The sensitivity is important, but it is known and can be avoided by model calibration.

- **Type IV:** There is an insignificant effect on model calibration, but a significant effect on predictive model results (relative to modelling objectives). The model calibration is not affected and does not help constrain this parameter value, while the results of the predictive model are sensitive to this parameter. Type IV sensitivity is cause for concern because non-uniqueness, the model input may allow for a range of valid calibrations, but the choice of value significantly impacts model prediction. It is important to determine the actual value of this parameter and not rely on model calibration to estimate this parameter. It should be measured with robust data (model field audit) and, ideally, the data should represent the same stresses as in the predictive model simulations.

Table 6-24 to Table 6-26 compile the results of the sensitivity analysis, and Table 6-27 the sensitivity types assigned to each parameter. The analysis shows that:

- The hydraulic head calibration is sensitive to global variations of hydraulic conductivity, recharge, and to the increase only of K in the sand-gravel-rich till and Skeena group units.
- The baseflow calibration is sensitive to global variations of hydraulic conductivity, recharge, and to the increase of K in the silt-clay-rich till, sand-gravel rich till and Skeena group units.
- The maximum open pit inflow predicted by the sensitivity models was about 1,550 m^3/d in the case of a higher recharge at 30%, or when the Skeena group K increased by one standard deviation. The open pit inflow predictions are found to be sensitive to all parameters except specific yield, and type IV sensitivities are found with a:
  - Decrease to the silt-clay rich till K
  - Decrease to the sand-gravel rich till K
  - Increase or decrease to the Skeena group unit K anisotropy
  - Increase or decrease to the volcanic rocks K
- None of the scenarios predicted that groundwater drawdowns our mounds would reach the areas where private wells are located, downstream of the Project. Drawdown predictions are found to be sensitive to all parameters except for the increase to the sand-gravel rich till K, decrease to Skeena group K, and Skeena group anisotropy, and variations to specific yield. Type IV sensitivities are found with a:
  - Decrease to the silt-clay rich till K
  - Decrease to the sand-gravel rich till K
  - Increase or decrease to the volcanic rocks K
- All the sensitivity scenarios show larger effects of the Project on the baseflows in Tenas Creek compared to Goathorn Creek. Significant reductions to baseflows in Tenas Creek occur only in a few cases, when the recharge is increased (-14%) or the sand-gravel rich till K is varied by one standard deviation (- 21%); the other scenarios predict low changes. In Goathorn Creek, the maximum reduction predicted by the sensitivity models is -3%. Baseflow predictions are most sensitive to variations in recharge and sand-gravel rich till K. The variations to K in volcanic rock and the decrease to K in sand-gravel rich till are categorized as Type IV, which emphasizes the importance of actual site values for these parameters.

- The predicted times to private wells are more than at least 170 years for all scenarios. The travel times predictions are sensitive to all the tested parameters. Type IV sensitivities are found with a:
  - Decrease in sand-gravel rich till K
  - Decrease in silt-clay-rich till K
  - Decrease in Skeena group K
  - Variations the anisotropy in the Skeena group
  - Variations to the specific yield for all units
- The predictions of mine affected groundwater contribution to creeks were not found to be sensitive to any of the tested parameters. The sensitivity scenarios predicted a maximum contribution of 11% in Tenas Creek in the case of the Skeena group K increased by one standard deviation, and 1% in the Goathorn Creek. In terms of travel times, the WBLM (Section 4, Chapter 3 of the EAC Application) assume conservatively that 100% of the loads from potential waste and water management ponds are discharged into creeks after 25 years.

Table 6-24: Sensitivity of the model calibration

ID	RPD (%) between calibrated model and sensitivity baseline scenarios	
	Sensitivity to head calibration	**Sensitivity to baseflow calibration**
Calibrated model	NRMSE: 3.2%	NRMSE: 3.6%
HighK	**4.0%**	**7.7%**
R+	**3.8%**	**233.8%**
R-	1.8%	**23.2%**
Kst+	**4.0%**	**20.9%**
Kst-	2.0%	-0.9%
Nst+	0.0%	0.0%
Nst-	0.0%	0.0%
Kct+	1.9%	**5.7%**
Kct-	0.2%	-0.9%
Nct+	0.0%	0.0%
Nct-	0.0%	0.0%
Ksk+	**6.9%**	**8.9%**
Ksk-	1.9%	-1.4%
Anisk+	0.2%	0.2%
Anisk-	0.5%	0.7%
Nsk+	0.0%	0.0%
Nsk-	0.0%	0.0%
Kvl+	1.9%	1.7%
Kvl-	0.1%	-0.3%
Nvl+	0.0%	0.0%
Nvl-	0.0%	0.0%

Sources: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx

Notes:

The significance of effects to the model calibration and prediction are indicated by the format of the cell, with dark grey indicating high sensitivity, light grey medium sensitivity, pale yellow low sensitivity, and white no sensitivity.

Table 6-25: Sensitivity analysis of the EOM outputs

ID	RPD (%) between calibrated model and sensitivity EOM scenarios							
	Open pit inflow	Total extent of drawdown and mound	Changes to baseflow rates:		Travel time of first particle discharged to:		Contributions of mine affected groundwater to:	
			Tenas Ck u/s Goathorn Ck	Goathorn Ck u/s Telkwa Rv.	Tenas Ck u/s WQS04	Four Ck u/s WQS03DS	Tenas Ck u/s WQS04	Goathorn Ck u/s WQS06
Calibrated model	$Q_{open\ pit}$ = 550 m^3/d	Extent = 31 km^2	dQ = 3.2%	dQ = 0.8%	T = 16 years	No particle	Q = 0.4%	Q = 0%
HighK	**+22%**	**+41.8%**	**+27.6**	+6.1%	**-50.0%**	0.0%	+8.4%	+8.9%
R+	**+180.5%**	**-20.0%**	**-10.5%**	-3.6%	-4.0%	**Particle at 11 yr**	-0.3%	-0.2%
R-	**-75.8%**	**+234.8%**	**+12.0%**	+3.2%	+8.8%	0.0%	-0.2%	-0.2%
Kst+	**-12.0%**	-2.5%	**-17.7%**	+7.9%	**-66.7%**	**Particle at 18 yr**	+1.4%	-0.2%
Kst-	**+127.7%**	**+33.4%**	**-10.6%**	-2.9%	**-77.0%**	**Particle at 5 yr**	-0.1%	-0.1%
Nst+	0.0%	0.0%	0.0%	0.0%	**+24.3%**	0.0%	0.0%	0.0%
Nst-	0.0%	0.0%	0.0%	0.0%	**-61.6%**	**Particle at 18 yr**	0.0%	0.0%
Kct+	**-36.8%**	**+24.1%**	+6.8%	+1.2%	**+35.5%**	0.0%	-0.5%	-0.2%
Kct-	**+24.7%**	**+12.4%**	-1.1%	-0.1%	**-12.2%**	0.0%	-0.2%	-0.2%
Nct+	0.0%	0.0%	0.0%	0.0%	-3.6%	0.0%	0.0%	0.0%
Nct-	0.0%	0.0%	0.0%	0.0%	**-11.2%**	0.0%	0.0%	0.0%
Ksk+	**+160.3%**	**-12.0%**	+6.4%	+2.5%	**-78.3%**	0.0%	+2.2%	-0.2%
Ksk-	**-79.6%**	-7.0%	-2.1%	+0.3%	**35.3%**	0.0%	-0.6%	-0.2%
Anisk+	**+31.5%**	**+10.4%**	+1.3%	+0.1%	**-15.9%**	0.0%	-0.3%	-0.2%
Anisk-	**+88.9%**	+3.7%	+0.3%	+0.1%	+4.4%	0.0%	0.0%	-0.2%
Nsk+	0.0%	0.0%	0.0%	0.0%	**-15.6%**	0.0%	0.0%	0.0%
Nsk-	0.0%	0.0%	0.0%	0.0%	-1.2%	0.0%	0.0%	0.0%
Kvl+	**-11.5%**	**+291.6%**	+1.1%	+0.6%	+0.8%	0.0%	-0.3%	-0.2%
Kvl-	**-47.4%**	**-20.2%**	-1.2%	-0.9%	+6.6%	0.0%	-0.3%	-0.2%
Nvl+	0.0%	0.0%	0.0%	0.0%	+6.8%	0.0%	0.0%	0.0%
Nvl-	0.0%	0.0%	0.0%	0.0%	**-10.4%**	0.0%	0.0%	0.0%

Sources: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx, and Telkwa_EIA_Mdl travel time analz_20210119.xlsx

Notes:

The significance of effects to the model calibration and prediction are indicated by the format of the cell, with dark grey indicating high sensitivity, light grey medium sensitivity, pale yellow low sensitivity, and white no sensitivity.

u/s, upstream

Table 6-26: Sensitivity analysis of the post-closure outputs

ID	RPD (%) between calibrated model and sensitivity post-closure scenarios							
	Total extent of drawdown and mound	Changes to baseflow rates:		Travel time to discharge 50% of all particles respectively migrating to WQS04, WQS03DS or WQS06			Contributions of mine affected groundwater to:	
		Tenas Ck u/s Goathorn Ck	Goathorn Ck u/s Telkwa Rv.	Tenas Ck u/s WQS04	Four Ck u/s WQS03DS	Goathorn Ck u/s WQS06	Tenas Ck u/s WQS04	Goathorn Ck u/s WQS06
Calibrated model	Extent = 28 km^2	dQ = 2.9%	dQ = 1.1%	T = 60 years	T = 96 years	T = 125 years	Q = 6%	Q = 0.3%
HighK	**+39.4%**	-26.7%	-5.9%	**-61.6%**	**-53.4%**	**-40.0%**	+8.2%	+13.9%
R+	**-15.0%**	-7.0%	-2.6%	**-33.3%**	**-13.1%**	**+32.4%**	-4.4%	-0.4%
R-	**+265.1%**	+14.2%	+4.1%	-7.9%	+7.4%	**+84.7%**	+2.2%	+1.1%
Kst+	-5.2%	-14.0%	8.7%	**-74.3%**	**-56.4%**	**-63.8%**	-1.4%	0.6%
Kst-	**+33.5%**	-7.6%	-2.1%	**+190.1%**	**+90.6%**	**+343.1%**	-1.8%	+0.1%
Nst+	0.0%	0.0%	0.0%	+1.7%	**+32.9%**	**+20.0%**	-0.1%	0.0%
Nst-	0.0%	0.0%	0.0%	**-59.0%**	**-50.3%**	**-52.3%**	+0.1%	0.0%
Kct+	+4.4%	+9.7%	+2.3%	**-18.7%**	-7.6%	**+205.5%**	+1.1%	-0.4%
Kct-	**+12.5%**	+1.8%	+0.8%	**-20.4%**	+6.0%	**-15.1%**	-1.9%	0.3%
Nct+	0.0%	0.0%	0.0%	**-11.0%**	**+10.9%**	+3.7%	-0.1%	+0.1%
Nct-	0.0%	0.0%	0.0%	**-18.8%**	-3.8%	-9.4%	0.0%	0.0%
Ksk+	**+19.2%**	+10.2%	+4.5%	-1.5%	-10.2%	**-19.1%**	+4.6%	-0.5%
Ksk-	-2.2%	+0.6%	+0.9%	-1.2%	**+19.9%**	-6.4%	-2.1%	0.0%
Anisk+	+9.3%	+3.2%	+1.1%	**-31.3%**	+2.9%	**+70.5%**	-0.9%	+0.8%
Anisk-	+2.1%	+4.3%	+1.3%	**-22.6%**	2.4%	4.5%	-0.5%	+0.4%
Nsk+	0.0%	0.0%	0.0%	-7.9%	+1.3%	-2.7%	-0.1%	0.0%
Nsk-	0.0%	0.0%	0.0%	**-20.3%**	+3.3%	+1.2%	0.0%	0.0%
Kvl+	**+315.7%**	+4.6%	+0.7%	-7.3%	+8.0%	**+89.1%**	+0.3%	+0.1%
Kvl-	**-18.3%**	+3.8%	+1.8%	**-12.2%**	+4.6%	**-8.0%**	-0.4%	+0.4%
Nvl+	0.0%	0.0%	0.0%	**-12.1%**	+2.9%	-4.9%	-0.1%	0.1%
Nvl-	0.0%	0.0%	0.0%	**-21.5%**	+0.5%	-2.4%	0.0%	0.0%

Sources: Telkwa_EA_Mdl Setup-Calib-AnlzResults_20240920.xlsx, and Telkwa_EIA_Mdl travel time analz_20210119.xlsx

Notes:

The significance of effects to the model calibration and prediction are indicated by the format of the cell, with dark grey indicating high sensitivity, light grey medium sensitivity, pale yellow low sensitivity, and white no sensitivity.

u/s, upstream

Table 6-27: Sensitivity types related for the predictions of changes to heads

Change in calibration

Change in prediction results		**Insignificant**					**Significant**				
		Type I					**Type II**				
	Insignificant	**Open pit inflow**	**Changes to head**	**Changes to baseflow**	**Travel times**	**Mine affected contributions to baseflows**	**Open pit inflow**	**Changes to head**	**Changes to baseflow**	**Travel times**	**Mine affected contributions to baseflows**
		Nst+/- Nct+/- Nsk+/- Nvl+/-	*Ksk-* *Anisk+/-* Nst+/- Nct+/- Nsk+/- Nvl+/-	*Kct-* *Ksk-* *Anisk+/-* Nst+/- Nct+/- Nsk+/- Nvl+/-	*Kvl+/-*	*Kst-* *Kct-* *Ksk-* *Anisk+/-* *Kvl+/-* Nst+/- Nct+/- Nsk+/- Nvl+/-	-	*Kst+*	*HighK* *Kct+* *Ksk+*	-	*HighK* *R+/-* *Kst+* *Kct+* *Ksk+*
		Type IV					**Type III**				
	Significant	**Open pit inflow**	**Changes to head**	**Changes to baseflow**	**Travel times**	**Mine affected contributions to baseflows**	**Open pit inflow**	**Changes to head**	**Changes to baseflow**	**Travel times**	**Mine affected contributions to baseflows**
		Kst- *Kct-* *Ksk-* *Anisk+/-* *Kvl+/-*	*Kst-* *Kct-* *Kvl+/-*	*Kst-* *Kvl+/-*	*Kst-* *Kct-* *Ksk-* *Anisk+/-* Nst+/- Nct+/- Nsk+/- Nvl+/-	-	*HighK* *R+/-* *Kst+* *Kct+* *Ksk+*	*HighK* *R+/-* *Kct+* *Ksk+*	*R+/-* *Kst+*	*HIghK* *R+/-* *Kst+* *Kct+* *Ksk+*	-

6.9 Limitations of the Groundwater Model

The British Columbia Groundwater Modeling Guidelines (BC MOE 2012) defines three levels of modeling complexity based on potential impacts, modeling objectives, hydrogeological framework and data availability. The model developed here may be classified as moderate complexity, defined as follows: *"These are conceptual or numerical models based on a reasonable, though limited, dataset and having limited calibration. These models may be used to determine the potential range of change or to "bracket"* potential effects that may occur due to a given stress." Hence, while specific results are calculated during the modelling process, there always remains a degree of uncertainty associated with these estimates.

- The model is based on a unique conceptualisation of the 3D geology, constructed from the analyses of drillhole intercepts (TML's database), geological maps (surface and bedrock geology, regional and local maps, 2D cross sections; Clague 1984, MEMPR 1993, BCGS 2005, TML 2018), and considerations on the ability of a unit to convey groundwater. While geological structures have been mapped and do not appear to influence the flow system, it is not possible to confirm if other large-scale fractures and/or faults are connected and if they act as a conduit or as barrier to flows.
- The characterization of aquitards or aquicludes is uncertain because historical hydraulic conductivity measurements tended to be biased towards specific units (coal) and high permeability intervals in bedrock and overburden. The local heterogeneities that cause perched groundwater lenses in the till, and the potential influence of thick low K mudstone are not well characterized.
- The calibrated model results are deemed reasonable considering the calibrated properties are aligned with the average site observations and model integrated all the available data. However, model was only calibrated to steady state conditions and the results have highest confidence in the vicinity of the mine area, where there are relatively more data. Actual ground conditions and properties may vary locally where data are not available; additional collection of K and Sy values would increase the confidence in the model predictions, where parameters are identified as Type IV.
- The groundwater drawdowns and baseflow reductions predicted by the numerical model during mining conditions are biased high because the modelling assumes steady state conditions have been reached, when they most likely won't have by the end of operations.

7 Conclusions

The models developed for the Tenas Project were based on climate and hydrology data, regional and local geology, site drillholes, and site groundwater data. The level of details, methods, and quality of the information were adequate for a Joint Application for a Mines Act permit, and for an effluent discharge permit.

The hydrogeological conceptual model was used as a basis to develop a numerical model calibrated to field data, with a final NRMSE of 3.2% for hydraulic heads and 3.6% for baseflows. The models relied on steady-state conditions to predict at EoY1, EoY7, EOM, and post-closure conditions.

The conclusions of the modelling can be summarized as follows:

- Open pit inflows are expected to range between 320 and 890 m^3/d. Under groundwater conditions alone, inflows of these magnitudes are typically managed with open pit sumps and do not require active dewatering systems.
- Neither mining induced drawdown nor mounding are expected to reach the private well locations.
- The mining scenario shows maximum reductions of baseflows occur prior to construction of the material and water management facilities (i.e., reductions to the entire creeks of about 6% at Tenas Creek, 5% at Four Creek, 2% at the Goathorn Creek, and 2% at the Telkwa River). The potential contributions of mine affected groundwater to baseflows, after 25 years of operations, were 0.8% for Tenas Creek at WQS04, less than 0.3% for Goathorn Creek at WQS05, and less than 0.2% for the Telkwa River at WQS09.
- The post-closure scenario indicates baseflows to the entire creeks will either remain unchanged or slightly increase due to the influence of the management ponds on groundwater levels, with a 3% increase at Tenas Creek, 4% increase at Four Creek, 1% increase at the Goathorn Creek, and 1% increase at the Telkwa River. The predicted long-term contributions of mine affected groundwater to baseflows were less than 9.3% for Tenas Creek at WQS04, less than 4.6% for Goathorn Creek at WQS05, and less than 0.8% for the Telkwa River at WQS09.
- Mine affected particles are predicted to slowly migrate towards three private wells 3.8 km north of the Project and west of Goathorn Creek (Goalder, Baker, and Mapletoft); however, travel times are expected to be in excess of 400 years, and less than 170 years for sensitivities. The wells located east of Goathorn Creek are not located along particle paths.
- Three private wells (Goalder, Mapletoft, and Baker) located in the Telkwa River valley are potentially within the paths of mine affected groundwater. No constituent is predicted to exceed the BC-DWG. The processes of diffusion, dispersion, or natural attenuation, and the predicted travel times (i.e., > 400 years) between the Project and the Telkwa alluvial floodplain were not considered in the analysis which means results are conservative and will be lower when Project is developed.

The modeling presented herein provides forecasts of the expected Project behavior, derived from the available hydrogeological information. The steady state conditions were found to reasonably simulate the site observations and the regional behaviour, with the highest confidence in the vicinity of the Project. Upgrades to the model should be considered as additional information becomes available.

This report, Hydrogeology Technical Report for the Tenas Coal Project, was prepared by;

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Associate Senior Consultant
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and reviewed by

Daniel Mackie, MSc. PGeo. (BC)
Principal Consultant

SRK Consulting (Canada) Inc Engineers and Geoscientist BC Permit to Practice No: 1003655

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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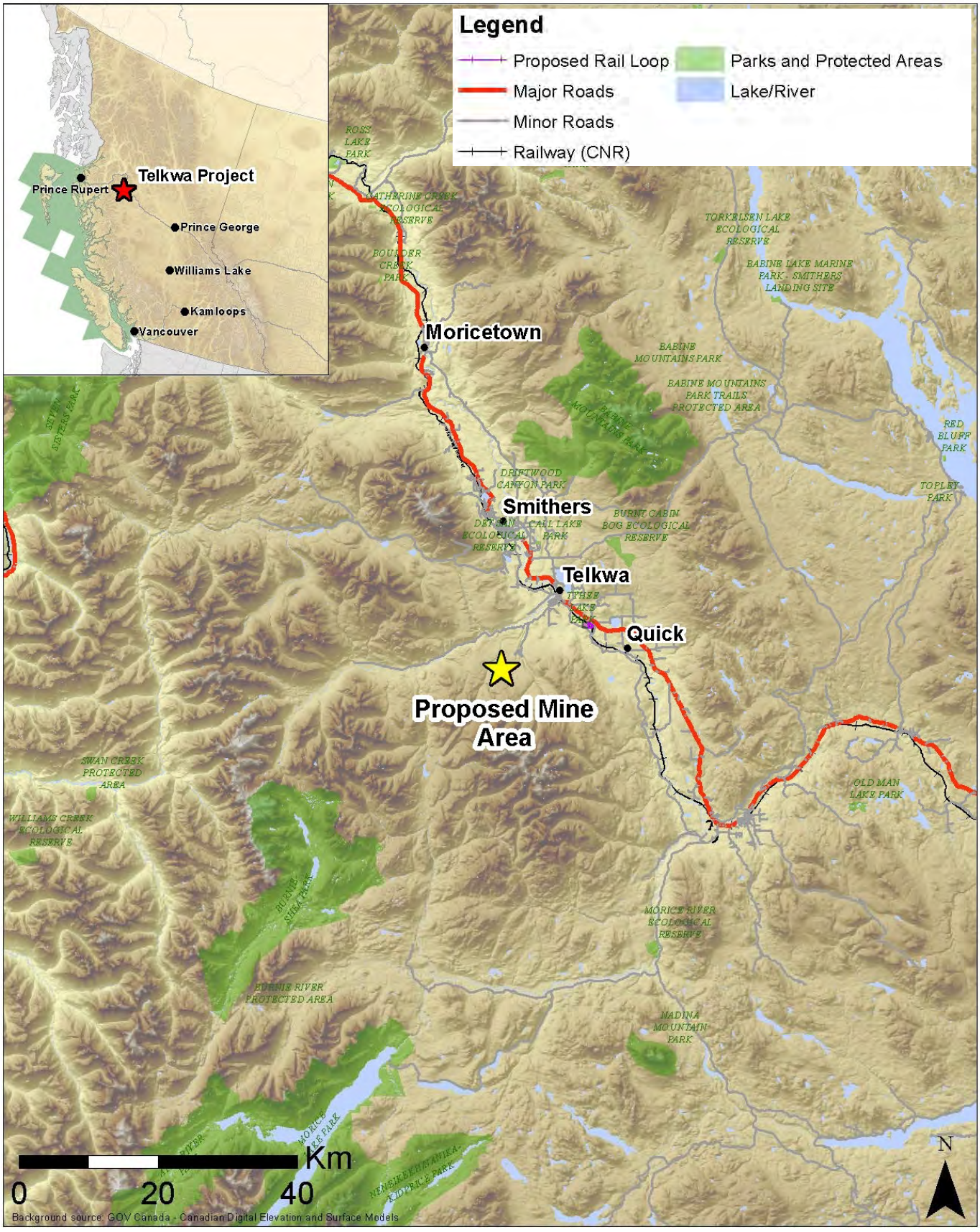

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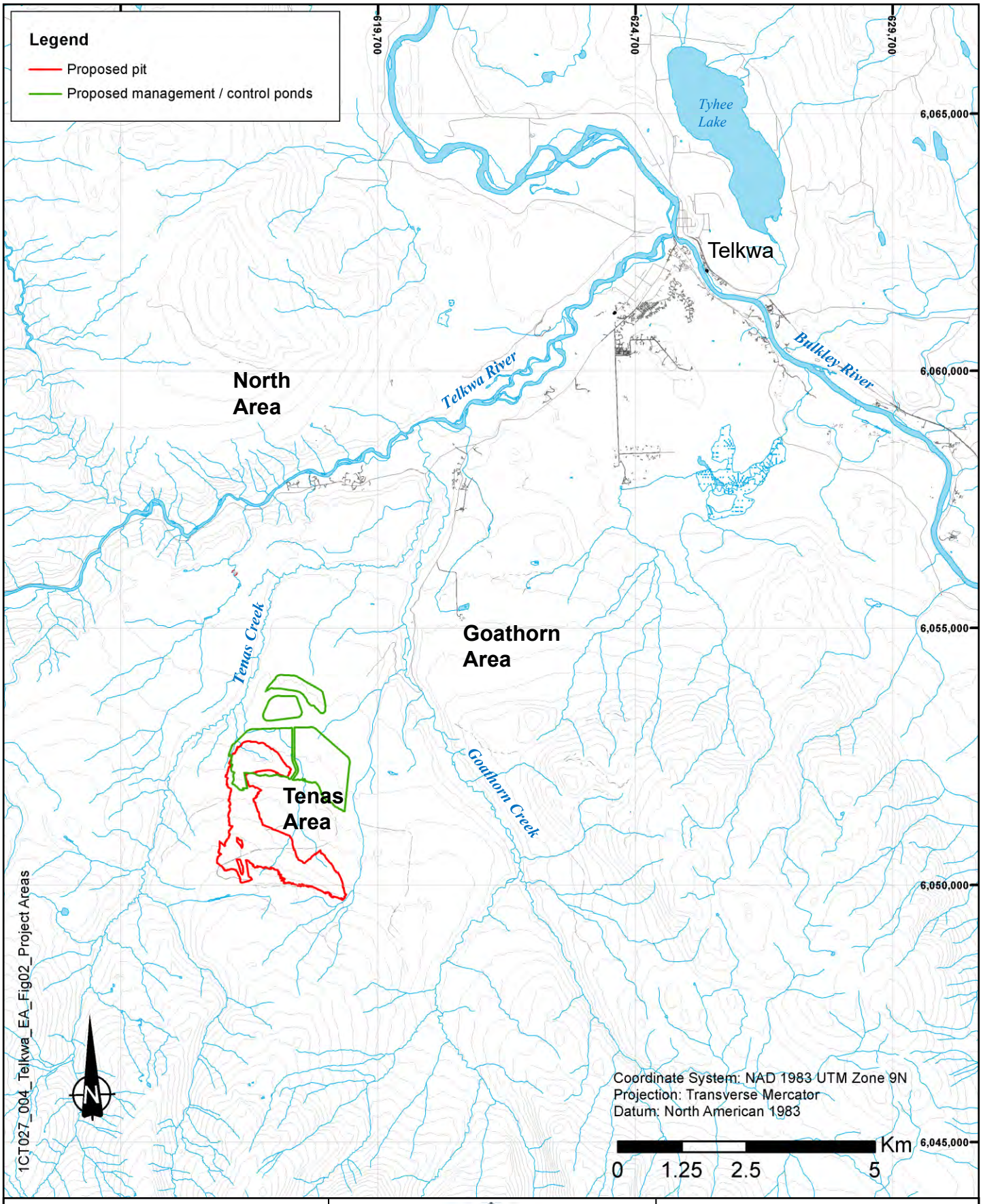


srk consulting

TELKWA COAL LIMITED

Groundwater Technical Report

Project Areas

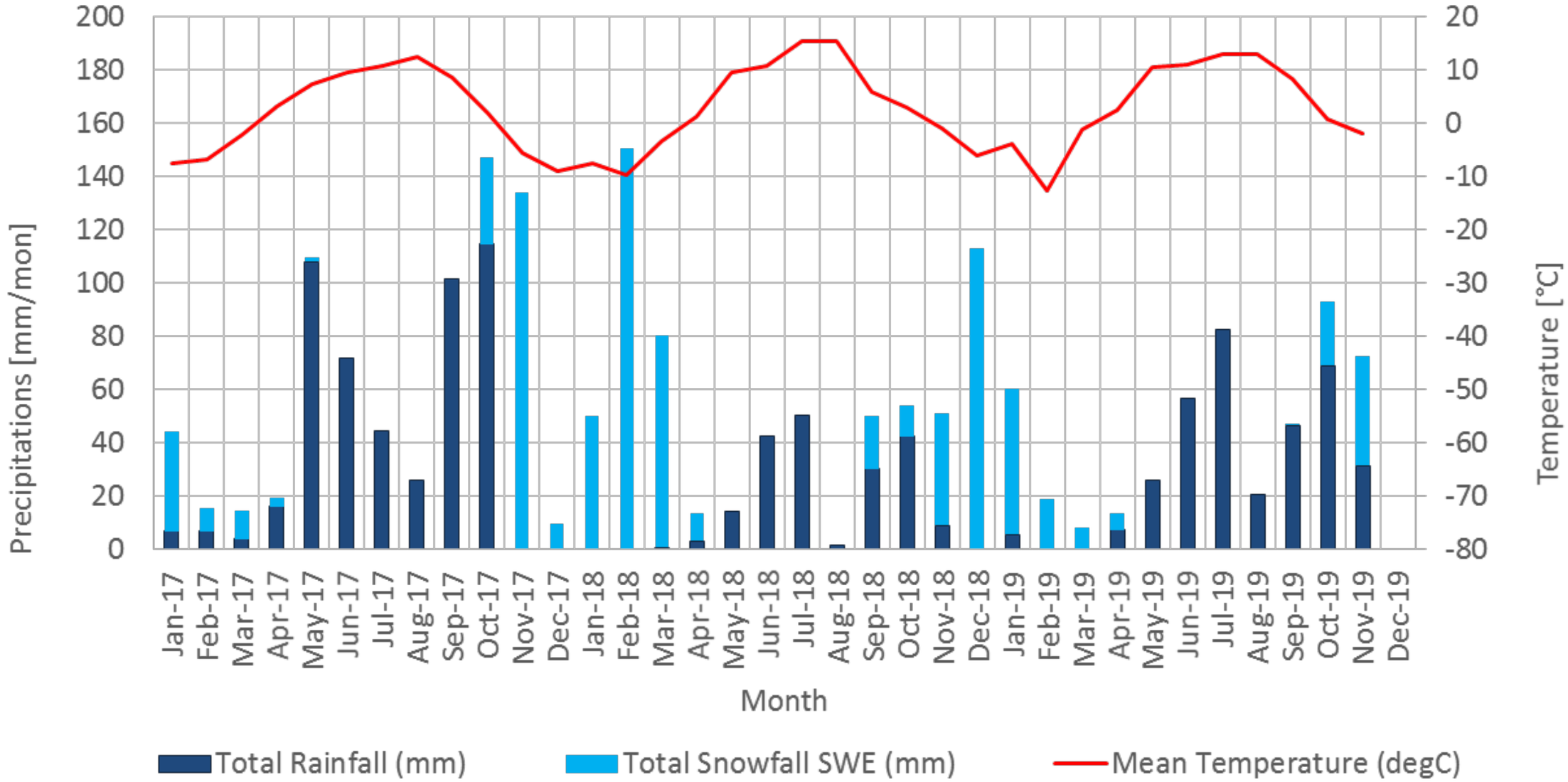
Job No: 1CT027.004

Filename: Fig02_Project Areas.pptx

Tenas Project

Date:	Approved:	Figure:
Nov 2020	GF	2

Source: Tenas Deposit met 2017-2019 daily comp.xlsx



srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
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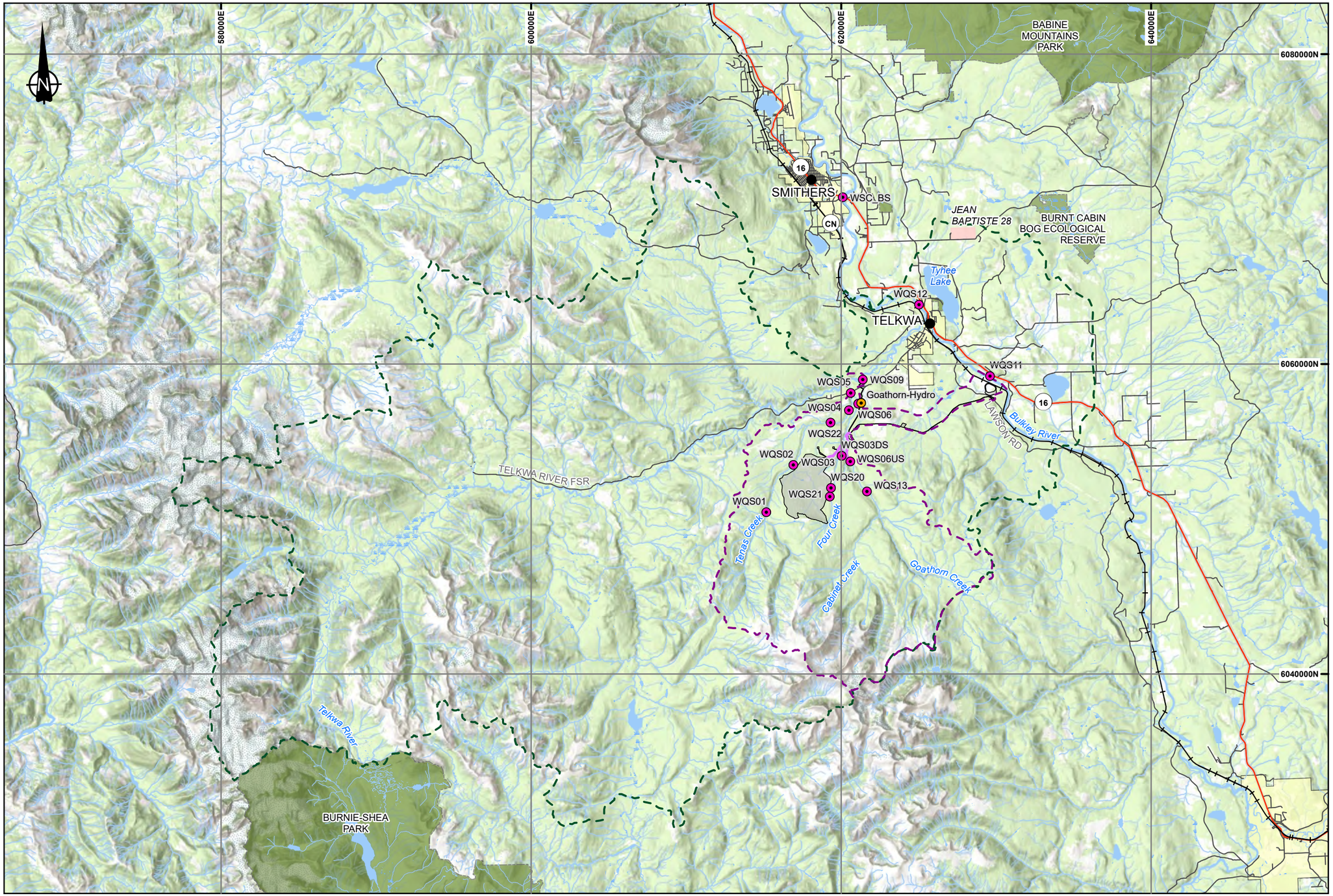

LEGEND

- WBLM Nodes
- Hydrometric Stations
- City/Town
- LSA Boundary
- RSA Boundary
- Tenas Access Corridor
- Rail Line
- Highway
- Road
- Project Area
- Waterbody
- Wetland
- Watercourse
- Park or Protected Area
- First Nation Reserve
- Municipal Area

NOTES

1. All mapped features are approximate and should be used for discussion purposed only.

REFERENCES

NAD 1983 UTM Zone 9N
Project features: Allegiance Coal, 2020
Basedata: Government of British Columbia
Basemap: World Topo Base

0 2500 5000 7500 10000
Meters

srk consulting

SRK JOB NO: 1CT027.004

FILENAME: Fig04_Topo_main_Drainage_basins.pdf

ALLEGIANCE COAL LIMITED

Tenas Project

Groundwater Technical Report

Topography of the Main Drainage Basins

Date:	Approved:	Figure:
Jan 2021	GF	**04**

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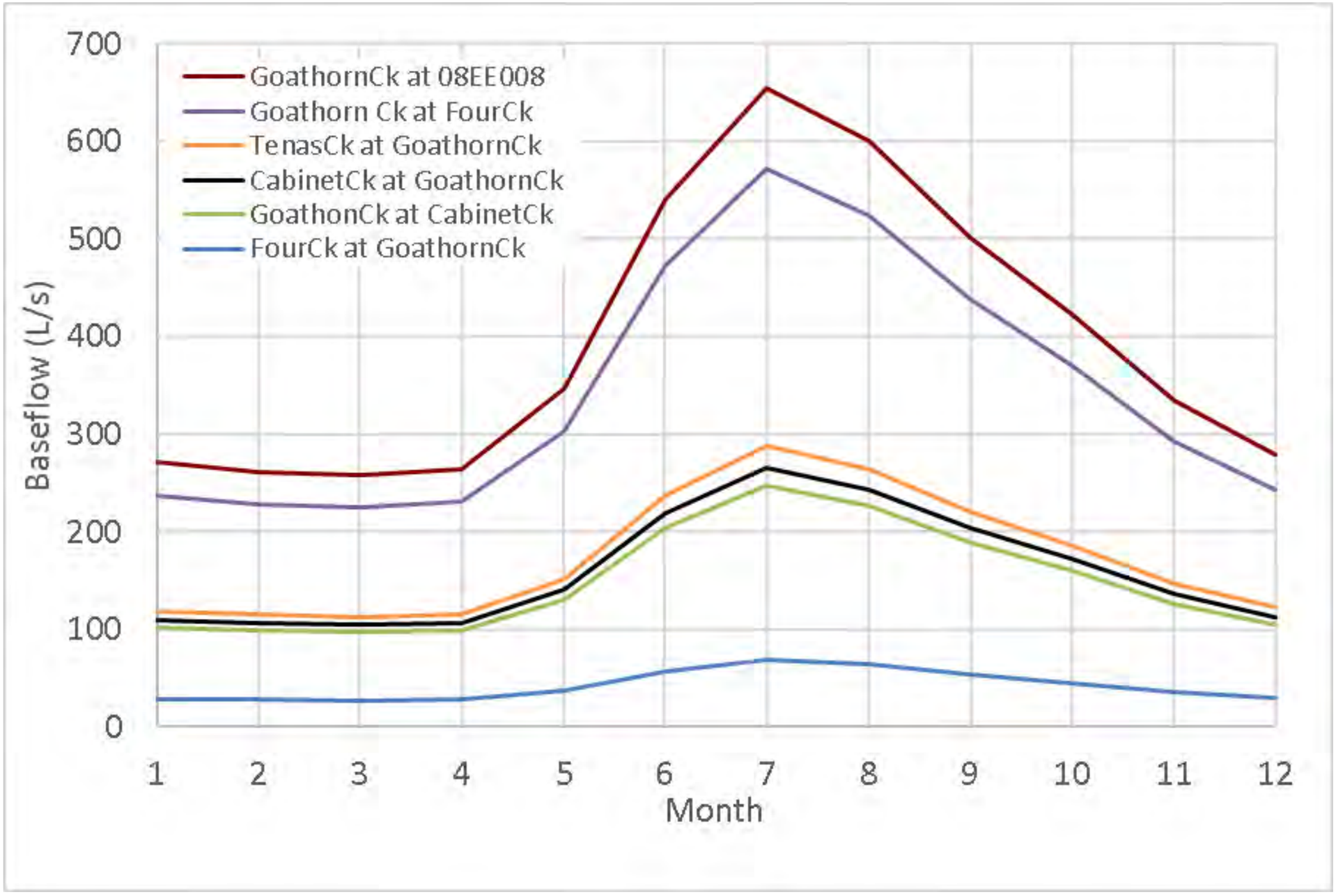

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		Estimated Baseflows
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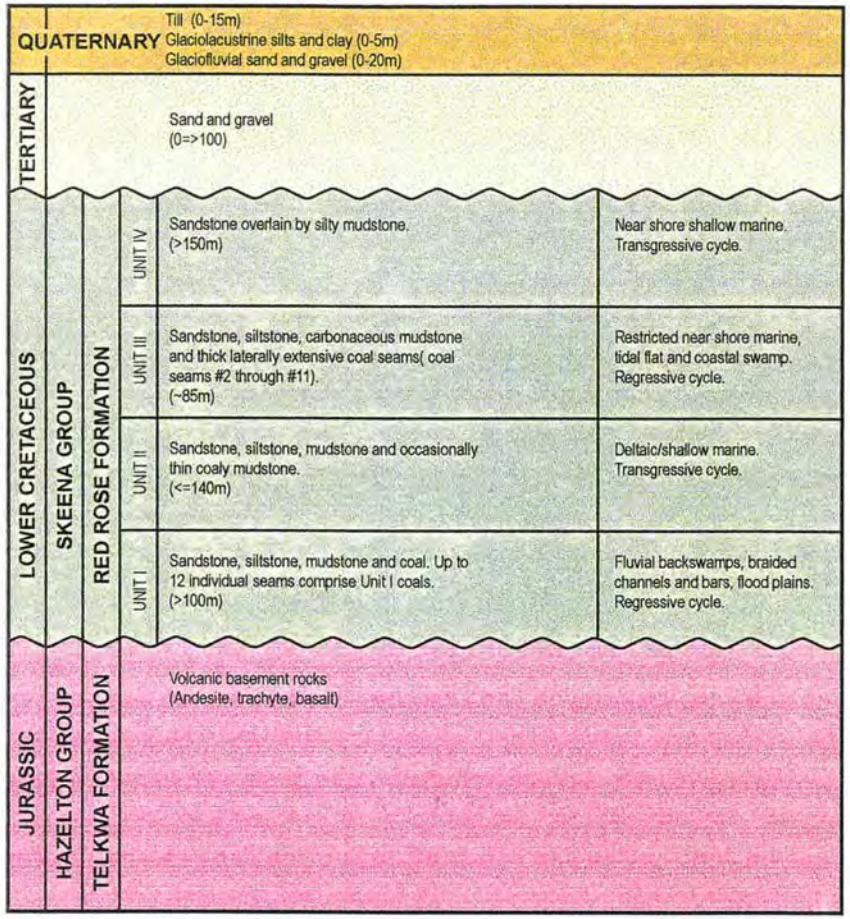
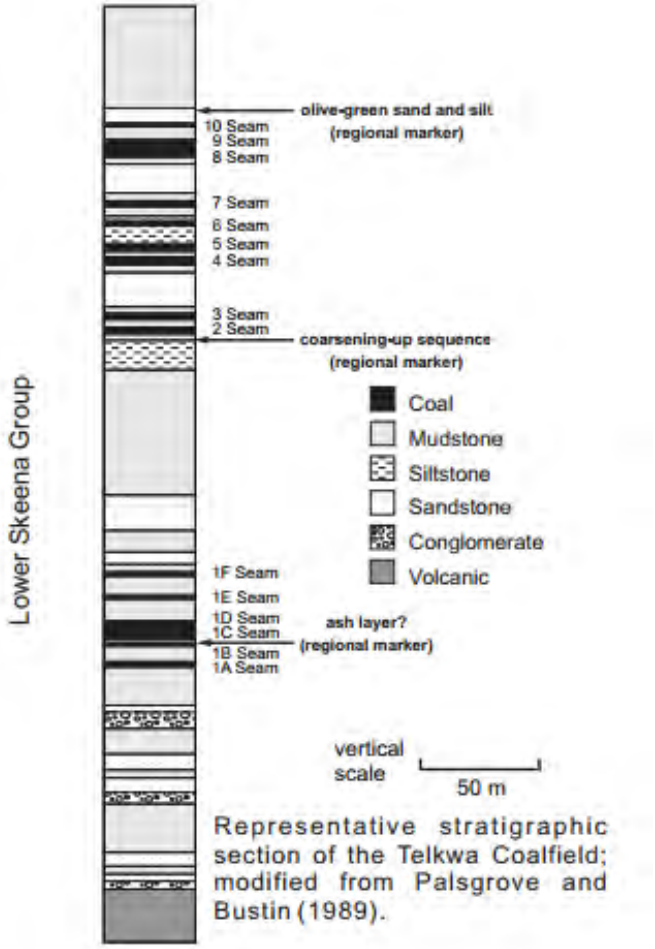


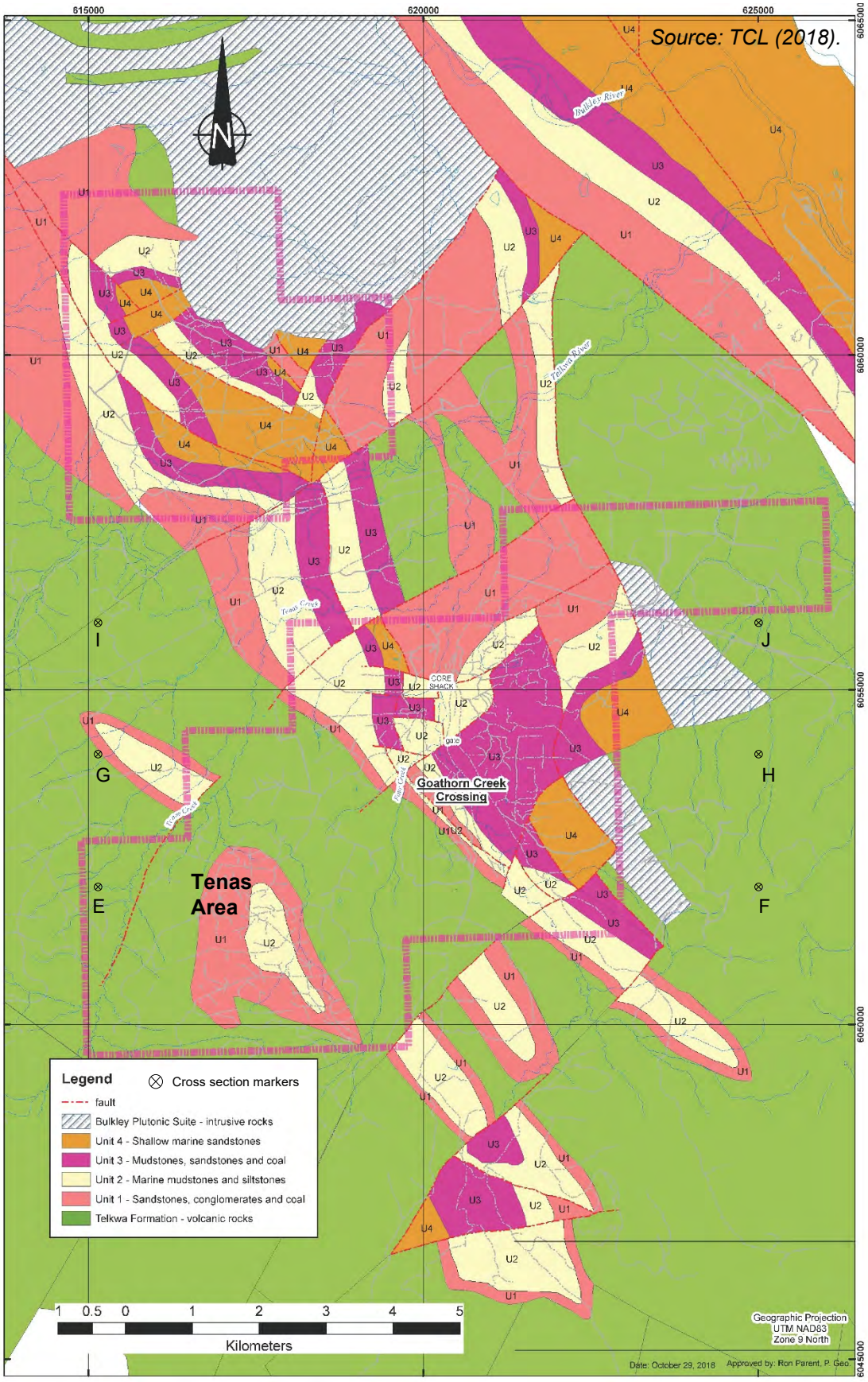
Notes:
1. All formation thicknesses are approximate and could locally vary significantly (esp. Quaternary and Tertiary).
2. Bedrock geology after Manalta (1998).

Simplified Stratigraphic Column (Piteau, 1998).



Representative stratigraphic section of the Telkwa Coalfield; modified from Palsgrove and Bustin (1989).

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Stratigraphic column of the Telkwa Project area
Job No: 1CT027.004 Filename: Fig6_Strat Colums.pptx	Tenas Project	Date: Nov. 2018 / Approved: GF / Figure: 6



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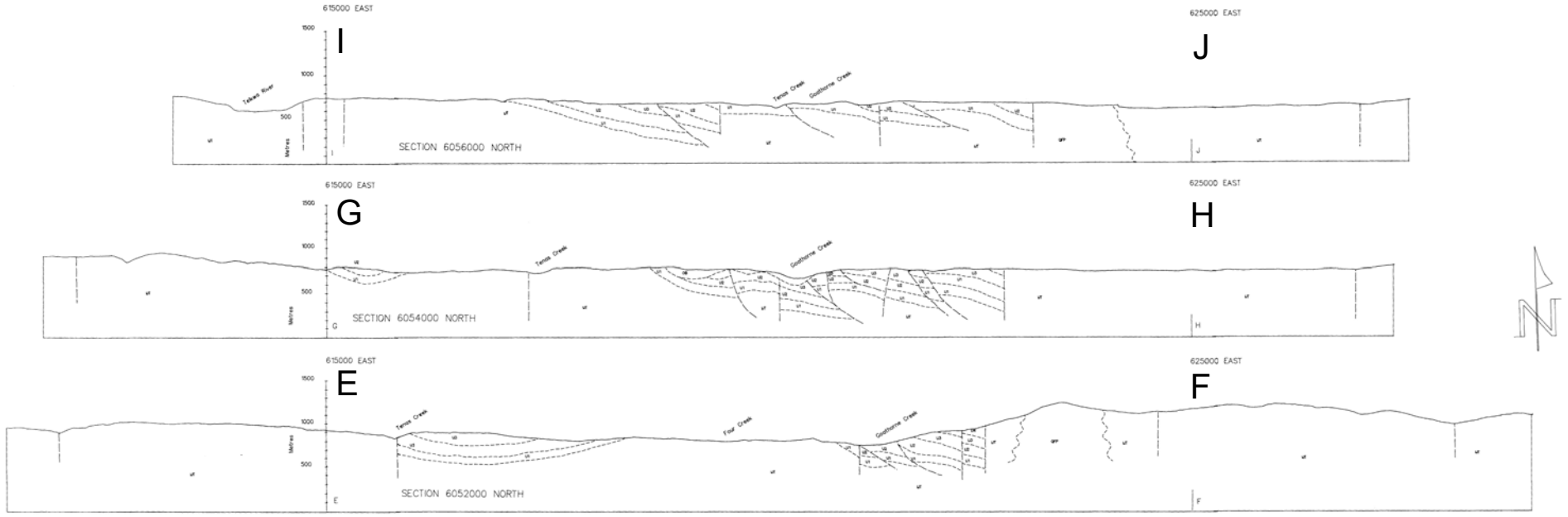
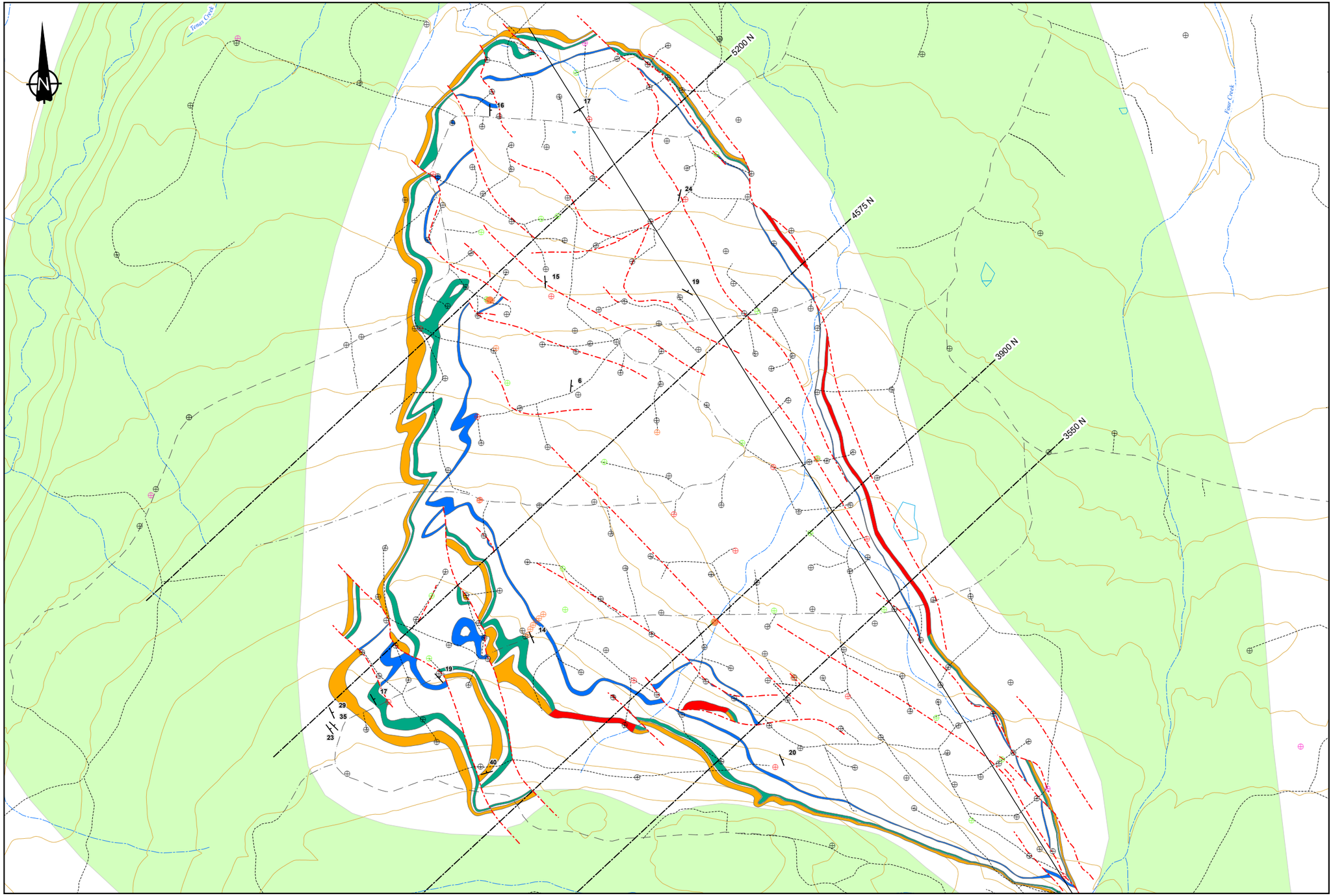


srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Cross sections of the Telkwa coal field (Palsgrove, 1991)
Job No: 1CT027.004 Filename: Fig8_CS Telkwa coal field.pptx	Tenas Project	Date: Nov.2018 / Approved: GF / Figure: **8**



LEGEND

Existing Drillholes

- ARD Core
- Bulk Sample Core
- Core
- Rotary Core
- Rotary Bulk Samples
- Rotary
- Bedding
- Syncline
- Fault
- Seam C
- Seam 1 Lower
- Seam 1 Upper
- Seam 1
- Hazleton Volcanics
- Creeks
- Cross Sections
- Forest Service Road
- Existing Trails
- Contours (20m)

NOTES

1. All mapped features are approximate and should be used for discussion purposed only.

REFERENCES

NAD 1983 UTM Zone 9N

Figure produced by SRK, project features provided by Allegiance Coal, 2020

0 250 500 750

Meters

srk consulting

SRK JOB NO: 1CT027.004

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Tenas Project

Groundwater Technical Report

Geological Map of the Tenas Area

Date:	Approved:	Figure:
Jan 2021	GF	9

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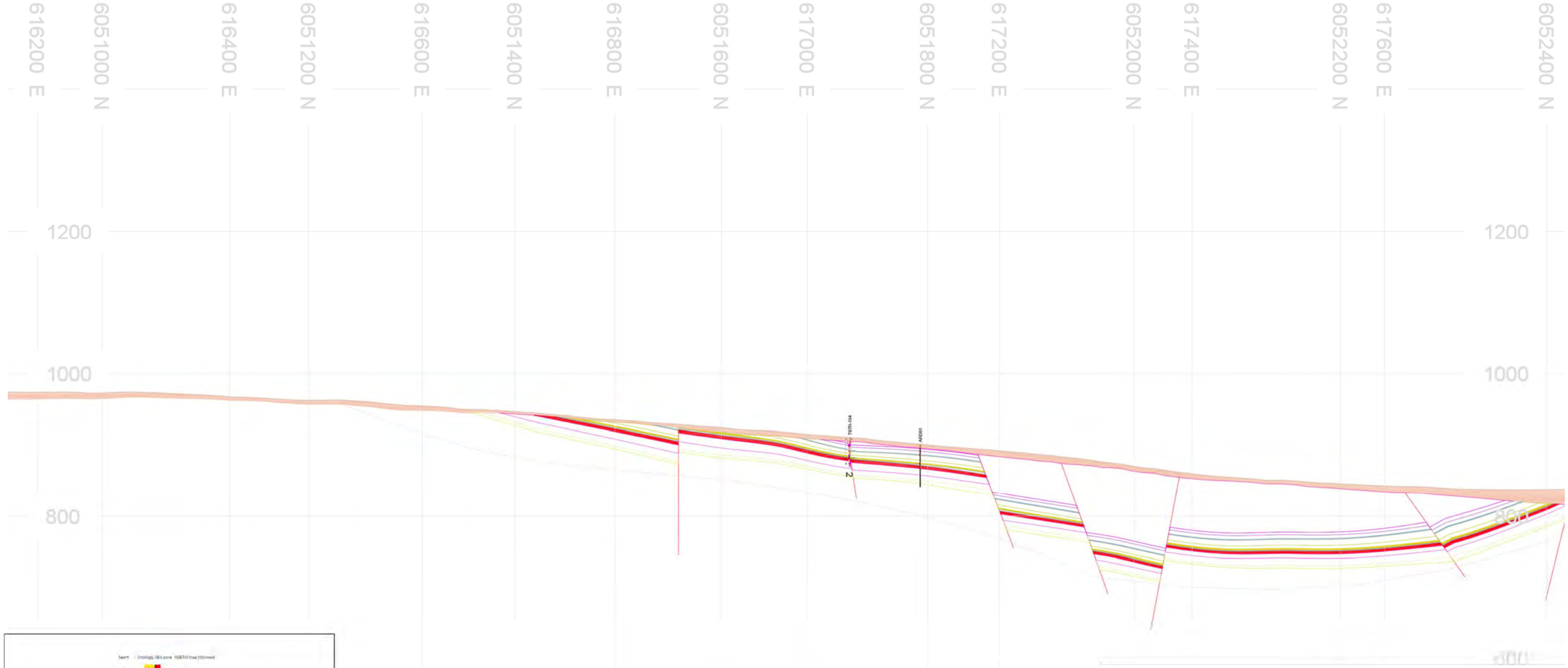

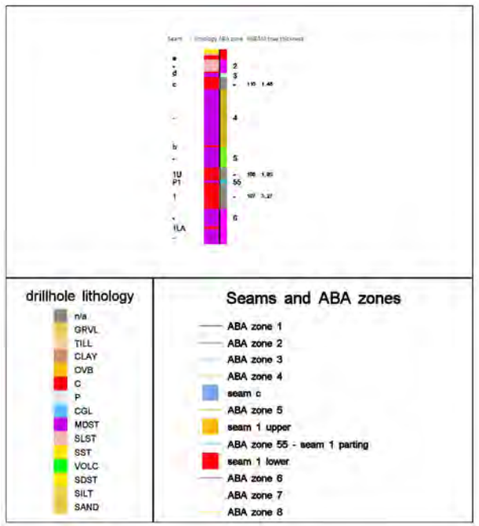

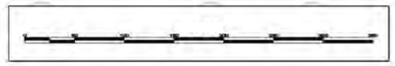

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Groundwater Technical Report

SEC 5200 facing NW (317 az)

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Tenas Project

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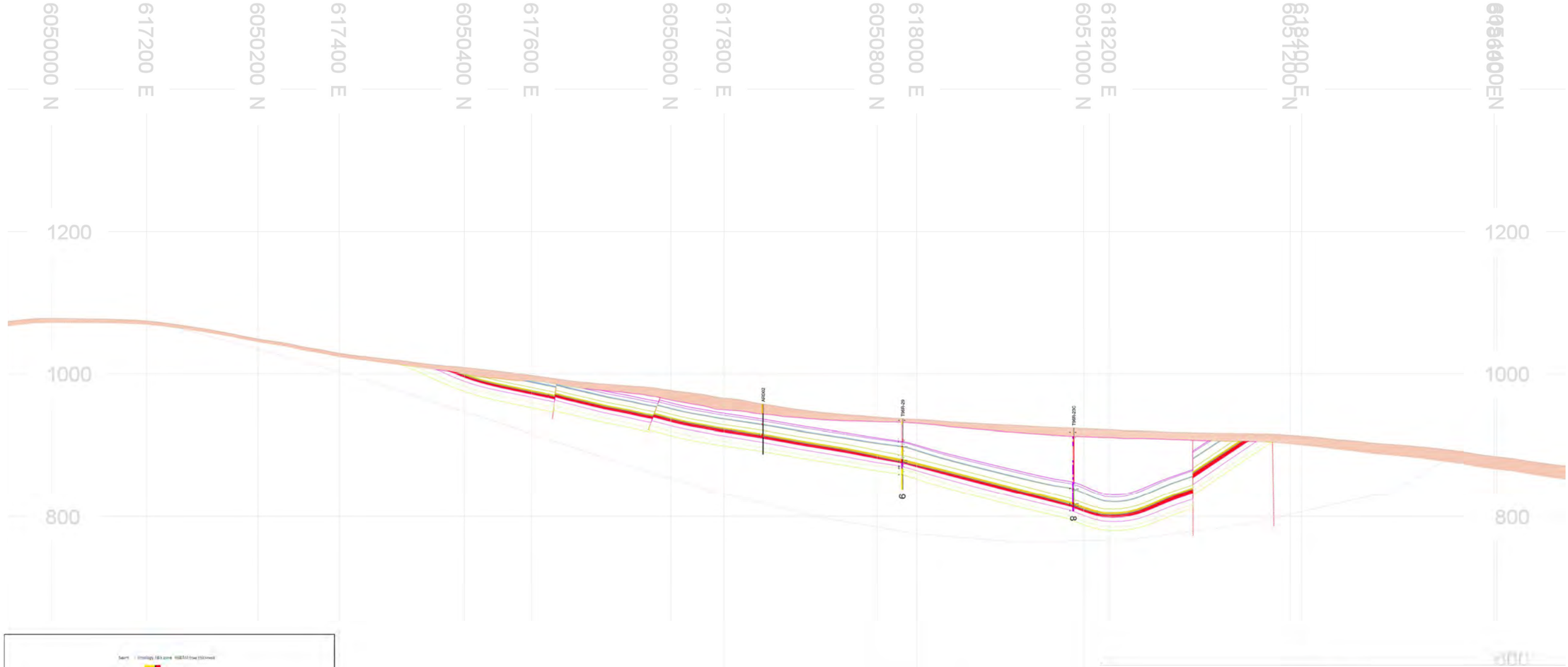
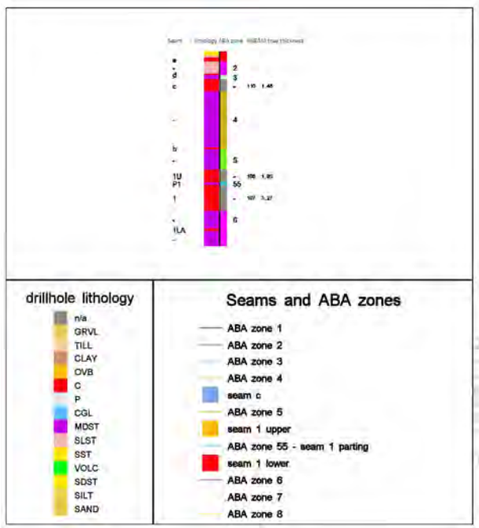
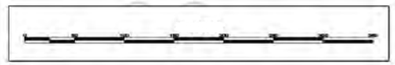
January 2021	GF	10







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Groundwater Technical Report

SEC 3900 facing NW (317 az)

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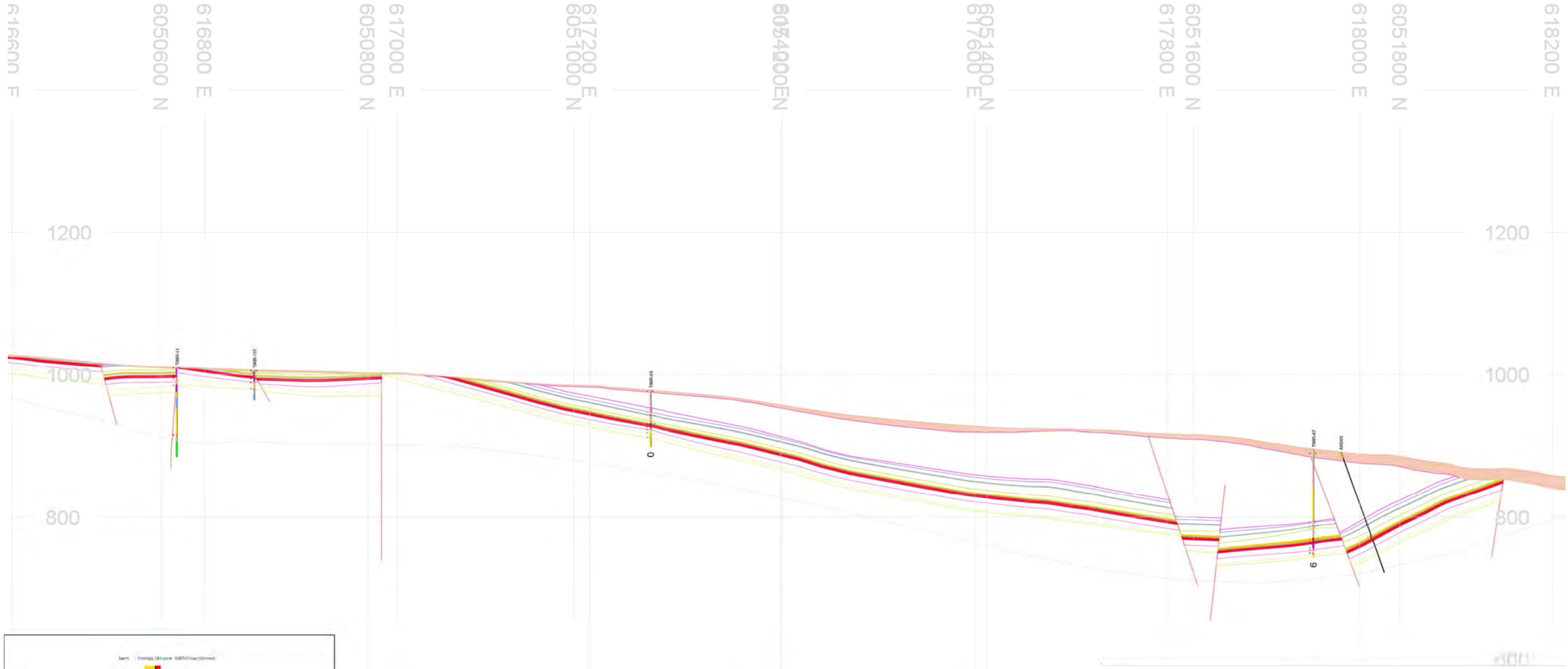

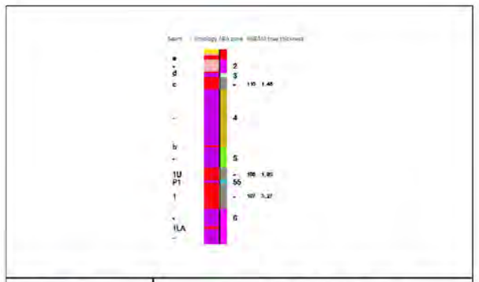

drillhole lithology

- n/a
- GRVL
- TILL
- CLAY
- OVB
- C
- P
- CGL
- MDST
- SLST
- SST
- VOLC
- SDST
- SILT
- SAND

Seams and ABA zones

- ABA zone 1
- ABA zone 2
- ABA zone 3
- ABA zone 4
- seam c
- ABA zone 5
- seam 1 upper
- ABA zone 55 - seam 1 parting
- seam 1 lower
- ABA zone 6
- ABA zone 7
- ABA zone 8

srk consulting	ALLEGIANCE COAL LIMITED	Groundwater Technical Report
SRK JOB NO.: 1CT027.004	Tenas Project	SEC 4575 facing NW (317 az)
FILE NAME: 1CT027.004 Tenas Geological Model Sections.dwg		DATE: January 2021 / APPROVED: GF / FIGURE: 12

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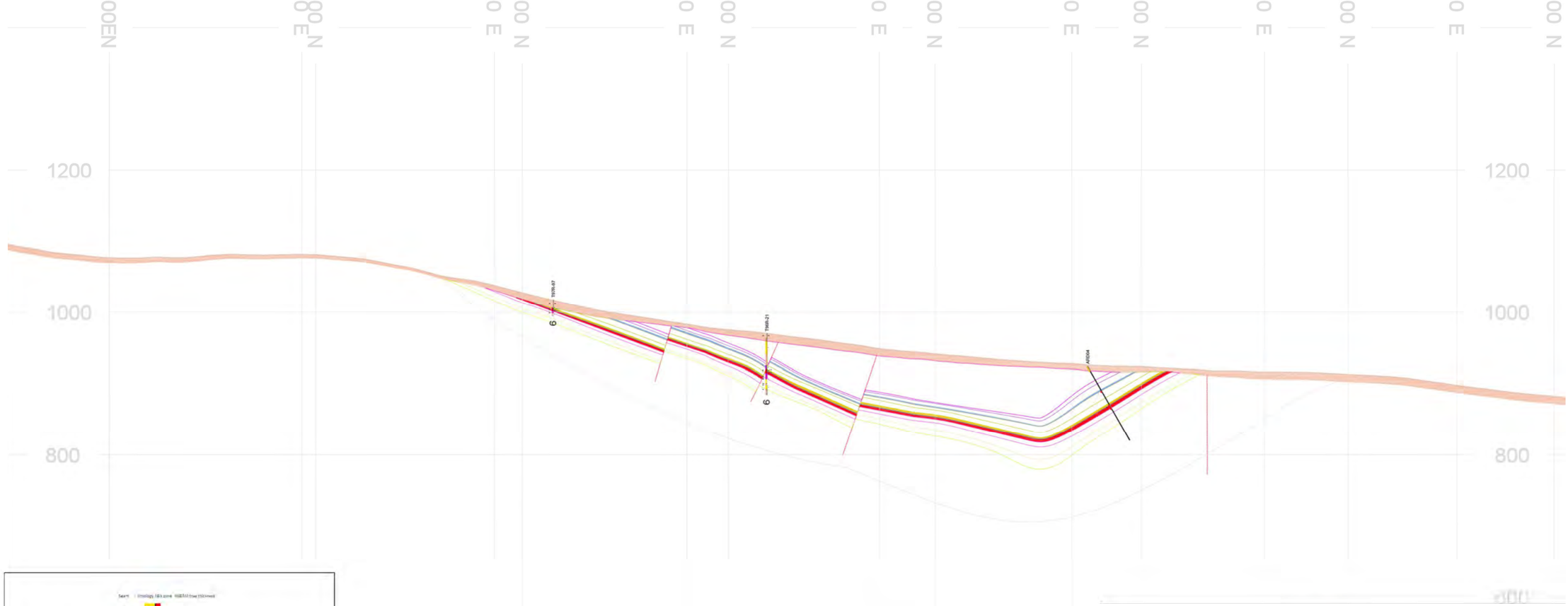
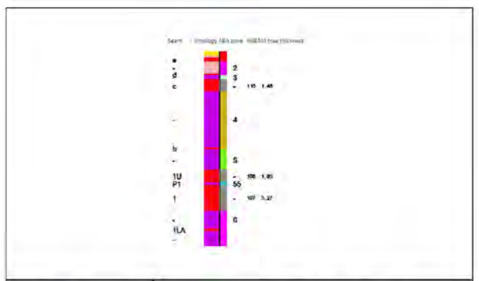


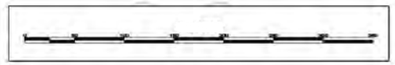


drillhole lithology

- n/a
- GRVL
- TILL
- CLAY
- OVB
- C
- P
- CGL
- MDST
- SLST
- SST
- VOLC
- SDST
- SILT
- SAND

Seams and ABA zones

- ABA zone 1
- ABA zone 2
- ABA zone 3
- ABA zone 4
- seam c
- ABA zone 5
- seam 1 upper
- ABA zone 55 - seam 1 parting
- seam 1 lower
- ABA zone 6
- ABA zone 7
- ABA zone 8



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Volcanics

Volcanics

Weathered Volcanics

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report	
		Example Photos of Volcanic Units	
Job No: 1CT017.004 Filename: Fig14_Volcanics_Photos.pptx	Tenas Project	Date: Apr 2019	Approved: GF	Figure: **14**

Sandstone

Coal

Mudstone/Siltstone

Interbedded Coal and Siltstone

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Example Photos of Skeena Group Units
Job No: 1CT017.004 Filename: Fig15_SkeenaGp_Photos.pptx	Tenas Project	Date: Apr 2019 / Approved: GF / Figure: **15**

614000E
616000E
618000E
620000E
622000E
6054000N
6052000N
6050000N

LEGEND

- Test Pit
- Sonic
- Upper Till
- Lower Till
- Sand and Gravel
- Creeks
- Roads

NOTES

1. All mapped features are approximate and should be used for discussion purposed only.

REFERENCES

NAD 1983 UTM Zone 9N

Figure produced by SRK, data provided by Allegiance Coal, 2020

0 250 500 750 1000

Meters

srk consulting

SRK JOB NO: 1CT027.004

FILENAME: Fig16_Surficial_Geology.pdf

ALLEGIANCE COAL LIMITED

Tenas Project

Groundwater Technical Report

Tenas Creek
Surficial Geology

Date:	Approved:	Figure:
Jan 2021	GF	**16**

C:\Users\sconard\OneDrive - SRK Consulting\Projects\Telkwa\20210111_Groundwater_Technical_Report\1CT027_004_Groundwater_Technical_Report.aprx

Till (Diamond)

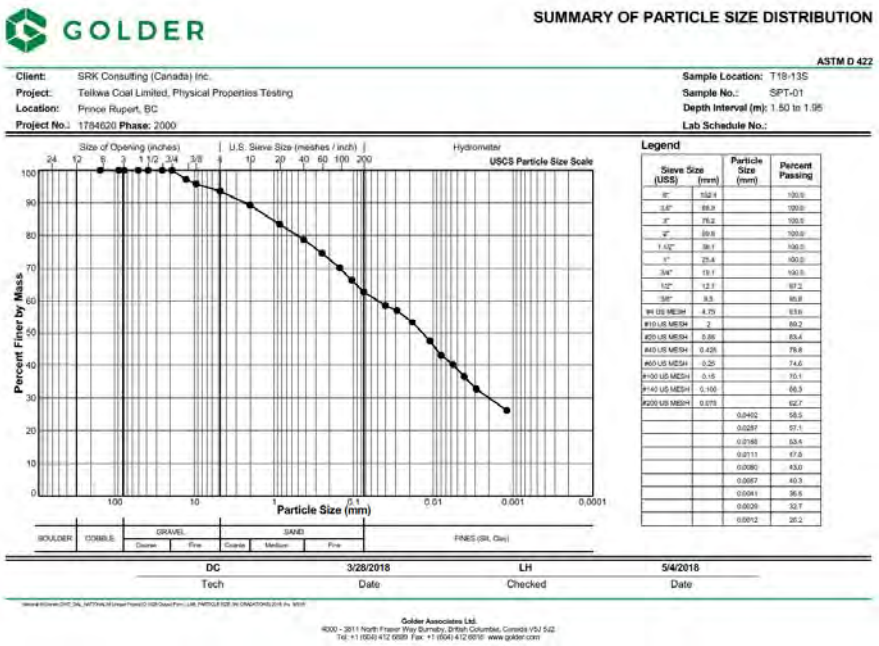
Till (Shelby)

Clayey/Silty Sand

Sand and Gravel

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Example Photos of Overburden Units
Job No: 1CT017.004 Filename: Fig17_Overburden_Photos.pptx	Tenas Project	Date: Apr 2019 / Approved: GF / Figure: **17**

Till



GOLDER

SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM D 422

Client: SRK Consulting (Canada) Inc.
Project: Telkwa Coal Limited, Physical Properties Testing
Location: Prince Rupert, BC
Project No.: 1784620 Phase: 2000

Sample Location: T18-13S
Sample No.: SPT-01
Depth Interval (m): 1.50 to 1.95
Lab Schedule No.:

Size of Opening (inches) | U.S. Sieve Size (meshes / inch) | Hydrometer — USCS Particle Size Scale

Percent Finer by Mass

Particle Size (mm)

BOULDER | COBBLE | GRAVEL (Coarse, Fine) | SAND (Coarse, Medium, Fine) | FINES (Silt, Clay)

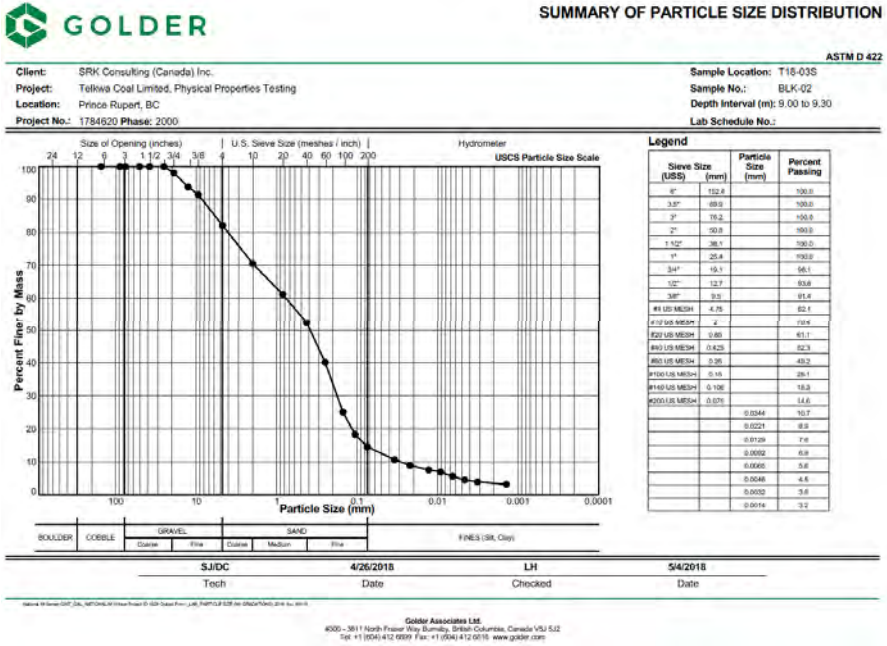
Legend

Sieve Size (US$)	(mm)	Particle Size (mm)	Percent Passing
6"	152.4		100.0
3.5"	88.9		100.0
3"	76.2		100.0
2"	50.8		100.0
1 1/2"	38.1		100.0
1"	25.4		100.0
3/4"	19.1		100.0
1/2"	12.7		97.2
3/8"	9.5		95.8
#4 US MESH	4.75		93.6
#10 US MESH	2		89.2
#20 US MESH	0.85		83.4
#40 US MESH	0.425		78.8
#60 US MESH	0.25		74.6
#100 US MESH	0.15		70.1
#140 US MESH	0.106		66.3
#200 US MESH	0.075		62.7
		0.0402	58.5
		0.0287	57.1
		0.0168	53.4
		0.0111	47.8
		0.0080	43.0
		0.0057	40.3
		0.0041	36.6
		0.0029	32.7
		0.0012	26.2

DC	3/28/2018	LH	5/4/2018
Tech	Date	Checked	Date

Golder Associates Ltd.
4000 - 3811 North Fraser Way Burnaby, British Columbia, Canada V5J 5J2
Tel: +1 (604) 412 6999 Fax: +1 (604) 412 6010 www.golder.com

Sand and Gravel



GOLDER

SUMMARY OF PARTICLE SIZE DISTRIBUTION

ASTM D 422

Client: SRK Consulting (Canada) Inc.
Project: Telkwa Coal Limited, Physical Properties Testing
Location: Prince Rupert, BC
Project No.: 1784620 Phase: 2000

Sample Location: T18-03S
Sample No.: BLK-02
Depth Interval (m): 9.00 to 9.30
Lab Schedule No.:

Size of Opening (inches) | U.S. Sieve Size (meshes / inch) | Hydrometer — USCS Particle Size Scale

Percent Finer by Mass

Particle Size (mm)

BOULDER | COBBLE | GRAVEL (Coarse, Fine) | SAND (Coarse, Medium, Fine) | FINES (Silt, Clay)

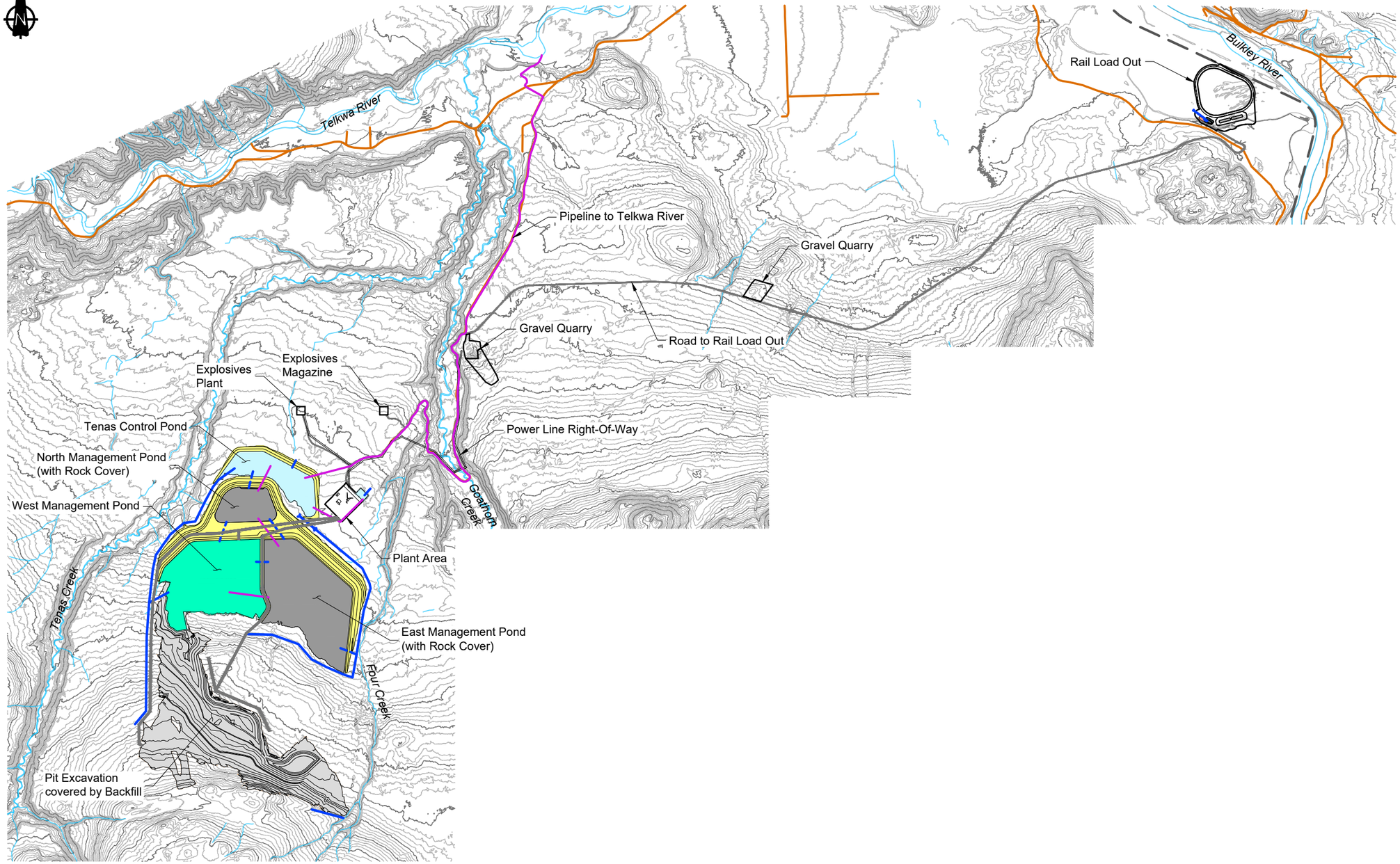
Legend

Sieve Size (US$)	(mm)	Particle Size (mm)	Percent Passing
6"	152.4		100.0
3.5"	88.9		100.0
3"	76.2		100.0
2"	50.8		100.0
1 1/2"	38.1		100.0
1"	25.4		100.0
3/4"	19.1		98.1
1/2"	12.7		93.8
3/8"	9.5		91.4
#4 US MESH	4.75		82.1
#10 US MESH	2		70.5
#20 US MESH	0.85		61.1
#40 US MESH	0.425		52.3
#60 US MESH	0.25		43.2
#100 US MESH	0.15		29.1
#140 US MESH	0.106		18.3
#200 US MESH	0.075		14.6
		0.0344	10.7
		0.0221	9.9
		0.0129	7.6
		0.0092	6.9
		0.0065	5.8
		0.0046	4.6
		0.0032	3.8
		0.0014	3.2

SJ/DC	4/26/2018	LH	5/4/2018
Tech	Date	Checked	Date

Golder Associates Ltd.
4000 - 3811 North Fraser Way Burnaby, British Columbia, Canada V5J 5J2
Tel: +1 (604) 412 6999 Fax: +1 (604) 412 6010 www.golder.com

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Example of Overburden Particle Size Distribution
Job No: 1CT017.004 Filename: Fig18_OverburdenPSD.pptx	Tenas Project	Date: Apr 2019 | Approved: GF | Figure: **18**



LEGEND

- Water Management Feature
- Spillway
- Existing Watercourse
- Pipeline
- Existing Road
- Proposed Road
- Dams and Buttresses
- Control Pond
- Management Pond
- Backfill / NAG Pile
- Rock Cover

NOTES

1. Contours shown at 5.0m intervals.
2. All dimensions shown in meters unless otherwise stated.
3. Pile designs by SRK Consulting Ltd.

REFERENCE

NAD83 UTM Zone 9.

0m 500 1000 1500 2000

srk consulting	ALLEGIANCE COAL LIMITED	Groundwater Technical Report
SRK JOB NO.: 1CT027.004	Tenas Project	Mine Plan
FILE NAME: Fig19_Mine_Plan.pdf	DATE: Jan 2021 / APPROVED: GF / FIGURE: 19	

\\srk.ad\DFS\vancan\Projects\01_SITES\Telkwa Coal\1040_AutoCAD\Figures\1CT027.004 GW Technical Report Mine Plan.dwg

LEGEND

- City/Town
- Groundwater LSA
- Groundwater RSA
- Tenas Access Corridor
- Rail Line
- Highway
- Road
- Project Area
- Waterbody
- Wetland
- Watercourse
- Park or Protected Area
- First Nation Reserve
- Municipal Area

NOTES

1. All mapped features are approximate and should be used for discussion purposed only.

REFERENCES

NAD 1983 UTM Zone 9N
Project features: Allegiance Coal, 2020
Basedata: Government of British Columbia
Basemap: World Topo Base

0 2500 5000 7500 10000
Meters

srk consulting

SRK JOB NO: 1CT027.004

FILENAME: Fig20_Groundwater_RSA_LSA.pdf

ALLEGIANCE COAL LIMITED

Tenas Project

Groundwater Technical Report

Local Study Area (LSA) and Regional Study Area (RSA)

Date:	Approved:	Figure:
Jan 2021	GF	**20**

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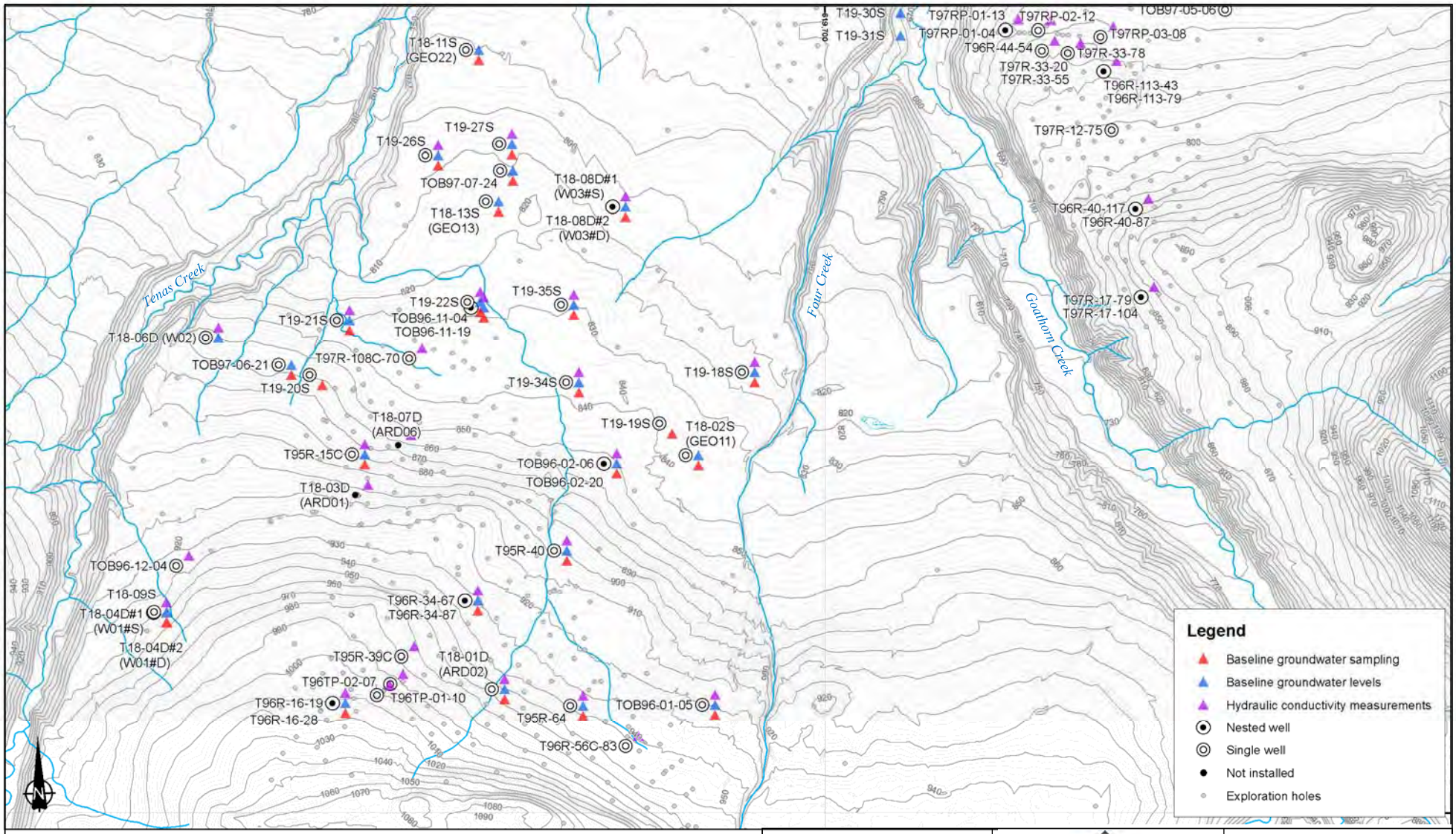
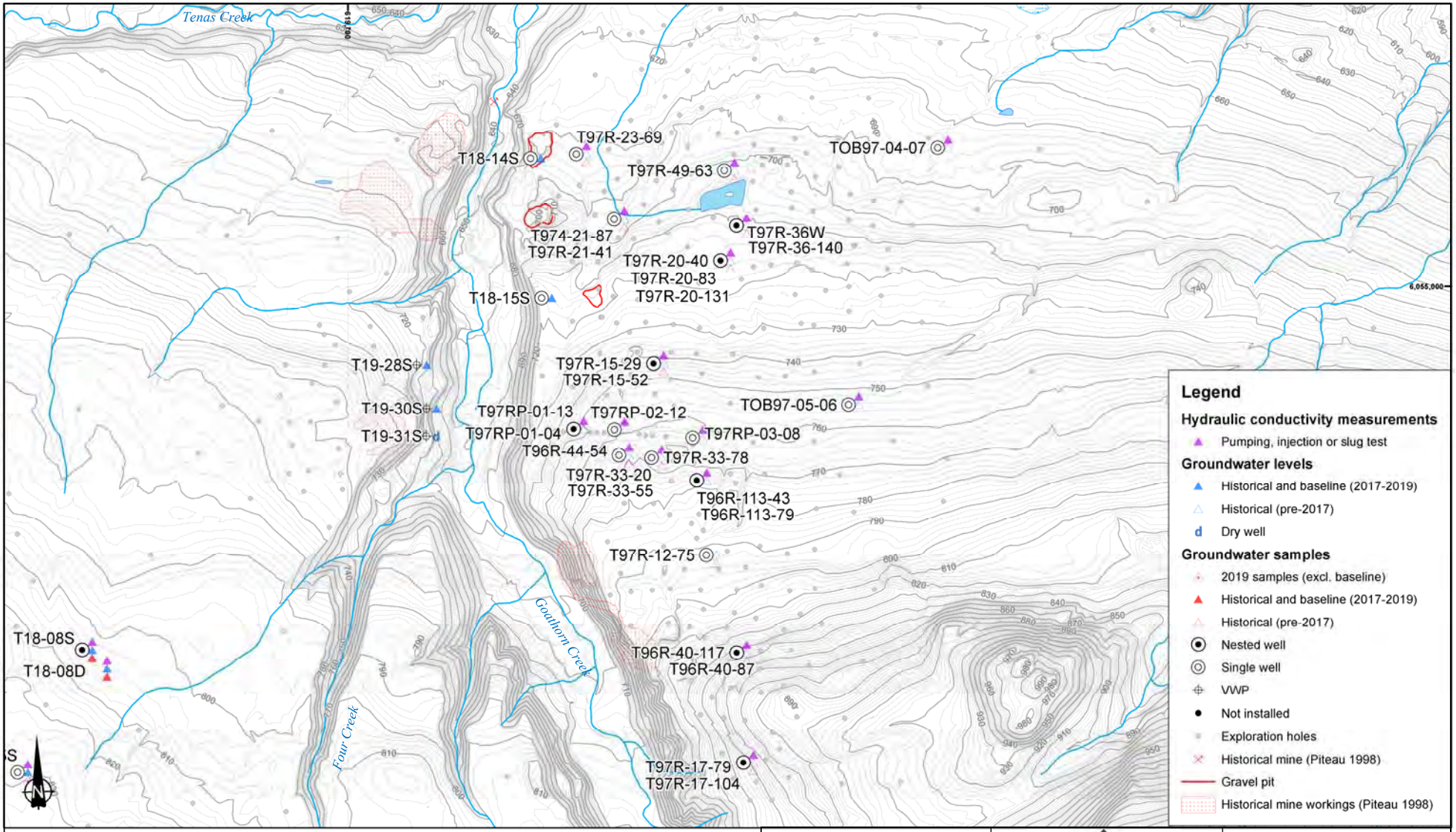

T18-11S (GEO22)
T19-27S
T19-26S
TOB97-07-24
T18-13S (GEO13)
T18-08D#1 (W03#S)
T18-08D#2 (W03#D)
T19-30S
T19-31S
T97RP-01-13
T97RP-01-04
T97RP-02-12
T97RP-03-08
TOB97-05-06
T96R-44-54
T97R-33-78
T97R-33-20
T97R-33-55
T96R-113-43
T96R-113-79
T97R-12-75
T96R-40-117
T96R-40-87
T97R-17-79
T97R-17-104
Tenas Creek
Four Creek
Goathorn Creek
T19-22S
T19-35S
T19-21S
TOB96-11-04
TOB96-11-19
T18-06D (W02)
TOB97-06-21
T97R-108C-70
T19-20S
T19-34S
T19-18S
T18-07D (ARD06)
T19-19S
T18-02S (GEO11)
T95R-15C
TOB96-02-06
TOB96-02-20
T18-03D (ARD01)
T95R-40
TOB96-12-04
T18-09S
T18-04D#1 (W01#S)
T18-04D#2 (W01#D)
T96R-34-67
T96R-34-87
T95R-39C
T18-01D (ARD02)
T96TP-02-07
T96TP-01-10
T96R-16-19
T96R-16-28
T95R-64
TOB96-01-05
T96R-56C-83
Legend
Baseline groundwater sampling
Baseline groundwater levels
Hydraulic conductivity measurements
Nested well
Single well
Not installed
Exploration holes
N
Kilometers
0 0.325 0.65 1.3
Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983
srk consulting
Job No: 1CT027.004
Filename: Fig21_MW locations in Tenas Area
TELKWA COAL LIMITED
Tenas Project
Groundwater Technical Report
Monitoring well locations in Tenas Area
Date: Nov 2020
Approved: GF
Figure: 21
W:\AN-SVR\Projects\01_SITES\Telkwa Coal\020_Site-Wide_Data\GIS\Maps\Figure Maps\1CT027_004_Telkwa_EA_Fig20_TenasMW.mxd



\\VAN-SVR01\Projects\01_SITES\Telkwa Coal\020_Site-Wide_Data\GIS\Maps\Figure Maps\1CT027_004_Telkwa_EA_Fig21_GoathornMW.mxd

0 0.25 0.5 1 Kilometers

Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

srk consulting

Job No: 1CT027.004
Filename: Fig22_MW locations in Goathorn Area.pptx

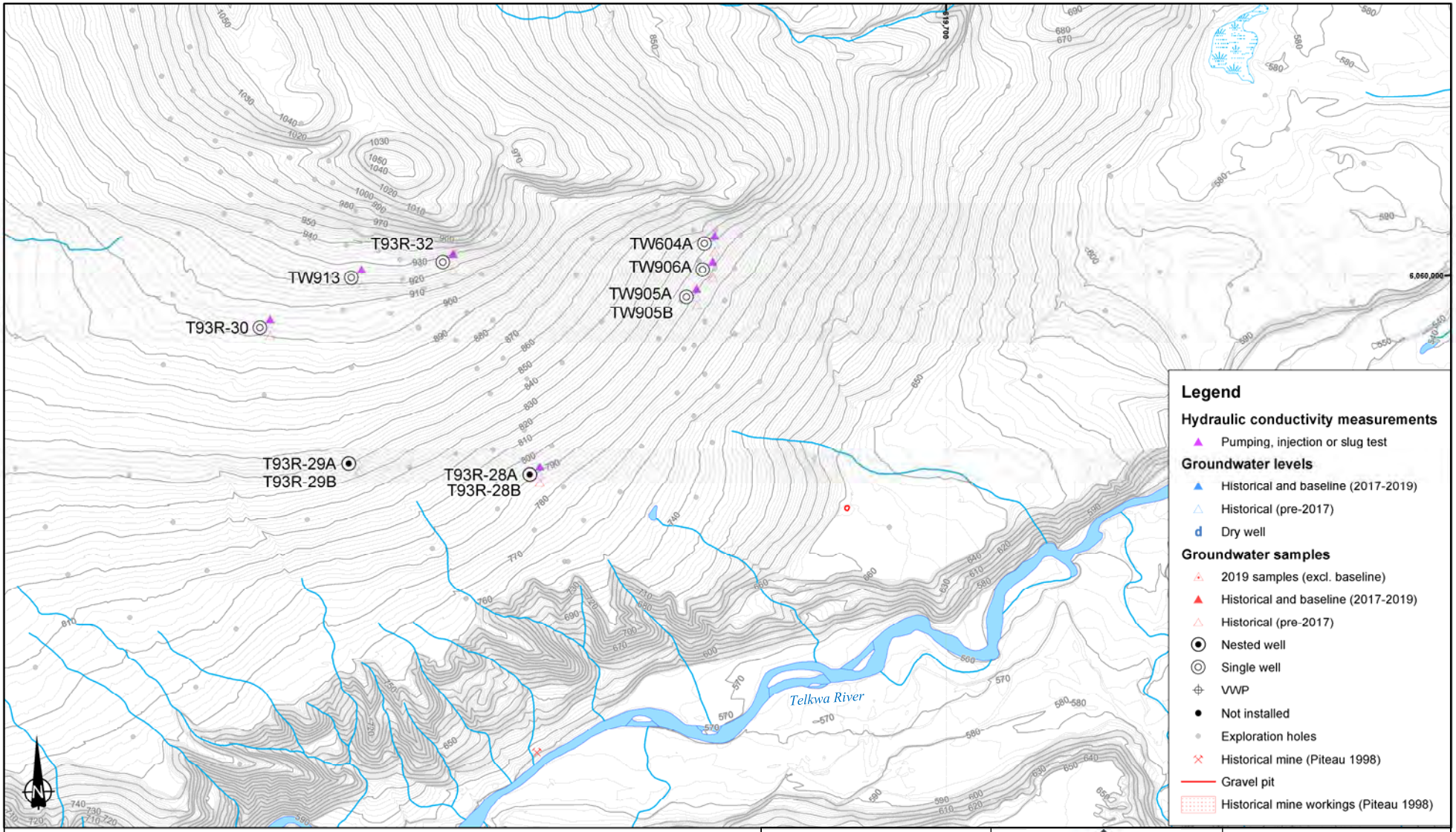
TELKWA COAL LIMITED

Tenas Project

Groundwater Technical Report

Monitoring well locations in Goathorn Area

Date:	Approved:	Figure:
Nov 2020	GF	22



\\VAN-SVR0\Projects\01_SITES\Telkwa Coal\020_Site-Wide_Data\GIS\Maps\Figure Maps\1CT027_004_Telkwa_EA_Fig22_NorthMW.mxd

srk consulting

Job No: 1CT027.004
Filename: Fig23_MW locations in North Area.pptx

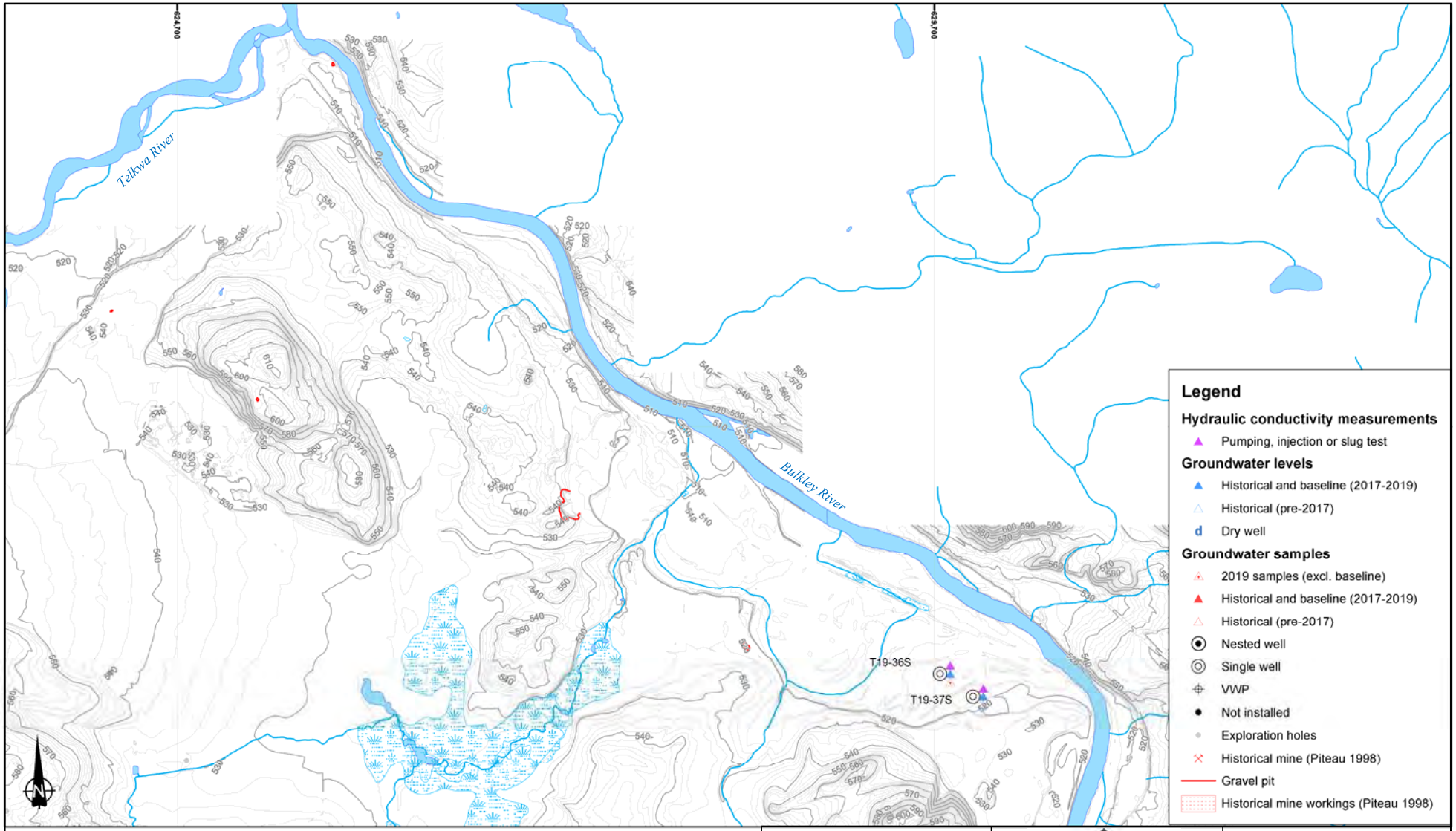
TELKWA COAL LIMITED

Tenas Project

Groundwater Technical Report

Monitoring Well Locations in North Area

Date:	Approved:	Figure:
Nov 2020	GF	23



Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

srk consulting

Job No: 1CT027.004
Filename: Fig24_MW locations in Rail Loadout Area.pptx

TELKWA COAL LIMITED

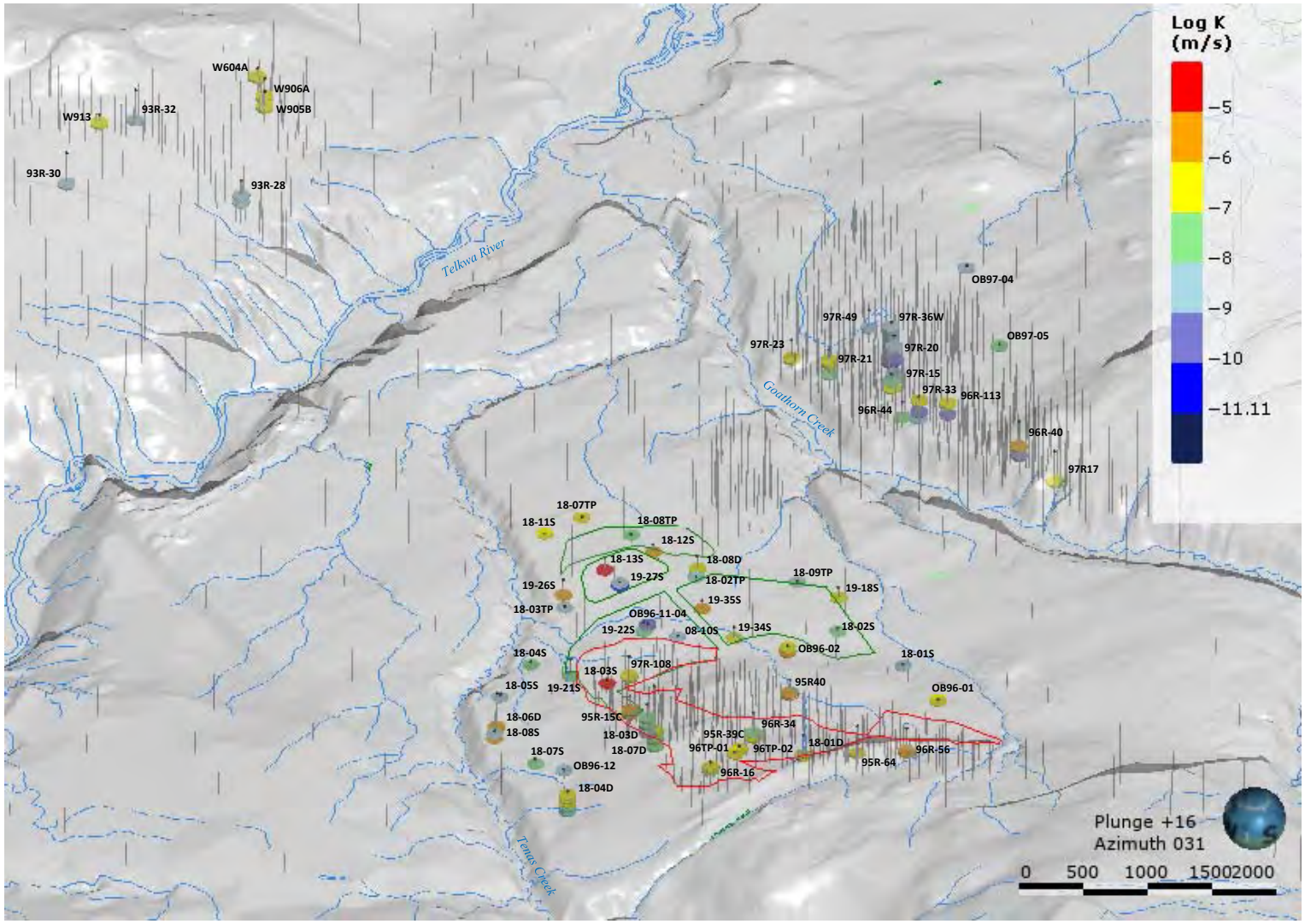
Tenas Project

Groundwater Technical Report

Monitoring Well Locations in Rail Loadout Area

Date:	Approved:	Figure:
Nov 2020	GF	24

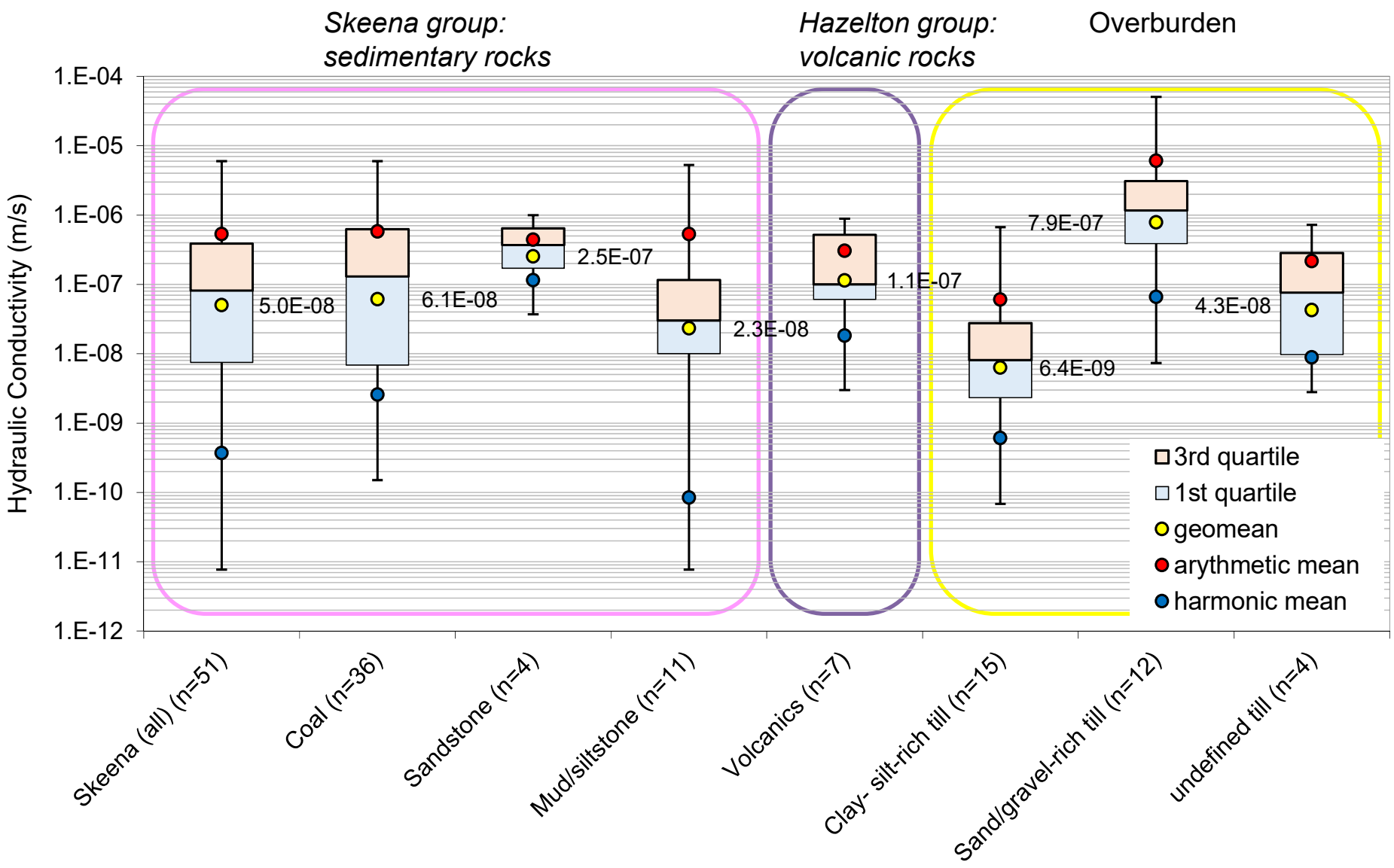
\\VAN-SVR0\Projects\01_SITES\Telkwa Coal\020_Site-Wide_Data\GIS\Maps\Figure Maps\1CT027_004_Telkwa_EA_Fig23_RailLoadoutMW.mxd



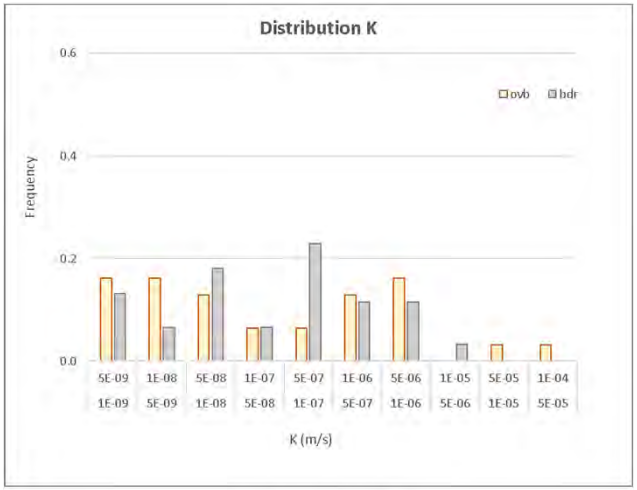
Footprint of the proposed management ponds and control pond

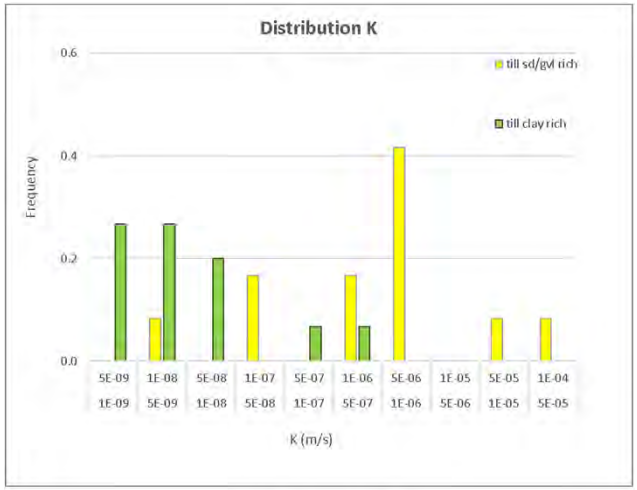
Footprint of the proposed pit

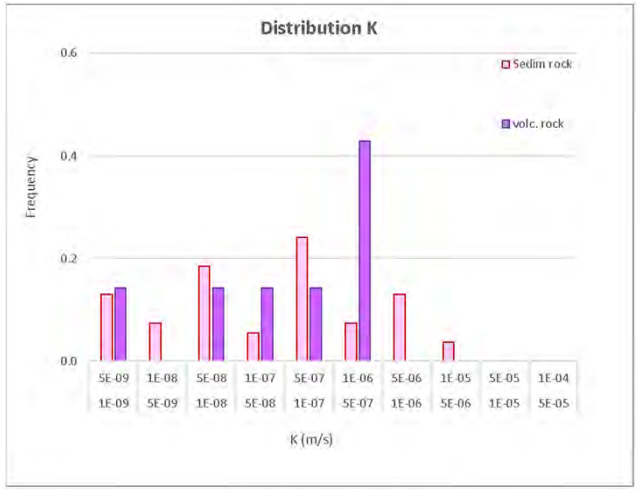
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		3D perspective view of the hydraulic conductivity measurements
Job No: 1CT027.004 Filename: Fig25_3d perspctv K tests.pptx	Tenas Project	Date: Oct 2020 / Approved: GF / Figure: **25**

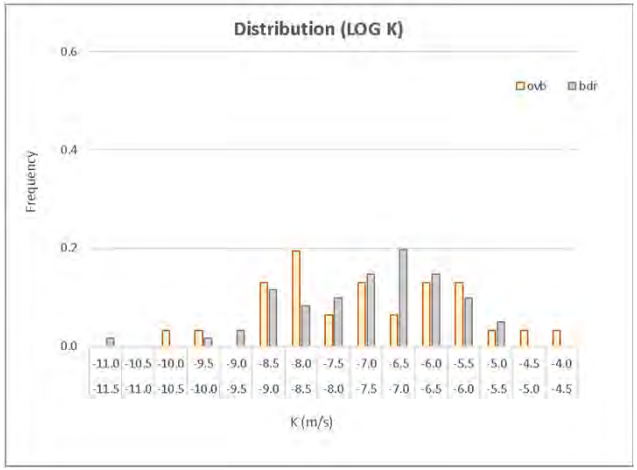


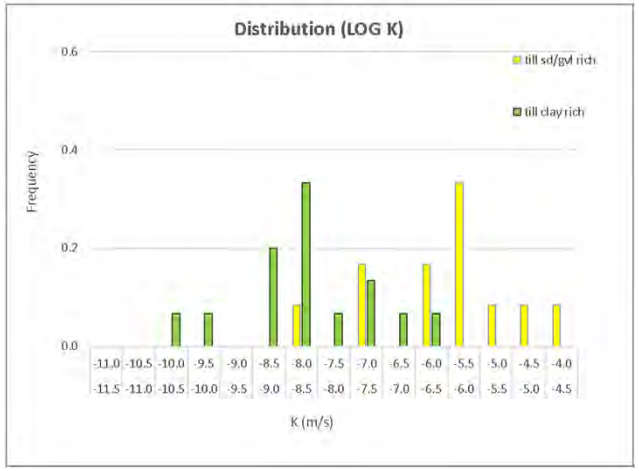
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Box plots of K conductivity measurements by lithology
Job No: 1CT027.004 Filename: Fig26_Box plots of K measurements.pptx	Tenas Project	Date: Oct 2020 | Approved: GF | Figure: **26**

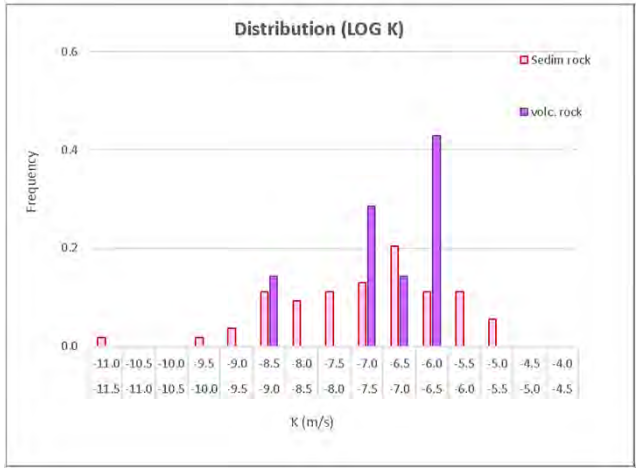






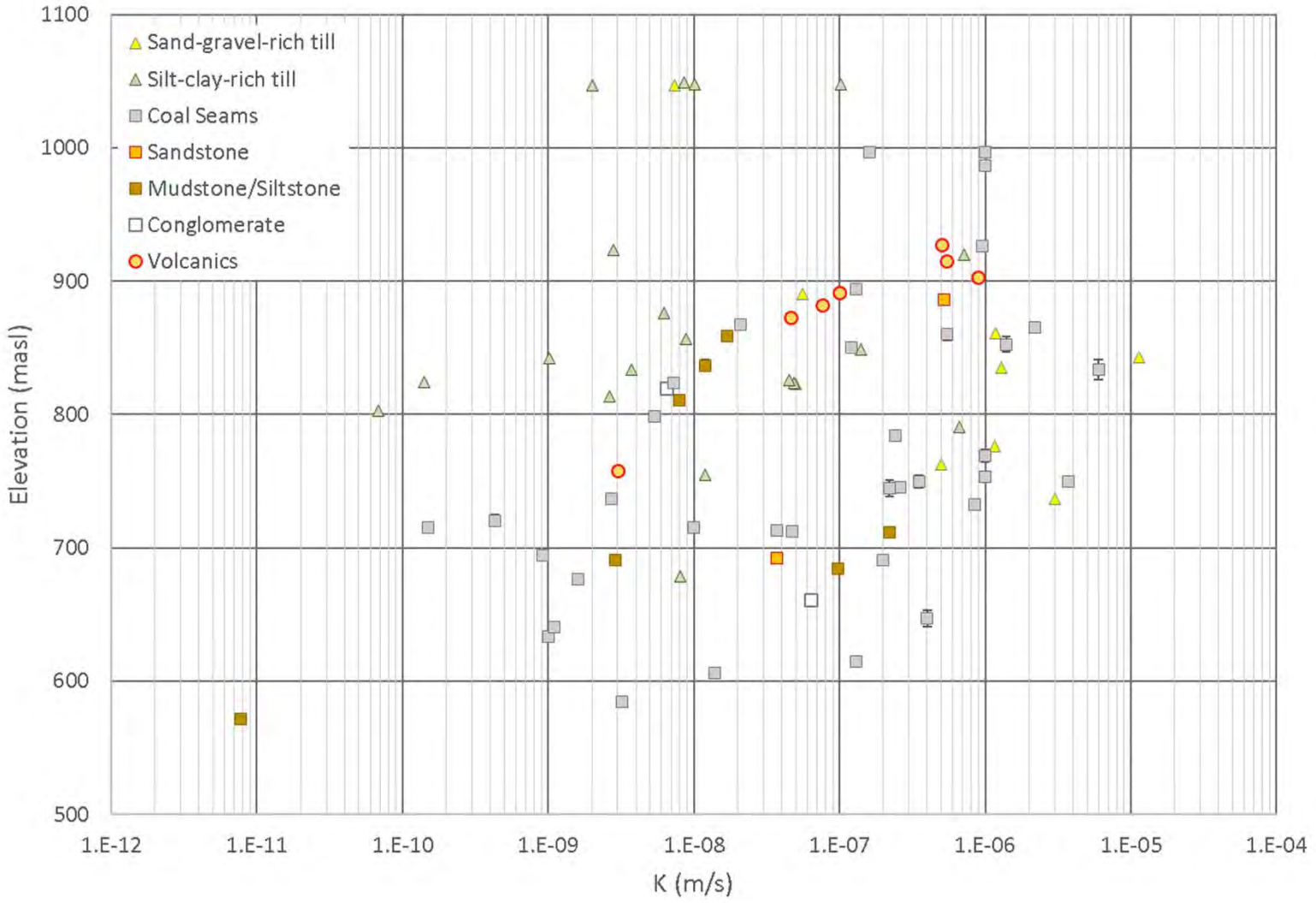




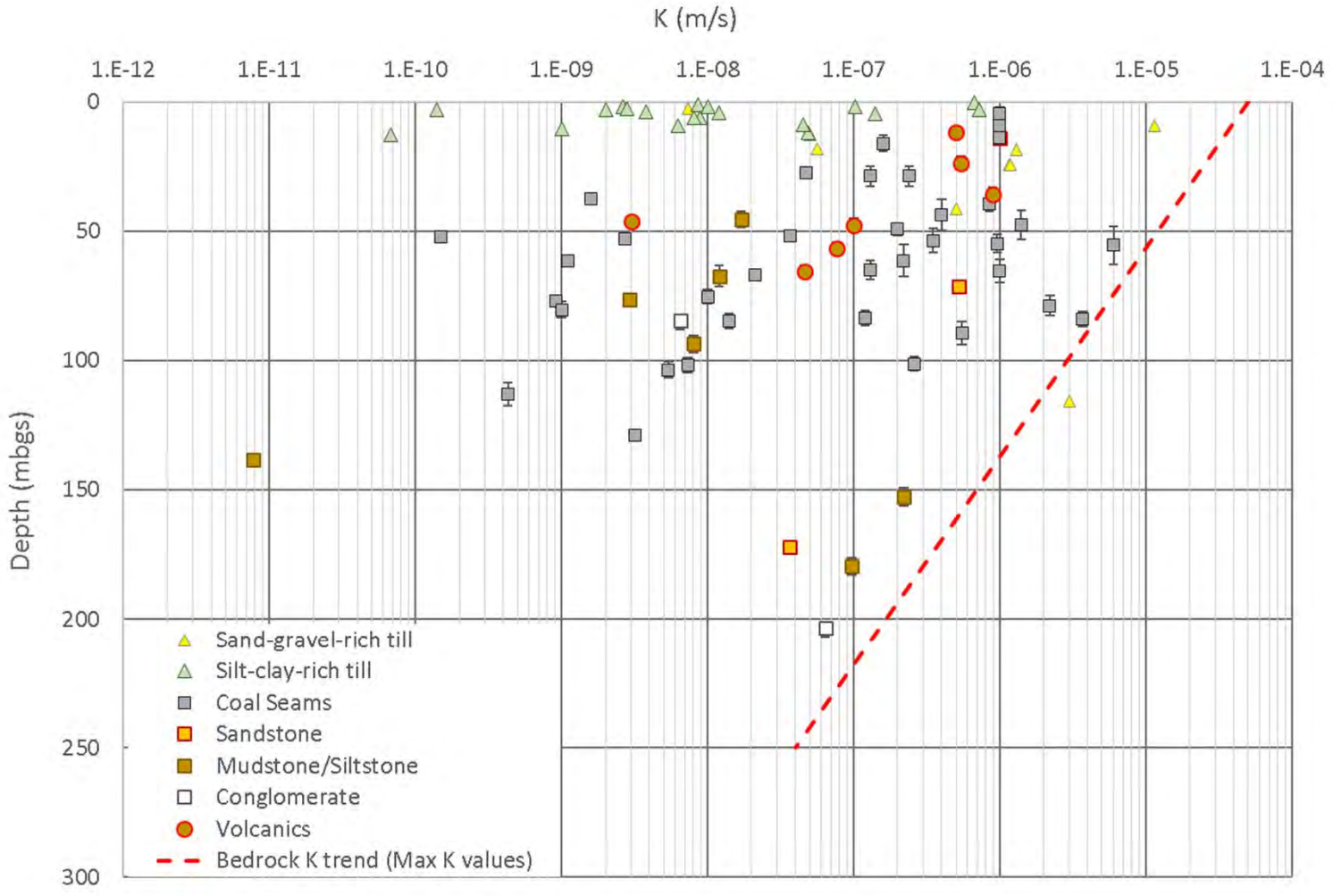


Note:
ovb, overburden.
bdr, bedrock.
till sd/gvl rich, sand-gravel-rich till.
till clay rich, silt-clay rich till.
sedim rock, sedimentary rocks.
volc rock, volcanic rocks.

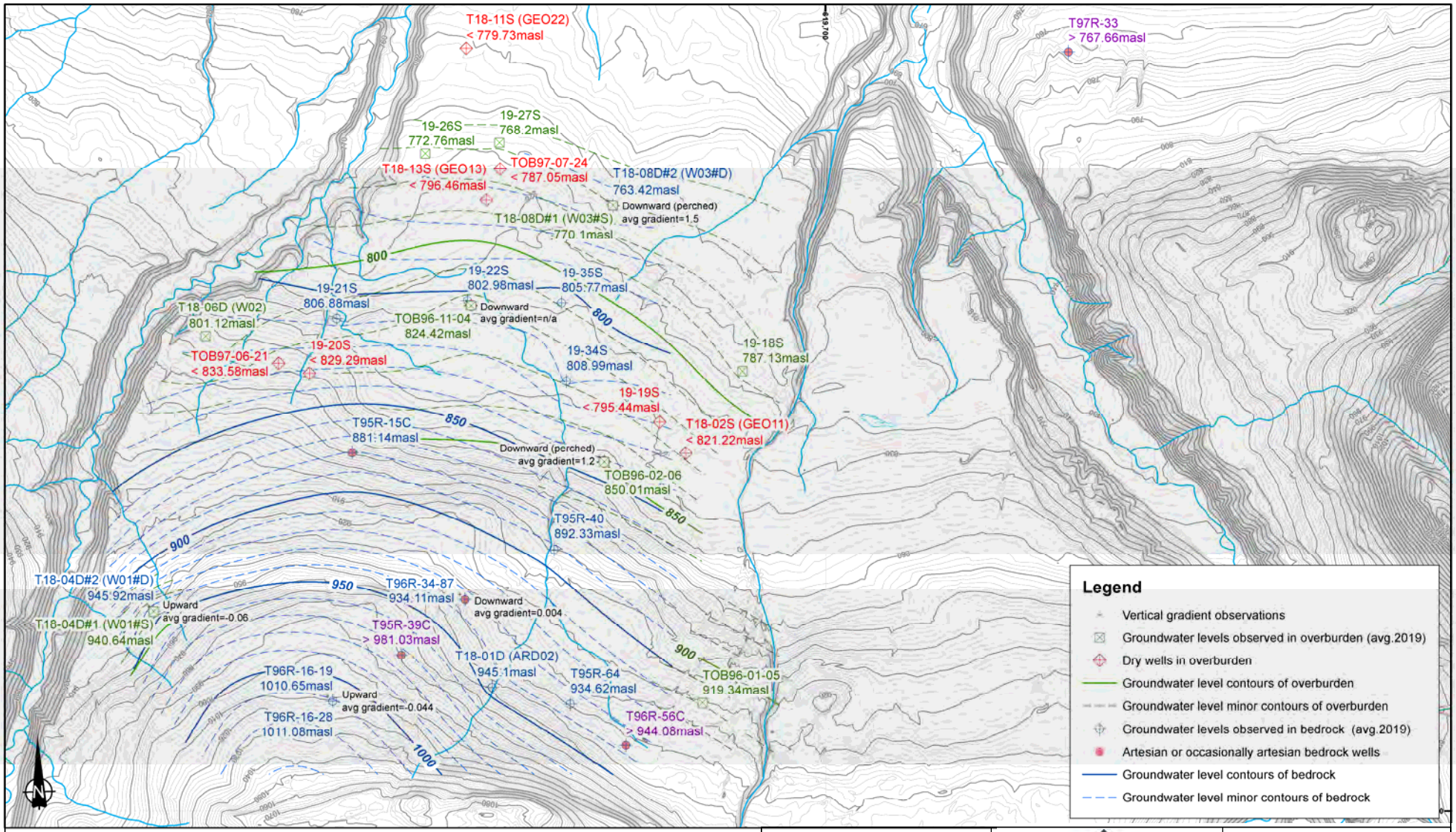
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig27_K distributions.pptx	Tenas Project	**Distribution of K measurements by lithological types**
		Date: Oct 2020 / Approved: GF / Figure: **27**



srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		K versus Elevation (Tenas, Goathorn and North Areas)
Job No: 1CT027.004 Filename: Fig28_KvsZ	Tenas Project	Date: Oct 2020 / Approved: GF / Figure: **28**



srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig29_KvsD	Tenas Project	**K versus Depth (Tenas, Goathorn and North Areas)**
		Date: Oct 2020 | Approved: GF | Figure: **29**



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srk consulting

Job No: 1CT027.004
Filename: Fig30_Groundwater Tenas 2019.pptx

TELKWA COAL LIMITED

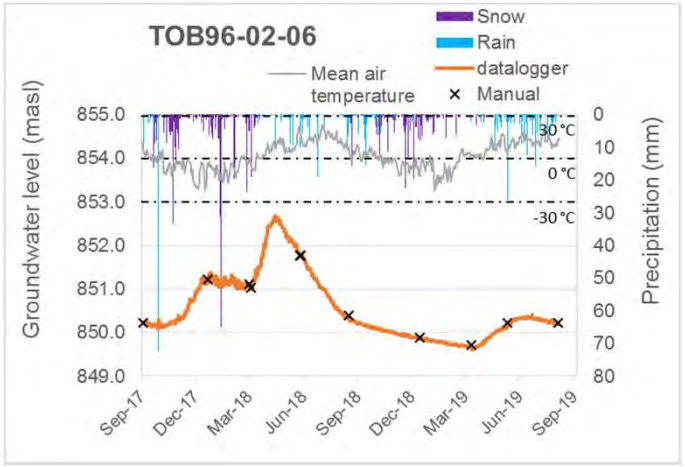
Tenas Project

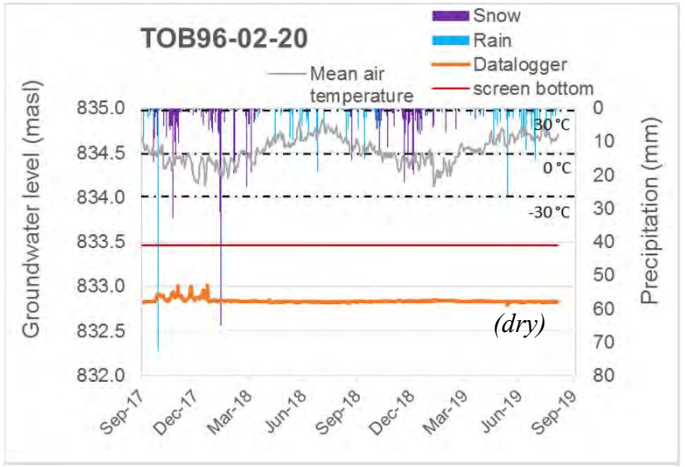
Groundwater Technical Report

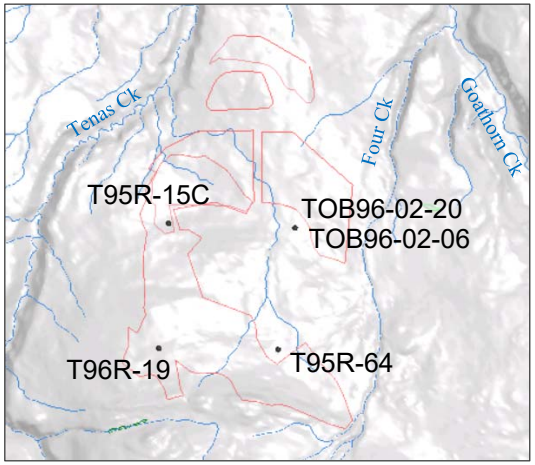
Groundwater tables in overburden and bedrock in the Tenas area

Date:	Approved:	Figure:
Nov 2020	GF	30

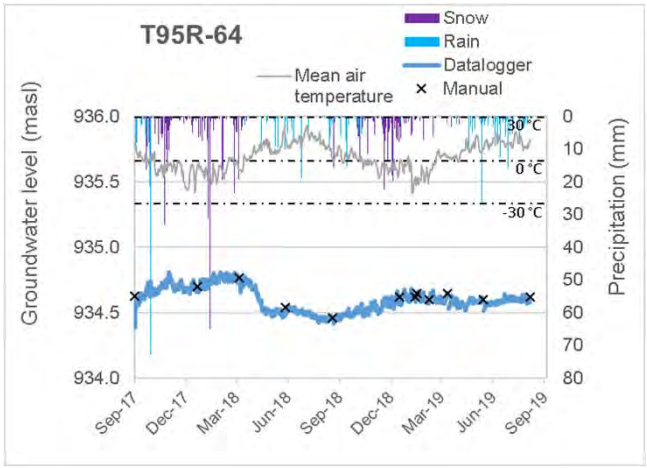
Level observations in overburden

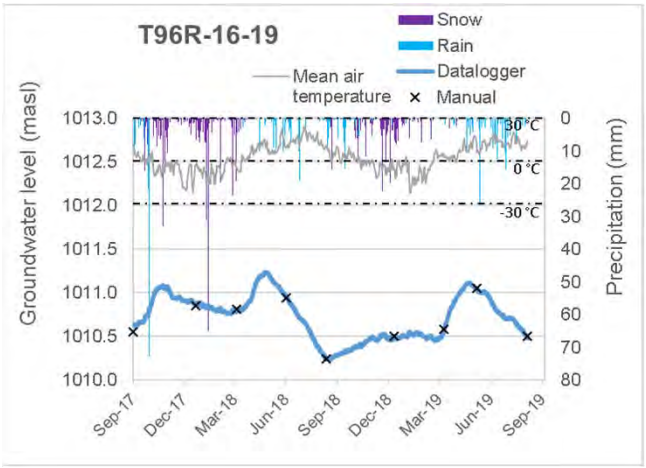


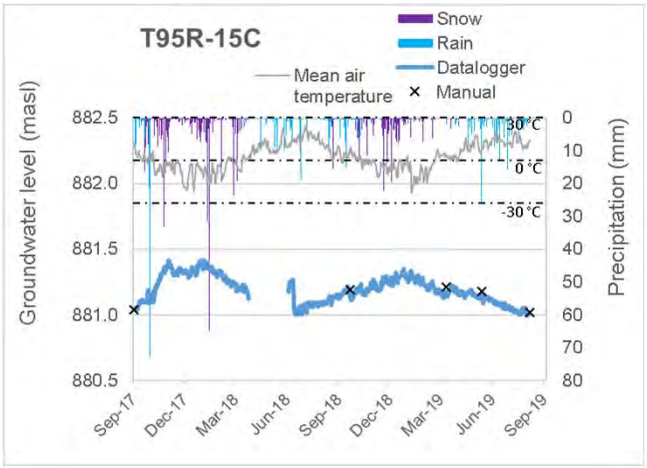




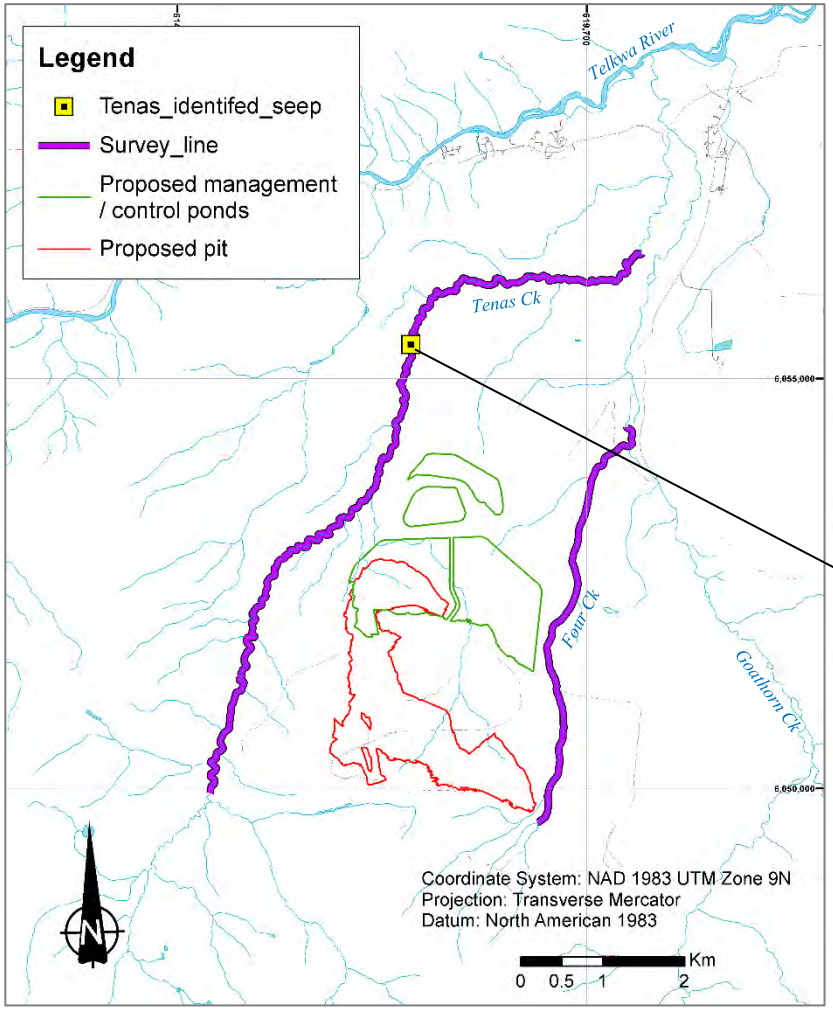
Level observations in bedrock





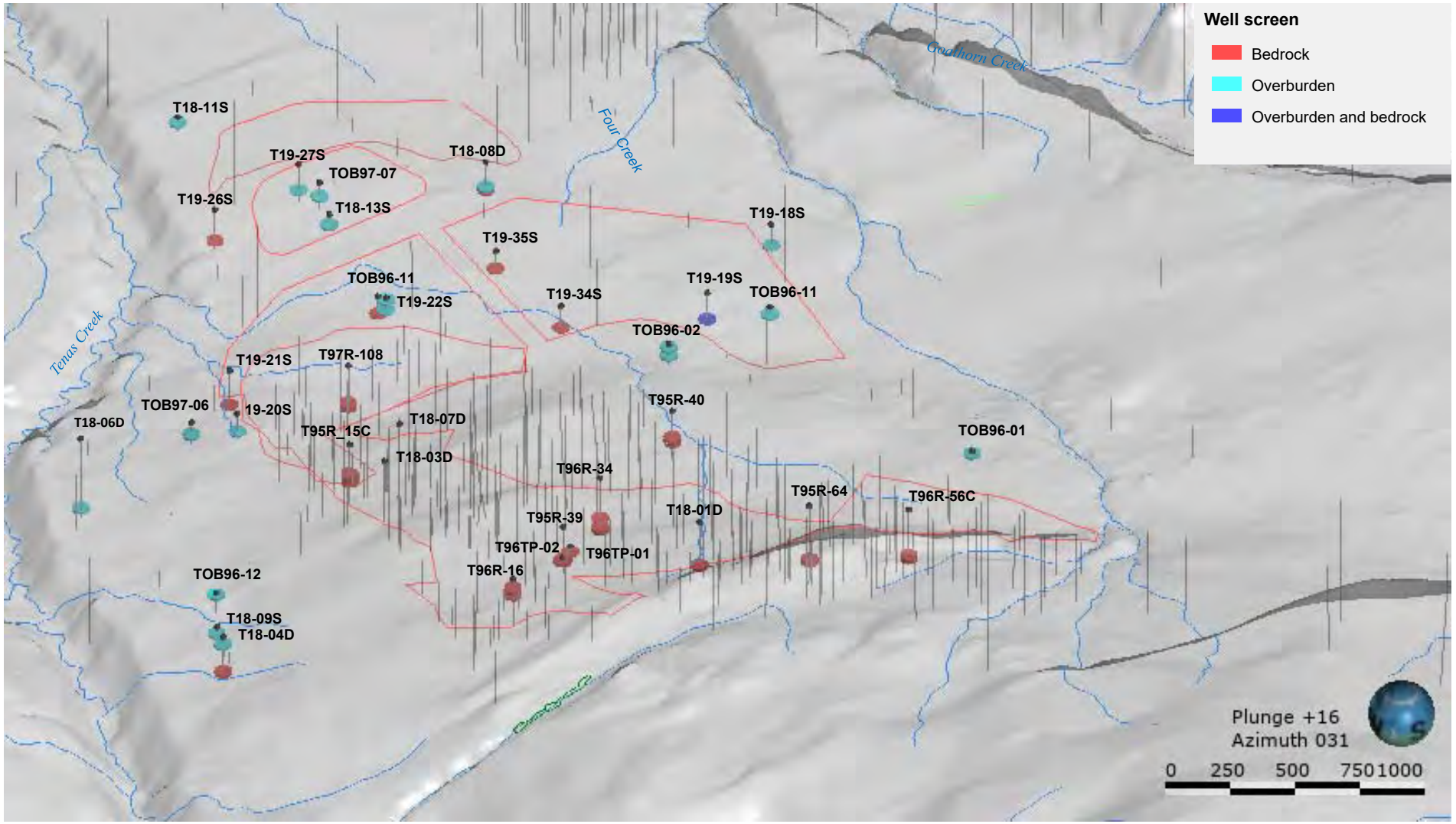


srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig31_SeasonalGWL.pptx	Tenas Project	**Seasonal Groundwater Level Observations**
		Date: Oct 2020 / Approved: GF / Figure: **31**

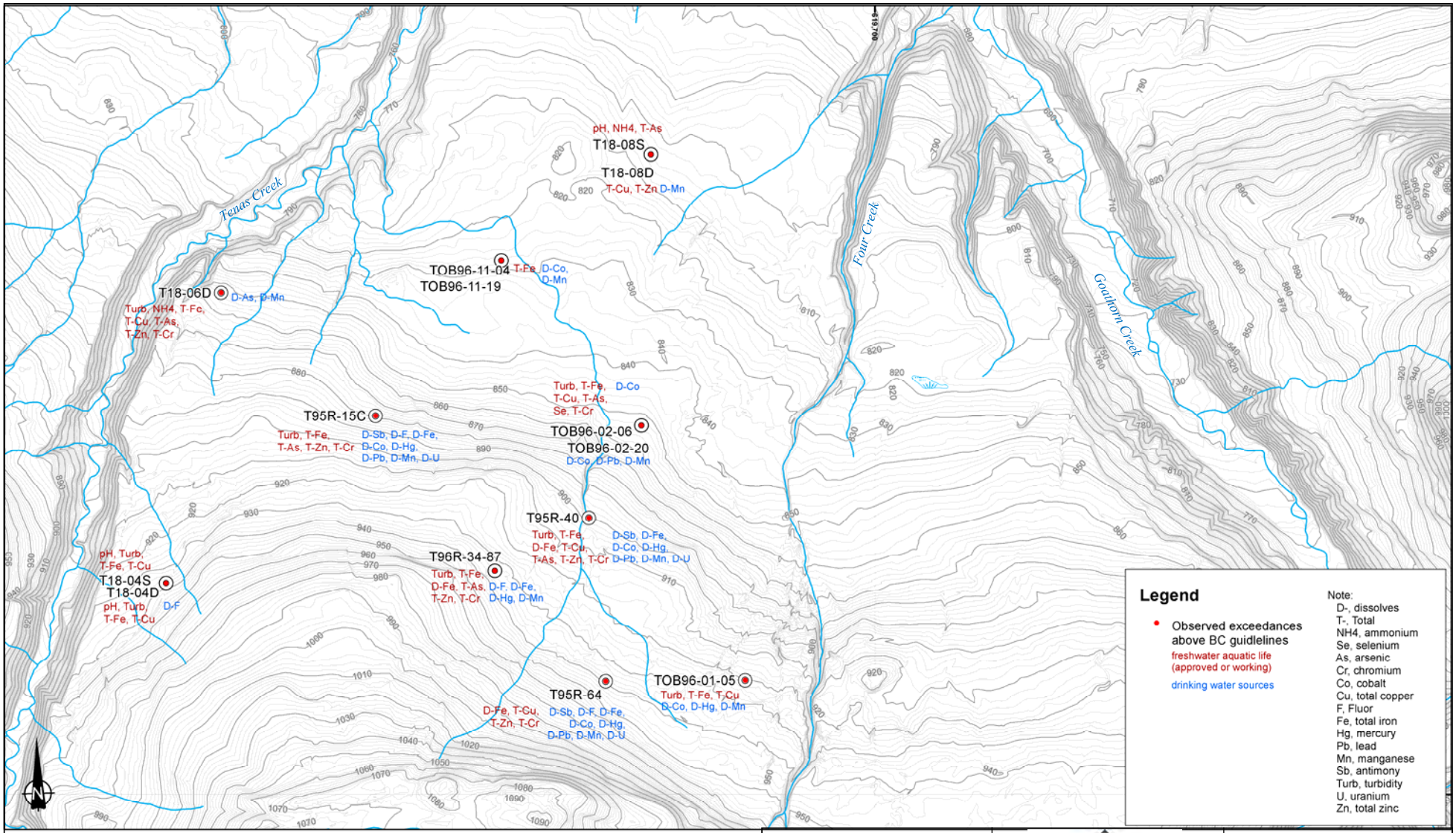


Tenas seep located at E 617555 N6055416.
Photographed on Dec. 15th 2017.

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report		
		Seep survey		
Job No: 1CT027.002 Filename: Fig32_Seep Survey.pptx	Tenas Project	Date: 12 Nov. 2018	Approved: GF	Figure: **32**



srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		3D perspective view of the monitoring well screens
Job No: 1CT027.004 Filename: Fig33_3d perspctv well screen.pptx	Tenas Project	Date: Nov 2020 / Approved: GF / Figure: **33**



Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983

srk consulting

Job No: 1CT027.004
Filename: Fig34_GWQ-Exceedances Tenas Area.pptx

TELKWA COAL LIMITED

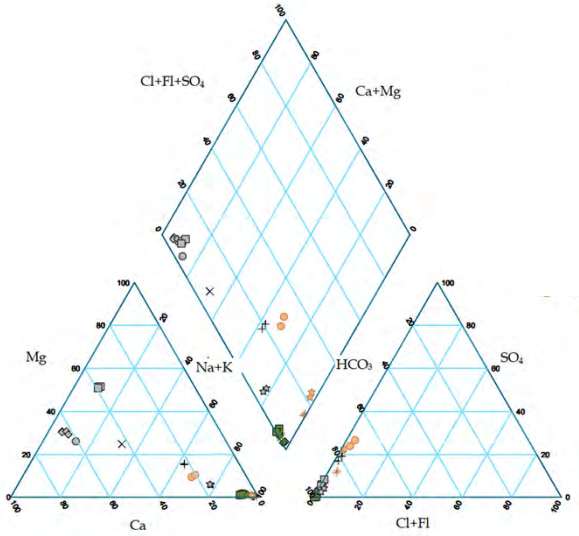
Tenas Project

Groundwater Technical Report

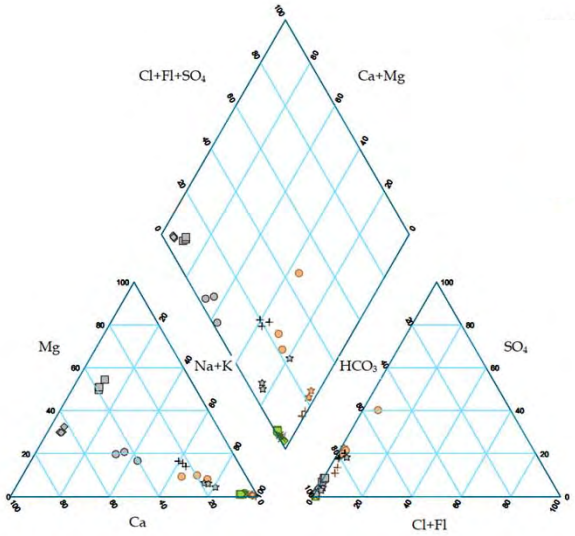
Groundwater quality exceedances observed in the 2020 Tenas baseline data

Date:	Approved:	Figure:
Jan 2021	GF	34

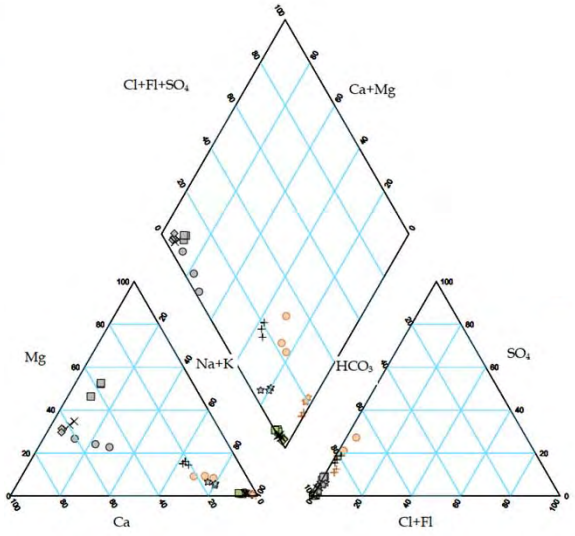
\\VAN-SVR01\Projects\01_SITES\Telkwa Coal\020_Site-Wide_Data\GIS\Maps\Figure Maps\1CT027_004_Telkwa_EA_GWQ Exceedances.mxd



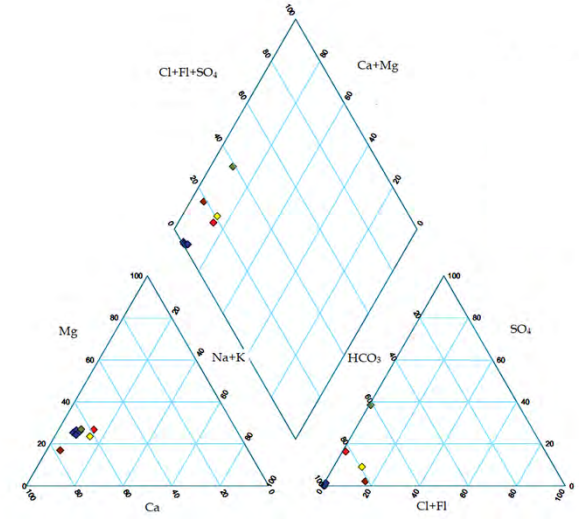
Project wells, September to November Historical, and 2017 to 2019 Baseline Data [1]



Project wells, January and March/April 2018 and 2019 Baseline Data [2]



Project wells, June to August, Historical, and 2017 to 2019 Baseline Data [3]



Residential wells, Yearly average 2019

Project wells

Bedrock Wells	Overburden Wells
T95R-15C	TOB96-01-05
T95R-40	TOB96-02-06
T95R-64	TOB96-11-04
T96R-34-87	W2 (T18-06D)
W1 Deep (T18-04D#2)	W3 Shallow (T18-08D#1)
W1 Shallow (T18-04D#1)	
W3 Deep (T18-08D#2)	

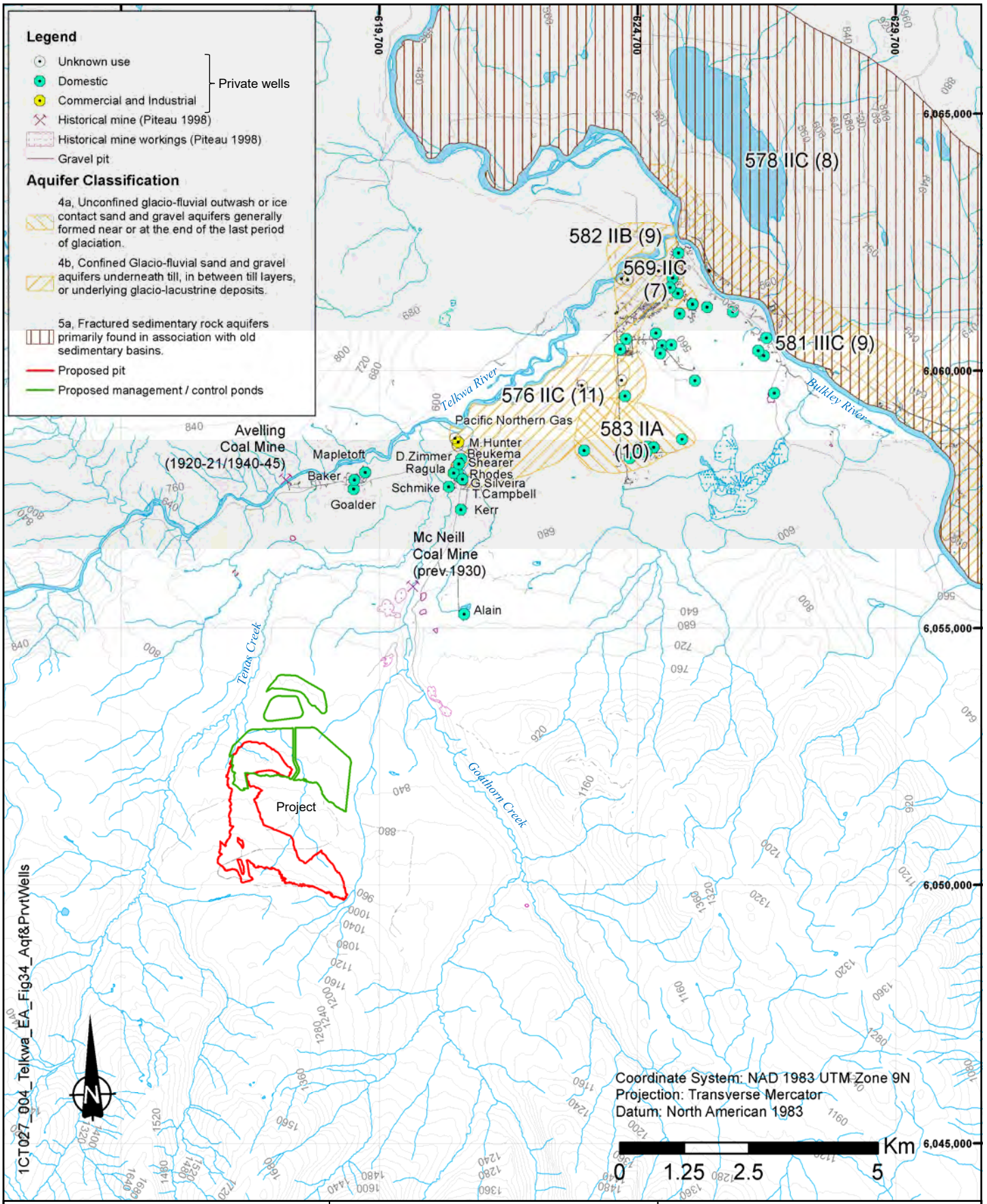
Private domestic wells

- Beukema
- Kerr
- Ragula
- Schmike
- Shearer

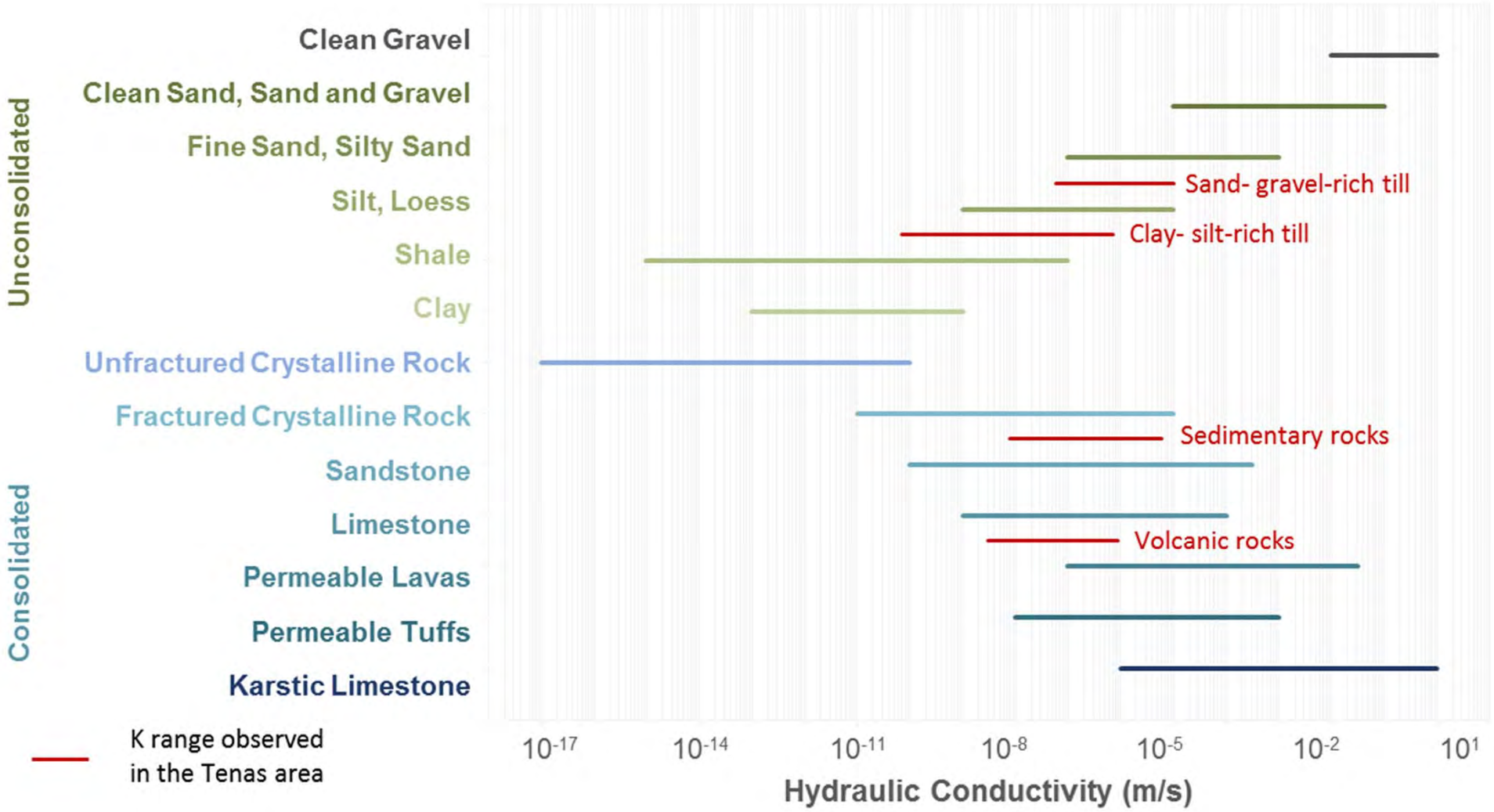
Source: 2017 to 2019 Baseline Report, March 2020. Project #0403488. Cassiar geosciences and ERM (2020)

Notes:
[1] Data from October 1995, September and October 1996, November 2016, September 2017, September 2018, and November 2019.
[2] Date from January 2018, March/April 2018, January 2019, and March/April 2019.
[3] Data from August 1997, August 2017, June 2018, June 2019, and August 2019.

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Piper plots of the groundwater quality at Project wells, and residential wells
Job No: 1CT027.004 Filename: Fig35_GWQ diagram.pptx	Tenas Project	Date: Nov 2020 / Approved: GF / Figure: 35

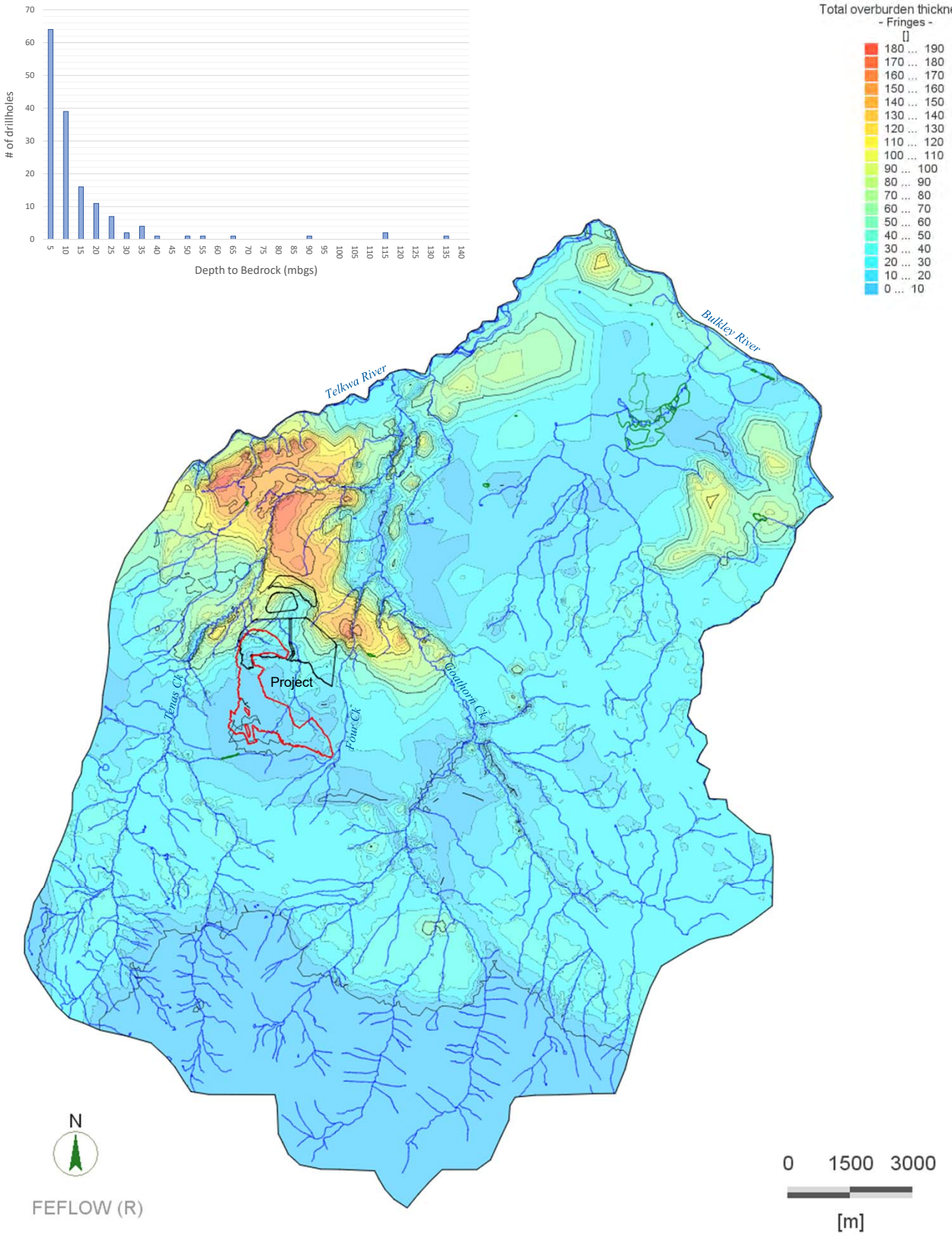


srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Aquifers and private wells
Job No: 1CT027.004 Filename: Fig36_Aqf&PrvtWells.pptx	Tenas Project	Date: Oct 2020 | Approved: GF | Figure: **36**



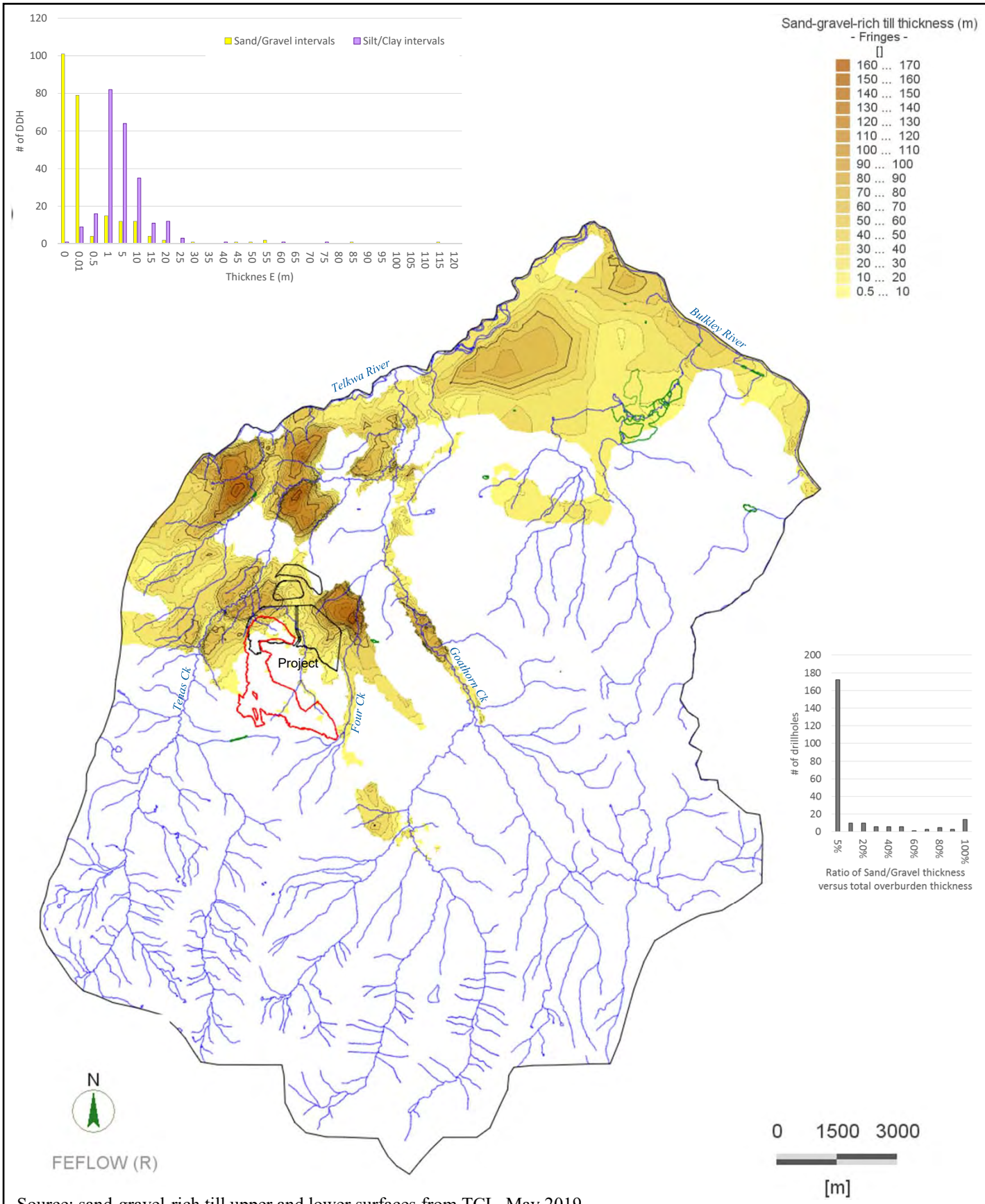
Source K range: Beale G, and J Reed. 2013. Guidelines for evaluating water in pit slope stability. CSIRO Publishing, Collingwood, Australia. 600 p.

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report		
		Comparison of Telkwa K values to other hydrostratigraphic units		
Job No: 1CT027.004 Filename: Fig37_Compar_K_Other_Hydrostrat.pptx	Tenas Project	Date: Nov 2020	Approved: GF	Figure: **37**



Source: overburden contact surfaced from TCL, May 2019

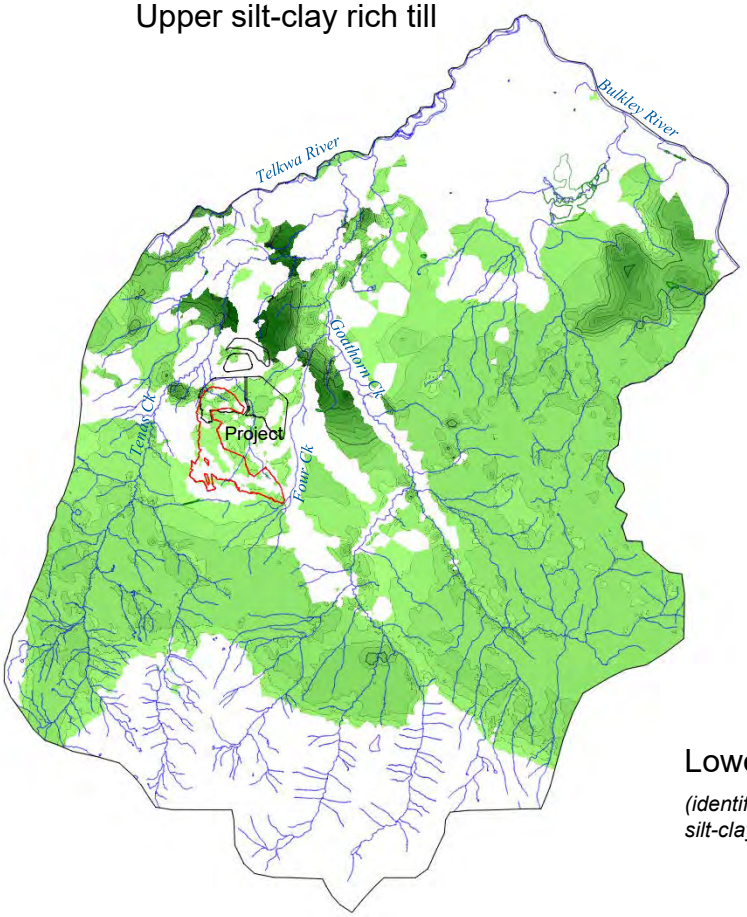
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report		
		Total modelled thickness of the overburden		
Job No: 1CT027.004 Filename: Fig38_ThckOVB.pptx	Tenas Project	Date: Dec 2020	Approved: GF	Figure: **38**



Source: sand-gravel-rich till upper and lower surfaces from TCL, May 2019

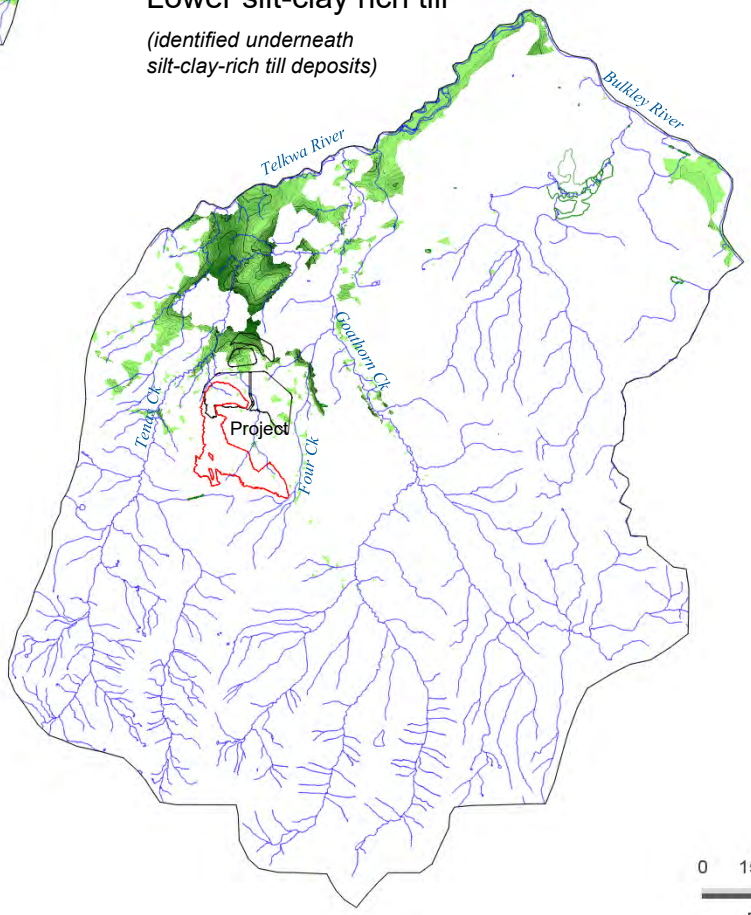
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Modelled thickness of the sand-gravel-rich till
Job No: 1CT027.004 Filename: Fig39_ThckSdGvl.pptx	Tenas Project	Date: Dec 2020 | Approved: GF | Figure: **39**

Upper silt-clay rich till



Lower silt-clay rich till

(identified underneath silt-clay-rich till deposits)



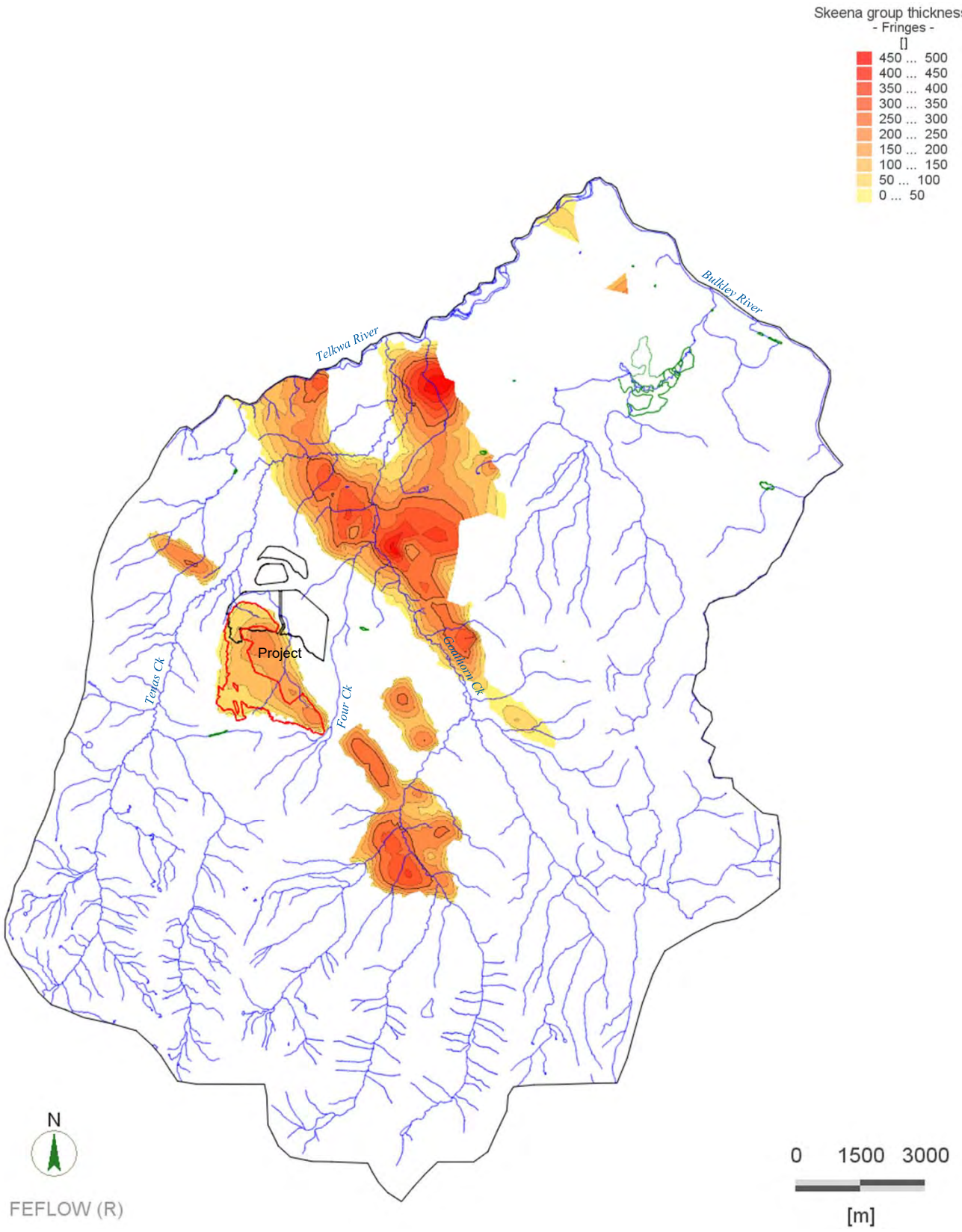
FEFLOW (R)

0 1500 3000

[m]

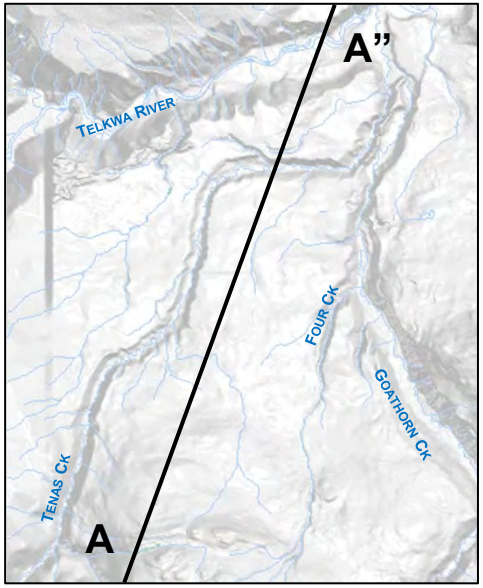
Source: silt-clay-rich till upper and lower surfaces from TCL, May 2019

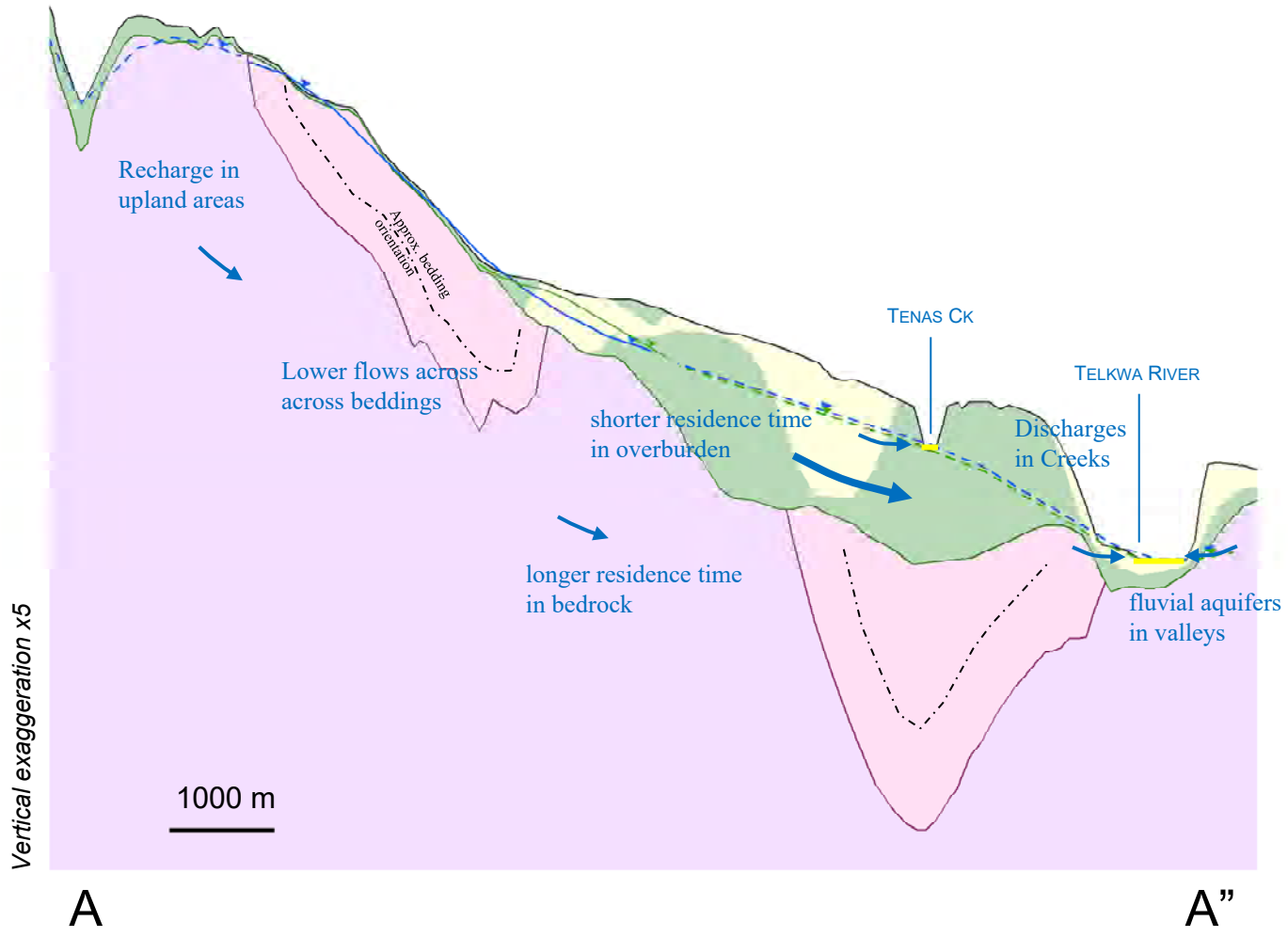
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report		
		Modelled thickness of the silt-clay-rich till		
Job No: 1CT027.004 Filename: Fig40_ThckOVB.pptx	Tenas Project	Date: Dec 2020	Approved: GF	Figure: **40**



Source: Interpolation based on geological maps, digitized plan view geological maps and vertical cross sections from TCL and MEMPR 1991

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report		
		Modelled thickness of the sedimentary rocks (Skeena group)		
Job No: 1CT027.004 Filename: Fig41_ThckSKN.pptx	Tenas Project	Date: Dec 2020	Approved: GF	Figure: **41**

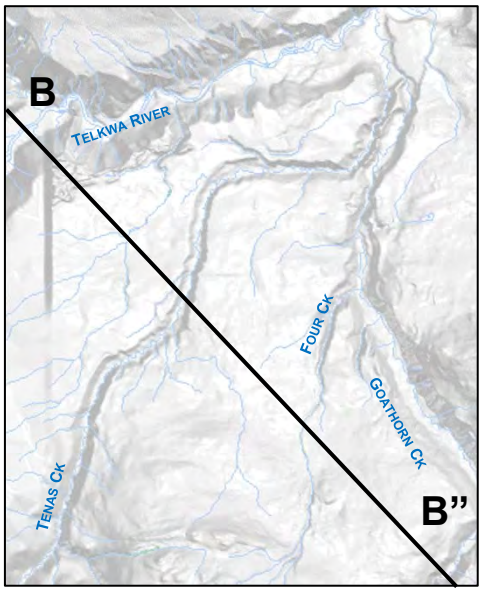


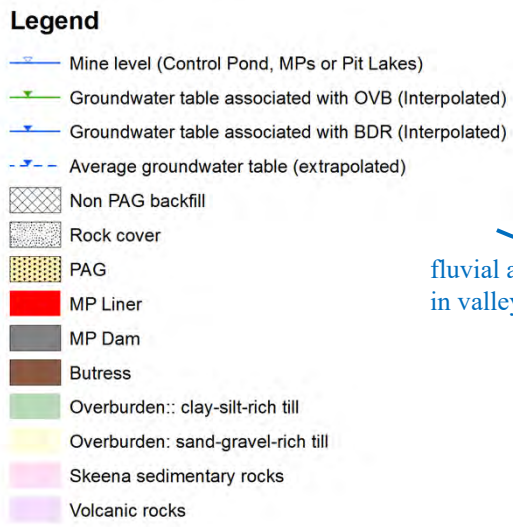


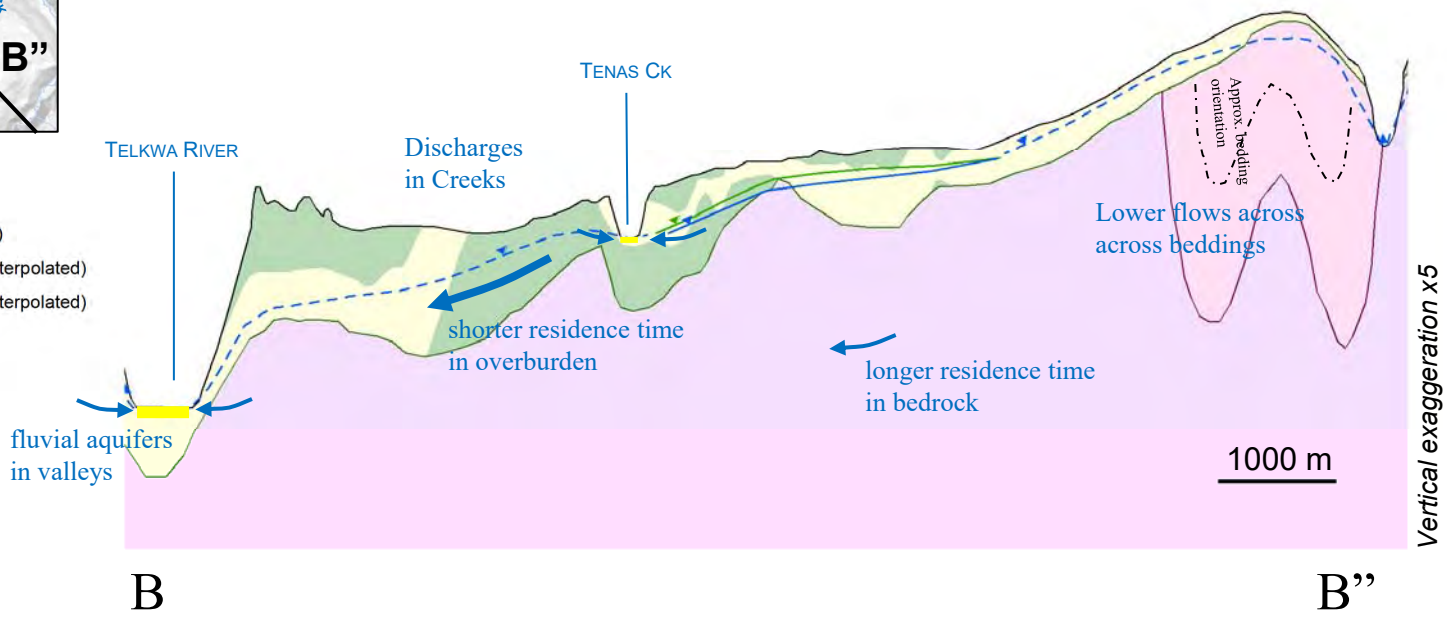
Legend

- Mine level (Control Pond, MPs or Pit Lakes)
- Groundwater table associated with OVB (Interpolated)
- Groundwater table associated with BDR (Interpolated)
- Average groundwater table (extrapolated)
- Non PAG backfill
- Rock cover
- PAG
- MP Liner
- MP Dam
- Butress
- Overburden:: clay-silt-rich till
- Overburden: sand-gravel-rich till
- Skeena sedimentary rocks
- Volcanic rocks

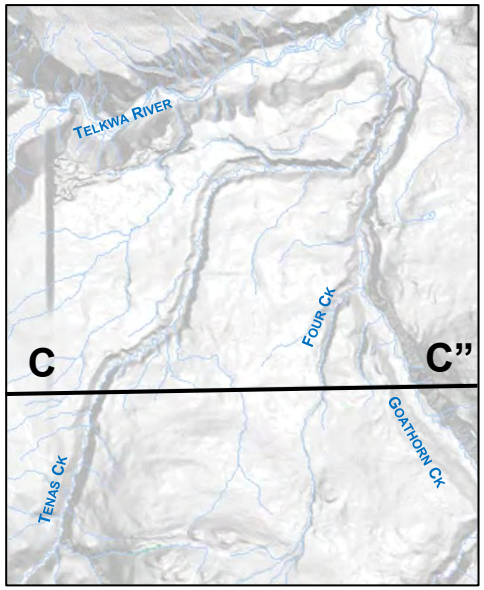
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section AA” Baseline**
		Date: Dec.2020 / Approved: GF / Figure: **42**





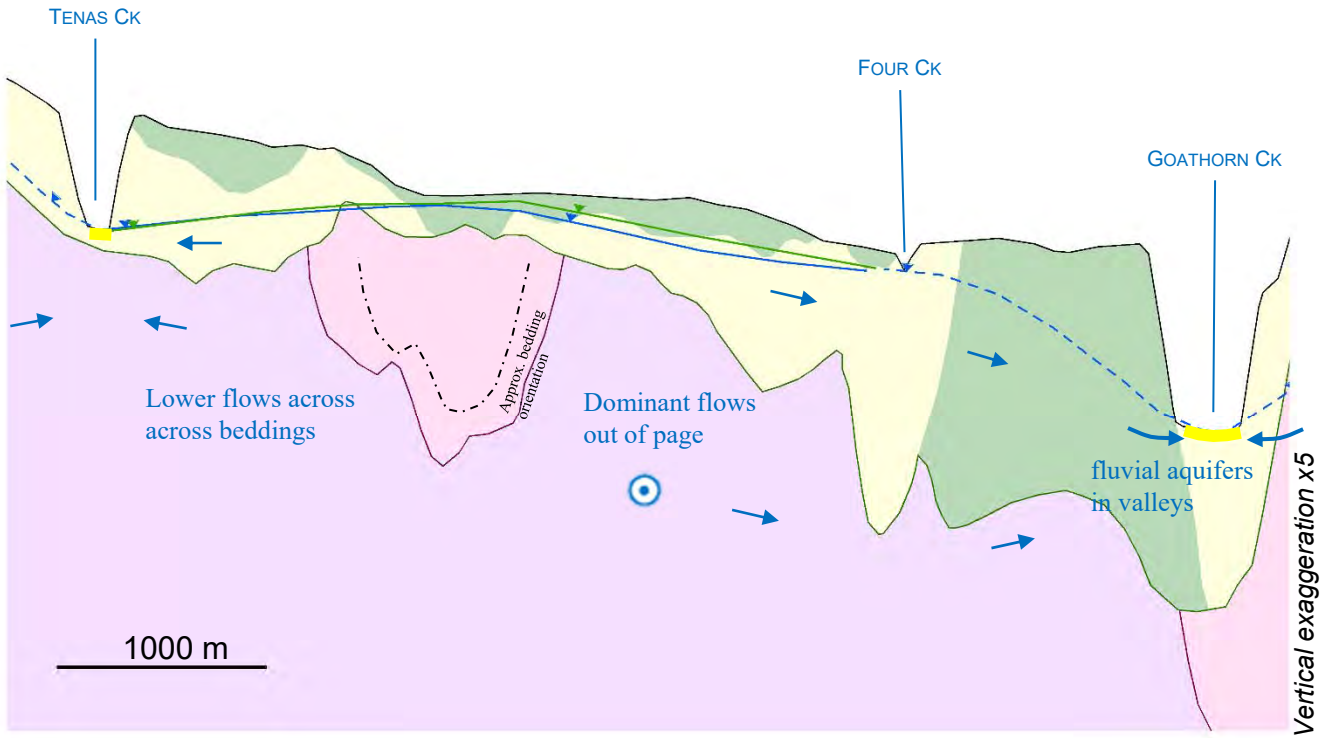


srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section BB” Baseline**
		Date: Dec.2020 / Approved: GF / Figure: **43**

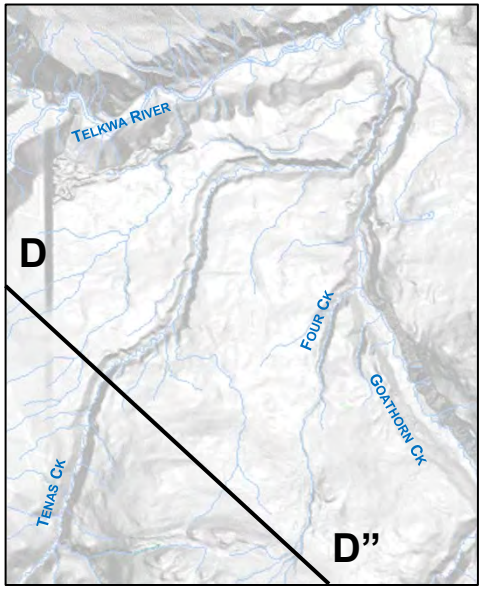


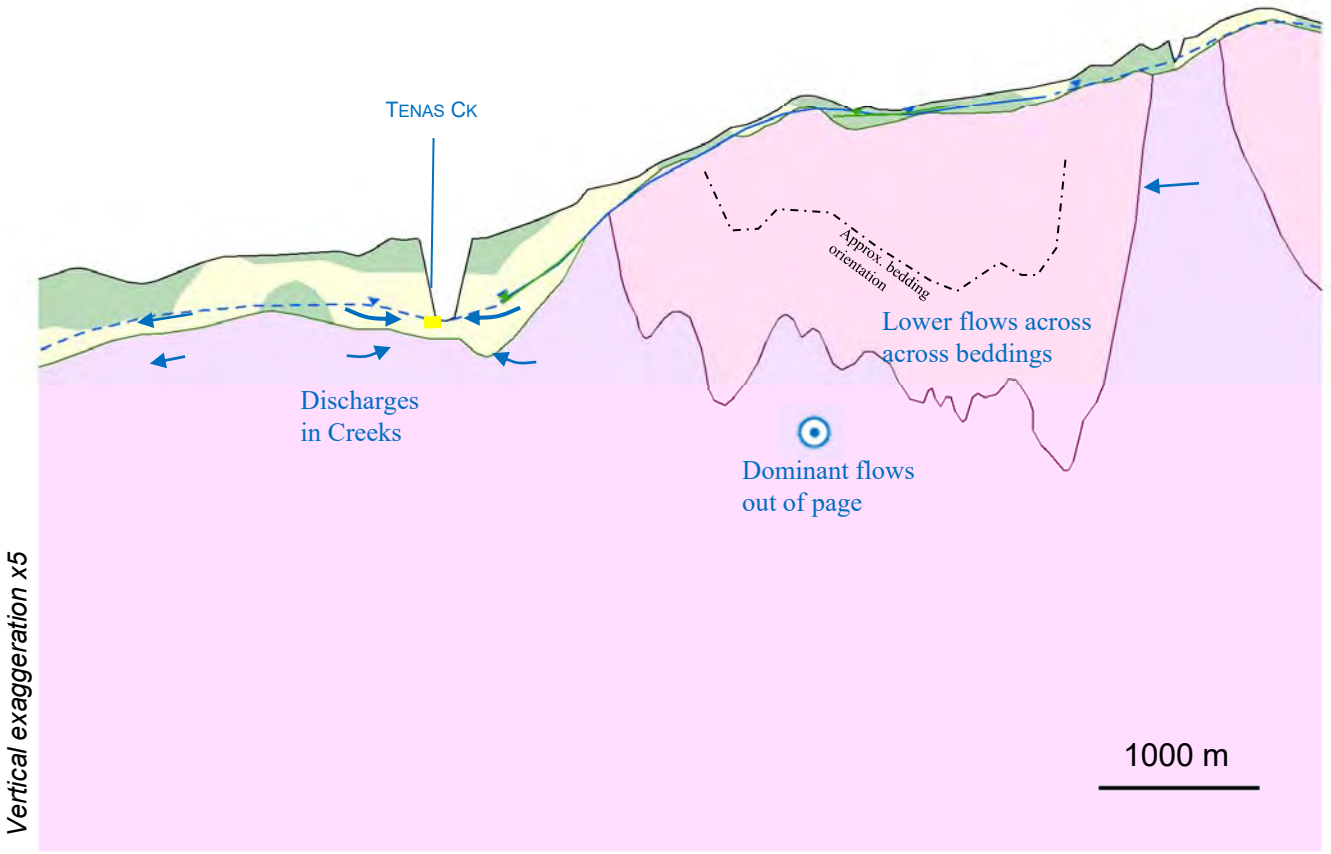
Legend

- Mine level (Control Pond, MPs or Pit Lakes)
- Groundwater table associated with OVB (Interpolated)
- Groundwater table associated with BDR (Interpolated)
- Average groundwater table (extrapolated)
- Non PAG backfill
- Rock cover
- PAG
- MP Liner
- MP Dam
- Butress
- Overburden:: clay-silt-rich till
- Overburden: sand-gravel-rich till
- Skeena sedimentary rocks
- Volcanic rocks



srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section CC” Baseline**
		Date: Dec.2020 / Approved: GF / Figure: **44**





Legend

- Mine level (Control Pond, MPs or Pit Lakes)
- Groundwater table associated with OVB (Interpolated)
- Groundwater table associated with BDR (Interpolated)
- Average groundwater table (extrapolated)
- Non PAG backfill
- Rock cover
- PAG
- MP Liner
- MP Dam
- Butress
- Overburden:: clay-silt-rich till
- Overburden: sand-gravel-rich till
- Skeena sedimentary rocks
- Volcanic rocks

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TELKWA COAL LIMITED

Groundwater Technical Report

Conceptual Cross Section DD” Baseline

Job No: 1CT027.004

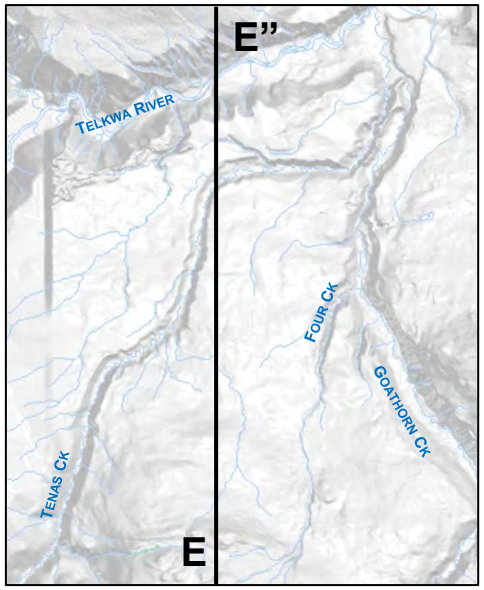
Filename: Fig42to51_ConceptualCrossX.pptx

Tenas Project

Date: Dec.2020

Approved: GF

Figure: **45**



Legend

- Mine level (Control Pond, MPs or Pit Lakes)
- Groundwater table associated with OVB (Interpolated)
- Groundwater table associated with BDR (Interpolated)
- Average groundwater table (extrapolated)
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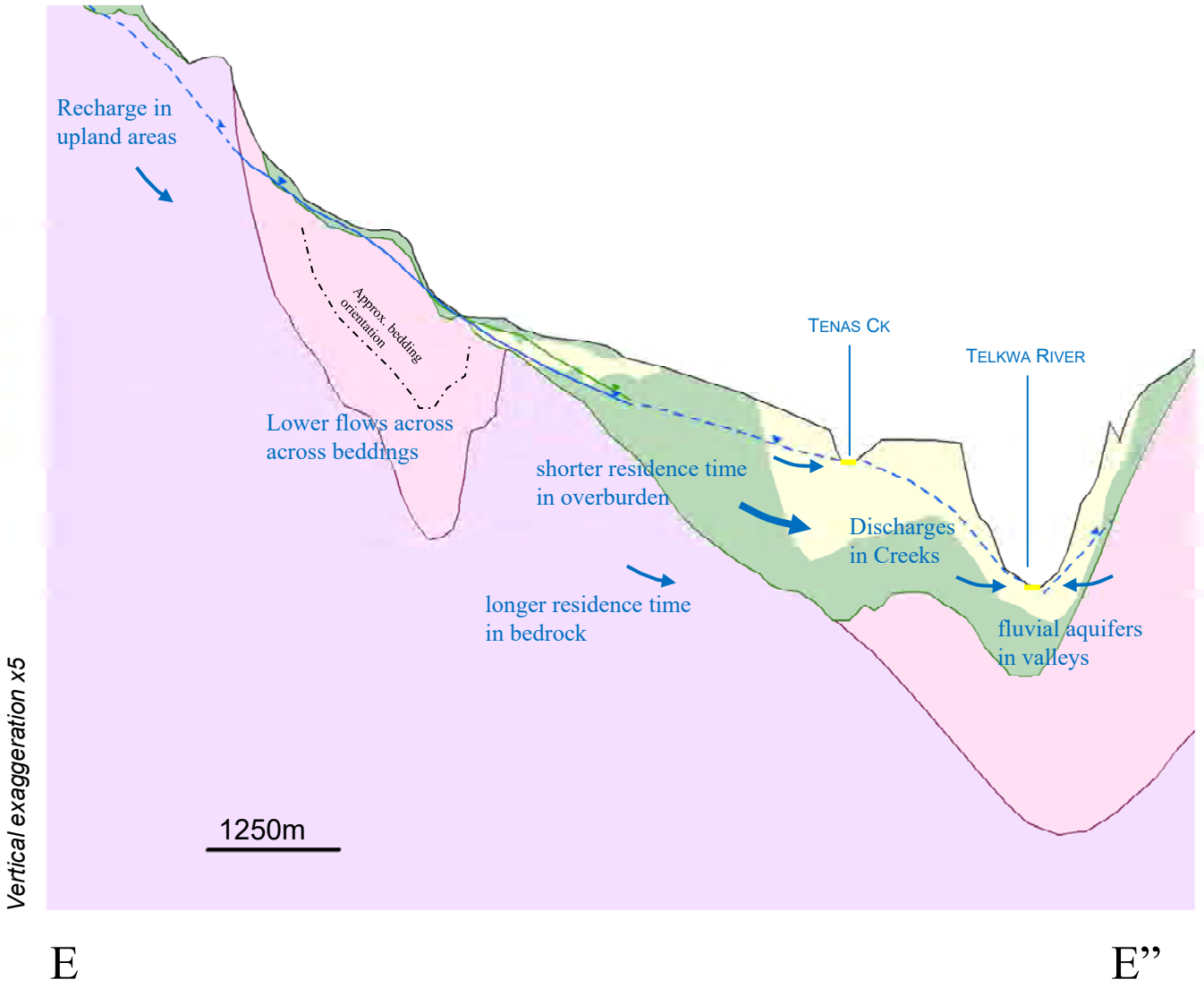
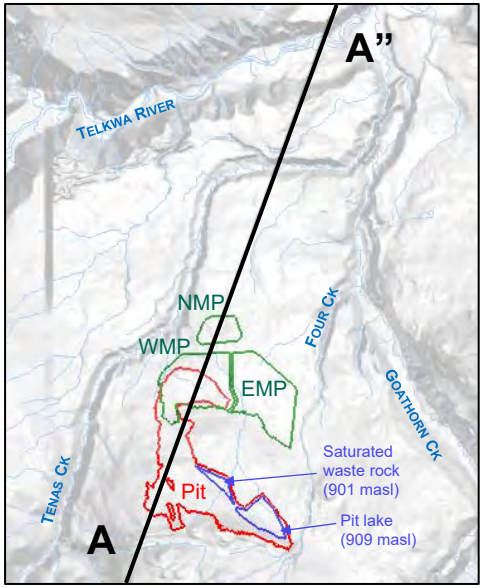
- MP Liner
- MP Dam
- Butress
- Overburden:: clay-silt-rich till
- Overburden: sand-gravel-rich till
- Skeena sedimentary rocks
- Volcanic rocks



srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section EE” Baseline** Date: Dec.2020 · Approved: GF · Figure: **46**



Legend

- Mine level (Control Pond, MPs or Pit Lakes)
- Groundwater table associated with OVB (Interpolated)
- Groundwater table associated with BDR (Interpolated)
- Average groundwater table (extrapolated)
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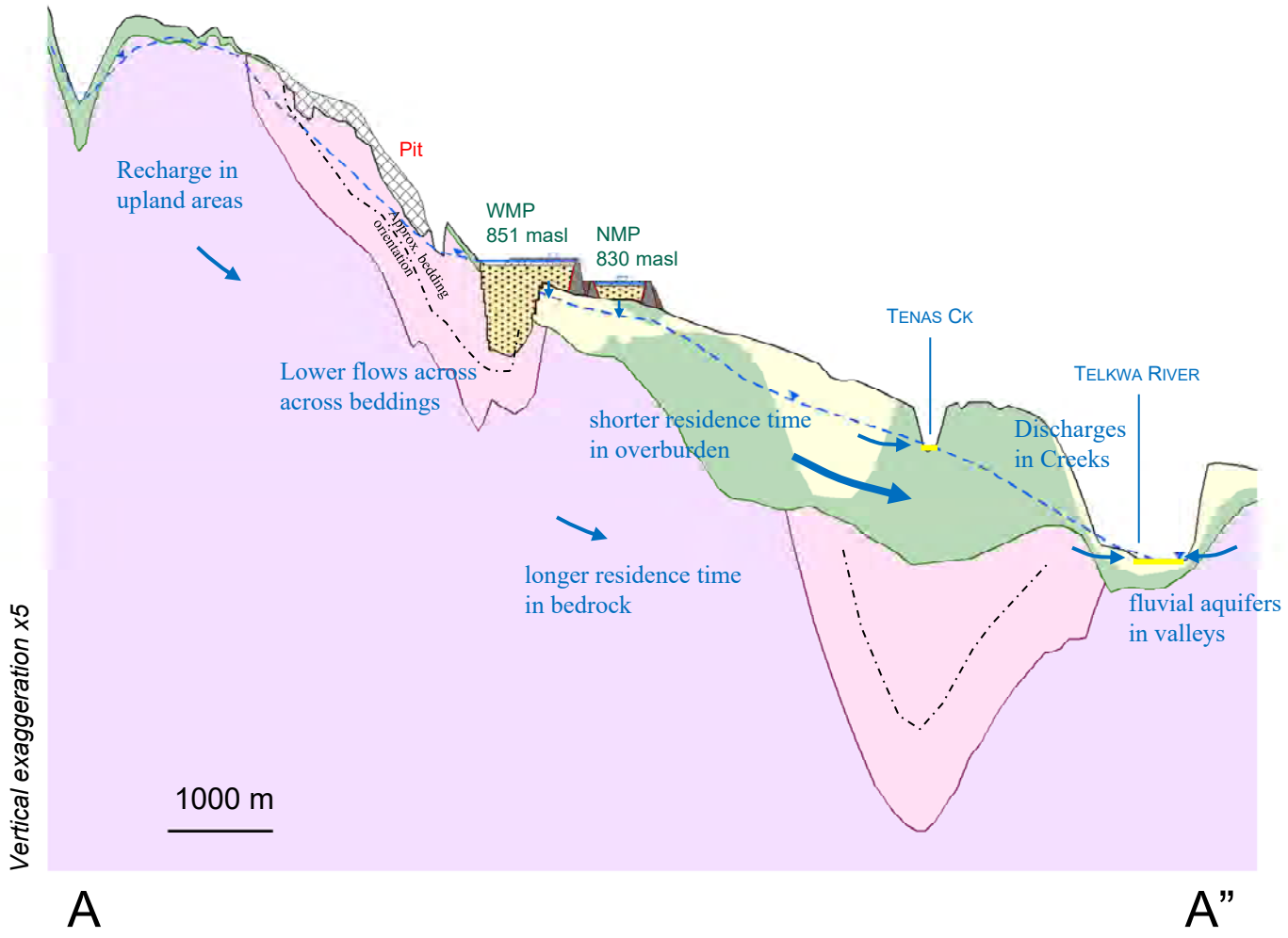
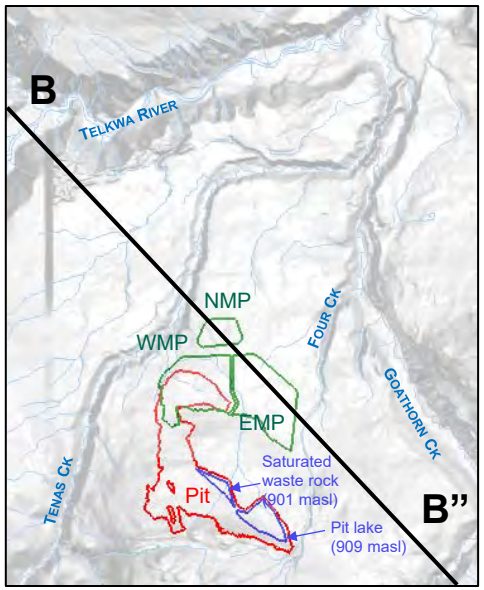
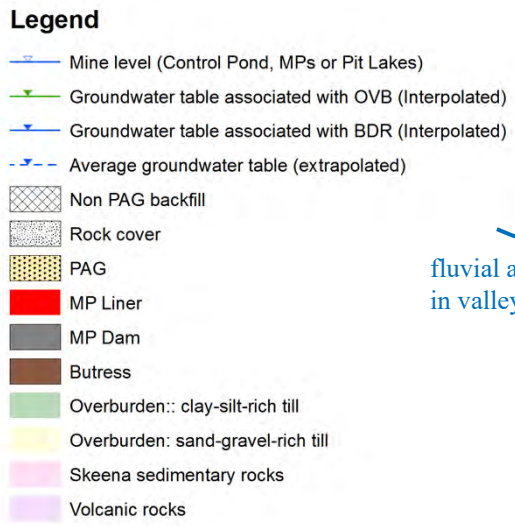
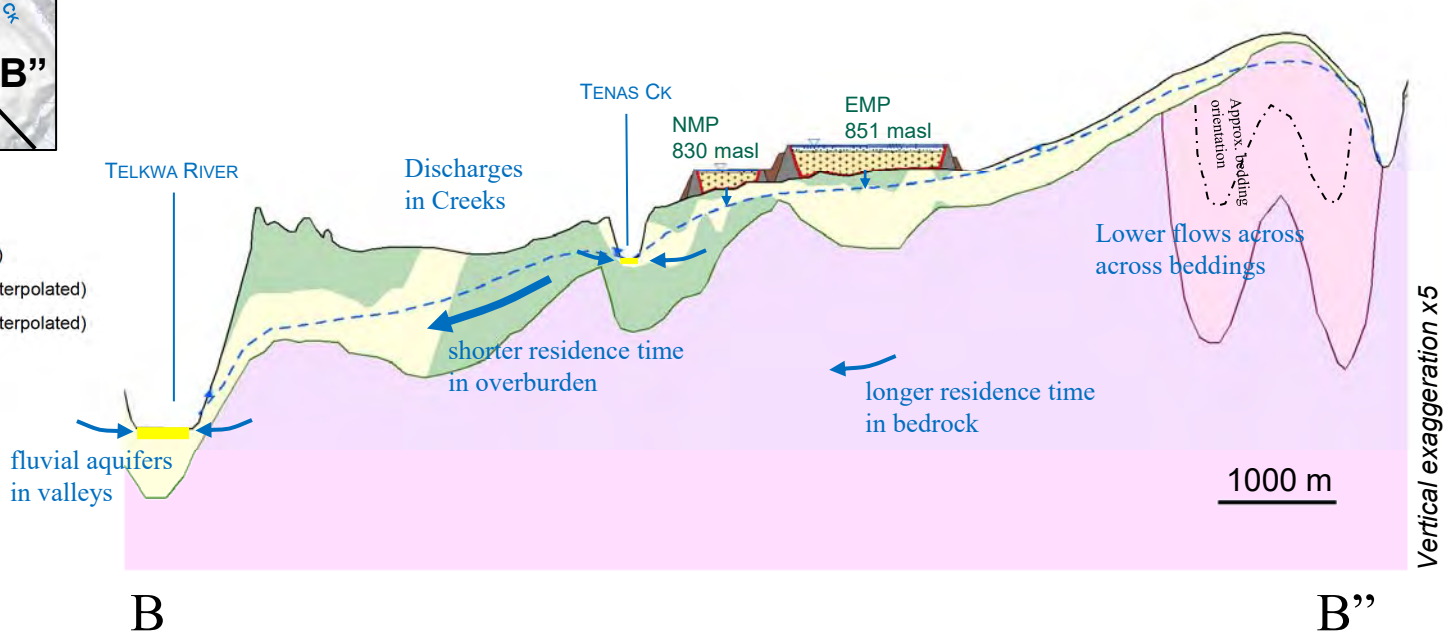
- PAG
- MP Liner
- MP Dam
- Butress
- Overburden:: clay-silt-rich till
- Overburden: sand-gravel-rich till
- Skeena sedimentary rocks
- Volcanic rocks



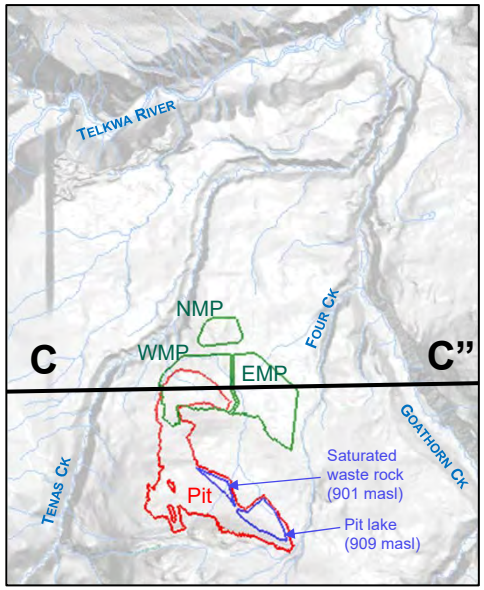
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section AA” Post closure**
		Date: Dec.2020 / Approved: GF / Figure: **47**







srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section BB” Post closure**
		Date: Dec.2020 / Approved: GF / Figure: **48**



Legend

- Mine level (Control Pond, MPs or Pit Lakes)
- Groundwater table associated with OVB (Interpolated)
- Groundwater table associated with BDR (Interpolated)
- Average groundwater table (extrapolated)
- Non PAG backfill
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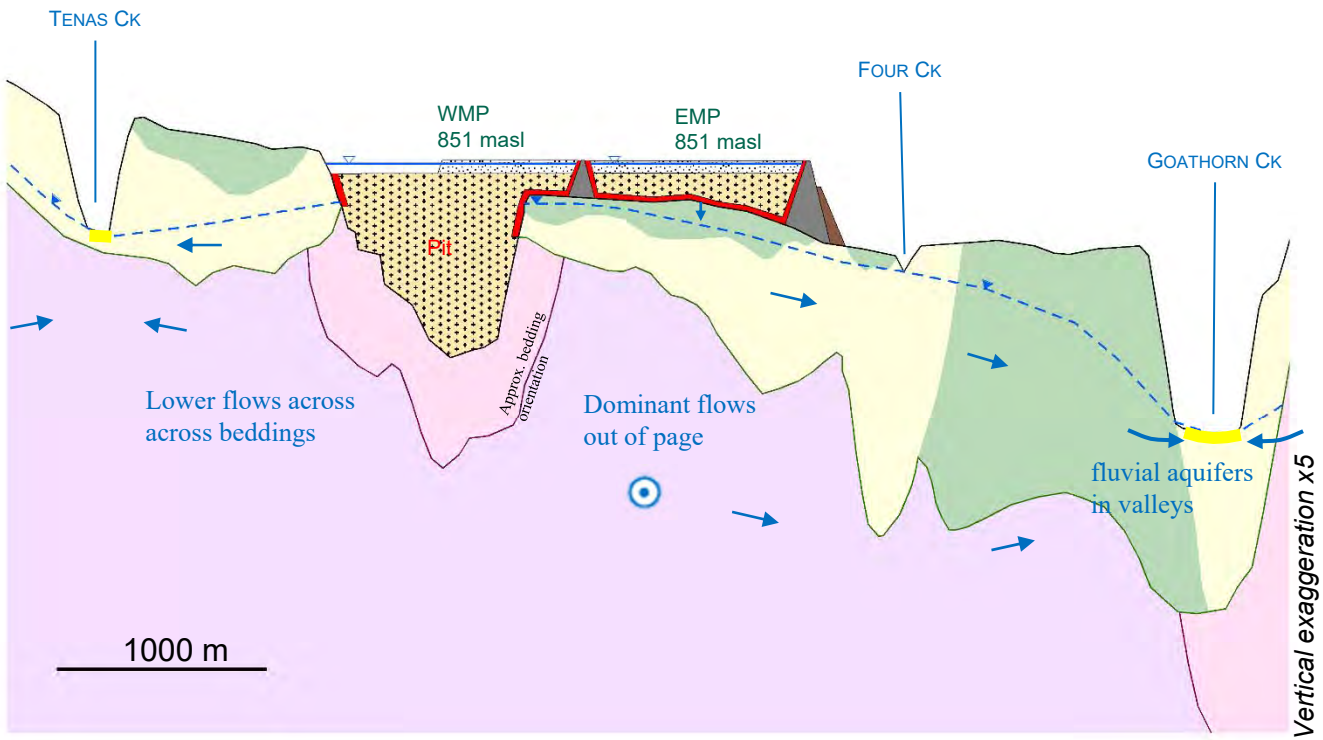
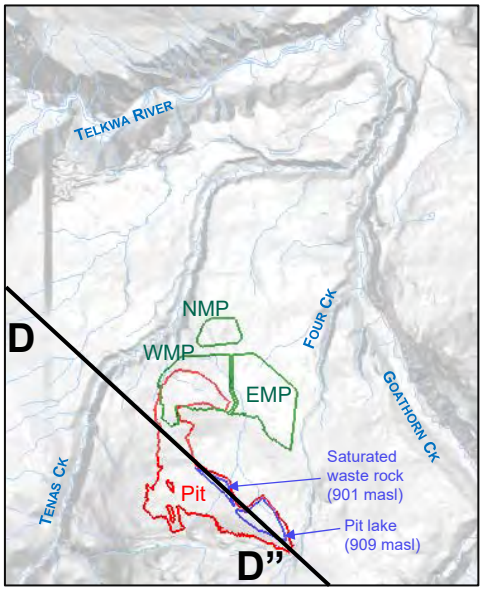
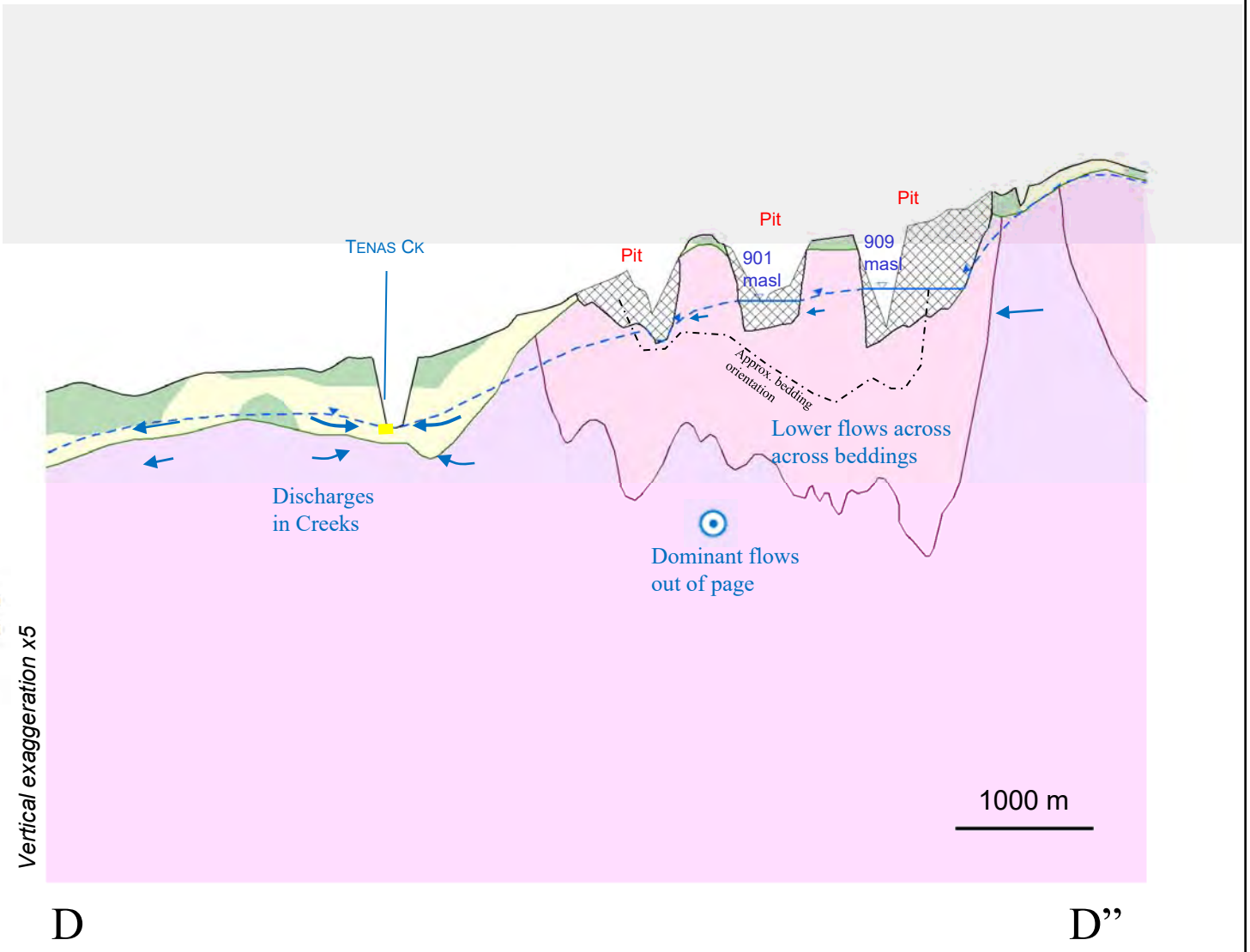
- MP Liner
- MP Dam
- Butress
- Overburden:: clay-silt-rich till
- Overburden: sand-gravel-rich till
- Skeena sedimentary rocks
- Volcanic rocks



C C”

srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section CC” Post closure**
		Date: Dec.2020 / Approved: GF / Figure: **49**





Legend

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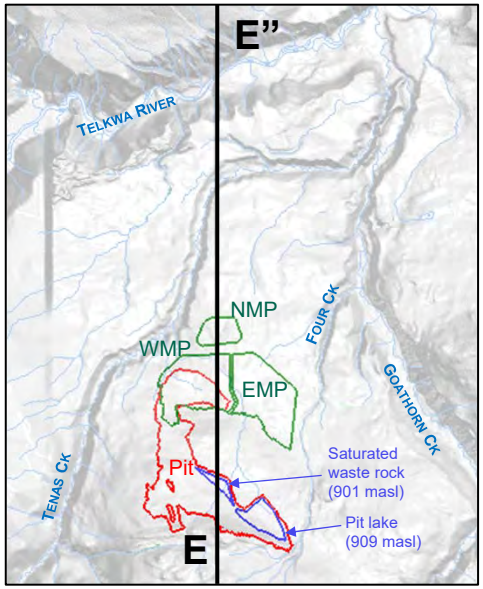
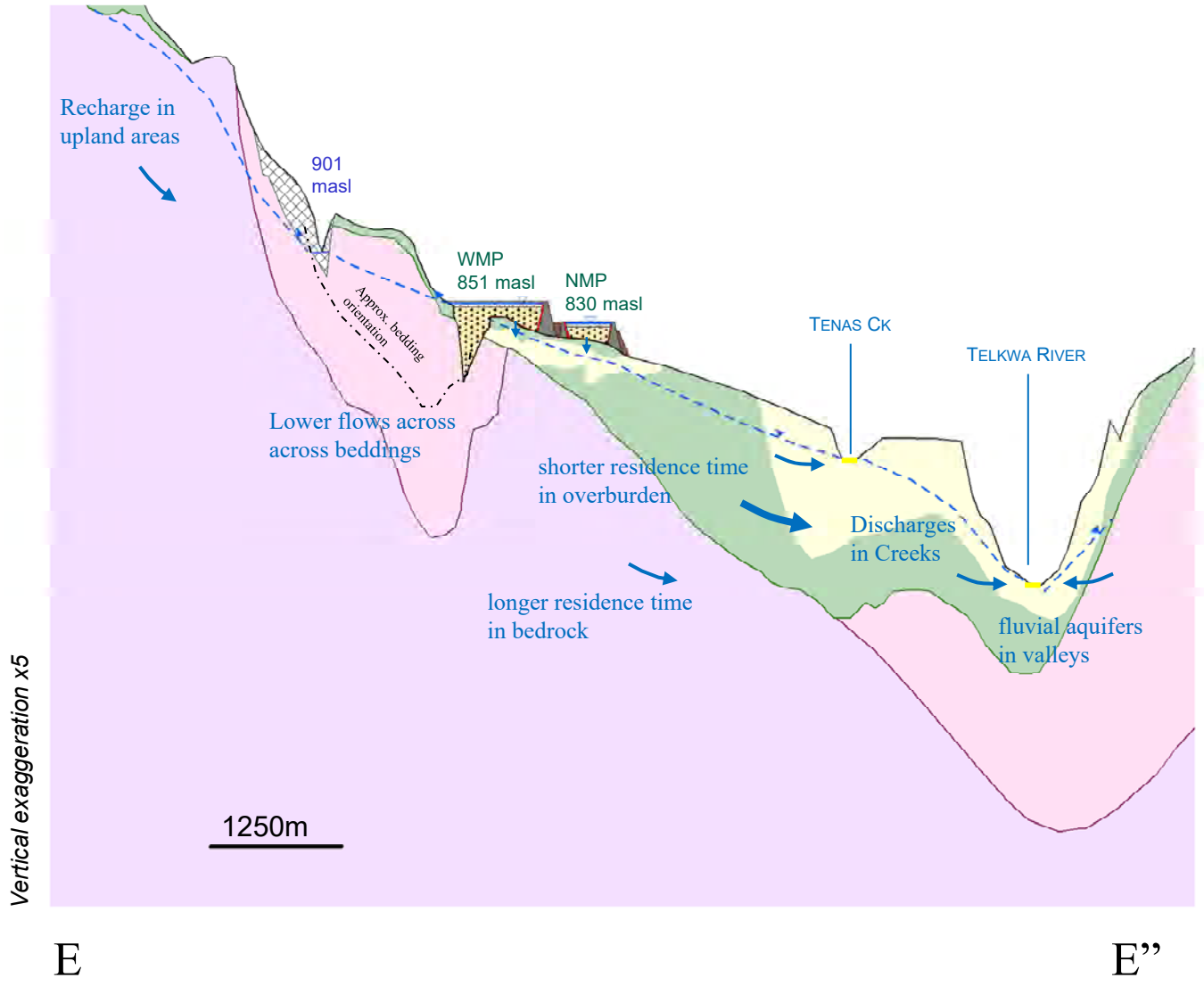
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig42to51_ConceptualCrossX.pptx	Tenas Project	**Conceptual Cross Section DD" Post closure**
		Date: Dec.2020 / Approved: GF / Figure: **50**





Legend

- Mine level (Control Pond, MPs or Pit Lakes)
- Groundwater table associated with OVB (Interpolated)
- Groundwater table associated with BDR (Interpolated)
- Average groundwater table (extrapolated)
- Non PAG backfill
- Rock cover
- PAG
- MP Liner
- MP Dam
- Butress
- Overburden:: clay-silt-rich till
- Overburden: sand-gravel-rich till
- Skeena sedimentary rocks
- Volcanic rocks

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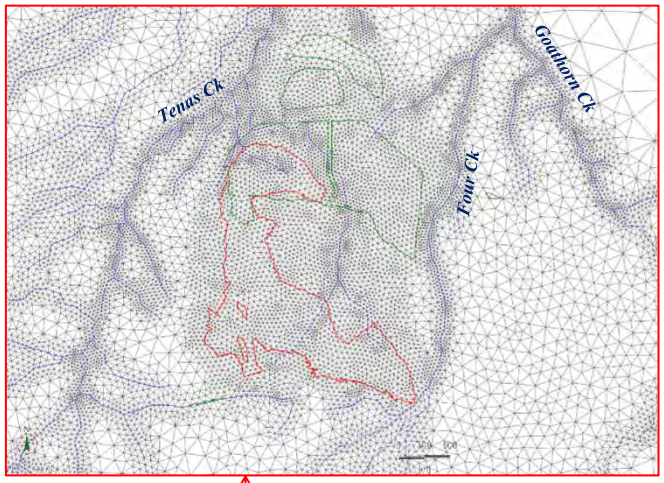
Groundwater Technical Report

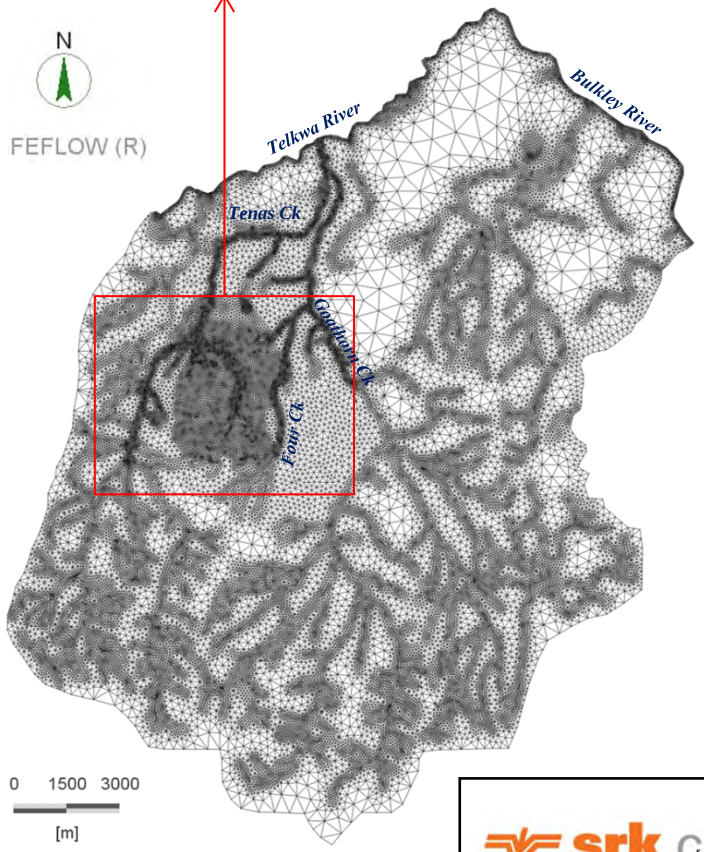
Conceptual Cross Section EE”
Post closure

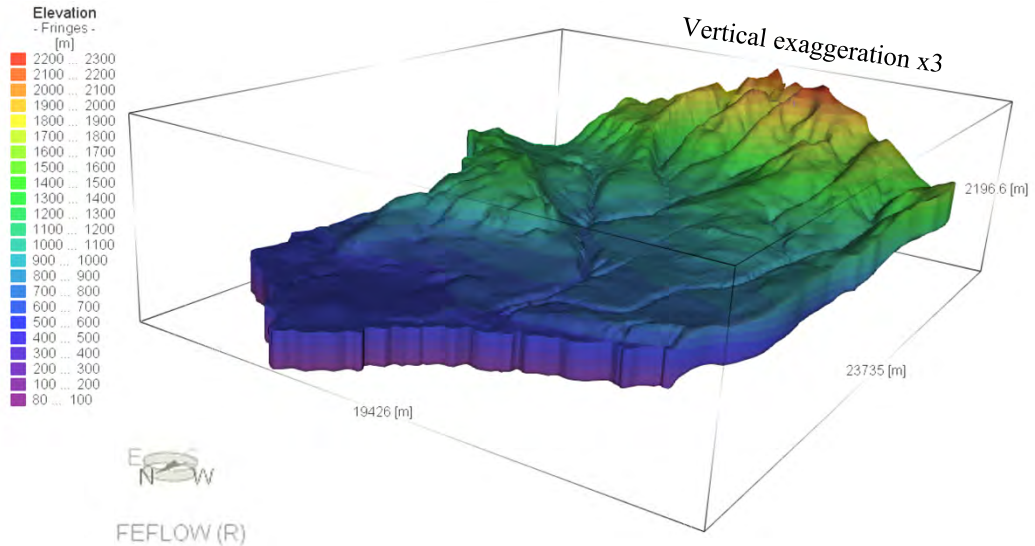
Job No: 1CT027.004
Filename: Fig42to51_ConceptualCrossX.pptx

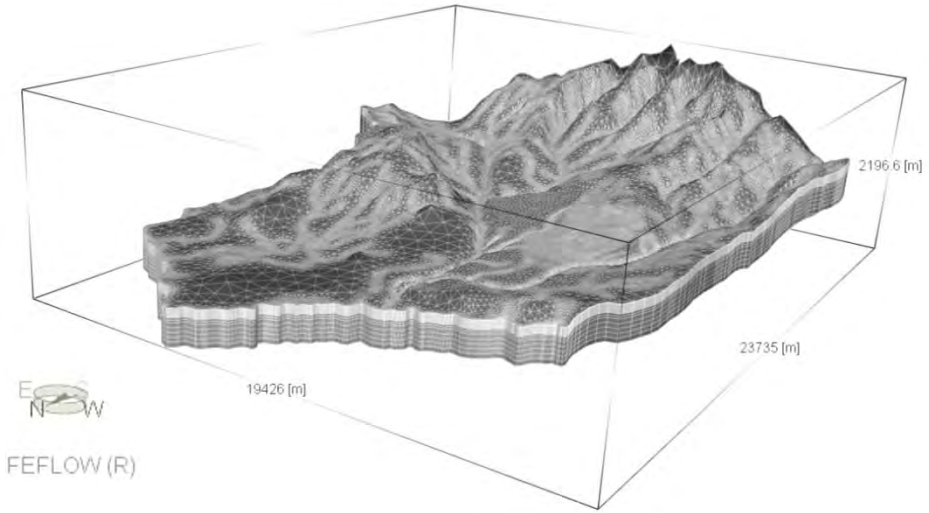
Tenas Project

Date: Dec.2020 | Approved: GF | Figure: **51**





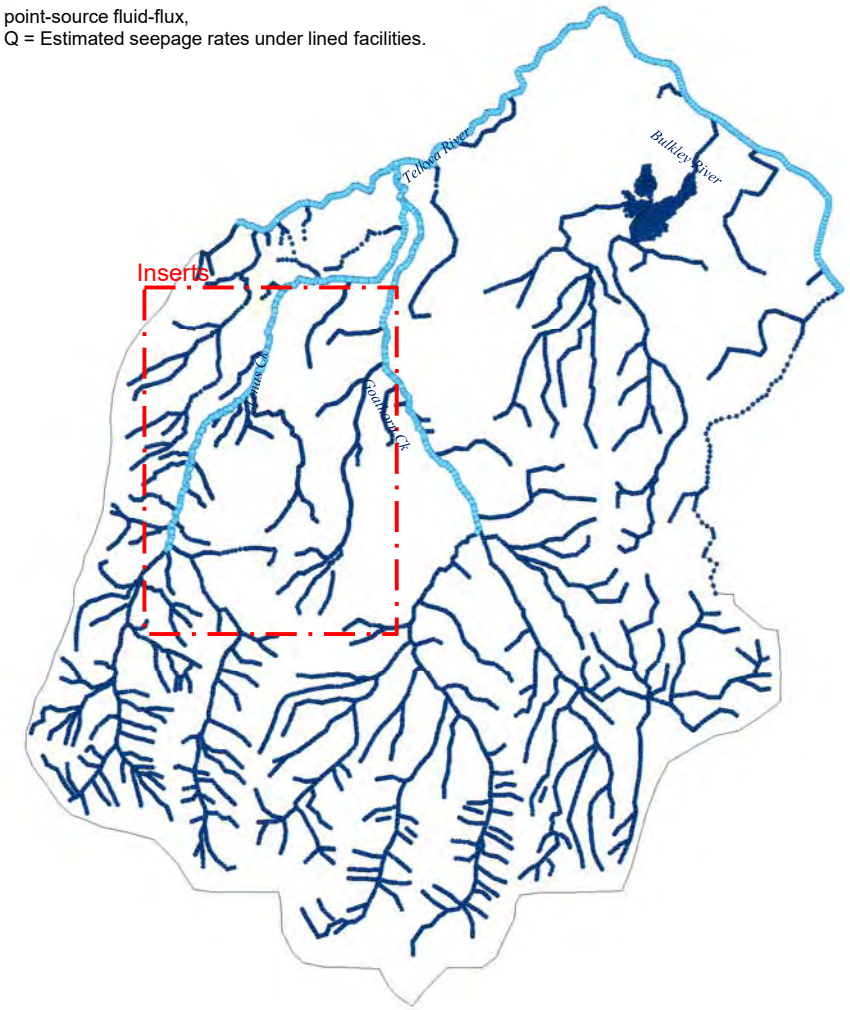


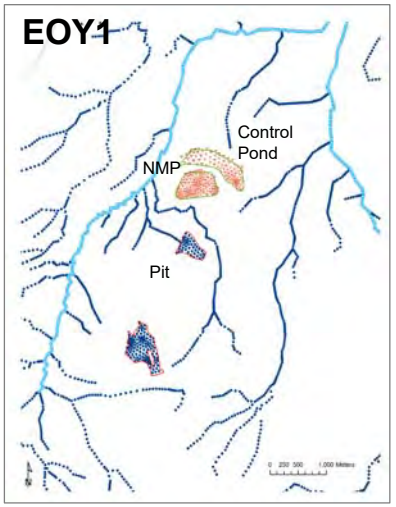


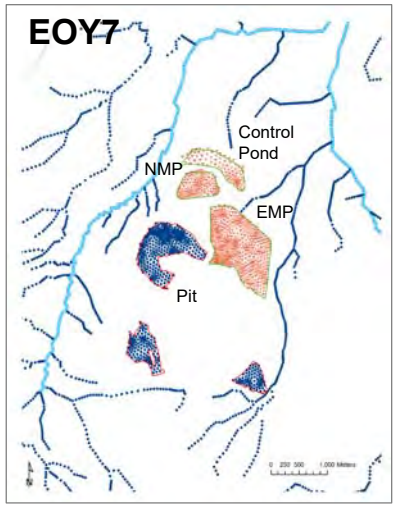
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig52_Domain and mesh.pptx	Tenas Project	**Domain and mesh of the 3D numerical model**
		Date: Nov 2020 / Approved: GF / Figure: **52**

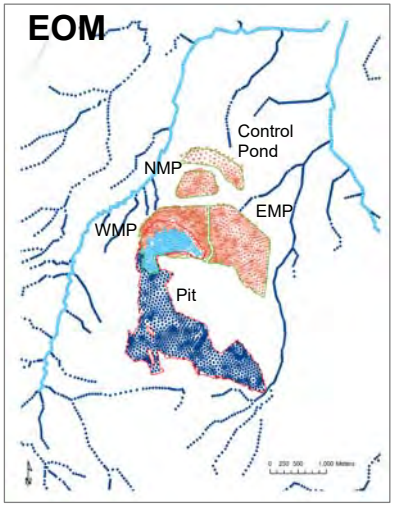
Legend

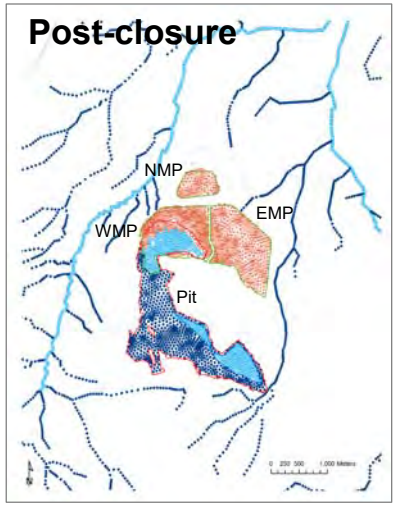
- Dirichlet (constant head),
  H = topo elevation, or water levels at unlined WMP, in-pit saturated waste rock / lake.
- Dirichlet (constant head) with flux constraint (seepage),
  H = Topo elevation, or pit elevation (ie., pit walls).
- point-source fluid-flux,
  Q = Estimated seepage rates under lined facilities.



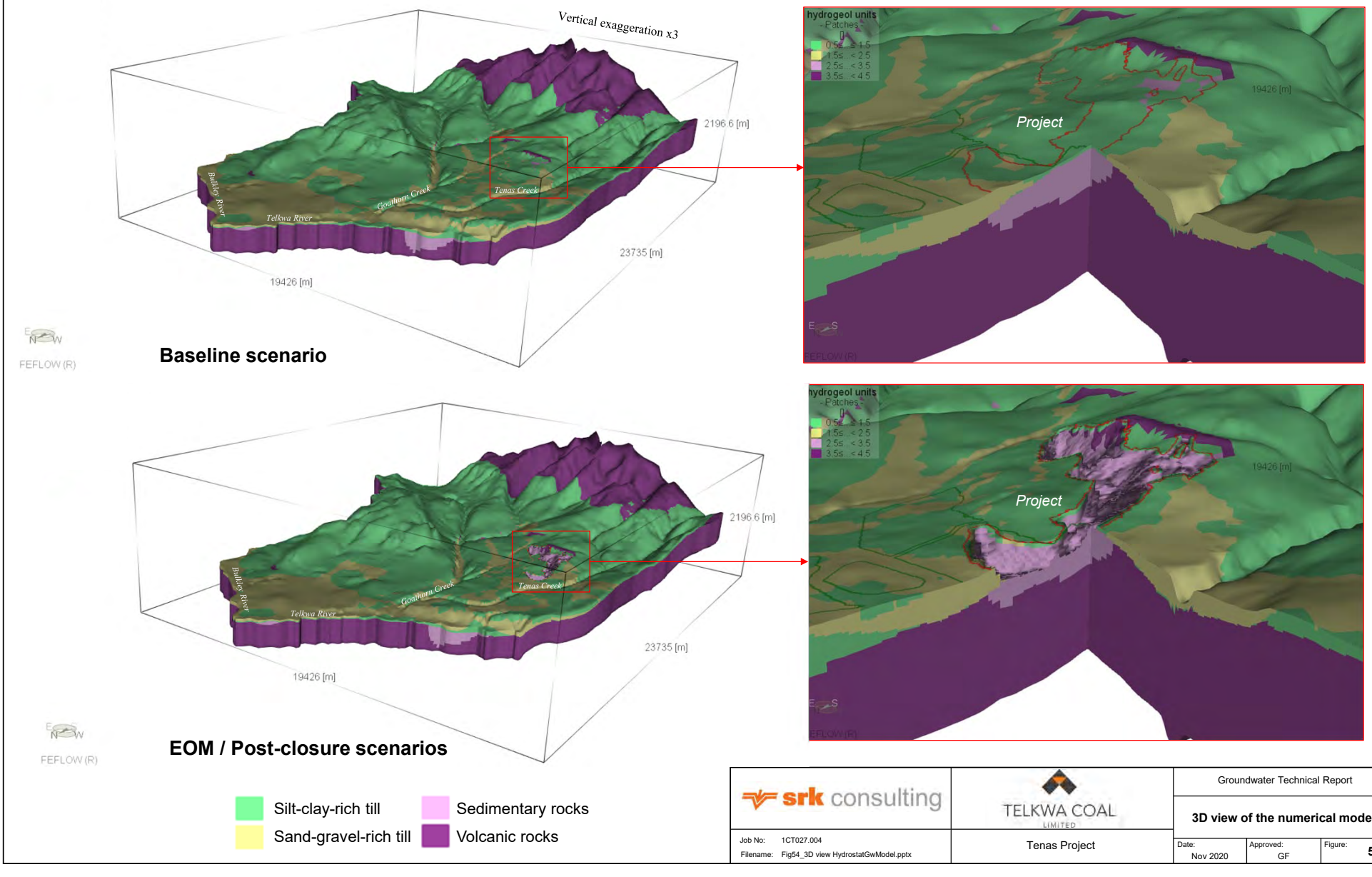




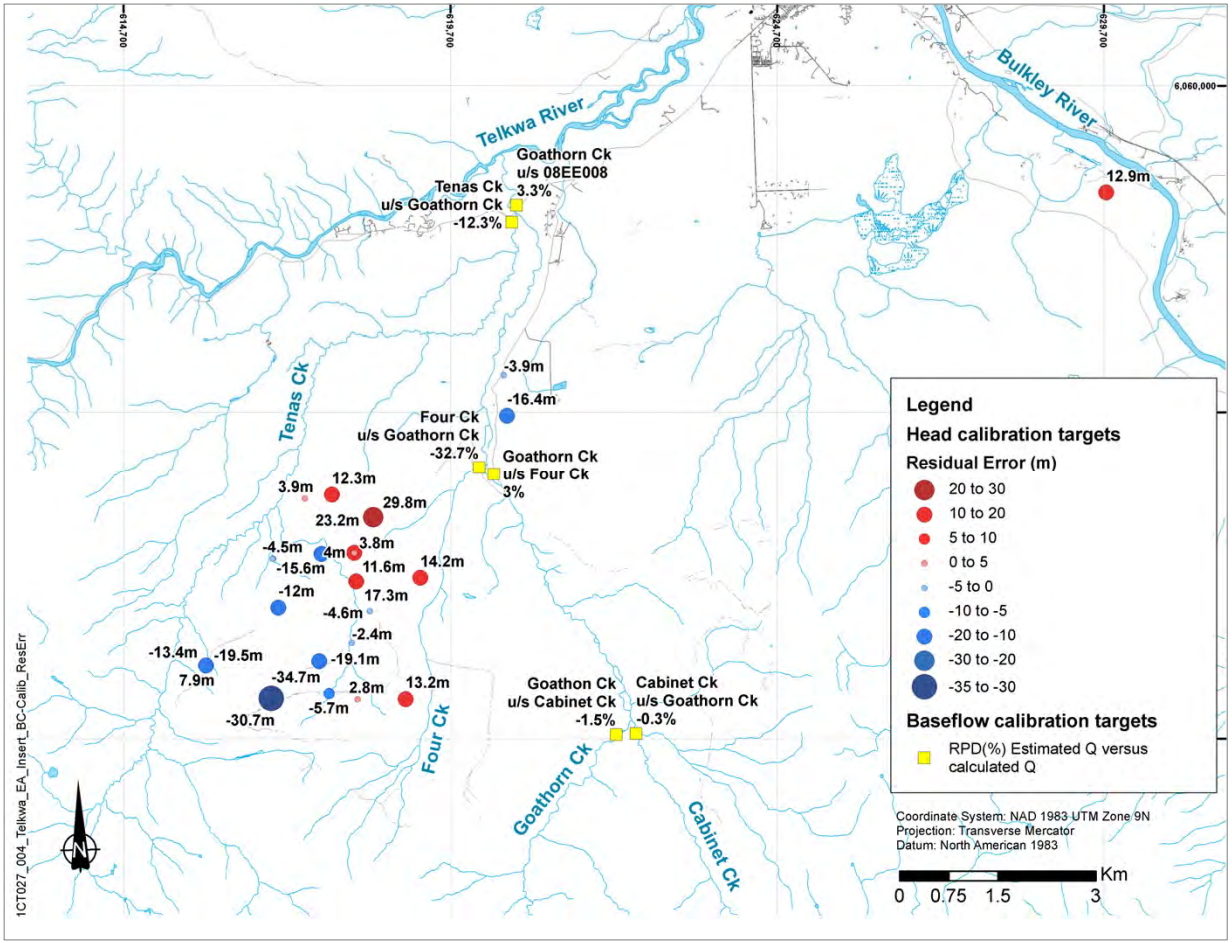


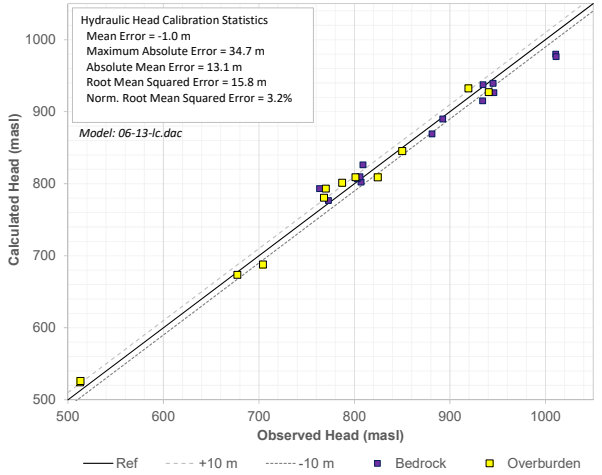


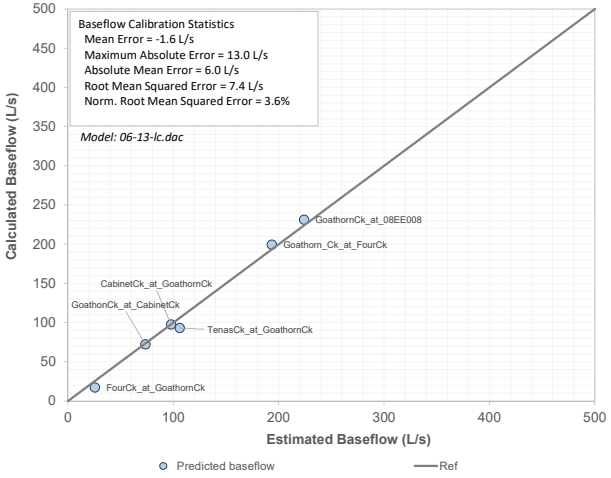
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Boundary conditions
Job No: 1CT027.004 Filename: Fig53_Boundary conditions.pptx	Tenas Project	Date: Dec 2020 / Approved: GF / Figure: 53



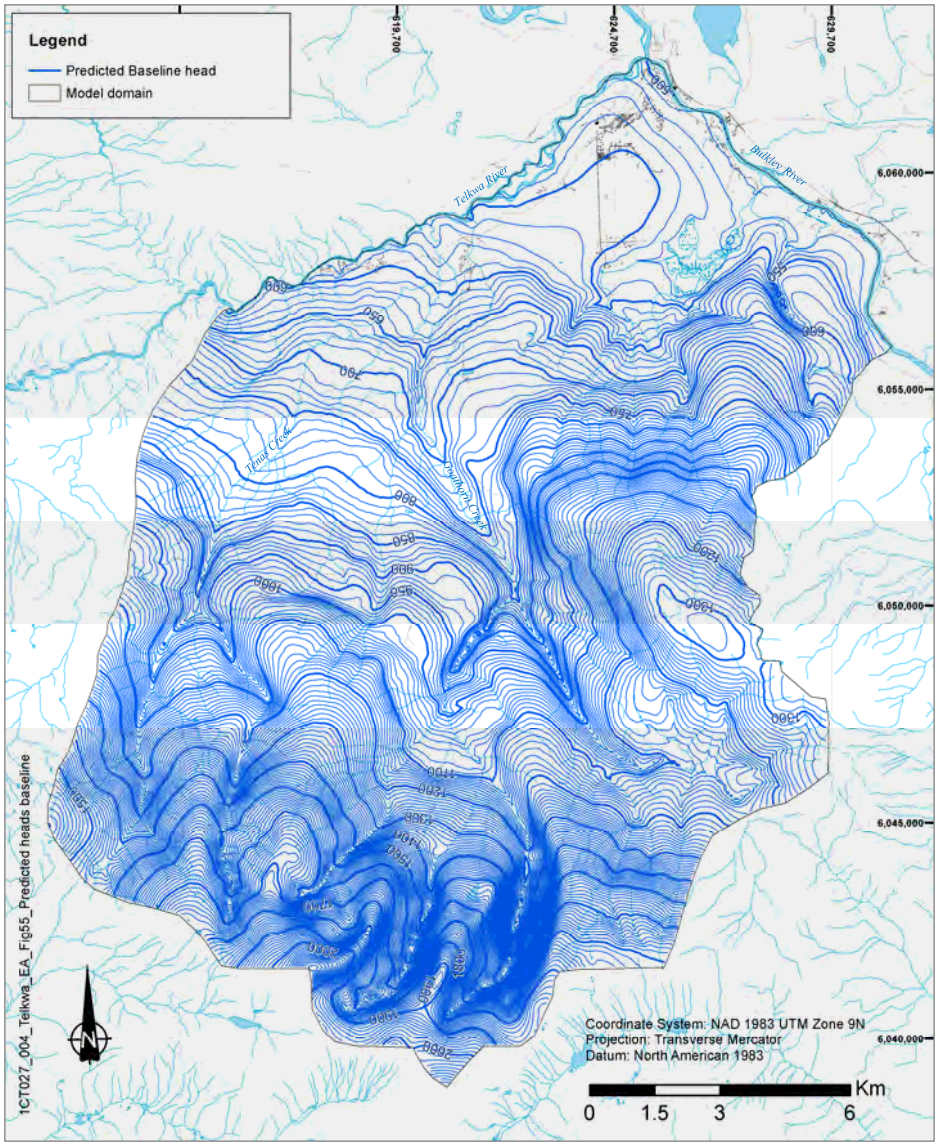
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		3D view of the numerical model
Job No: 1CT027.004 Filename: Fig54_3D view HydrostatGwModel.pptx	Tenas Project	Date: Nov 2020 / Approved: GF / Figure: **54**

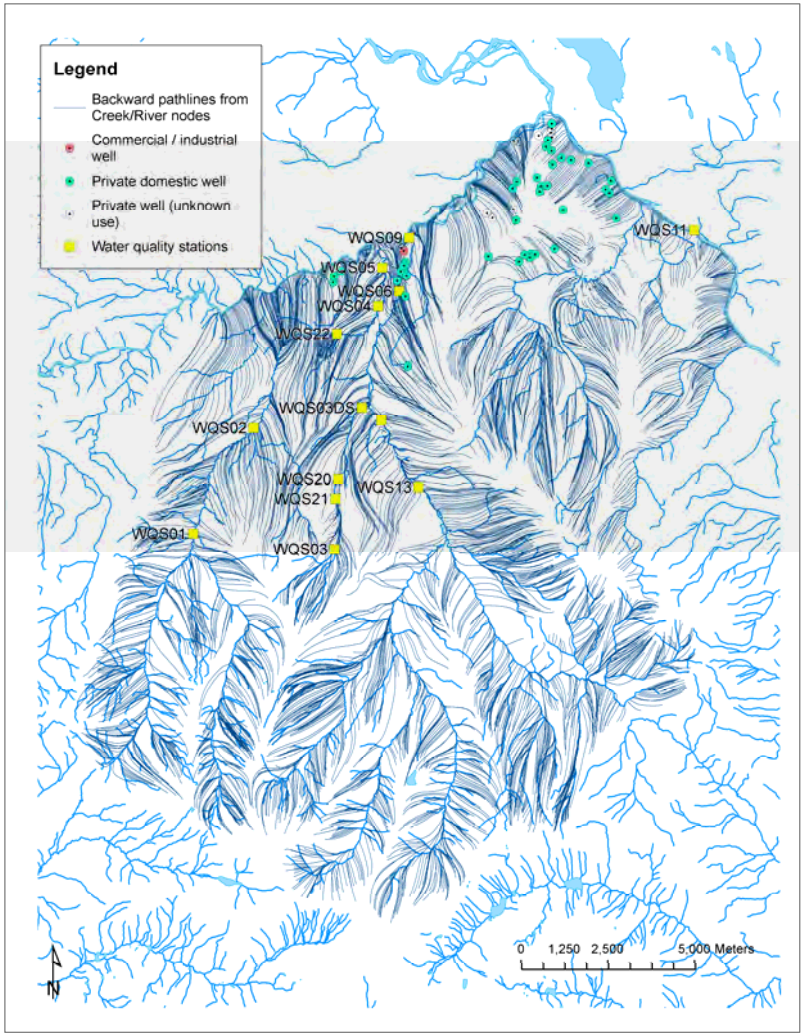




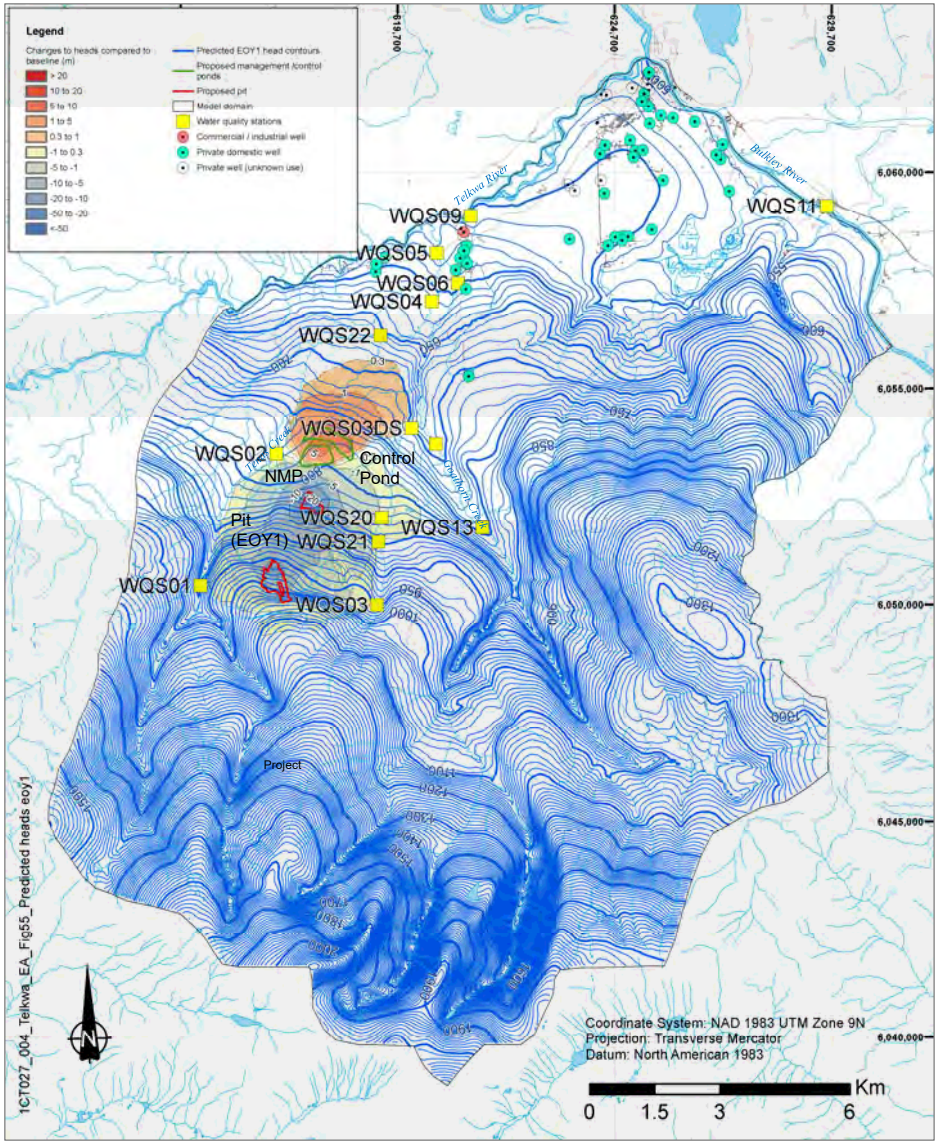


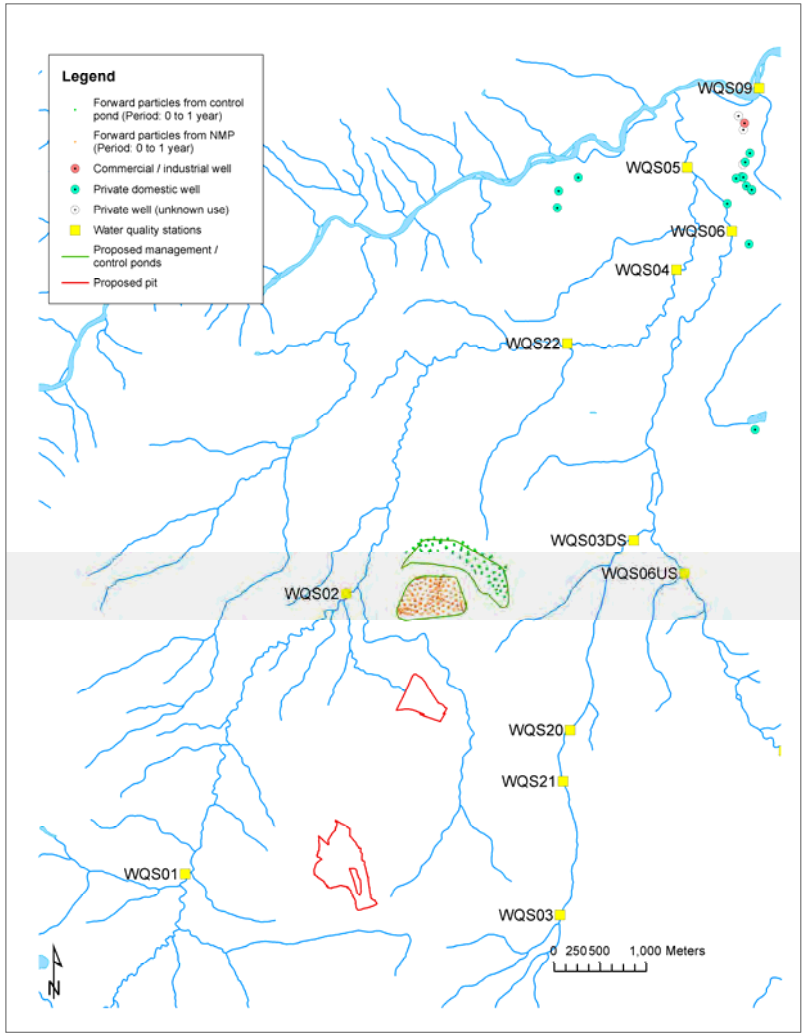
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Base case calibration
Job No: 1CT027.004 Filename: Fig55_BC_Calibration.pptx	Tenas Project	Date: Dec 2020 / Approved: GF / Figure: **55**



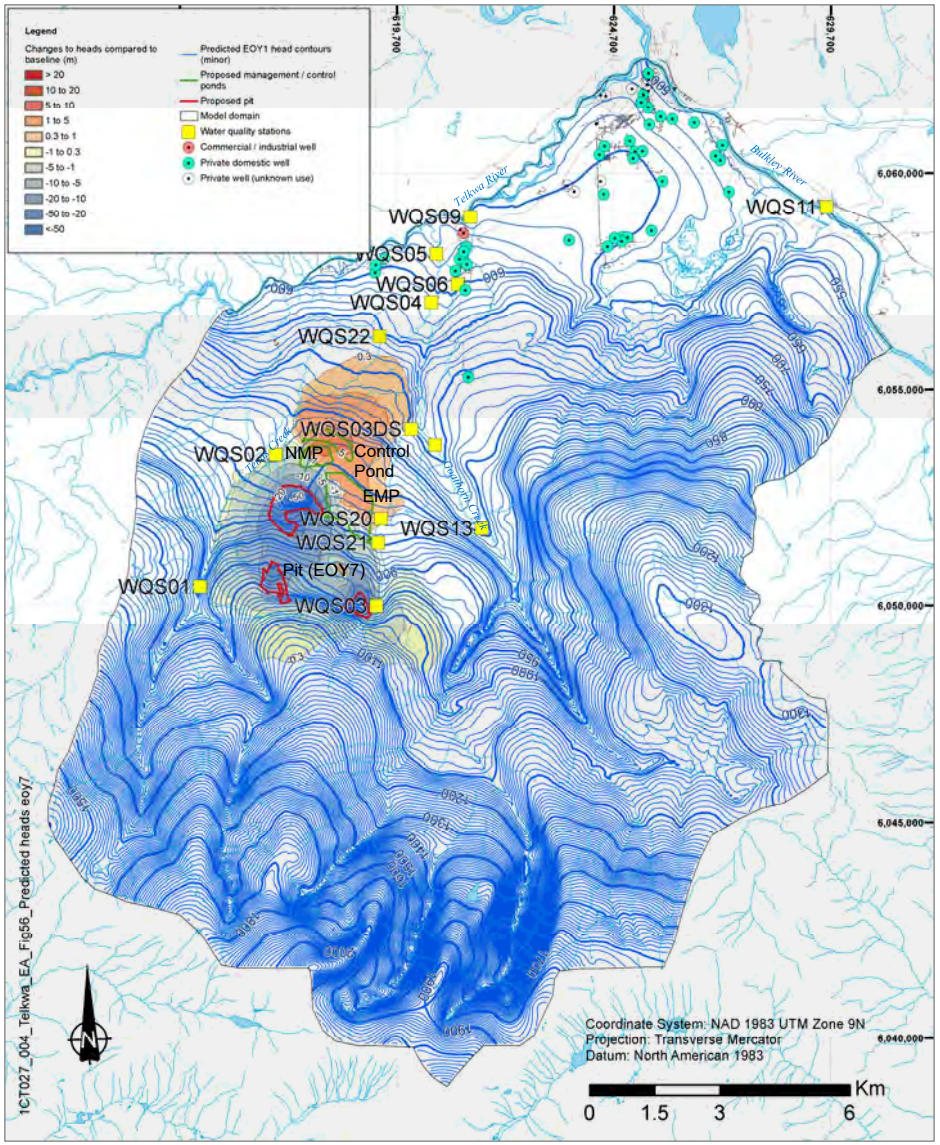


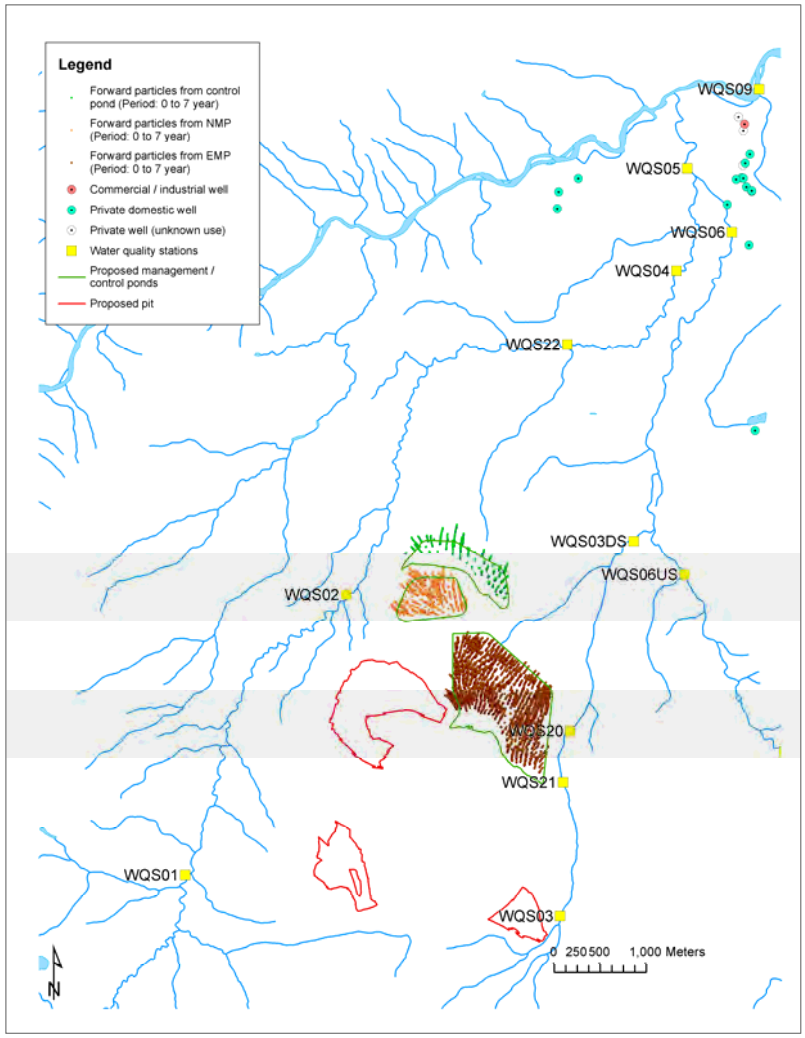
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Base case heads and backward paths for baseline conditions
Job No: 1CT027.002 Filename: Fig56_Base case heads&paths bsln.pptx	Tenas Project	Date: Dec 2020 / Approved: GF / Figure: **56**



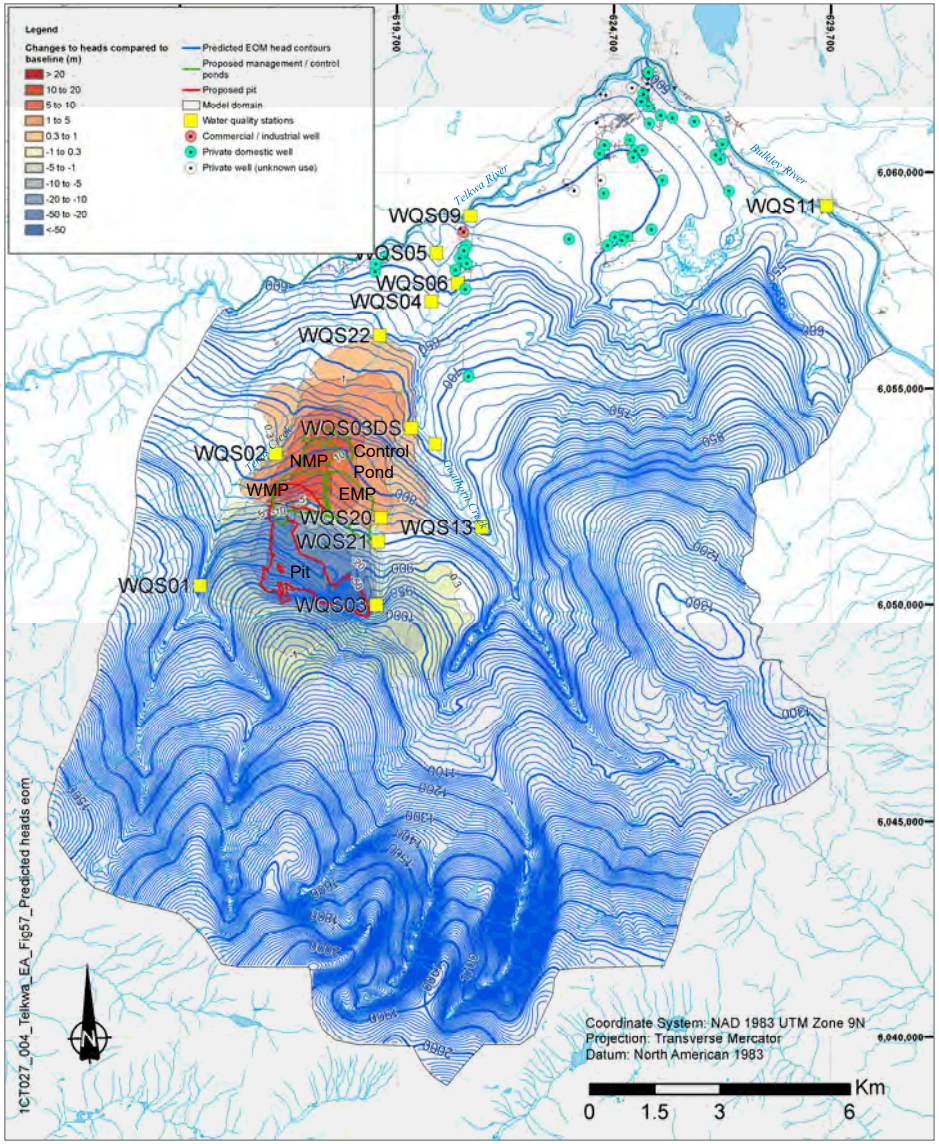


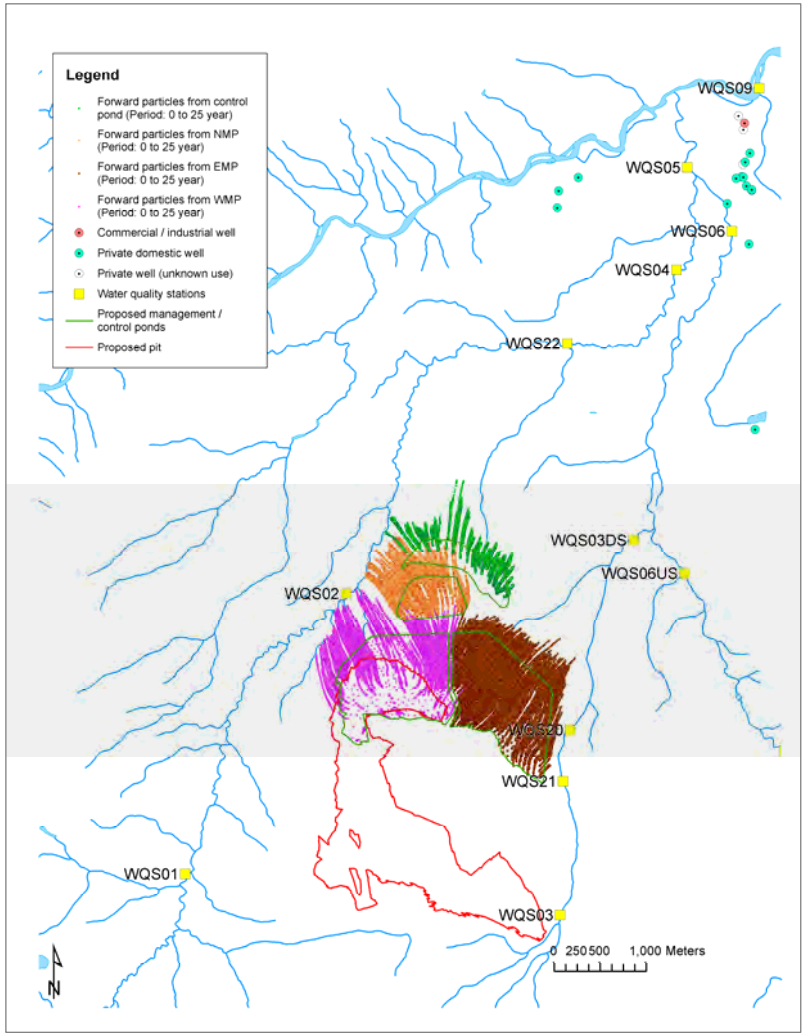
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Modelled heads and forward paths for EoY1 conditions
Job No: 1CT027.002 Filename: Fig57_Base case heads&paths eoy1.pptx	Tenas Project	Date: Dec 2020 / Approved: GF / Figure: **57**



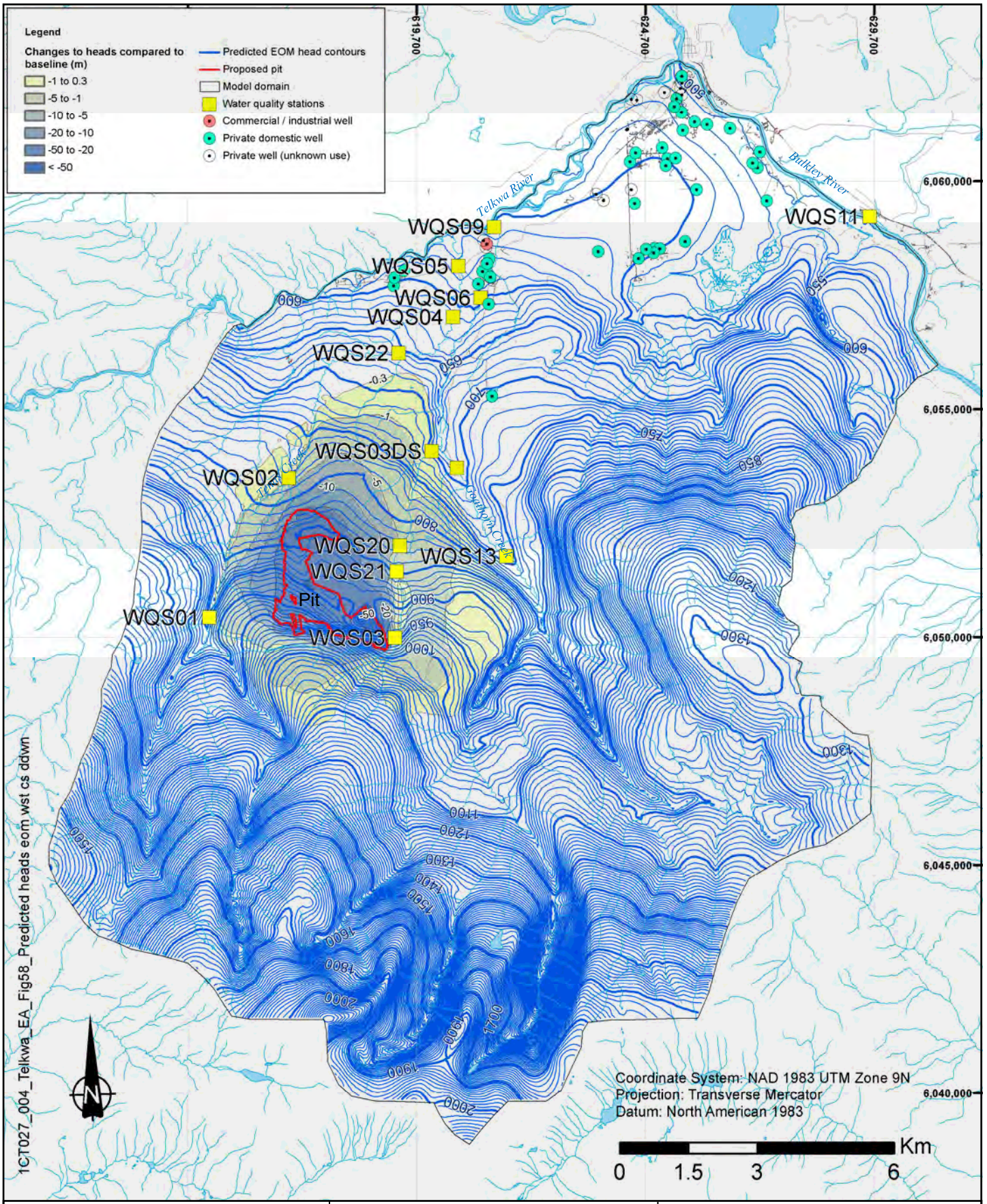


srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Modelled heads and forward paths for EoY7 conditions
Job No: 1CT027.002 Filename: Fig58_Base case heads&paths eoy7.pptx	Tenas Project	Date: Dec 2020 / Approved: GF / Figure: **58**

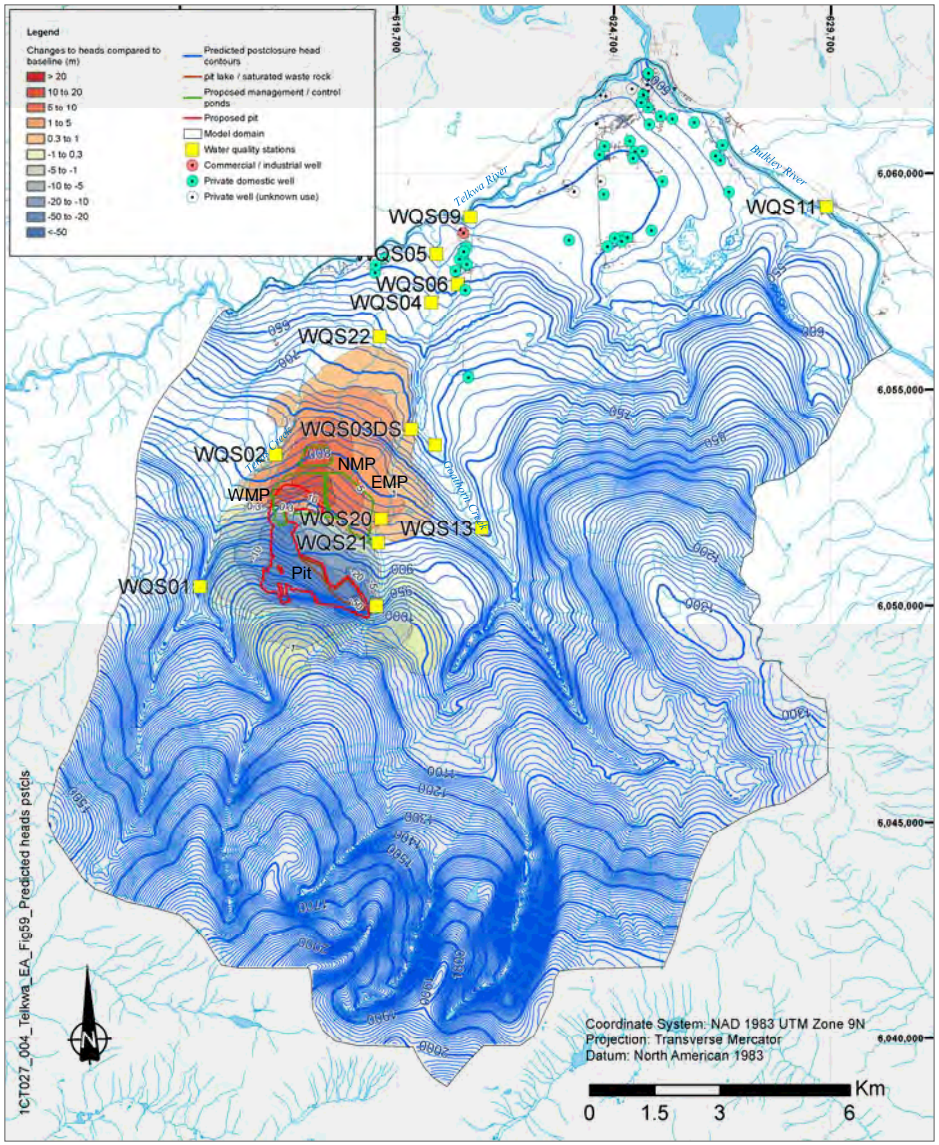


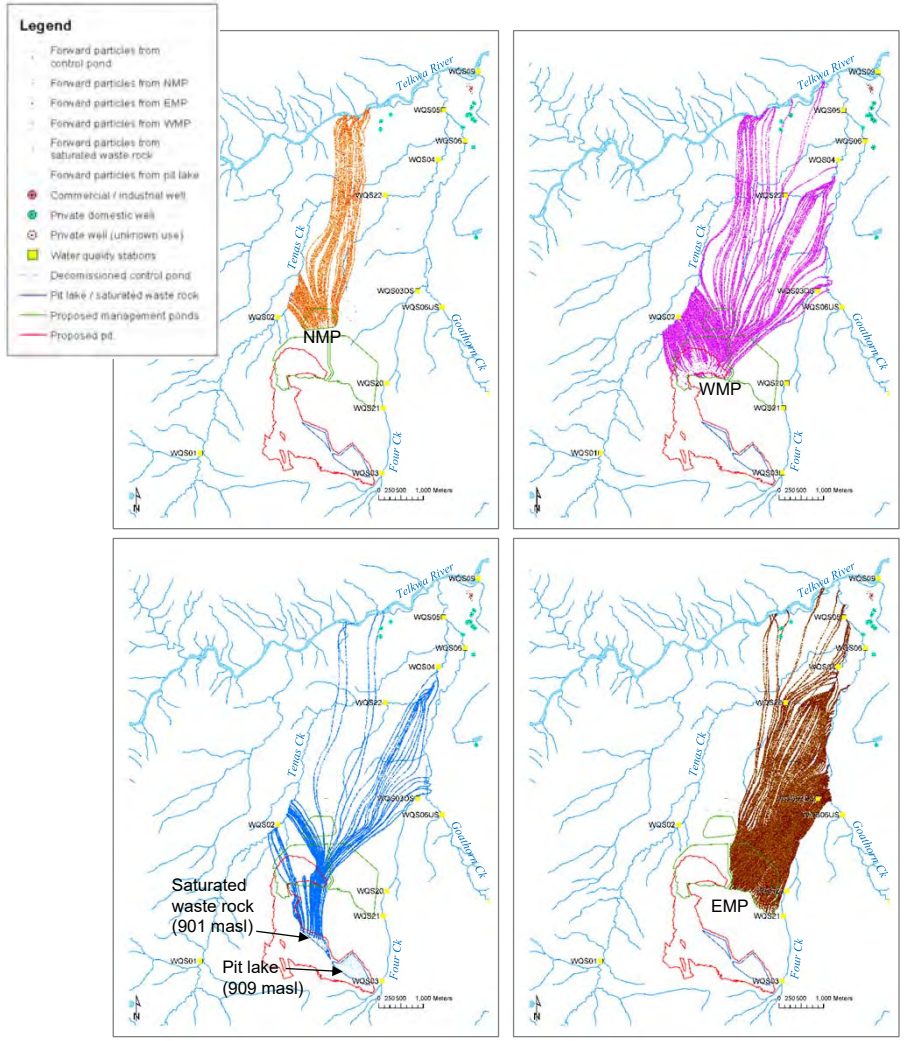


srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Modelled heads and forward paths for EOM conditions
Job No: 1CT027.002 Filename: Fig59_Base case heads&paths eom.pptx	Tenas Project	Date: Dec 2020 / Approved: GF / Figure: **59**

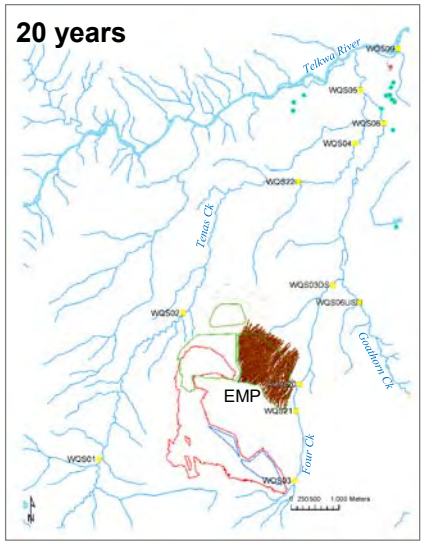


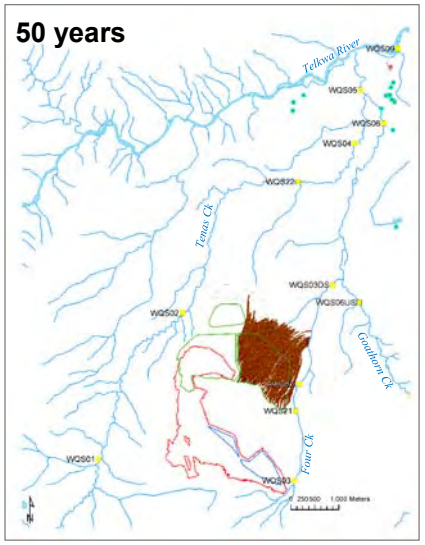
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Modelled heads for EOM pit conditions and no management ponds (worst case drawdown)
Job No: 1CT027.004 Filename: Fig60_Base case heads eom wstddwn.pptx	Tenas Project	Date: Dec 2020 | Approved: GF | Figure: **60**

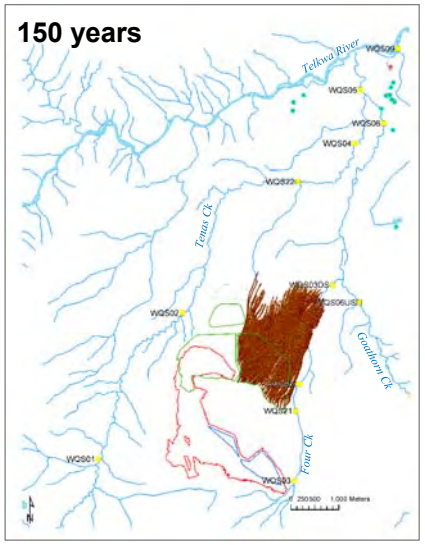


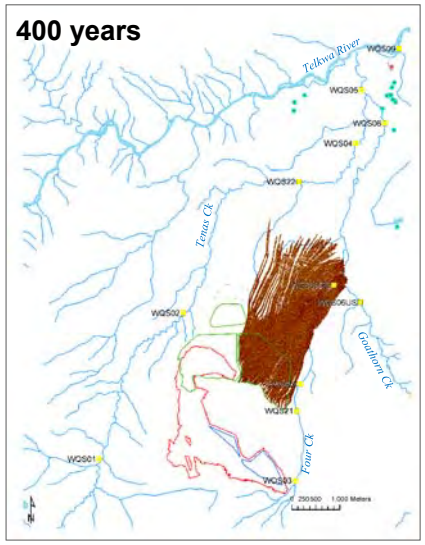


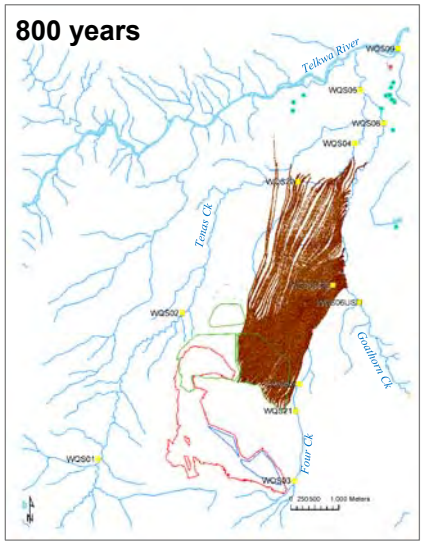
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
		Modelled heads and forward paths for post-closure conditions
Job No: 1CT027.002 Filename: Fig61_Base case heads&paths pstcls.pptx	Tenas Project	Date: Dec 2020 / Approved: GF / Figure: **61**

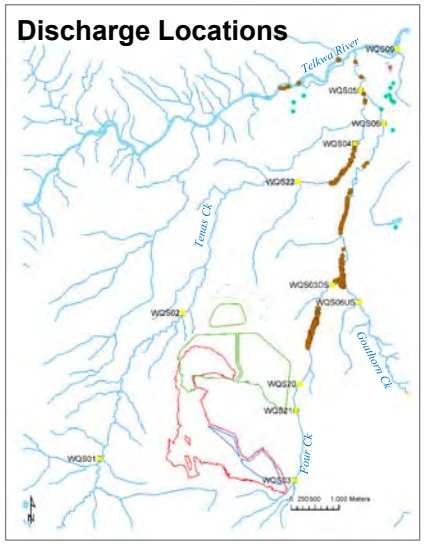












Legend

- Forward particles from EMP
- Commercial / industrial well
- Private domestic well
- Private well (unknown use)
- Water quality stations
- Proposed management / control ponds
- Proposed pit

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Groundwater Technical Report

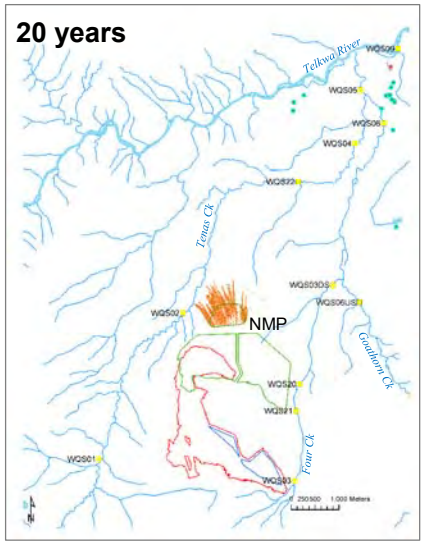
Modelled forward particle paths from the EMP

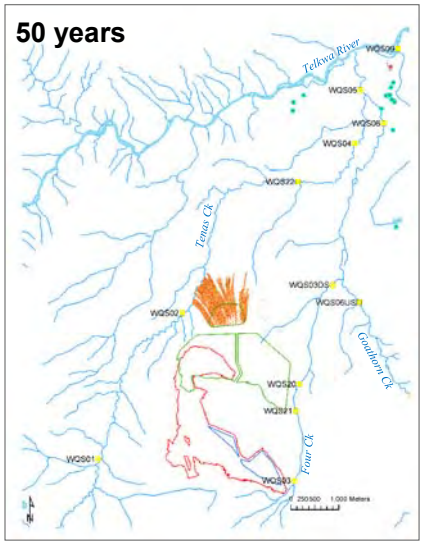
Job No: 1CT027.004

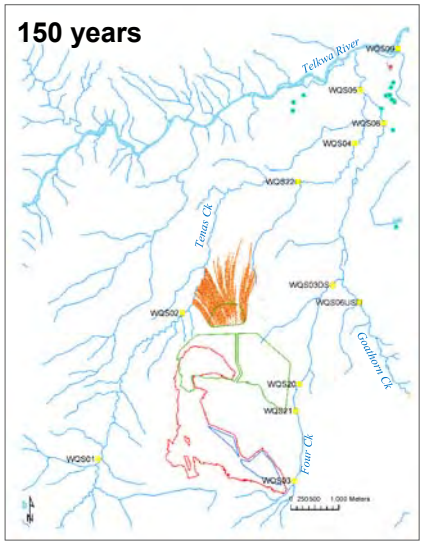
Filename: Fig62_BC_Particles_timesteps_EMP.pptx

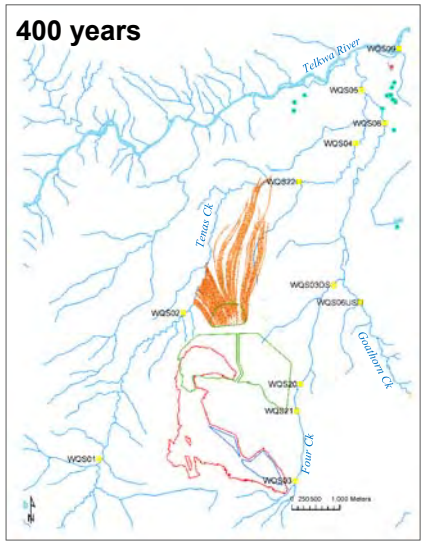
Tenas Project

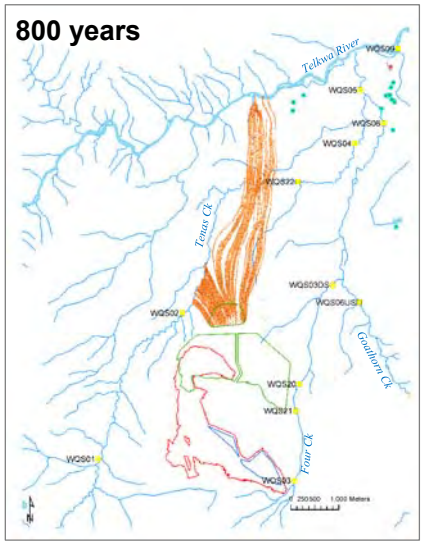
Date:	Approved:	Figure:
Dec 2020	GF	62

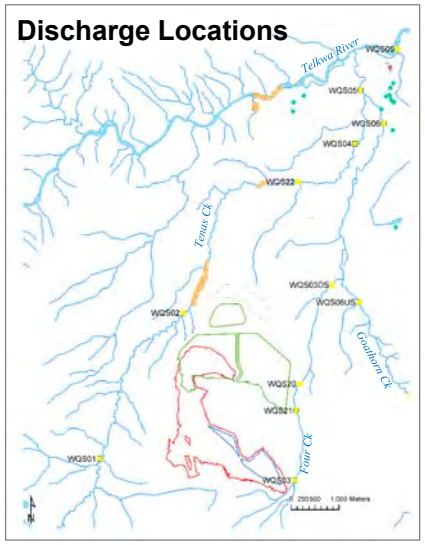












Legend

- Forward particles from NMP
- Commercial / industrial well
- Private domestic well
- Private well (unknown use)
- Water quality stations
- Proposed management / control ponds
- Proposed pit

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Groundwater Technical Report

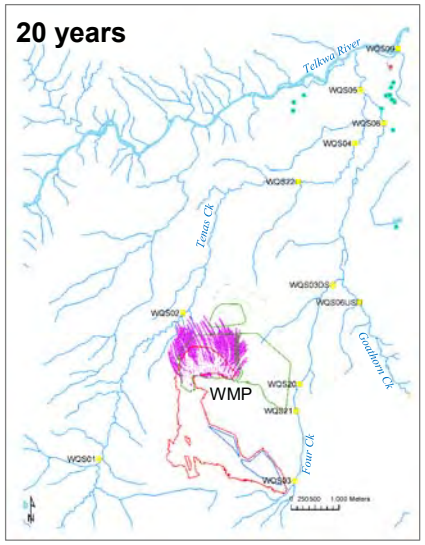
Modelled forward particle paths from the NMP

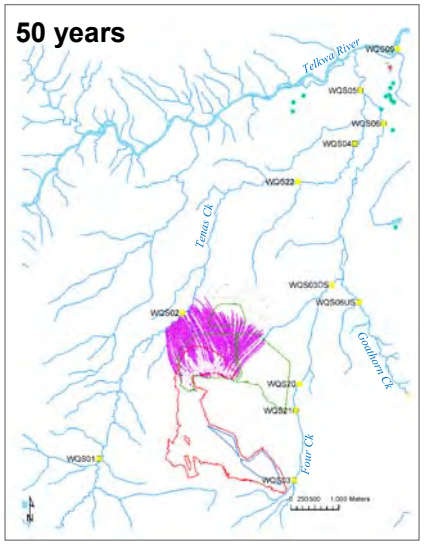
Job No: 1CT027.004

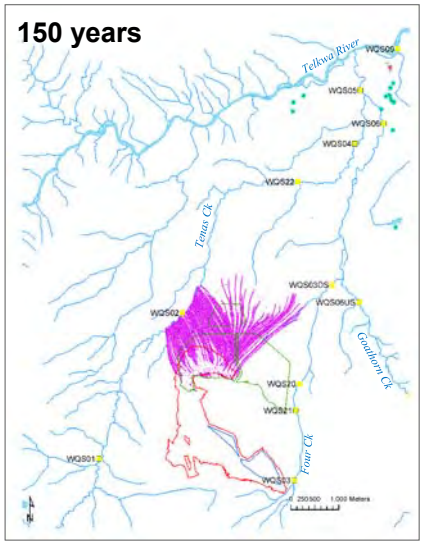
Filename: Fig63_BC_Particles_timesteps_NMP.pptx

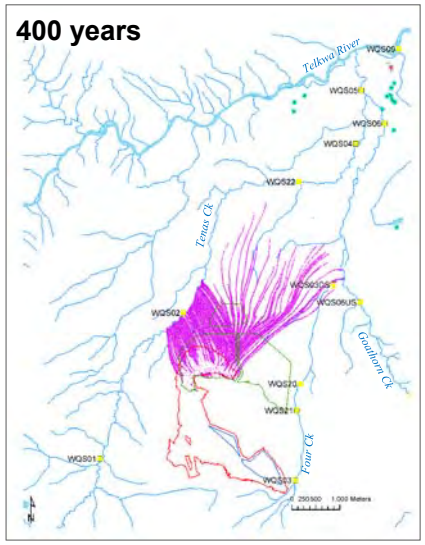
Tenas Project

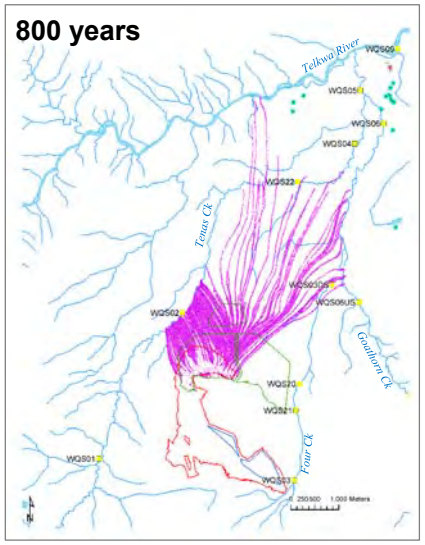
Date:	Approved:	Figure:
Dec 2020	GF	63

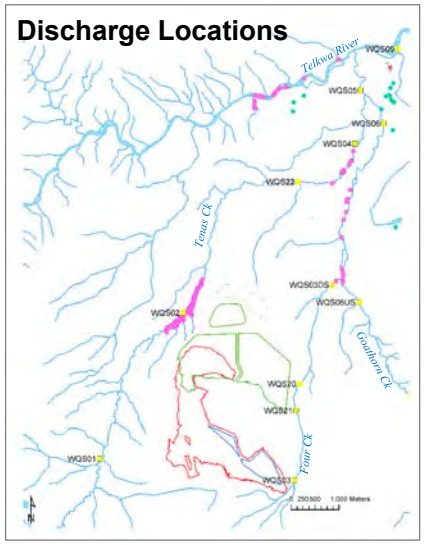








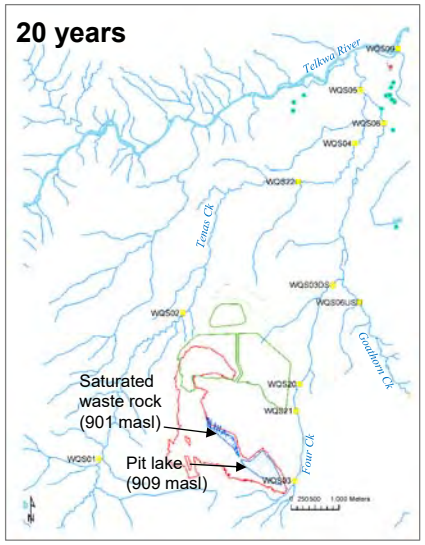


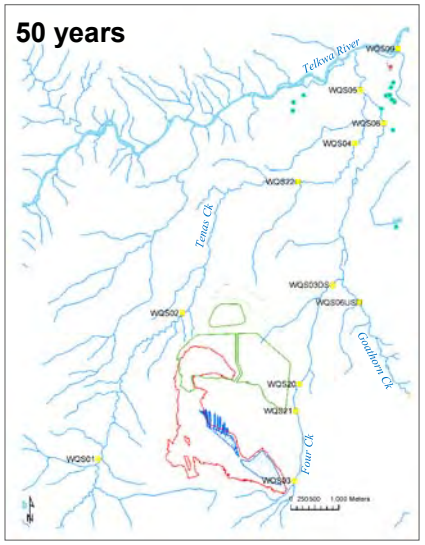


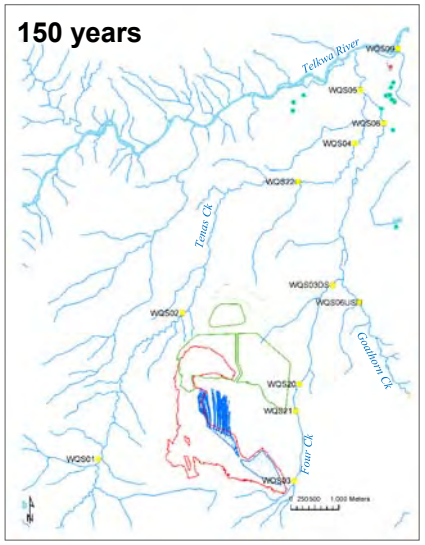
Legend

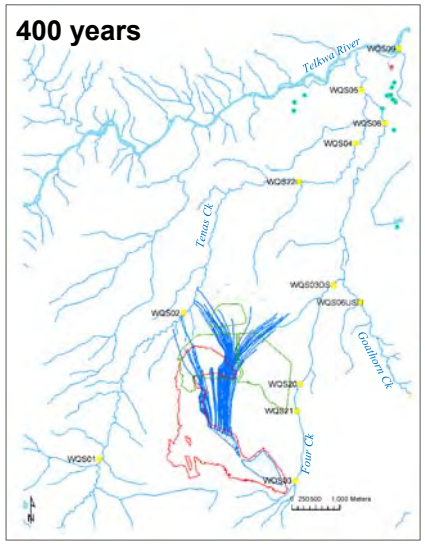
- Forward particles from WMP
- Commercial / industrial well
- Private domestic well
- Private well (unknown use)
- Water quality stations
- Proposed management / control ponds
- Proposed pit

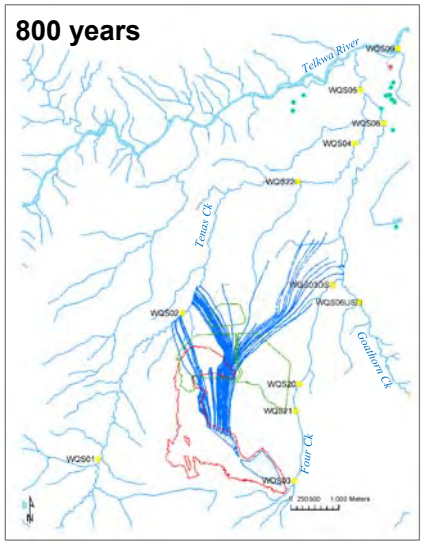
srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report
Job No: 1CT027.004 Filename: Fig64_BC_Particles_timesteps_WMP.pptx	Tenas Project	**Modelled forward particle paths from the WMP**
		Date: Dec 2020 / Approved: GF / Figure: **64**

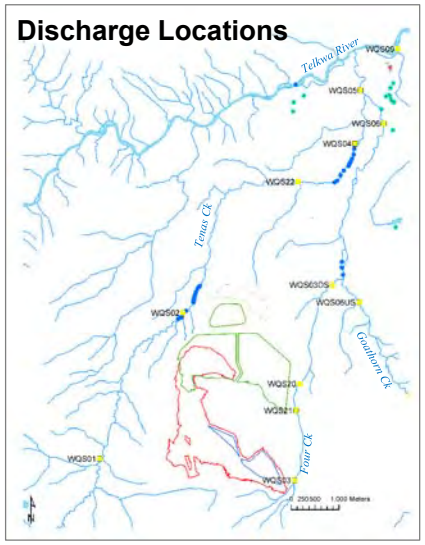












Legend

- Forward particles from saturated waste rock
- Forward particles from pit lake
- Commercial / industrial well
- Private domestic well
- Private well (unknown use)
- Water quality stations
- Proposed management / control ponds
- Proposed pit

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Tenas Project

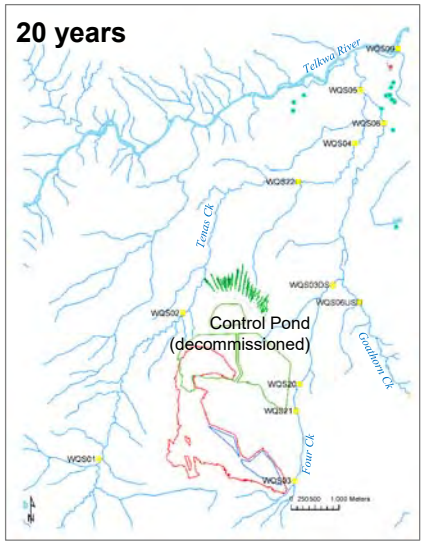
Job No: 1CT027.004

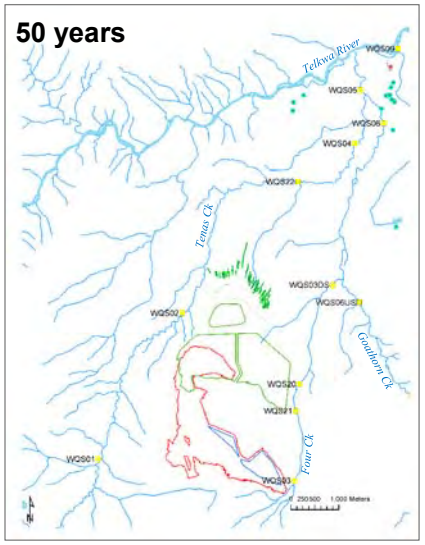
Filename: Fig65_BC_Particles_timesteps_PL_SWr.pptx

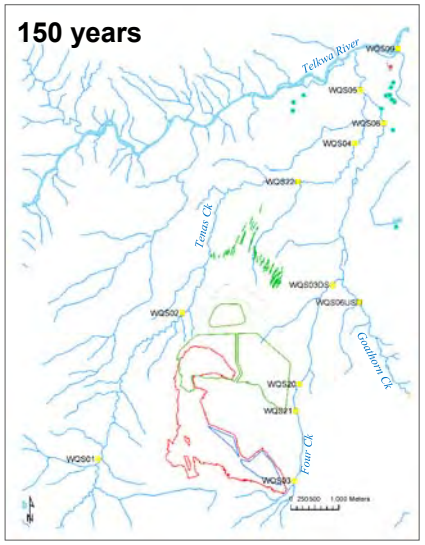
Groundwater Technical Report

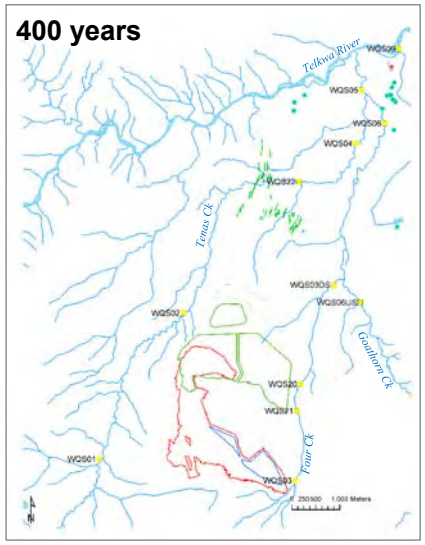
Modelled forward particle paths from the pit lake / saturated waste rock

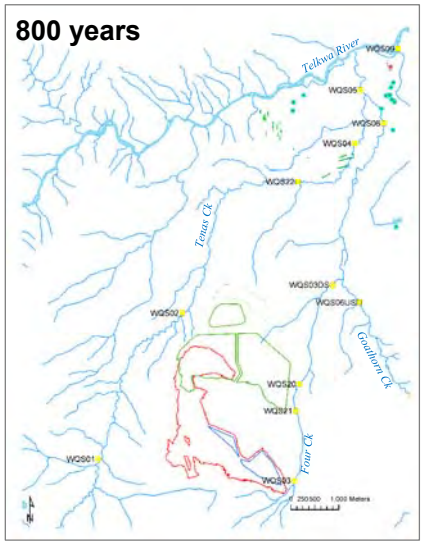
Date:	Approved:	Figure:
Dec 2020	GF	65

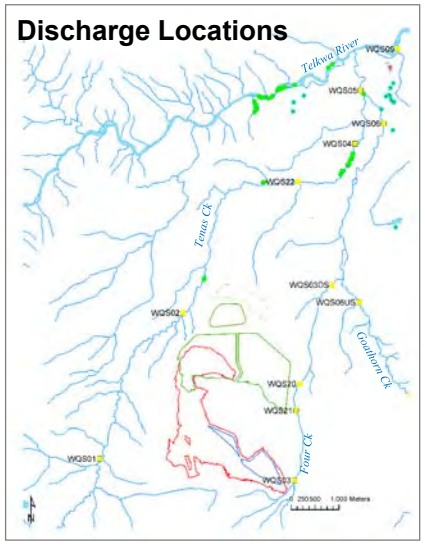












Legend

- Forward particles from control pond (25 year pulse)
- Commercial / industrial well
- Private domestic well
- Private well (unknown use)
- Water quality stations
- Proposed management / control ponds
- Proposed pit

srk consulting

TELKWA COAL LIMITED

Groundwater Technical Report

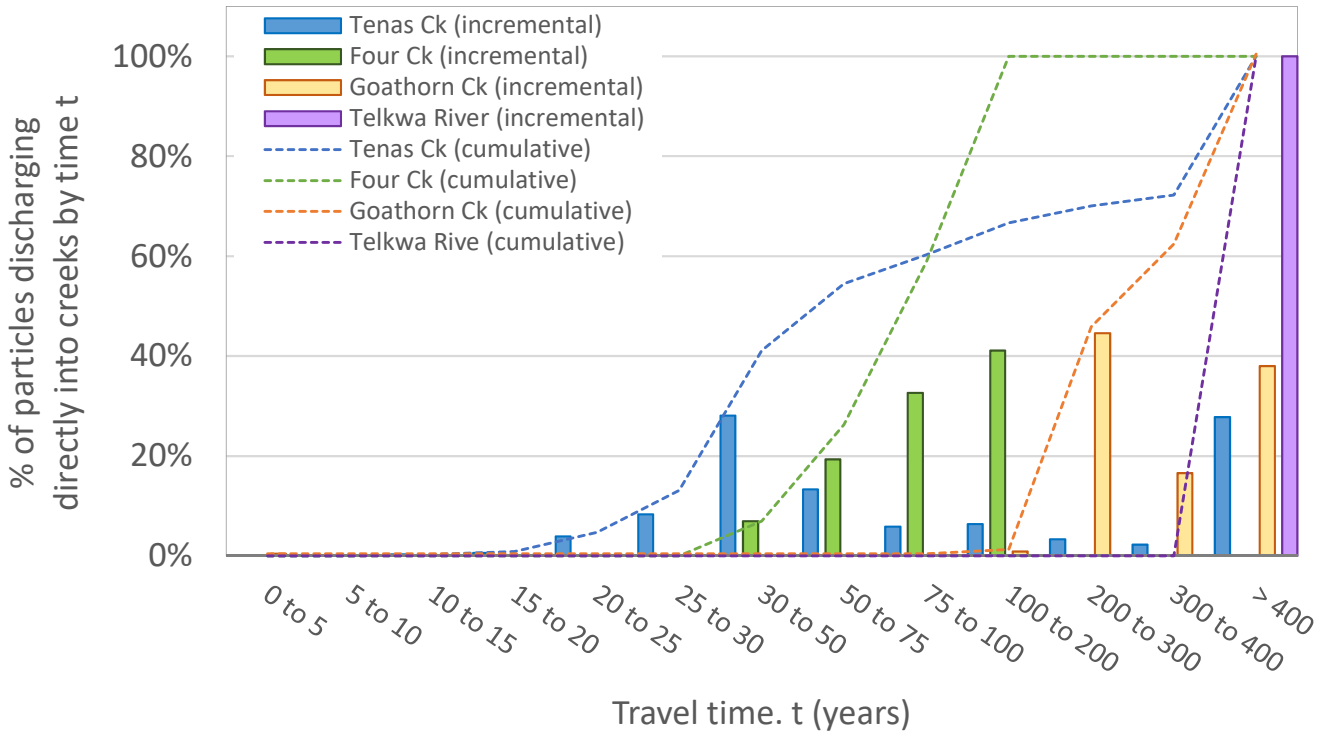
Modelled forward particle paths from the control pond

Job No: 1CT027.004

Filename: Fig66_BC_Particles_timesteps_CP.pptx

Tenas Project

Date:	Approved:	Figure:
Dec 2020	GF	66



srk consulting	TELKWA COAL LIMITED	Groundwater Technical Report	
		Plots of predicted particle travel times to creeks	
Job No: 1CT027.004 Filename: Fig67_plots_travel_times.pptx	Tenas Project	Date: Dec.2020	Approved: GF	Figure: **67**

Appendix A – Monitoring Well Installation and Monitoring Details

ID	Area	Installation type	Geol. along Screen	Data availability and usage in EA baseline study			Damaged	Dry	Easting	Northing	Collar Elev.	Stick-up	Total depth	Diam.	Screen Top	Screen Bottom	Source	Inspected	Last date of inspection	Comment Last Inspection
-		-	-	*Hydraulic test*	*Level*	*Sampling*	(yes/no)	(yes/no)	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*mags*	*mbgs*	*inch*	*mgbs*	*mbgs*	-		**dd/mm/yy**	
T18-01D (ARD02)	Tenas	Single well	BDR	yes	yes	No	No	No	6050689	617841	956.50	0.99	78.6	3.0	69.8	72.9	SRK 2018	Yes	6-Sep-18	-
T18-02S (GEO11)	Tenas	Single well	OVB	No	dry	No	No	No	6051995	618921	835.22	0.50	19.5	2.0	11.0	14.0	SRK 2018	Yes	8-Sep-18	-
T18-03D (ARD01)	Tenas	None	OVB+BDR	yes	No	No	n/a	n/a	6051772	617080	904.32	n/a	102.6	n/a	n/a	n/a	SRK 2018	Yes	Feb 18	-
T18-04D (W1D)	Tenas	Nested well	BDR	yes	yes	yes	No	No	6051115	615955	938.09	1.00	70.0	2.0	56.4	59.5	SRK 2018	Yes	13-Sep-18	-
T18-04S (W1S)	Tenas	Nested well	OVB	yes	yes	yes	No	No	6051115	615955	938.18	0.80	70.0	2.0	10.1	13.1	SRK 2018	Yes	6-Sep-18	-
T18-06D (W2)	Tenas	Single well	OVB	yes	yes	Yes	No	No	6052647	616245	851.60	0.80	131.3	2.0	114.8	117.8	SRK 2018	Yes	10-Sep-18	-
T18-07D (ARD06)	Tenas	None	OVB+BDR	yes	No	No	n/a	n/a	6052051	617318	864.16	n/a	213.7	n/a	n/a	n/a	SRK 2018	Yes	Feb 18	-
T18-08D (W3D)	Tenas	Nested well	BDR	yes	yes	Yes	No	No	6053379	618515	803.52	1.00	53.2	2.0	44.7	47.8	SRK 2018	Yes	8-Sep-18	-
T18-08S (W3S)	Tenas	Nested well	OVB	yes	yes	yes	No	No	6053379	618515	803.52	1.00	53.2	1.5	40.0	43.1	SRK 2018	Yes	8-Sep-18	-
T18-09S	Tenas	Single well	OVB	No	No	No	No	No	6051117	615957	938.26		13.5	2.0	10.1	13.1	SRK 2018	Yes	10-Feb-18	
T18-11S (GEO22)	Tenas	Single well	OVB	No	dry	No	No	Yes	6054253	617697	790.23	0.75	19.5	2.0	7.5	10.5	SRK 2018	Yes	8-Sep-18	-
T18-13S (GEO13)	Tenas	Single well	OVB	No	dry	No	No	Yes	6053408	617809	814.36	0.87	18.4	2.0	14.9	17.9	SRK 2018	Yes	8-Sep-18	-
T19-18S	Tenas	Single well	OVB	yes	yes	Yes***	No	No	6052454	619237	822.00	1.00	47.2	2.0	34.1	35.6	SRK 2019	Yes	16-Jan-19	Bedrock intercepted at 43.4 m. Hole Terminated at 47.2 m
T19-19S	Tenas	Single well	OVB+BDR	No	dry	No	No	Yes	6052171	618775	839.97	2.20	47.2	2.0	43.5	45.0	SRK 2019	Yes	19-Jan-19	Bedrock intercepted at 44.9 m. Hole Terminated at 47.2 m
T19-20S	Tenas	Single well	OVB	No	dry	No	No	Yes	6052440	616824	858.78	1.70	44.2	2.0	28.7	30.2	SRK 2019	Yes	21-Jan-19	Bedrock intercepted at 43.0 m. Hole Terminated at 44.2 m
T19-21S	Tenas	Single well	BDR	yes	yes	Yes***	No	No	6052746	616976	833.45	1.80	59.4	2.0	56.7	58.2	SRK 2019	Yes	27-Jan-19	Bedrock intercepted at 56.1 m. Hole Terminated at 59.4 m
T19-22S	Tenas	Single well	BDR	yes	yes	Yes***	No	No	6052847	617705	825.81	2.80	29.7	2.0	27.8	29.3	SRK 2019	Yes	29-Jan-19	Bedrock intercepted at 28.0 m. Hole Terminated at 29.7 m
T19-26S	Tenas	Single well	OVB	yes	yes	Yes***	No	No	6053665	617469	814.00	1.90	67.1	2.0	50.8	52.3	SRK 2019	Yes	6-Feb-19	No bedrock intercepted. Hole terminated at 67.1 m
T19-27S	Tenas	Single well	OVB	yes	yes	Yes***	No	No	6053726	617883	815.07	1.90	67.1	2.0	43.0	44.5	SRK 2019	Yes	15-Feb-19	No bedrock intercepted. Hole terminated at 67.1 m
T19-34S	Tenas	Single well	BDR	yes	yes	Yes***	No	No	6052399	618256	836.51	1.50	38.1	2.0	35.1	36.6	SRK 2019	Yes	26-Feb-19	Bedrock intercepted at 33.5 m. Hole Terminated at 38.1 m
T19-35S	Tenas	Single well	BDR	yes	yes	Yes***	No	No	6052834	618228	827.98	2.20	30.5	2.0	28.3	29.8	SRK 2019	Yes	27-Feb-19	
T95R-15C	Tenas	Single well	BDR	yes	yes	yes	No	No	6051998	617062	888.36	1.66	66.0	2.0	48.0	63.0	Piteau 98, Stantec 2016	Yes	9-Nov-18	There is a crack in the upper part of the well but it is functional. There is no cap and no protective steel lid. Water level is above the ground surface.
T95R-39C	Tenas	Single well	BDR	yes	No*	No*	Yes	n/a	6050869	617336	981.03	0.80	80.0	2.0	51.2	58.4	Piteau 98, Stantec 2016	Yes	25-Jul-18	Upper part of the well and casing are destroyed.
T95R-40	Tenas	Single well	BDR	yes	yes	yes	No	No	6051461	618188	900.18	0.26	n/a	2.0	42.0	53.0	Piteau 98	Yes	15-Sep-18	The dedicated bailer fell down into the well.
T95R-64	Tenas	Single well	BDR	yes	yes	yes	No	No	6050597	618278	949.50	1.23	128.9	2.0	85.0	94.0	Piteau 98, Stantec 2016	Yes	31-Mar-18	-
T96R-16-19	Tenas	Nested well	BDR	yes	yes	No	No	No	6050613	616954	1012.90	0.75	78.8	2.0	13.1	19.1	Piteau 98, Stantec 2016	Yes	6-Sep-18	-
T96R-16-28	Tenas	Nested well	BDR	yes	yes	No	No	No	6050613	616954	1012.90	0.82	n/a	2.0	24.5	27.5	Piteau 98	Yes	6-Sep-18	-
T96R-34-67	Tenas	Nested well	BDR	yes	No*	No*	Yes	No	6051180	617691	934.02	0.94	n/a	2.0	66.2	67.5	Piteau 98	Yes	25-Jul-18	inside casing of T96R-34-67 was found to be damaged during the August 2017 sampling event
T96R-34-87	Tenas	Nested well	BDR	yes	yes	yes	No	No	6051180	617691	934.02	0.97	97.6	2.0	80.6	86.6	Piteau 98, Stantec 2016	Yes	12-Sep-18	-
T96R-56C-83	Tenas	Single well	BDR	yes	No*	No	Yes	No	6050370	618588	944.08	1.18	93.1	2.0	74.9	82.6	Piteau 98, Stantec 2016	Yes	25-Jul-18	Suspected damage. Depth to bottom is much shallower than the provided well details. The well casing looks disturbed and tilted.
T96TP-01-10	Tenas	Single well	BDR	yes	No*	No	Yes	No	6050718	617276	995.70	1.24	n/a	3.0	8.5	10.0	Piteau 98	Yes	25-Jul-18	The coordinates were off by about 26 meters. Could not find another well in the area. 3" well in some type of testing area. Well is surrounded by a fence. Depth to bottom off by 5 meters from the original depth (screened section is filled with fines?).
T96TP-02-07	Tenas	Single well	BDR	yes	No*	No	No	No	6050655	617201	1001.60	1.31	n/a	3.0	2.0	7.0	Piteau 98	Yes	25-Jul-18	3" diameter well surrounded by a fence. Soft bottom and shallower than original depth.
T97R-108C-70	Tenas	Single well	BDR	yes	No*	No	Yes	No	6052532	617380	834.48	0.42	81.0	2.0	61.0	70.0	Piteau 98, Stantec 2016	Yes	26-Jul-18	Well is damaged. Casing is bent and the ground around the well is depressed. Depth to bottom is very shallow.
TOB96-01-05	Tenas	Single well	OVB	yes	yes	yes	No	No	6050602	619014	922.87	0.75	10.5	2.0	1.6	4.6	Piteau 98, Stantec 2016	Yes	13-Sep-18	-
TOB96-02-06	Tenas	Nested well	OVB	yes	yes	yes	No	No	6051947	618466	853.41	0.38	33.5	2.0	3.0	6.0	Piteau 98, Stantec 2016	Yes	10-Sep-18	-
TOB96-02-20	Tenas	Nested well	OVB	yes	dry	yes	No	n/a	6051947	618466	853.41	0.34	n/a	2.0	17.0	20.0	Piteau 98	Yes	26-Jul-18	Observed dry 8 times out 11 sampling events.
TOB96-11-04	Tenas	Nested well	OVB	yes	yes	yes	No	No	6052818	617724	827.36	0.87	20.2	2.0	1.5	4.5	Piteau 98, Stantec 2016	Yes	6-Sep-18	-
TOB96-11-19	Tenas	Nested well	OVB	No	dry	No	No	Yes	6052818	617724	827.36	0.31	20.2	2.0	18.7	20.2	Piteau 98, Stantec 2016	Yes	6-Sep-18	Upper part of the PVC casing is cracked and broken (cap on the ground). Well is still useable. Steel protective casing looks good. Water level tape easily can get down the well.
TOB96-12-04	Tenas	Single well	OVB	yes	No*	No*	Yes	n/a	6051377	616082	926.02	0.42	37.0	2.0	1.0	4.0	Piteau 98, Stantec 2016	Yes	26-Jul-18	Well is damaged. Casing is bent over and the depth to bottom is shallower than the original depth.
TOB97-06-21	Tenas	Single well	OVB	No	dry	No	No	Yes	6052496	616652	854.58	0.74	21.0	2.0	18.0	21.0	Piteau 98, Stantec 2016	Yes	10-Sep-18	-
TOB97-07-24	Tenas	Single well	OVB	No	dry	No	No	Yes	6053579	617887	811.05	0.90	24.0	2.0	21.0	24.0	Piteau 98, Stantec 2016	Yes	8-Sep-18	-
T18-14S	Access Road	Single well	OVB	No	yes	No	No	No	6055570	620514	683.00	n/a		2.0	6.7	8.2	Westrek, 2020	Yes	date install.	Road Geotech
T18-15S	Access Road	Single well	OVB	No	yes	No	No	No	6054948	620563	716.70	n/a		2.0	11.3	14.3	Westrek, 2020	Yes	date install.	Road Geotech
T19-36S	Rail Loadout	Single well	OVB	yes	yes	yes	No	No	6058365	629737	515.35	0.88	5.2	2.0	3.7	5.2	Cassiar 2020	Yes	12-Mar-19	Rail loadout well
T19-37S	Rail Loadout	Single well	OVB	yes	yes	yes	No	No	6058215	629955	516.39	0.87	5.0	2.0	3.4	5.0	Cassiar 2020	Yes	12-Mar-19	Rail loadout well
T19-28S	Access Road	VWP	OVB	No	yes	No	No	No	6054651	620005	710.20			n/a	9.1	-	Westrek, 2020	Yes	date install.	Road Geotech
T19-30S	Access Road	VWP	OVB	No	yes	No	No	No	6054456	620050	706.70			n/a	14.9	-	Westrek, 2020	Yes	date install.	Road Geotech
T19-31S	Access Road	VWP	OVB	No	dry	No	No	Yes	6054334	620048	704.90			n/a	7.6	-	Westrek, 2020	Yes	date install.	Road Geotech
T96R-113-43	Goathorn	Nested well	BDR	yes	No*	No	n/a	n/a	6054134	621254	771.74	0.35**	n/a	2.0	36.5	42.5	Piteau 98	No	n/a	-
T96R-113-79	Goathorn	Nested well	BDR	yes	No*	No	n/a	n/a	6054134	621254	771.74	0.35**	94.0	2.0	75.5	78.5	Piteau 98, Stantec 2016	No	n/a	-
T96R-40-117	Goathorn	Nested well	BDR	yes	No*	No	n/a	n/a	6053367	621431	833.50	0.78**	n/a	2.0	108.4	117.4	Piteau 98, Stantec 2016	No	n/a	-
T96R-40-87	Goathorn	Nested well	BDR	yes	No*	No*	n/a	n/a	6053367	621431	833.55	0.8**	156.2	2.0	81.0	87.0	Piteau 98, Stantec 2016	No	n/a	-
T96R-44-54	Goathorn	Single well	BDR	yes	No*	No*	n/a	n/a	6054247	620908	764.94	0.62**	86.0	2.0	50.5	53.5	Piteau 98, Stantec 2016	No	n/a	-
T974-21-87	Goathorn	Single well	BDR	yes	No*	No	-	-	6055301	620886	690.64	n/a	n/a	2.0	81.7	87.7	Piteau 98	No	-	-
T97R-12-75	Goathorn	Single well	BDR	No	No*	No*	n/a	n/a	6053804	621297	792.54	0.65**	97.0	2.0	68.0	74.8	Piteau 98, Stantec 2016	No	n/a	-
T97R-15-29	Goathorn	Nested well	BDR	yes	No*	No*	n/a	n/a	6054655	621062	739.81	2.15**	79.3	2.0	26.0	29.0	Piteau 98, Stantec 2016	No	n/a	-
T97R-15-52	Goathorn	Nested well	BDR	yes	No*	No*	n/a	n/a	6054655	621062	739.81	0.60**	n/a	2.0	47.0	51.6	Piteau 98, Stantec 2016	No	n/a	-
T97R-17-104	Goathorn	Nested well	BDR	yes	No*	No	n/a	n/a	6052878	621462	846.30	0.55**	116.0	2.0	98.5	104.0	Piteau 98, Stantec 2016	No	n/a	-
T97R-17-79	Goathorn	Nested well	BDR	No	No*	No*	n/a	n/a	6052878	621462	846.30	0.52**	n/a	2.0	69.7	78.7	Piteau 98, Stantec 2016	No	n/a	-

ID	Area	Installation type	Geol. along Screen	Data availability and usage in EA baseline study			Damaged	Dry	Easting	Northing	Collar Elev.	Stick-up	Total depth	Diam.	Screen Top	Screen Bottom	Source	Inspected	Last date of inspection	Comment Last Inspection
-		-	-	*Hydraulic test*	*Level*	*Sampling*	(yes/no)	(yes/no)	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*mags*	*mbgs*	*inch*	*mgbs*	*mbgs*	-		**dd/mm/yy**	
T97R-20-131	Goathorn	Single well	BDR	yes	No*	No	n/a	n/a	6055114	621360	713.61	0.89**	n/a	2.0	127.0	131.0	Piteau 98, Stantec 2016	No	n/a	-
T97R-20-40	Goathorn	Nested well	BDR	yes	No*	No*	n/a	n/a	6055114	621360	713.61	0.82**	163.8	2.0	35.2	39.7	Piteau 98, Stantec 2016	No	n/a	-
T97R-20-83	Goathorn	Nested well	BDR	yes	No*	No*	n/a	n/a	6055114	621360	713.46	0.97**	n/a	2.0	77.2	83.5	Piteau 98, Stantec 2016	No	n/a	-
T97R-21-41	Goathorn	Single well	BDR	yes	No*	No*	n/a	n/a	6055301	620886	690.64	0.87**	140.0	2.0	37.7	49.7	Piteau 98, Stantec 2016	No	n/a	-
T97R-23-69	Goathorn	Single well	BDR	yes	No*	No*	n/a	n/a	6055588	620717	679.72	0.60**	104.8	2.0	61.5	68.5	Piteau 98, Stantec 2016	No	n/a	-
T97R-33-20	Goathorn	Single well	BDR	yes	No*	No*	n/a	n/a	6054236	621053	767.66	0.60**	125.4	2.0	12.5	15.5	Piteau 98, Stantec 2016	No	n/a	-
T97R-33-55	Goathorn	Single well	BDR	yes	No*	No*	n/a	n/a	6054236	621053	767.66	0.80**	125.4	2.0	50.7	53.7	Piteau 98, Stantec 2016	No	n/a	-
T97R-33-78	Goathorn	Single well	BDR	yes	No*	No*	n/a	n/a	6054236	621053	767.66	0.92**	125.4	2.0	75.1	78.1	Piteau 98, Stantec 2016	No	n/a	-
T97R-36-140	Goathorn	Nested well	BDR	yes	No*	No	n/a	n/a	6055272	621430	710.28	0.86**	n/a	2.0	137.0	140.0	Piteau 98	No	n/a	-
T97R-36W	Goathorn	Nested well	BDR	yes	No*	No*	n/a	n/a	6055272	621430	710.71	0.45**	n/a	n/a	11.5	132.5	Piteau 98	No	n/a	-
T97R-49-63	Goathorn	Single well	BDR	yes	No*	No*	n/a	n/a	6055515	621377	701.94	0.60**	116.4	2.0	60.0	63.0	Piteau 98, Stantec 2016	No	n/a	-
T97RP-01-04	Goathorn	Nested well	OVB	yes	No*	No	n/a	n/a	6054364	620705	744.49	0.66**	16.0	n/a	1.3	4.5	Piteau 98, Stantec 2016	No	n/a	-
T97RP-01-13	Goathorn	Nested well	OVB	yes	No*	No	n/a	n/a	6054364	620705	744.49	0.66**	16.0	n/a	11.5	13.0	Piteau 98, Stantec 2016	No	n/a	-
T97RP-02-12	Goathorn	Single well	OVB	yes	No*	No	n/a	n/a	6054362	620887	758.56	0.60**	21.0	n/a	10.8	12.3	Piteau 98, Stantec 2016	No	n/a	-
T97RP-03-08	Goathorn	Single well	OVB	yes	No*	No	n/a	n/a	6054325	621236	764.04	0.70**	12.0	n/a	5.5	8.5	Piteau 98, Stantec 2016	No	n/a	-
TOB97-04-07	Goathorn	Single well	OVB	yes	No*	No	n/a	n/a	6055616	622328	684.25	0.54**	9.0	n/a	4.5	7.5	Piteau 98, Stantec 2016	No	n/a	-
TOB97-05-06	Goathorn	Single well	OVB	yes	No*	No	n/a	n/a	6054474	621931	759.37	0.83**	8.0	n/a	2.8	5.9	Piteau 98, Stantec 2016	No	n/a	-
T93R-28A	North	Nested well	BDR	yes	No*	No*	n/a	n/a	6059121	617859	789.74	0.95**	n/a	2.0	51.0	55.3	Piteau 98	No	n/a	-
T93R-28B	North	Nested well	BDR	yes	No*	No*	n/a	n/a	6059121	617859	790.32	0.52**	n/a	2.0	72.5	78.1	Piteau 98	No	n/a	-
T93R-29B	North	Nested well	BDR	No	No*	No*	n/a	n/a	6059169	617057	849.69	0.7**	n/a	2.0	109.1	114.3	Piteau 98	No	n/a	-
T93R-30	North	Single well	BDR	yes	No*	No*	n/a	n/a	6059771	616666	902.16	0.48**	134.1	2.0	100.6	106.7	Piteau 98, Stantec 2016	No	n/a	-
T93R-32	North	Single well	BDR	yes	No	No	n/a	n/a	6060062	617474	925.66	0.79**	110.6	2.0	98.7	104.8	Piteau, 98; Stantec 2016	No	n/a	-
TW604A	North	Single well	BDR	yes	No*	No*	n/a	n/a	6060143	618631	812.64	0.68**	n/a	n/a	24.8	32.6	Piteau 98	No	n/a	-
TW905A	North	Single well	BDR	No	No*	No	n/a	n/a	6059908	618552	803.15	0.225**	n/a	n/a	17.8	26.0	Piteau 98	No	n/a	-
TW905B	North	Single well	BDR	yes	No	No	n/a	n/a	6059908	618552	803.15	0.28**	n/a	*n/a*	48.9	58.3	Piteau 98	No	n/a	-
TW906A	North	Single well	BDR	yes	No	No	n/a	n/a	6060028	618624	805.85	0.65**	n/a	*n/a*	55.2	67.6	Piteau 98	No	n/a	-
TW913	North	Single well	BDR	yes	No	No	n/a	n/a	6059992	617070	922.86	0.77**	n/a	*n/a*	24.9	32.5	Piteau 98	No	n/a	-
T93R-29A	North	Nested well	OVB	No	No*	No	n/a	n/a	6059169	617057	849.69	0.76**	n/a	2.0	26.5	33.5	Piteau 98	No	n/a	-

n/a, not applicable or not available
OVB, Overburden
BDR, Bedrock

[1] *Stickup value measurements from the latest inspection unless indicated. Note stickups were raised that a couple of wells after the initial installation. These details are reported with the groundwater level data.*

*, there is no recent (>2017) level data or groundwater samples, but there are level data from between 1989 and 1993, and groundwater sample from between 1993 and 1997.

**, information collected from reports and not verified in the field.

***, well sampled duing one event only, following installation. Groundwater quality not included in the baseline dataset

Appendix B – Hydraulic Conductivity Measurements

TEST ID	Hole ID	Area	Test Type	K	Log_K	Ground surf. elev.	Screen/packer/PSD Sample		Main geological type	Geological Unit	Geology Details	Source
							Top	Bottom				
-	-	-	-	*m/s*	*m/s*	*masl*	*mgbs*	*mbgs*	-	-	-	
T95R-15C	T95R-15C	Tenas	Slug test	6.0E-06	-5.2	889.4	48.0	63.0	BDR	I	Coal seam #1	Piteau, 1988
T95R-39C	T95R-39C	Tenas	Slug test	9.6E-07	-6.0	981.0	51.2	58.4	BDR	I	Coal seam #1	Piteau, 1988
T95R-40	T95R-40	Tenas	Slug test	1.4E-06	-5.9	900.2	42.0	53.0	BDR	I	Coal seam #1	Piteau, 1988
T95R-64	T95R-64	Tenas	Slug test	5.5E-07	-6.3	949.5	85.0	94.0	BDR	I	Coal seam #1 (1/1U?)	Piteau, 1988
T96R-16-19	T96R-16-19	Tenas	Slug test	1.6E-07	-6.8	1012.9	13.1	19.1	BDR	I	Coal seam #1	Piteau, 1988
T96R-16-28	T96R-16-28	Tenas	Slug test	3.2E-08	-7.5	1012.9	24.5	27.5	BDR	*n/a*	Un-named lower coal	Piteau, 1988
T96R-34-67	T96R-34-67	Tenas	Slug test	2.1E-08	-7.7	934.0	66.2	67.5	BDR	*n/a*	Coal (upper)	Piteau, 1988
T96R-34-87	T96R-34-87	Tenas	Slug test	1.2E-07	-6.9	934.0	80.6	86.6	BDR	I	Coal seam #1 (1/1U?)	Piteau, 1988
T96R-56C-83	T96R-56C-83	Tenas	Slug test	2.2E-06	-5.7	944.1	74.9	82.6	BDR	I	Coal seam #1	Piteau, 1988
T97R-108C-70	T97R-108C-70	Tenas	Slug test	>1E-6	-6.0	834.5	61.0	70.0	BDR	I	Coal seam #1	Piteau, 1988
T96TP-01-10	T96TP-01-10	Tenas	Slug test	>1E-6	-6.0	995.7	8.5	10.0	BDR	*n/a*	Coal seam C	Piteau, 1988
T96TP-02-07	T96TP-02-07	Tenas	Slug test	>1E-6	-6.0	1001.6	2.0	7.0	BDR	I	Coal seam #1	Piteau, 1988
TOB96-01-05	TOB96-01-05	Tenas	Slug test	7.2E-07	-6.1	922.9	1.6	4.6	OVB	*n/a*	Till	Piteau, 1988
TOB96-02-06	TOB96-02-06	Tenas	Slug test	1.4E-07	-6.9	853.4	3.0	6.0	OVB	*n/a*	Till	Piteau, 1988
TOB96-02-20	TOB96-02-20	Tenas	Slug test	1.3E-06	-5.9	853.4	17.0	20.0	OVB	*n/a*	SAND and GRAVEL	Piteau, 1988
TOB96-11-04	TOB96-11-04	Tenas	Slug test	1.4E-10	-9.9	827.4	1.5	4.5	OVB	*n/a*	CLAY	Piteau, 1988
TOB96-12-04	TOB96-12-04	Tenas	Slug test	2.8E-09	-8.6	926.0	1.0	4.0	OVB	*n/a*	Till	Piteau, 1988
T18-04D#1 (W1)	T18-04D	Tenas	Packer Injection Test	4.6E-08	-7.3	938.8	63.2	68.0	BDR	*n/a*	Volcanics	SRK, 2018
T18-04D#2 (W1)	T18-04D	Tenas	Packer Injection Test	7.6E-08	-7.1	938.8	54.2	59.0	BDR	*n/a*	Volcanics	SRK, 2018
T18-04D#3 (W1)	T18-04D	Tenas	Packer Injection Test	1.0E-07	-7.0	938.8	45.2	50.0	BDR	*n/a*	Volcanics	SRK, 2018
T18-04D#4 (W1)	T18-04D	Tenas	Packer Injection Test	8.9E-07	-6.1	938.8	33.2	38.0	BDR	*n/a*	Volcanics	SRK, 2018
T18-04D#5 (W1)	T18-04D	Tenas	Packer Injection Test	5.4E-07	-6.3	938.8	21.2	26.0	BDR	*n/a*	Volcanics	SRK, 2018
T18-03D#1 (ARD01)	T18-03D	Tenas	Packer Injection Test	8.0E-09	-8.1	904.3	90.2	97.0	BDR	*n/a*	Mudstone/Siltstone	SRK, 2018
T18-03D#2 (ARD01)	T18-03D	Tenas	Packer Injection Test	6.5E-09	-8.2	904.3	81.2	88.0	BDR	*n/a*	Conglomerate	SRK, 2018
T18-03D#3 (ARD01)	T18-03D	Tenas	Packer Injection Test	1.2E-08	-7.9	904.3	63.2	71.5	BDR	*n/a*	Siltstone	SRK, 2018
T18-03D#4 (ARD01)	T18-03D	Tenas	Packer Injection Test	1.7E-08	-7.8	904.3	42.2	48.5	BDR	*n/a*	Mudstone	SRK, 2018
T18-07D#1 (ARD06)	T18-07D	Tenas	Packer Injection Test	6.4E-08	-7.2	864.2	200.2	207.0	BDR	*n/a*	Conglomerate	SRK, 2018
T18-07D#2 (ARD06)	T18-07D	Tenas	Packer Injection Test	9.7E-08	-7.0	864.2	176.2	183.0	BDR	*n/a*	Siltstone	SRK, 2018
T18-07D#3 (ARD06)	T18-07D	Tenas	Packer Injection Test	3.7E-08	-7.4	864.2	170.2	174.0	BDR	*n/a*	Sandstone	SRK, 2018
T18-07D#4 (ARD06)	T18-07D	Tenas	Packer Injection Test	2.2E-07	-6.7	864.2	149.2	156.0	BDR	*n/a*	Siltstone	SRK, 2018
T18-01S	T18-01S	Tenas	Grain Size	8.9E-09	-8.1	862.8	6.1	6.4	OVB	*n/a*	Gravely CLAY with Trace Cobbles	SRK, 2018
T18-02S	T18-02S	Tenas	Grain Size	4.9E-08	-7.3	835.7	11.8	12.1	OVB	*n/a*	Clayey SILT with some Sand	SRK, 2018
T18-02S	T18-02S	Tenas	Grain Size	5.0E-08	-7.3	835.7	12.6	12.9	OVB	*n/a*	Silty SAND with trace clay and trace cobbles	SRK, 2018
T18-02TP	T18-02TP	Tenas	Grain Size	8.6E-09	-8.1	1050.0	0.9	1.2	OVB	*n/a*	Gravely CLAY with Trace Sand	SRK, 2018
T18-03S	T18-03S	Tenas	Grain Size	1.1E-05	-4.9	851.9	9.0	9.3	OVB	*n/a*	Gravely SAND with trace Silt	SRK, 2018
T18-03TP	T18-03TP	Tenas	Grain Size	7.3E-09	-8.1	1050.0	2.7	3.0	OVB	*n/a*	Clayey GRAVEL with Some Cobbles	SRK, 2018
T18-04S	T18-04S	Tenas	Grain Size	4.5E-08	-7.3	834.3	8.6	8.9	OVB	*n/a*	Sandy SILT with Some Clay	SRK, 2018
T18-05S	T18-05S	Tenas	Grain Size	1.0E-09	-9.0	852.4	10.2	10.5	OVB	*n/a*	Gravely CLAY with Trace Cobbles	SRK, 2018
T18-07S	T18-07S	Tenas	Grain Size	5.6E-08	-7.3	908.4	18.1	18.4	OVB	*n/a*	Gravely SAND with some Cobbles	SRK, 2018
T18-07TP	T18-07TP	Tenas	Grain Size	1.0E-07	-7.0	1050.0	1.9	2.2	OVB	*n/a*	Gravely CLAY with Some Cobbles	SRK, 2018
T18-08S	T18-08S	Tenas	Grain Size	6.3E-09	-8.2	885.4	9.1	9.4	OVB	*n/a*	Gravely CLAY with Trace Cobbles	SRK, 2018
T18-08TP	T18-08TP	Tenas	Grain Size	1.0E-08	-8.0	1050.0	1.9	2.2	OVB	*n/a*	Gravely CLAY with Some Cobbles	SRK, 2018
T18-09TP	T18-09TP	Tenas	Grain Size	2.0E-09	-8.7	1050.0	2.9	3.2	OVB	*n/a*	Gravely CLAY with Some Cobbles	SRK, 2018
T18-10S	T18-10S	Tenas	Grain Size	3.8E-09	-8.4	837.8	3.7	4.0	OVB	*n/a*	Gravely CLAY with Some Cobbles	SRK, 2018
T18-11S	T18-11S	Tenas	Grain Size	6.7E-07	-6.2	791.0	0.1	0.4	OVB	*n/a*	Sandy CLAY with Trace Cobbles	SRK, 2018
T18-12S	T18-12S	Tenas	Grain Size	1.2E-06	-5.9	800.8	24.1	24.4	OVB	*n/a*	Clayey SAND with Some Gravel	SRK, 2018
T18-13S	T18-13S	Tenas	Grain Size	2.7E-09	-8.6	815.2	1.6	1.9	OVB	*n/a*	Gravely CLAY with Some Cobbles	SRK, 2018
T18-13S	T18-13S	Tenas	Grain Size	6.8E-11	-10.2	815.2	12.6	12.9	OVB	*n/a*	Gravely CLAY with Trace Cobbles	SRK, 2018
T18-08S	T18-08S	Tenas	Grain Size	1.2E-06	-5.9	885.4	24.4	24.7	OVB	*n/a*	silty SAND	SRK, 2018
T18-06D (W2)	T18-06D	Tenas	Slug test	3.0E-06	-5.5	852.5	113.3	117.8	OVB	*n/a*	COBBLES	Cassiar, 2018
T18-01D (ARD02)	T18-01D	Tenas	Slug test	5.2E-07	-6.3	957.5	69.8	72.9	BDR	*n/a*	Sandstone	Cassiar, 2020
T18-04S (W1S)	T18-04D	Tenas	Slug test	5.0E-07	-6.3	938.8	10.1	13.1	BDR	*n/a*	Gravelly Fat Clay (Till) and Volcanics	Cassiar, 2018
T18-08S (W3S)	T18-08D	Tenas	Slug test	5.0E-07	-6.3	804.5	40.0	43.1	OVB	*n/a*	SAND lense in Till	Cassiar, 2018
T18-08D (W3D)	T18-08D	Tenas	Slug test	3.0E-09	-8.5	804.5	44.7	47.8	BDR	*n/a*	Volcanics	Cassiar, 2018
T18-01D (ARD02)	T18-08D	Tenas	Pump Test	2.2E-07	-6.7	957.5	69.8	72.9	BDR	*n/a*	Sandstone	Cassiar, 2020
T19-18S	T19-18S	Tenas	Slug Test	5.9E-07	-6.2	822.0	34.1	35.6	OVB	*n/a*	Clayey Sand	Cassiar, 2020
T19-21S	T19-21S	Tenas	Slug Test	3.0E-08	-7.5	833.5	56.7	58.2	BDR	*n/a*	Weathered Siltstone	Cassiar, 2020
T19-22S	T19-22S	Tenas	Slug Test	6.6E-08	-7.2	825.8	27.8	29.3	BDR	*n/a*	Weathered Siltstone	Cassiar, 2020
T19-26S	T19-26S	Tenas	Slug Test	3.3E-06	-5.5	814.0	50.8	52.3	OVB	*n/a*	Clayey Sand	Cassiar, 2020
T19-27S	T19-27S	Tenas	Slug Test	5.1E-05	-4.3	815.1	43.0	44.5	OVB	*n/a*	Silty Sand with Gravel	Cassiar, 2020
T19-34S	T19-34S	Tenas	Slug Test	1.4E-07	-6.9	836.5	35.1	36.6	BDR	*n/a*	Weathered Siltstone	Cassiar, 2020
T19-35S	T19-35S	Tenas	Slug Test	5.3E-06	-5.3	828.0	28.3	29.8	BDR	*n/a*	Weathered Siltstone	Cassiar, 2020
T19-36S	T19-36S	Rail loadout	Slug Test	7.5E-04	-3.1	515.4	3.3	5.3	OVB	*n/a*	fluvial well-graded sand and gravel	Cassiar, 2020
T19-37S	T19-37S	Rail loadout	Slug Test	7.2E-06	-5.1	516.4	3.0	5.0	OVB	*n/a*	fluvial well-graded sand and gravel	Cassiar, 2020
T96R-40-87	T96R-40-87	Goathorn	Slug Test	3.7E-06	-5.43	833.6	81.0	87.0	BDR	III	Coal seam #4 (5?)	Piteau, 1988
T96R-40-117	T96R-40-117	Goathorn	Slug Test	4.3E-10	-9.37	833.5	108.4	117.4	BDR	III	Coal seam #2	Piteau, 1988
T96R-44-54	T96R-44-54	Goathorn	Slug Test	3.7E-08	-7.43	764.9	50.5	53.5	BDR	III	Coal seam #2	Piteau, 1988
T96R-113-43	T96R-113-43	Goathorn	Slug Test	8.5E-07	-6.07	771.7	36.5	42.5	BDR	III	Coal seam #4-5	Piteau, 1988
T96R-113-79	T96R-113-79	Goathorn	Slug Test	9.2E-10	-9.04	771.7	75.5	78.5	BDR	III	Coal seam #2	Piteau, 1988
T97R-15-29	T97R-15-29	Goathorn	Slug Test	4.7E-08	-7.33	739.8	26.0	29.0	BDR	III	Coal seam #4-5	Piteau, 1988
T97R-15-52	T97R-15-52	Goathorn	Slug Test	2.0E-07	-6.70	739.8	47.0	51.6	BDR	III	Coal seam #3	Piteau, 1988
T97R-17-104	T97R-17-104	Goathorn	Slug Test	2.6E-07	-6.59	846.3	98.5	104.0	BDR	III	Coal seam #2	Piteau, 1988
T97R-20-40	T97R-20-40	Goathorn	Slug Test	1.6E-09	-8.80	713.6	35.2	39.7	BDR	III	Coal seam #8	Piteau, 1988
T97R-20-83	T97R-20-83	Goathorn	Slug Test	1.0E-09	-9.00	713.5	77.2	83.5	BDR	III	Coal seam #4-5	Piteau, 1988
T97R-20-131	T97R-20-131	Goathorn	Slug Test	3.2E-09	-8.49	713.6	127.0	131.0	BDR	III	Coal seam #2	Piteau, 1988
T97R-21-41	T97R-21-41	Goathorn	Slug Test	4.0E-07	-6.40	690.6	37.7	49.7	BDR	I	Coal seam (#?)	Piteau, 1988
T974-21-87	T974-21-87	Goathorn	Slug Test	1.4E-08	-7.85	690.6	81.7	87.7	BDR	I	Coal seam #1	Piteau, 1988
T97R-23-69	T97R-23-69	Goathorn	Slug Test	1.3E-07	-6.89	679.7	61.5	68.5	BDR	I	Coal seam #1	Piteau, 1988
T97R-33-20	T97R-33-20	Goathorn	Slug Test	>1E-6	-6.00	767.7	12.5	15.5	BDR	III	Upper Sandstone	Piteau, 1988
T97R-33-55	T97R-33-55	Goathorn	Slug Test	1.5E-10	-9.82	767.7	50.7	53.7	BDR	III	Sandstone, Coal seam #3	Piteau, 1988
T97R-33-78	T97R-33-78	Goathorn	Slug Test	2.9E-09	-8.54	767.7	75.1	78.1	BDR	III	Lower Mudstone	Piteau, 1988
T97R-36W	T97R-36W	Goathorn	Pump Test	2.1E-09	-8.68	710.7	11.5	132.5	BDR	*n/a*	Various	Piteau, 1988
T97R-36-140	T97R-36-140	Goathorn	Slug Test	7.7E-12	-11.11	710.3	137.0	140.0	BDR	*n/a*	Lower Mudstone	Piteau, 1988
T97R-49-63	T97R-49-63	Goathorn	Slug Test	1.1E-09	-8.96	701.9	60.0	63.0	BDR	III	Sandstone, Coal seam #3	Piteau, 1988
TOB97-04-07	TOB97-04-07	Goathorn	Slug Test	8.1E-09	-8.09	684.3	4.5	7.5	OVB	*n/a*	SILT (Till)	Piteau, 1988
TOB97-05-06	TOB97-05-06	Goathorn	Slug Test	1.2E-08	-7.92	759.4	2.8	5.9	OVB	*n/a*	Till	Piteau, 1988
T93R-28A	T93R-28A	North	Slug Test	2.7E-09	-8.57	789.7	51.0	55.3	BDR	*n/a*	Coal seam #6	Piteau, 1988
T93R-28B	T93R-28B	North	Slug Test	1.0E-08	-8.00	790.3	72.5	78.1	BDR	III	Coal seam #2	Piteau, 1988
T93R-30	T93R-30	North	Slug Test	5.4E-09	-8.27	902.2	100.6	106.7	BDR	I	Coal seam #1	Piteau, 1988
TW604A	TW604A	North	Slug Test	2.4E-07	-6.62	812.6	24.8	32.6	BDR	*n/a*	Coal seam #6, Mudstone	Piteau, 1988
TW905B	TW905B	North	Slug Test	3.5E-07	-6.46	803.2	48.9	58.3	BDR	III	Sandstone, Mudstone, Coal seam #2	Piteau, 1988
TW906A	TW906A	North	Slug Test	2.2E-07	-6.66	805.9	55.2	67.6	BDR	III	Mudstone, Coal seam #2	Piteau, 1988
TW913	TW913	North	Slug Test	1.3E-07	-6.89	922.9	24.9	32.5	BDR	III	Mudstone, Coal seam #2	Piteau, 1988
T93R-32	T93R-32	North	Slug Test	7.3E-09	-8.14	925.7	98.7	104.8	BDR	III	Coal seam #2	Piteau, 1988

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T18-01D	0	12.7	12.7	Overburden	Telkwa_Geotech.csv
T18-01D	12.7	14.5	1.8	MDST	Telkwa_Geotech.csv
T18-01D	14.5	15.7	1.2	COAL	Telkwa_Geotech.csv
T18-01D	15.7	21.7	6	MDST	Telkwa_Geotech.csv
T18-01D	21.7	23.2	1.5	COAL	Telkwa_Geotech.csv
T18-01D	23.2	30	6.8	MDST	Telkwa_Geotech.csv
T18-01D	30	36.42	6.42	SLTS	Telkwa_Geotech.csv
T18-01D	36.42	38.5	2.08	COAL	Telkwa_Geotech.csv
T18-01D	38.5	39.1	0.6	MDST	Telkwa_Geotech.csv
T18-01D	39.1	40.7	1.6	COAL	Telkwa_Geotech.csv
T18-01D	40.7	44.5	3.8	MDST	Telkwa_Geotech.csv
T18-01D	44.5	44.9	0.4	COAL	Telkwa_Geotech.csv
T18-01D	44.9	45.7	0.8	MDST	Telkwa_Geotech.csv
T18-01S	0	0.4	0.4	Overburden	Sonic_Logs_Combined_20180511.csv
T18-01TP	0	8	8	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-02D	8	8.4	0.4	Overburden	Telkwa_Geotech.csv
T18-02D	8.4	36.66	28.26	MDST	Telkwa_Geotech.csv
T18-02D	36.66	36.9	0.24	COAL	Telkwa_Geotech.csv
T18-02D	36.9	40.8	3.9	SLTS	Telkwa_Geotech.csv
T18-02D	40.8	41.45	0.65	COAL	Telkwa_Geotech.csv
T18-02D	41.45	48.6	7.15	MDST	Telkwa_Geotech.csv
T18-02D	48.6	50.3	1.7	COAL	Telkwa_Geotech.csv
T18-02D	50.3	58.1	7.8	MDST	Telkwa_Geotech.csv
T18-02D	58.1	58.58	0.48	COAL	Telkwa_Geotech.csv
T18-02D	58.58	68.36	9.78	SLTS	Telkwa_Geotech.csv
T18-02D	68.36	75.54	7.18	COAL	Telkwa_Geotech.csv
T18-02D	75.54	78.63	3.09	SLTS	Telkwa_Geotech.csv
T18-02D	78.63	79.8	1.17	COAL	Telkwa_Geotech.csv
T18-02D	79.8	80.38	0.58	MDST	Telkwa_Geotech.csv
T18-02D	80.38	81.3	0.92	COAL	Telkwa_Geotech.csv
T18-02D	81.3	91.8	10.5	MDST	Telkwa_Geotech.csv
T18-02D	91.8	92.6	0.8	COAL	Telkwa_Geotech.csv
T18-02D	92.6	105.3	12.7	SLTS	Telkwa_Geotech.csv
T18-02D	105.3	106.8	1.5	SST	Telkwa_Geotech.csv
T18-02D	106.8	108.3	1.5	n/a	Telkwa_Geotech.csv
T18-02D	108.3	109.8	1.5	SLTS	Telkwa_Geotech.csv
T18-02D	109.8	120.3	10.5	SST	Telkwa_Geotech.csv
T18-02D	120.3	121.8	1.5	SLTS	Telkwa_Geotech.csv
T18-02S	0	0.7	0.7	Overburden	Sonic_Logs_Combined_20180511.csv
T18-02TP	0	0.3	0.3	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-03S	0	0.4	0.4	Overburden	Sonic_Logs_Combined_20180511.csv
T18-03TP	0	0.2	0.2	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-04S	0	0.1	0.1	Overburden	Sonic_Logs_Combined_20180511.csv
T18-04TP	0	0.3	0.3	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-05D	0	13.5	13.5	Overburden	Telkwa_Geotech.csv
T18-05D	13.5	90	76.5	SLTS	Telkwa_Geotech.csv
T18-05D	90	93.62	3.62	MDST	Telkwa_Geotech.csv
T18-05D	93.62	94.1	0.48	COAL	Telkwa_Geotech.csv
T18-05D	94.1	97.5	3.4	MDST	Telkwa_Geotech.csv
T18-05D	97.5	99.4	1.9	SLTS	Telkwa_Geotech.csv
T18-05D	99.4	101.6	2.2	COAL	Telkwa_Geotech.csv
T18-05D	101.6	111	9.4	SLTS	Telkwa_Geotech.csv
T18-05D	111	111.37	0.37	MDST	Telkwa_Geotech.csv
T18-05D	111.37	111.67	0.3	COAL	Telkwa_Geotech.csv
T18-05D	111.67	118.95	7.28	SLTS	Telkwa_Geotech.csv
T18-05D	118.95	126.2	7.25	COAL	Telkwa_Geotech.csv
T18-05D	126.2	131.14	4.94	MDST	Telkwa_Geotech.csv
T18-05D	131.14	132.14	1	COAL	Telkwa_Geotech.csv
T18-05D	132.14	132.4	0.26	MDST	Telkwa_Geotech.csv
T18-05D	132.4	133.2	0.8	COAL	Telkwa_Geotech.csv
T18-05D	133.2	134.52	1.32	MDST	Telkwa_Geotech.csv
T18-05D	134.52	135.47	0.95	COAL	Telkwa_Geotech.csv
T18-05D	135.47	139.32	3.85	SLTS	Telkwa_Geotech.csv
T18-05D	139.32	140.46	1.14	COAL	Telkwa_Geotech.csv
T18-05D	140.46	141	0.54	MDST	Telkwa_Geotech.csv
T18-05D	141	142.1	1.1	COAL	Telkwa_Geotech.csv
T18-05D	142.1	156	13.9	MDST	Telkwa_Geotech.csv
T18-05D	156	175.5	19.5	SLTS	Telkwa_Geotech.csv
T18-05D	175.5	177	1.5	MDST	Telkwa_Geotech.csv
T18-05S	0	0.4	0.4	Overburden	Sonic_Logs_Combined_20180511.csv
T18-05TP	0	0.3	0.3	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-06TP	0	0.2	0.2	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-07S	0	26.2	26.2	Overburden	Sonic_Logs_Combined_20180511.csv
T18-07S	26.2	27.9	1.7	?	Sonic_Logs_Combined_20180511.csv
T18-07TP	0	0.2	0.2	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-08S	0	0.3	0.3	Overburden	Sonic_Logs_Combined_20180511.csv
T18-08TP	0	0.2	0.2	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-09S	0	12.9	12.9	Overburden	Sonic_Logs_Combined_20180511.csv
T18-09S	12.9	13.5	0.6	?	Sonic_Logs_Combined_20180511.csv
T18-09TP	0	0.2	0.2	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-10S	0	0.2	0.2	Overburden	Sonic_Logs_Combined_20180511.csv
T18-10TP	0	0.3	0.3	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-11S	0	0.5	0.5	Overburden	Sonic_Logs_Combined_20180511.csv
T18-11TP	0	0.2	0.2	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-12S	0	0.4	0.4	Overburden	Sonic_Logs_Combined_20180511.csv
T18-12TP	0	0.2	0.2	Overburden	Test_Pit_Logs_Combined_20180511.csv
T18-13S	0	11.7	11.7	Overburden	Sonic_Logs_Combined_20180511.csv
T81R-108	0	25.7	25.7	Overburden	Tenas_Lithology.csv
T81R-108	25.7	38.1	12.4	MDST	Tenas_Lithology.csv
T81R-108	38.1	52.7	14.6	SLTS	Tenas_Lithology.csv
T81R-108	52.7	71.9	19.2	VOLC	Tenas_Lithology.csv
T81R-108	71.9	73.8	1.9	SLTS	Tenas_Lithology.csv
T81R-108	73.8	76.2	2.4	SST	Tenas_Lithology.csv
T81R-108	76.2	77.1	0.9	MDST	Tenas_Lithology.csv
T81R-108	77.1	87.7	10.6	SLTS	Tenas_Lithology.csv
T81R-108	87.7	90.25	2.55	SST	Tenas_Lithology.csv
T81R-108	90.25	95.6	5.35	SLTS	Tenas_Lithology.csv
T81R-108	95.6	100.8	5.2	SST	Tenas_Lithology.csv
T81R-108	100.8	108.5	7.7	SLTS	Tenas_Lithology.csv
T81R-108	108.5	115.6	7.1	MDST	Tenas_Lithology.csv
T81R-108	115.6	126.8	11.2	SLTS	Tenas_Lithology.csv
T81R-108	126.8	129	2.2	CGL	Tenas_Lithology.csv
T81R-108	129	130	1	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T81R-108	130	156.8	26.8	VOLC	Tenas_Lithology.csv
T81R-108	156.8	157.9	1.1	SLTS	Tenas_Lithology.csv
T81R-108	157.9	160.2	2.3	MDST	Tenas_Lithology.csv
T81R-108	160.2	169.8	9.6	VOLC	Tenas_Lithology.csv
T92R-39C	0	2.3	2.3	Overburden	Tenas_Lithology.csv
T92R-39C	2.3	2.47	0.17	SLTS	Tenas_Lithology.csv
T92R-39C	2.47	4.21	1.74	COAL	Tenas_Lithology.csv
T92R-39C	4.21	6.68	2.47	SLTS	Tenas_Lithology.csv
T92R-39C	6.68	11.03	4.35	COAL	Tenas_Lithology.csv
T92R-39C	11.03	11.48	0.45	SLTS	Tenas_Lithology.csv
T92R-39C	11.48	11.76	0.28	COAL	Tenas_Lithology.csv
T92R-39C	11.76	15.9	4.14	SLTS	Tenas_Lithology.csv
T92R-39C	15.9	19.03	3.13	MDST	Tenas_Lithology.csv
T92R-39C	19.03	19.1	0.07	COAL	Tenas_Lithology.csv
T92R-39C	19.1	19.63	0.53	MDST	Tenas_Lithology.csv
T92R-39C	19.63	19.75	0.12	COAL	Tenas_Lithology.csv
T92R-39C	19.75	21.2	1.45	SLTS	Tenas_Lithology.csv
T92R-39C	21.2	21.4	0.2	COAL	Tenas_Lithology.csv
T92R-39C	21.4	23.88	2.48	SLTS	Tenas_Lithology.csv
T92R-39C	23.88	24.1	0.22	COAL	Tenas_Lithology.csv
T92R-39C	24.1	27.2	3.1	SST	Tenas_Lithology.csv
T92R-39C	27.2	27.46	0.26	COAL	Tenas_Lithology.csv
T92R-39C	27.46	29.42	1.96	SLTS	Tenas_Lithology.csv
T92R-39C	29.42	29.62	0.2	COAL	Tenas_Lithology.csv
T92R-39C	29.62	35.2	5.58	SLTS	Tenas_Lithology.csv
T92R-39C	35.2	62.5	27.3	SST	Tenas_Lithology.csv
T92R-42	0	7.26	7.26	Overburden	Tenas_Lithology.csv
T92R-42	7.26	10.7	3.44	MDST	Tenas_Lithology.csv
T92R-42	10.7	15.05	4.35	SLTS	Tenas_Lithology.csv
T92R-42	15.05	20	4.95	SST	Tenas_Lithology.csv
T92R-42	20	22.45	2.45	MDST	Tenas_Lithology.csv
T92R-42	22.45	25.5	3.05	SST	Tenas_Lithology.csv
T92R-42	25.5	28.1	2.6	SLTS	Tenas_Lithology.csv
T92R-43	0	6.71	6.71	Overburden	Tenas_Lithology.csv
T92R-43	6.71	26.81	20.1	MDST	Tenas_Lithology.csv
T92R-43	26.81	27.22	0.41	COAL	Tenas_Lithology.csv
T92R-43	27.22	30.1	2.88	MDST	Tenas_Lithology.csv
T92R-43	30.1	30.61	0.51	COAL	Tenas_Lithology.csv
T92R-43	30.61	33.59	2.98	SLTS	Tenas_Lithology.csv
T92R-43	33.59	34.06	0.47	COAL	Tenas_Lithology.csv
T92R-43	34.06	38.79	4.73	SLTS	Tenas_Lithology.csv
T92R-43	38.79	39.22	0.43	COAL	Tenas_Lithology.csv
T92R-43	39.22	42.89	3.67	SLTS	Tenas_Lithology.csv
T92R-43	42.89	48.69	5.8	COAL	Tenas_Lithology.csv
T92R-43	48.69	50.87	2.18	SLTS	Tenas_Lithology.csv
T92R-43	50.87	51.31	0.44	COAL	Tenas_Lithology.csv
T92R-43	51.31	55	3.69	MDST	Tenas_Lithology.csv
T92R-43	55	56.6	1.6	SST	Tenas_Lithology.csv
T92R-43	56.6	57.42	0.82	MDST	Tenas_Lithology.csv
T92R-43	57.42	57.98	0.56	COAL	Tenas_Lithology.csv
T92R-43	57.98	61.86	3.88	SLTS	Tenas_Lithology.csv
T92R-43	61.86	62.45	0.59	COAL	Tenas_Lithology.csv
T92R-43	62.45	62.85	0.4	SLTS	Tenas_Lithology.csv
T92R-43	62.85	63.2	0.35	COAL	Tenas_Lithology.csv
T92R-43	63.2	67.57	4.37	SLTS	Tenas_Lithology.csv
T92R-43	67.57	67.98	0.41	COAL	Tenas_Lithology.csv
T92R-43	67.98	85.3	17.32	SST	Tenas_Lithology.csv
T93D-45	0	39.5	39.5	Overburden	Tenas_Lithology.csv
T93D-45	39.5	40.03	0.53	COAL	Tenas_Lithology.csv
T93D-45	40.03	44.08	4.05	MDST	Tenas_Lithology.csv
T93D-45	44.08	44.57	0.49	COAL	Tenas_Lithology.csv
T93D-45	44.57	44.76	0.19	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93D-45	44.76	46.13	1.37	COAL	Tenas_Lithology.csv
T93D-45	46.13	58.17	12.04	MDST	Tenas_Lithology.csv
T93D-45	58.17	60	1.83	COAL	Tenas_Lithology.csv
T93D-45	60	61.5	1.5	MDST	Tenas_Lithology.csv
T93D-45	61.5	62.3	0.8	COAL	Tenas_Lithology.csv
T93D-45	62.3	65.6	3.3	SLTS	Tenas_Lithology.csv
T93D-45	65.6	66.2	0.6	COAL	Tenas_Lithology.csv
T93D-45	66.2	67.6	1.4	SLTS	Tenas_Lithology.csv
T93D-45	67.6	68.2	0.6	COAL	Tenas_Lithology.csv
T93D-45	68.2	76.4	8.2	SLTS	Tenas_Lithology.csv
T93D-45	76.4	107.5	31.1	SST	Tenas_Lithology.csv
T93D-45	107.5	115.6	8.1	SLTS	Tenas_Lithology.csv
T93D-45	115.6	128.75	13.15	SST	Tenas_Lithology.csv
T93D-45	128.75	129.23	0.48	COAL	Tenas_Lithology.csv
T93D-45	129.23	131.3	2.07	MDST	Tenas_Lithology.csv
T93D-45	131.3	134.7	3.4	SST	Tenas_Lithology.csv
T93D-45	134.7	142.8	8.1	CGL	Tenas_Lithology.csv
T93D-47	0	12.21	12.21	Overburden	Tenas_Lithology.csv
T93D-47	12.21	38.6	26.39	SLTS	Tenas_Lithology.csv
T93D-47	38.6	52.4	13.8	SST	Tenas_Lithology.csv
T93D-47	52.4	92	39.6	SLTS	Tenas_Lithology.csv
T93D-47	92	100	8	SST	Tenas_Lithology.csv
T93D-47	100	110	10	SLTS	Tenas_Lithology.csv
T93D-47	110	116.7	6.7	SST	Tenas_Lithology.csv
T93D-47	116.7	141	24.3	SLTS	Tenas_Lithology.csv
T93D-47	141	166.81	25.81	SST	Tenas_Lithology.csv
T93D-47	166.81	167.17	0.36	COAL	Tenas_Lithology.csv
T93D-47	167.17	168.03	0.86	MDST	Tenas_Lithology.csv
T93D-47	168.03	168.95	0.92	COAL	Tenas_Lithology.csv
T93D-47	168.95	170.02	1.07	MDST	Tenas_Lithology.csv
T93D-47	170.02	171.13	1.11	SLTS	Tenas_Lithology.csv
T93D-47	171.13	173	1.87	CGL	Tenas_Lithology.csv
T93D-47	173	178.9	5.9	SST	Tenas_Lithology.csv
T93D-53	0	7.52	7.52	Overburden	Tenas_Lithology.csv
T93D-53	7.52	9.56	2.04	SLTS	Tenas_Lithology.csv
T93D-53	9.56	14.86	5.3	SST	Tenas_Lithology.csv
T93D-53	14.86	33.43	18.57	SLTS	Tenas_Lithology.csv
T93D-53	33.43	35.83	2.4	SST	Tenas_Lithology.csv
T93D-53	35.83	36.42	0.59	MDST	Tenas_Lithology.csv
T93D-53	36.42	36.47	0.05	COAL	Tenas_Lithology.csv
T93D-53	36.47	39.73	3.26	MDST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T93D-53	39.73	39.89	0.16	SLTS	Tenas_Lithology.csv
T93D-53	39.89	39.97	0.08	MDST	Tenas_Lithology.csv
T93D-53	39.97	40.12	0.15	COAL	Tenas_Lithology.csv
T93D-53	40.12	40.96	0.84	SLTS	Tenas_Lithology.csv
T93D-53	40.96	41.29	0.33	COAL	Tenas_Lithology.csv
T93D-53	41.29	41.39	0.1	MDST	Tenas_Lithology.csv
T93D-53	41.39	43.61	2.22	SLTS	Tenas_Lithology.csv
T93D-53	43.61	43.79	0.18	COAL	Tenas_Lithology.csv
T93D-53	43.79	43.82	0.03	MDST	Tenas_Lithology.csv
T93D-53	43.82	46.45	2.63	SLTS	Tenas_Lithology.csv
T93D-53	46.45	46.48	0.03	MDST	Tenas_Lithology.csv
T93D-53	46.48	48.18	1.7	COAL	Tenas_Lithology.csv
T93D-53	48.18	50.02	1.84	MDST	Tenas_Lithology.csv
T93D-53	50.02	50.41	0.39	SLTS	Tenas_Lithology.csv
T93D-53	50.41	51.32	0.91	MDST	Tenas_Lithology.csv
T93D-53	51.32	56.19	4.87	SLTS	Tenas_Lithology.csv
T93D-53	56.19	58.65	2.46	COAL	Tenas_Lithology.csv
T93D-53	58.65	58.69	0.04	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93D-53	58.69	62.96	4.27	COAL	Tenas_Lithology.csv
T93D-53	62.96	63.07	0.11	MDST	Tenas_Lithology.csv
T93D-53	63.07	67.35	4.28	SLTS	Tenas_Lithology.csv
T93D-53	67.35	67.72	0.37	COAL	Tenas_Lithology.csv
T93D-53	67.72	67.93	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93D-53	67.93	68.23	0.3	COAL	Tenas_Lithology.csv
T93D-53	68.23	70.88	2.65	SLTS	Tenas_Lithology.csv
T93D-53	70.88	71.23	0.35	MDST	Tenas_Lithology.csv
T93D-53	71.23	71.57	0.34	COAL	Tenas_Lithology.csv
T93D-53	71.57	73.39	1.82	SLTS	Tenas_Lithology.csv
T93D-53	73.39	74.4	1.01	MDST	Tenas_Lithology.csv
T93D-53	74.4	75.15	0.75	COAL	Tenas_Lithology.csv
T93D-53	75.15	75.31	0.16	MDST	Tenas_Lithology.csv
T93D-53	75.31	75.93	0.62	SST	Tenas_Lithology.csv
T93D-53	75.93	76.64	0.71	SLTS	Tenas_Lithology.csv
T93D-53	76.64	77.44	0.8	COAL	Tenas_Lithology.csv
T93D-53	77.44	78.32	0.88	SST	Tenas_Lithology.csv
T93D-53	78.32	78.42	0.1	COAL	Tenas_Lithology.csv
T93D-53	78.42	79.06	0.64	MDST	Tenas_Lithology.csv
T93D-53	79.06	81.02	1.96	SLTS	Tenas_Lithology.csv
T93D-53	81.02	81.59	0.57	SST	Tenas_Lithology.csv
T93D-53	81.59	84.96	3.37	MDST	Tenas_Lithology.csv
T93D-53	84.96	85.34	0.38	COAL	Tenas_Lithology.csv
T93D-53	85.34	91.4	6.06	SLTS	Tenas_Lithology.csv
T93R-02	0	1.66	1.66	Overburden	Tenas_Lithology.csv
T93R-02	1.66	3.35	1.69	COAL	Tenas_Lithology.csv
T93R-02	3.35	3.74	0.39	MDST	Tenas_Lithology.csv
T93R-02	3.74	7.18	3.44	COAL	Tenas_Lithology.csv
T93R-02	7.18	8.55	1.37	SLTS	Tenas_Lithology.csv
T93R-02	8.55	9.28	0.73	COAL	Tenas_Lithology.csv
T93R-02	9.28	10	0.72	SLTS	Tenas_Lithology.csv
T93R-02	10	14.62	4.62	SST	Tenas_Lithology.csv
T93R-02	14.62	14.84	0.22	COAL	Tenas_Lithology.csv
T93R-02	14.84	15.59	0.75	MDST	Tenas_Lithology.csv
T93R-02	15.59	15.72	0.13	COAL	Tenas_Lithology.csv
T93R-02	15.72	20.4	4.68	MDST	Tenas_Lithology.csv
T93R-02	20.4	21.01	0.61	COAL	Tenas_Lithology.csv
T93R-02	21.01	21.39	0.38	MDST	Tenas_Lithology.csv
T93R-02	21.39	21.98	0.59	COAL	Tenas_Lithology.csv
T93R-02	21.98	24	2.02	MDST	Tenas_Lithology.csv
T93R-02	24	28.84	4.84	SLTS	Tenas_Lithology.csv
T93R-02	28.84	29.25	0.41	COAL	Tenas_Lithology.csv
T93R-02	29.25	31.4	2.15	SLTS	Tenas_Lithology.csv
T93R-02	31.4	34.75	3.35	SST	Tenas_Lithology.csv
T93R-02	34.75	39	4.25	SLTS	Tenas_Lithology.csv
T93R-02	39	53.34	14.34	SST	Tenas_Lithology.csv
T93R-02	53.34	57.9	4.56	SLTS	Tenas_Lithology.csv
T93R-02	57.9	63.1	5.2	MDST	Tenas_Lithology.csv
T93R-02	63.1	68.6	5.5	SST	Tenas_Lithology.csv
T93R-02	68.6	80.6	12	MDST	Tenas_Lithology.csv
T93R-03	0	4.43	4.43	Overburden	Tenas_Lithology.csv
T93R-03	4.43	6.7	2.27	MDST	Tenas_Lithology.csv
T93R-03	6.7	58.52	51.82	SLTS	Tenas_Lithology.csv
T93R-03	58.52	67.07	8.55	MDST	Tenas_Lithology.csv
T93R-03	67.07	67.41	0.34	COAL	Tenas_Lithology.csv
T93R-03	67.41	67.73	0.32	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-03	67.73	68.14	0.41	COAL	Tenas_Lithology.csv
T93R-03	68.14	71.95	3.81	MDST	Tenas_Lithology.csv
T93R-03	71.95	72.26	0.31	COAL	Tenas_Lithology.csv
T93R-03	72.26	75.71	3.45	MDST	Tenas_Lithology.csv
T93R-03	75.71	76.04	0.33	COAL	Tenas_Lithology.csv
T93R-03	76.04	76.97	0.93	MDST	Tenas_Lithology.csv
T93R-03	76.97	78.25	1.28	COAL	Tenas_Lithology.csv
T93R-03	78.25	78.38	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-03	78.38	78.65	0.27	COAL	Tenas_Lithology.csv
T93R-03	78.65	78.94	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-03	78.94	79.3	0.36	COAL	Tenas_Lithology.csv
T93R-03	79.3	79.4	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-03	79.4	81.52	2.12	COAL	Tenas_Lithology.csv
T93R-03	81.52	82.78	1.26	MDST	Tenas_Lithology.csv
T93R-03	82.78	83.2	0.42	COAL	Tenas_Lithology.csv
T93R-03	83.2	84.12	0.92	SLTS	Tenas_Lithology.csv
T93R-03	84.12	85.16	1.04	COAL	Tenas_Lithology.csv
T93R-03	85.16	88.9	3.74	SLTS	Tenas_Lithology.csv
T93R-03	88.9	89.12	0.22	COAL	Tenas_Lithology.csv
T93R-03	89.12	91.79	2.67	SLTS	Tenas_Lithology.csv
T93R-03	91.79	92.77	0.98	COAL	Tenas_Lithology.csv
T93R-03	92.77	93.6	0.83	MDST	Tenas_Lithology.csv
T93R-03	93.6	94.47	0.87	COAL	Tenas_Lithology.csv
T93R-03	94.47	96	1.53	SLTS	Tenas_Lithology.csv
T93R-03	96	100.8	4.8	SST	Tenas_Lithology.csv
T93R-04	0	2.14	2.14	Overburden	Tenas_Lithology.csv
T93R-04	2.14	14.32	12.18	SST	Tenas_Lithology.csv
T93R-04	14.32	19.51	5.19	MDST	Tenas_Lithology.csv
T93R-04	19.51	23.16	3.65	SST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T93R-04	23.16	25.3	2.14	MDST	Tenas_Lithology.csv
T93R-04	25.3	29.87	4.57	SST	Tenas_Lithology.csv
T93R-04	29.87	57.91	28.04	MDST	Tenas_Lithology.csv
T93R-04	57.91	60.65	2.74	SST	Tenas_Lithology.csv
T93R-04	60.65	68.9	8.25	MDST	Tenas_Lithology.csv
T93R-04	68.9	89	20.1	VOLC	Tenas_Lithology.csv
T93R-05	0	3.67	3.67	Overburden	Tenas_Lithology.csv
T93R-05	3.67	11.28	7.61	MDST	Tenas_Lithology.csv
T93R-05	11.28	18.9	7.62	SLTS	Tenas_Lithology.csv
T93R-05	18.9	24.38	5.48	MDST	Tenas_Lithology.csv
T93R-05	24.38	25.6	1.22	SST	Tenas_Lithology.csv
T93R-05	25.6	38.69	13.09	MDST	Tenas_Lithology.csv
T93R-05	38.69	39.15	0.46	COAL	Tenas_Lithology.csv
T93R-05	39.15	41.17	2.02	MDST	Tenas_Lithology.csv
T93R-05	41.17	41.68	0.51	COAL	Tenas_Lithology.csv
T93R-05	41.68	44.17	2.49	MDST	Tenas_Lithology.csv
T93R-05	44.17	44.4	0.23	COAL	Tenas_Lithology.csv
T93R-05	44.4	44.84	0.44	MDST	Tenas_Lithology.csv
T93R-05	44.84	46.34	1.5	COAL	Tenas_Lithology.csv
T93R-05	46.34	54.24	7.9	MDST	Tenas_Lithology.csv
T93R-05	54.24	54.62	0.38	COAL	Tenas_Lithology.csv
T93R-05	54.62	58.79	4.17	MDST	Tenas_Lithology.csv
T93R-05	58.79	64.5	5.71	COAL	Tenas_Lithology.csv
T93R-05	64.5	65.48	0.98	MDST	Tenas_Lithology.csv
T93R-05	65.48	65.82	0.34	COAL	Tenas_Lithology.csv
T93R-05	65.82	66.25	0.43	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-05	66.25	66.8	0.55	COAL	Tenas_Lithology.csv
T93R-05	66.8	68.27	1.47	MDST	Tenas_Lithology.csv
T93R-05	68.27	71.02	2.75	SST	Tenas_Lithology.csv
T93R-05	71.02	77.8	6.78	MDST	Tenas_Lithology.csv
T93R-05	77.8	78.03	0.23	COAL	Tenas_Lithology.csv
T93R-05	78.03	79.39	1.36	MDST	Tenas_Lithology.csv
T93R-05	79.39	80.08	0.69	COAL	Tenas_Lithology.csv
T93R-05	80.08	81.05	0.97	SLTS	Tenas_Lithology.csv
T93R-05	81.05	81.3	0.25	COAL	Tenas_Lithology.csv
T93R-05	81.3	83.14	1.84	SLTS	Tenas_Lithology.csv
T93R-05	83.14	83.5	0.36	COAL	Tenas_Lithology.csv
T93R-05	83.5	85.32	1.82	SLTS	Tenas_Lithology.csv
T93R-05	85.32	85.59	0.27	COAL	Tenas_Lithology.csv
T93R-05	85.59	92.4	6.81	SLTS	Tenas_Lithology.csv
T93R-06C	0	1.23	1.23	Overburden	Tenas_Lithology.csv
T93R-06C	1.23	4.84	3.61	MDST	Tenas_Lithology.csv
T93R-06C	4.84	5.38	0.54	COAL	Tenas_Lithology.csv
T93R-06C	5.38	8.58	3.2	MDST	Tenas_Lithology.csv
T93R-06C	8.58	8.79	0.21	COAL	Tenas_Lithology.csv
T93R-06C	8.79	10.28	1.49	MDST	Tenas_Lithology.csv
T93R-06C	10.28	11.88	1.6	COAL	Tenas_Lithology.csv
T93R-06C	11.88	18.55	6.67	MDST	Tenas_Lithology.csv
T93R-06C	18.55	18.83	0.28	COAL	Tenas_Lithology.csv
T93R-06C	18.83	21.01	2.18	MDST	Tenas_Lithology.csv
T93R-06C	21.01	22.88	1.87	COAL	Tenas_Lithology.csv
T93R-06C	22.88	23.9	1.02	MDST	Tenas_Lithology.csv
T93R-06C	23.9	27.07	3.17	COAL	Tenas_Lithology.csv
T93R-06C	27.07	27.43	0.36	MDST	Tenas_Lithology.csv
T93R-06C	27.43	27.93	0.5	COAL	Tenas_Lithology.csv
T93R-06C	27.93	29.07	1.14	MDST	Tenas_Lithology.csv
T93R-06C	29.07	29.47	0.4	COAL	Tenas_Lithology.csv
T93R-06C	29.47	36.75	7.28	MDST	Tenas_Lithology.csv
T93R-06C	36.75	37.18	0.43	COAL	Tenas_Lithology.csv
T93R-06C	37.18	44	6.82	MDST	Tenas_Lithology.csv
T93R-06C	44	44.28	0.28	COAL	Tenas_Lithology.csv
T93R-06C	44.28	50.3	6.02	MDST	Tenas_Lithology.csv
T93R-06C	50.3	51.21	0.91	SLTS	Tenas_Lithology.csv
T93R-06C	51.21	55.8	4.59	SST	Tenas_Lithology.csv
T93R-08C	0	1.84	1.84	Overburden	Tenas_Lithology.csv
T93R-08C	1.84	3.13	1.29	MDST	Tenas_Lithology.csv
T93R-08C	3.13	4.63	1.5	COAL	Tenas_Lithology.csv
T93R-08C	4.63	8.56	3.93	SLTS	Tenas_Lithology.csv
T93R-08C	8.56	10.62	2.06	COAL	Tenas_Lithology.csv
T93R-08C	10.62	11.42	0.8	MDST	Tenas_Lithology.csv
T93R-08C	11.42	12.43	1.01	COAL	Tenas_Lithology.csv
T93R-08C	12.43	14.15	1.72	MDST	Tenas_Lithology.csv
T93R-08C	14.15	14.9	0.75	COAL	Tenas_Lithology.csv
T93R-08C	14.9	16.57	1.67	SLTS	Tenas_Lithology.csv
T93R-08C	16.57	17.16	0.59	COAL	Tenas_Lithology.csv
T93R-08C	17.16	18.64	1.48	MDST	Tenas_Lithology.csv
T93R-08C	18.64	18.95	0.31	COAL	Tenas_Lithology.csv
T93R-08C	18.95	26.46	7.51	SLTS	Tenas_Lithology.csv
T93R-08C	26.46	27.01	0.55	COAL	Tenas_Lithology.csv
T93R-08C	27.01	27.72	0.71	SST	Tenas_Lithology.csv
T93R-08C	27.72	28.27	0.55	COAL	Tenas_Lithology.csv
T93R-08C	28.27	43	14.73	SST	Tenas_Lithology.csv
T93R-09	0	1.23	1.23	Overburden	Tenas_Lithology.csv
T93R-09	1.23	4.27	3.04	MDST	Tenas_Lithology.csv
T93R-09	4.27	7.01	2.74	SST	Tenas_Lithology.csv
T93R-09	7.01	15.54	8.53	MDST	Tenas_Lithology.csv
T93R-09	15.54	21.03	5.49	SLTS	Tenas_Lithology.csv
T93R-09	21.03	23.77	2.74	MDST	Tenas_Lithology.csv
T93R-09	23.77	26.52	2.75	SLTS	Tenas_Lithology.csv
T93R-09	26.52	42.37	15.85	MDST	Tenas_Lithology.csv
T93R-09	42.37	50.29	7.92	SLTS	Tenas_Lithology.csv
T93R-09	50.29	60.65	10.36	MDST	Tenas_Lithology.csv
T93R-09	60.65	63.4	2.75	SLTS	Tenas_Lithology.csv
T93R-09	63.4	67.66	4.26	SST	Tenas_Lithology.csv
T93R-09	67.66	71.63	3.97	SLTS	Tenas_Lithology.csv
T93R-09	71.63	75.9	4.27	MDST	Tenas_Lithology.csv
T93R-09	75.9	77.72	1.82	SST	Tenas_Lithology.csv
T93R-09	77.72	83.21	5.49	SLTS	Tenas_Lithology.csv
T93R-09	83.21	88.7	5.49	MDST	Tenas_Lithology.csv
T93R-09	88.7	92.05	3.35	SLTS	Tenas_Lithology.csv
T93R-09	92.05	94.18	2.13	MDST	Tenas_Lithology.csv
T93R-09	94.18	106.37	12.19	SST	Tenas_Lithology.csv
T93R-09	106.37	111.56	5.19	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T93R-09	111.56	126.65	15.09	MDST	Tenas_Lithology.csv
T93R-09	126.65	127.46	0.81	COAL	Tenas_Lithology.csv
T93R-09	127.46	132.13	4.67	MDST	Tenas_Lithology.csv
T93R-09	132.13	132.56	0.43	COAL	Tenas_Lithology.csv
T93R-09	132.56	137.77	5.21	MDST	Tenas_Lithology.csv
T93R-09	137.77	140.21	2.44	SST	Tenas_Lithology.csv
T93R-09	140.21	141.43	1.22	SLTS	Tenas_Lithology.csv
T93R-09	141.43	147.22	5.79	SST	Tenas_Lithology.csv
T93R-09	147.22	148.13	0.91	MDST	Tenas_Lithology.csv
T93R-09	148.13	157.58	9.45	SST	Tenas_Lithology.csv
T93R-09	157.58	164.59	7.01	MDST	Tenas_Lithology.csv
T93R-09	164.59	171.3	6.71	SST	Tenas_Lithology.csv
T93R-10	0	3.36	3.36	Overburden	Tenas_Lithology.csv
T93R-10	3.36	28.78	25.42	SST	Tenas_Lithology.csv
T93R-10	28.78	29.65	0.87	COAL	Tenas_Lithology.csv
T93R-10	29.65	32.58	2.93	SLTS	Tenas_Lithology.csv
T93R-10	32.58	33.22	0.64	COAL	Tenas_Lithology.csv
T93R-10	33.22	35.4	2.18	MDST	Tenas_Lithology.csv
T93R-10	35.4	36.1	0.7	COAL	Tenas_Lithology.csv
T93R-10	36.1	53.34	17.24	SLTS	Tenas_Lithology.csv
T93R-10	53.34	61	7.66	VOLC	Tenas_Lithology.csv
T93R-12	0	15.56	15.56	Overburden	Tenas_Lithology.csv
T93R-12	15.56	24.08	8.52	MDST	Tenas_Lithology.csv
T93R-12	24.08	29.26	5.18	SLTS	Tenas_Lithology.csv
T93R-12	29.26	32.61	3.35	MDST	Tenas_Lithology.csv
T93R-12	32.61	35.97	3.36	SLTS	Tenas_Lithology.csv
T93R-12	35.97	65.53	29.56	MDST	Tenas_Lithology.csv
T93R-12	65.53	67.38	1.85	SLTS	Tenas_Lithology.csv
T93R-12	67.38	68.12	0.74	COAL	Tenas_Lithology.csv
T93R-12	68.12	72.85	4.73	MDST	Tenas_Lithology.csv
T93R-12	72.85	73.65	0.8	COAL	Tenas_Lithology.csv
T93R-12	73.65	76.02	2.37	MDST	Tenas_Lithology.csv
T93R-12	76.02	76.25	0.23	COAL	Tenas_Lithology.csv
T93R-12	76.25	78.77	2.52	MDST	Tenas_Lithology.csv
T93R-12	78.77	80.8	2.03	COAL	Tenas_Lithology.csv
T93R-12	80.8	89.61	8.81	MDST	Tenas_Lithology.csv
T93R-12	89.61	91.44	1.83	SST	Tenas_Lithology.csv
T93R-12	91.44	92.7	1.26	MDST	Tenas_Lithology.csv
T93R-12	92.7	93.05	0.35	COAL	Tenas_Lithology.csv
T93R-12	93.05	100.31	7.26	SLTS	Tenas_Lithology.csv
T93R-12	100.31	108.29	7.98	COAL	Tenas_Lithology.csv
T93R-12	108.29	113	4.71	MDST	Tenas_Lithology.csv
T93R-12	113	113.52	0.52	COAL	Tenas_Lithology.csv
T93R-12	113.52	113.97	0.45	MDST	Tenas_Lithology.csv
T93R-12	113.97	114.7	0.73	COAL	Tenas_Lithology.csv
T93R-12	114.7	116.2	1.5	MDST	Tenas_Lithology.csv
T93R-12	116.2	116.85	0.65	COAL	Tenas_Lithology.csv
T93R-12	116.85	120.85	4	MDST	Tenas_Lithology.csv
T93R-12	120.85	121.9	1.05	COAL	Tenas_Lithology.csv
T93R-12	121.9	121.96	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-12	121.96	122.77	0.81	COAL	Tenas_Lithology.csv
T93R-12	122.77	122.87	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-12	122.87	123.57	0.7	COAL	Tenas_Lithology.csv
T93R-12	123.57	128.9	5.33	MDST	Tenas_Lithology.csv
T93R-13	0	23.81	23.81	Overburden	Tenas_Lithology.csv
T93R-13	23.81	28.04	4.23	MDST	Tenas_Lithology.csv
T93R-13	28.04	36.58	8.54	SLTS	Tenas_Lithology.csv
T93R-13	36.58	59.13	22.55	MDST	Tenas_Lithology.csv
T93R-13	59.13	60.05	0.92	SLTS	Tenas_Lithology.csv
T93R-13	60.05	64	3.95	MDST	Tenas_Lithology.csv
T93R-13	64	140.8	76.8	VOLC	Tenas_Lithology.csv
T93R-14	0	3.67	3.67	Overburden	Tenas_Lithology.csv
T93R-14	3.67	13.41	9.74	VOLC	Tenas_Lithology.csv
T93R-14	13.41	39.62	26.21	SLTS	Tenas_Lithology.csv
T93R-14	39.62	49.68	10.06	SST	Tenas_Lithology.csv
T93R-14	49.68	54.25	4.57	VOLC	Tenas_Lithology.csv
T93R-14	54.25	57.91	3.66	SST	Tenas_Lithology.csv
T93R-14	57.91	71.63	13.72	VOLC	Tenas_Lithology.csv
T93R-14	71.63	79.86	8.23	SST	Tenas_Lithology.csv
T93R-14	79.86	110	30.14	VOLC	Tenas_Lithology.csv
T93R-15	0	0.13	0.13	Overburden	Tenas_Lithology.csv
T93R-16	0	11.1	11.1	Overburden	Tenas_Lithology.csv
T93R-17	0	3.97	3.97	Overburden	Tenas_Lithology.csv
T93R-17	3.97	26.21	22.24	MDST	Tenas_Lithology.csv
T93R-17	26.21	27.43	1.22	SST	Tenas_Lithology.csv
T93R-17	27.43	43.89	16.46	MDST	Tenas_Lithology.csv
T93R-17	43.89	49.07	5.18	SLTS	Tenas_Lithology.csv
T93R-17	49.07	51.51	2.44	MDST	Tenas_Lithology.csv
T93R-17	51.51	56.08	4.57	SLTS	Tenas_Lithology.csv
T93R-17	56.08	63.7	7.62	SST	Tenas_Lithology.csv
T93R-17	63.7	68.88	5.18	SLTS	Tenas_Lithology.csv
T93R-17	68.88	75.9	7.02	MDST	Tenas_Lithology.csv
T93R-17	75.9	77.41	1.51	SST	Tenas_Lithology.csv
T93R-17	77.41	77.95	0.54	MDST	Tenas_Lithology.csv
T93R-17	77.95	80.41	2.46	COAL	Tenas_Lithology.csv
T93R-17	80.41	81.66	1.25	MDST	Tenas_Lithology.csv
T93R-17	81.66	82.44	0.78	COAL	Tenas_Lithology.csv
T93R-17	82.44	82.7	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-17	82.7	85.9	3.2	COAL	Tenas_Lithology.csv
T93R-17	85.9	88.88	2.98	MDST	Tenas_Lithology.csv
T93R-17	88.88	89	0.12	COAL	Tenas_Lithology.csv
T93R-17	89	89.2	0.2	MDST	Tenas_Lithology.csv
T93R-17	89.2	89.54	0.34	COAL	Tenas_Lithology.csv
T93R-17	89.54	89.72	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T93R-17	89.72	90.82	1.1	COAL	Tenas_Lithology.csv
T93R-17	90.82	101.43	10.61	SLTS	Tenas_Lithology.csv
T93R-17	101.43	102.27	0.84	COAL	Tenas_Lithology.csv
T93R-17	102.27	103.14	0.87	MDST	Tenas_Lithology.csv
T93R-17	103.14	103.61	0.47	COAL	Tenas_Lithology.csv
T93R-17	103.61	107.01	3.4	MDST	Tenas_Lithology.csv
T93R-17	107.01	107.3	0.29	COAL	Tenas_Lithology.csv
T93R-17	107.3	123.75	16.45	MDST	Tenas_Lithology.csv
T93R-17	123.75	128.9	5.15	SST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T93R-18	0	25.08	25.08	Overburden	Tenas_Lithology.csv
T93R-18	25.08	27.1	2.02	n/a	Tenas_Lithology.csv
T93R-18	27.1	40.55	13.45	MDST	Tenas_Lithology.csv
T93R-19	0	10.37	10.37	Overburden	Tenas_Lithology.csv
T93R-19	10.37	122	111.63	VOLC	Tenas_Lithology.csv
T93R-51	0	3.67	3.67	Overburden	Tenas_Lithology.csv
T93R-51	3.67	13.5	9.83	SLTS	Tenas_Lithology.csv
T93R-51	13.5	18.2	4.7	SST	Tenas_Lithology.csv
T93R-51	18.2	19.3	1.1	MDST	Tenas_Lithology.csv
T93R-51	19.3	21	1.7	SST	Tenas_Lithology.csv
T93R-51	21	29.5	8.5	MDST	Tenas_Lithology.csv
T93R-51	29.5	33.53	4.03	SST	Tenas_Lithology.csv
T93R-51	33.53	36.6	3.07	MDST	Tenas_Lithology.csv
T93R-51	36.6	40.5	3.9	SLTS	Tenas_Lithology.csv
T93R-51	40.5	44.5	4	MDST	Tenas_Lithology.csv
T93R-51	44.5	51.52	7.02	SLTS	Tenas_Lithology.csv
T93R-51	51.52	71.3	19.78	MDST	Tenas_Lithology.csv
T94R-01	0	3.06	3.06	Overburden	Tenas_Lithology.csv
T94R-01	3.06	8.2	5.14	SLTS	Tenas_Lithology.csv
T94R-01	8.2	10.48	2.28	MDST	Tenas_Lithology.csv
T94R-01	10.48	12.53	2.05	COAL	Tenas_Lithology.csv
T94R-01	12.53	15.65	3.12	SLTS	Tenas_Lithology.csv
T94R-01	15.65	17.98	2.33	COAL	Tenas_Lithology.csv
T94R-01	17.98	18.34	0.36	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T94R-01	18.34	18.61	0.27	COAL	Tenas_Lithology.csv
T94R-01	18.61	18.83	0.22	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T94R-01	18.83	19.11	0.28	COAL	Tenas_Lithology.csv
T94R-01	19.11	21	1.89	MDST	Tenas_Lithology.csv
T94R-01	21	22.62	1.62	SLTS	Tenas_Lithology.csv
T94R-01	22.62	23.19	0.57	COAL	Tenas_Lithology.csv
T94R-01	23.19	24.1	0.91	MDST	Tenas_Lithology.csv
T94R-01	24.1	24.59	0.49	COAL	Tenas_Lithology.csv
T94R-01	24.59	25.6	1.01	MDST	Tenas_Lithology.csv
T94R-01	25.6	31.2	5.6	SLTS	Tenas_Lithology.csv
T94R-01	31.2	31.56	0.36	COAL	Tenas_Lithology.csv
T94R-01	31.56	33.12	1.56	SLTS	Tenas_Lithology.csv
T94R-01	33.12	33.46	0.34	COAL	Tenas_Lithology.csv
T94R-01	33.46	39.11	5.65	SST	Tenas_Lithology.csv
T94R-01	39.11	39.59	0.48	COAL	Tenas_Lithology.csv
T94R-01	39.59	40.44	0.85	SLTS	Tenas_Lithology.csv
T94R-01	40.44	41.97	1.53	MDST	Tenas_Lithology.csv
T94R-01	41.97	72	30.03	SST	Tenas_Lithology.csv
T94R-01	72	74.25	2.25	SLTS	Tenas_Lithology.csv
T94R-01	74.25	74.66	0.41	COAL	Tenas_Lithology.csv
T94R-01	74.66	75.76	1.1	SLTS	Tenas_Lithology.csv
T94R-01	75.76	76.2	0.44	COAL	Tenas_Lithology.csv
T94R-01	76.2	76.4	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T94R-01	76.4	76.98	0.58	COAL	Tenas_Lithology.csv
T94R-01	76.98	77.51	0.53	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T94R-01	77.51	77.96	0.45	COAL	Tenas_Lithology.csv
T94R-01	77.96	83.8	5.84	SLTS	Tenas_Lithology.csv
T94R-02	0	0.71	0.71	Overburden	Tenas_Lithology.csv
T94R-02	0.71	37	36.29	VOLC	Tenas_Lithology.csv
T94R-03	0	0.61	0.61	Overburden	Tenas_Lithology.csv
T94R-03	0.61	1.5	0.89	COAL	Tenas_Lithology.csv
T94R-03	1.5	4.15	2.65	MDST	Tenas_Lithology.csv
T94R-03	4.15	8.61	4.46	SST	Tenas_Lithology.csv
T94R-03	8.61	9.04	0.43	COAL	Tenas_Lithology.csv
T94R-03	9.04	14.09	5.05	SLTS	Tenas_Lithology.csv
T94R-03	14.09	19.41	5.32	COAL	Tenas_Lithology.csv
T94R-03	19.41	20.4	0.99	MDST	Tenas_Lithology.csv
T94R-03	20.4	20.75	0.35	COAL	Tenas_Lithology.csv
T94R-03	20.75	21.12	0.37	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T94R-03	21.12	21.87	0.75	COAL	Tenas_Lithology.csv
T94R-03	21.87	23.2	1.33	MDST	Tenas_Lithology.csv
T94R-03	23.2	23.59	0.39	COAL	Tenas_Lithology.csv
T94R-03	23.59	25.8	2.21	MDST	Tenas_Lithology.csv
T94R-03	25.8	28.84	3.04	SLTS	Tenas_Lithology.csv
T94R-03	28.84	29.11	0.27	COAL	Tenas_Lithology.csv
T94R-03	29.11	30.81	1.7	SLTS	Tenas_Lithology.csv
T94R-03	30.81	31.19	0.38	COAL	Tenas_Lithology.csv
T94R-03	31.19	38.5	7.31	SST	Tenas_Lithology.csv
T94R-03	38.5	38.78	0.28	COAL	Tenas_Lithology.csv
T94R-03	38.78	59.8	21.02	SST	Tenas_Lithology.csv
T94R-03	59.8	71	11.2	SLTS	Tenas_Lithology.csv
T94R-03	71	84.8	13.8	SST	Tenas_Lithology.csv
T94R-04C	0	9.91	9.91	Overburden	Tenas_Lithology.csv
T94R-04C	9.91	10.97	1.06	MDST	Tenas_Lithology.csv
T94R-04C	10.97	13.77	2.8	SST	Tenas_Lithology.csv
T94R-04C	13.77	15.2	1.43	SLTS	Tenas_Lithology.csv
T94R-04C	15.2	17.77	2.57	MDST	Tenas_Lithology.csv
T94R-04C	17.77	24.2	6.43	SLTS	Tenas_Lithology.csv
T94R-04C	24.2	30.85	6.65	SST	Tenas_Lithology.csv
T94R-04C	30.85	32.2	1.35	MDST	Tenas_Lithology.csv
T94R-04C	32.2	33.09	0.89	SLTS	Tenas_Lithology.csv
T94R-04C	33.09	33.33	0.24	COAL	Tenas_Lithology.csv
T94R-04C	33.33	36.1	2.77	MDST	Tenas_Lithology.csv
T94R-04C	36.1	36.12	0.02	SLTS	Tenas_Lithology.csv
T94R-04C	36.12	37.5	1.38	MDST	Tenas_Lithology.csv
T94R-04C	37.5	37.79	0.29	COAL	Tenas_Lithology.csv
T94R-04C	37.79	40.44	2.65	SLTS	Tenas_Lithology.csv
T94R-04C	40.44	42.38	1.94	COAL	Tenas_Lithology.csv
T94R-04C	42.38	43.28	0.9	MDST	Tenas_Lithology.csv
T94R-04C	43.28	49.4	6.12	SLTS	Tenas_Lithology.csv
T94R-04C	49.4	49.76	0.36	COAL	Tenas_Lithology.csv
T94R-04C	49.76	53.95	4.19	SLTS	Tenas_Lithology.csv
T94R-04C	53.95	55.8	1.85	COAL	Tenas_Lithology.csv
T94R-04C	55.8	56.36	0.56	MDST	Tenas_Lithology.csv
T94R-04C	56.36	60.17	3.81	COAL	Tenas_Lithology.csv
T94R-04C	60.17	62.16	1.99	MDST	Tenas_Lithology.csv
T94R-04C	62.16	62.64	0.48	COAL	Tenas_Lithology.csv
T94R-04C	62.64	62.85	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T94R-04C	62.85	63.05	0.2	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T94R-04C	63.05	65.5	2.45	MDST	Tenas_Lithology.csv
T94R-04C	65.5	69	3.5	SLTS	Tenas_Lithology.csv
T94R-04C	69	69.25	0.25	COAL	Tenas_Lithology.csv
T94R-04C	69.25	70.63	1.38	SLTS	Tenas_Lithology.csv
T94R-04C	70.63	70.8	0.17	COAL	Tenas_Lithology.csv
T94R-04C	70.8	73.65	2.85	SST	Tenas_Lithology.csv
T94R-04C	73.65	73.82	0.17	COAL	Tenas_Lithology.csv
T94R-04C	73.82	74.7	0.88	SST	Tenas_Lithology.csv
T94R-05	0	3.97	3.97	Overburden	Tenas_Lithology.csv
T94R-05	3.97	8.5	4.53	MDST	Tenas_Lithology.csv
T94R-05	8.5	14	5.5	SLTS	Tenas_Lithology.csv
T94R-05	14	38.4	24.4	SST	Tenas_Lithology.csv
T94R-05	38.4	49.5	11.1	SLTS	Tenas_Lithology.csv
T94R-05	49.5	58.68	9.18	SST	Tenas_Lithology.csv
T94R-05	58.68	59.03	0.35	COAL	Tenas_Lithology.csv
T94R-05	59.03	64.2	5.17	SLTS	Tenas_Lithology.csv
T94R-05	64.2	70.56	6.36	SST	Tenas_Lithology.csv
T94R-05	70.56	71.62	1.06	COAL	Tenas_Lithology.csv
T94R-05	71.62	79.31	7.69	SLTS	Tenas_Lithology.csv
T94R-05	79.31	79.57	0.26	COAL	Tenas_Lithology.csv
T94R-05	79.57	82.35	2.78	SLTS	Tenas_Lithology.csv
T94R-05	82.35	82.79	0.44	COAL	Tenas_Lithology.csv
T94R-05	82.79	84.85	2.06	MDST	Tenas_Lithology.csv
T94R-05	84.85	85.52	0.67	COAL	Tenas_Lithology.csv
T94R-05	85.52	86.46	0.94	MDST	Tenas_Lithology.csv
T94R-05	86.46	86.86	0.4	COAL	Tenas_Lithology.csv
T94R-05	86.86	88.26	1.4	SST	Tenas_Lithology.csv
T94R-05	88.26	88.91	0.65	COAL	Tenas_Lithology.csv
T94R-05	88.91	90.5	1.59	SST	Tenas_Lithology.csv
T94R-05	90.5	91.33	0.83	COAL	Tenas_Lithology.csv
T94R-05	91.33	92.3	0.97	CGL	Tenas_Lithology.csv
T94R-05	92.3	93.53	1.23	SST	Tenas_Lithology.csv
T94R-05	93.53	94.21	0.68	COAL	Tenas_Lithology.csv
T94R-05	94.21	97	2.79	SST	Tenas_Lithology.csv
T94R-05	97	108	11	SLTS	Tenas_Lithology.csv
T94R-05	108	113.4	5.4	SST	Tenas_Lithology.csv
T94R-05	113.4	114.6	1.2	CGL	Tenas_Lithology.csv
T94R-05	114.6	116.46	1.86	MDST	Tenas_Lithology.csv
T94R-05	116.46	121.6	5.14	SST	Tenas_Lithology.csv
T94R-06	0	1.51	1.51	Overburden	Tenas_Lithology.csv
T94R-06	1.51	69	67.49	SLTS	Tenas_Lithology.csv
T94R-06	69	70.6	1.6	SST	Tenas_Lithology.csv
T94R-06	70.6	75.7	5.1	SLTS	Tenas_Lithology.csv
T94R-06	75.7	80.1	4.4	MDST	Tenas_Lithology.csv
T94R-06	80.1	81.3	1.2	SST	Tenas_Lithology.csv
T94R-06	81.3	84.5	3.2	SLTS	Tenas_Lithology.csv
T94R-06	84.5	92.5	8	MDST	Tenas_Lithology.csv
T94R-06	92.5	96.2	3.7	SST	Tenas_Lithology.csv
T94R-06	96.2	102.6	6.4	SLTS	Tenas_Lithology.csv
T94R-06	102.6	105	2.4	MDST	Tenas_Lithology.csv
T94R-06	105	128.3	23.3	SLTS	Tenas_Lithology.csv
T94R-06	128.3	133.5	5.2	SST	Tenas_Lithology.csv
T94R-06	133.5	135	1.5	SLTS	Tenas_Lithology.csv
T94R-06	135	135.14	0.14	COAL	Tenas_Lithology.csv
T94R-06	135.14	137.8	2.66	SLTS	Tenas_Lithology.csv
T94R-06	137.8	140	2.2	SST	Tenas_Lithology.csv
T94R-06	140	141.74	1.74	SLTS	Tenas_Lithology.csv
T94R-06	141.74	142.13	0.39	COAL	Tenas_Lithology.csv
T94R-06	142.13	144.12	1.99	MDST	Tenas_Lithology.csv
T94R-06	144.12	144.58	0.46	COAL	Tenas_Lithology.csv
T94R-06	144.58	145.61	1.03	MDST	Tenas_Lithology.csv
T94R-06	145.61	145.9	0.29	COAL	Tenas_Lithology.csv
T94R-06	145.9	147.06	1.16	MDST	Tenas_Lithology.csv
T94R-06	147.06	147.32	0.26	COAL	Tenas_Lithology.csv
T94R-06	147.32	150.56	3.24	SLTS	Tenas_Lithology.csv
T94R-06	150.56	150.88	0.32	COAL	Tenas_Lithology.csv
T94R-06	150.88	151.94	1.06	SST	Tenas_Lithology.csv
T94R-06	151.94	152.21	0.27	COAL	Tenas_Lithology.csv
T94R-06	152.21	152.22	0.01	SLTS	Tenas_Lithology.csv
T94R-07	0	6.11	6.11	Overburden	Tenas_Lithology.csv
T94R-07	6.11	54.5	48.39	SLTS	Tenas_Lithology.csv
T94R-07	54.5	62.5	8	SST	Tenas_Lithology.csv
T94R-07	62.5	63.1	0.6	SLTS	Tenas_Lithology.csv
T94R-07	63.1	63.22	0.12	COAL	Tenas_Lithology.csv
T94R-07	63.22	64.56	1.34	SLTS	Tenas_Lithology.csv
T94R-07	64.56	64.68	0.12	COAL	Tenas_Lithology.csv
T94R-07	64.68	66.5	1.82	MDST	Tenas_Lithology.csv
T94R-07	66.5	79.28	12.78	SLTS	Tenas_Lithology.csv
T94R-07	79.28	80.52	1.24	COAL	Tenas_Lithology.csv
T94R-07	80.52	89.65	9.13	MDST	Tenas_Lithology.csv
T94R-07	89.65	90.01	0.36	COAL	Tenas_Lithology.csv
T94R-07	90.01	96.37	6.36	SLTS	Tenas_Lithology.csv
T94R-07	96.37	102.27	5.9	COAL	Tenas_Lithology.csv
T94R-07	102.27	107.23	4.96	MDST	Tenas_Lithology.csv
T94R-07	107.23	108.36	1.13	COAL	Tenas_Lithology.csv
T94R-07	108.36	109.7	1.34	MDST	Tenas_Lithology.csv
T94R-07	109.7	110.27	0.57	COAL	Tenas_Lithology.csv
T94R-07	110.27	114.86	4.59	MDST	Tenas_Lithology.csv
T94R-07	114.86	115.43	0.57	COAL	Tenas_Lithology.csv
T94R-07	115.43	116.52	1.09	MDST	Tenas_Lithology.csv
T94R-07	116.52	117.11	0.59	COAL	Tenas_Lithology.csv
T94R-07	117.11	117.72	0.61	MDST	Tenas_Lithology.csv
T94R-07	117.72	118	0.28	COAL	Tenas_Lithology.csv
T94R-07	118	119.69	1.69	MDST	Tenas_Lithology.csv
T94R-07	119.69	120.19	0.5	COAL	Tenas_Lithology.csv
T94R-07	120.19	120.9	0.71	SLTS	Tenas_Lithology.csv
T94R-08	0	17.68	17.68	Overburden	Tenas_Lithology.csv
T94R-08	17.68	21.7	4.02	SST	Tenas_Lithology.csv
T94R-08	21.7	54.5	32.8	MDST	Tenas_Lithology.csv
T94R-08	54.5	106.4	51.9	SLTS	Tenas_Lithology.csv
T94R-08	106.4	113.14	6.74	MDST	Tenas_Lithology.csv
T94R-08	113.14	113.79	0.65	COAL	Tenas_Lithology.csv
T94R-08	113.79	123.8	10.01	MDST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T94R-08	123.8	124.17	0.37	COAL	Tenas_Lithology.csv
T94R-08	124.17	132.4	8.23	MDST	Tenas_Lithology.csv
T94R-08	132.4	138.3	5.9	SLTS	Tenas_Lithology.csv
T94R-08	138.3	144.5	6.2	SST	Tenas_Lithology.csv
T94R-09	0	56.39	56.39	Overburden	Tenas_Lithology.csv
T94R-09	56.39	92.29	35.9	CGL	Tenas_Lithology.csv
T94R-09	92.29	146.66	54.37	VOLC	Tenas_Lithology.csv
T94R-10C	0	6.11	6.11	Overburden	Tenas_Lithology.csv
T94R-10C	6.11	42.9	36.79	MDST	Tenas_Lithology.csv
T94R-10C	42.9	45.73	2.83	SLTS	Tenas_Lithology.csv
T94R-10C	45.73	46.34	0.61	COAL	Tenas_Lithology.csv
T94R-10C	46.34	49.33	2.99	MDST	Tenas_Lithology.csv
T94R-10C	49.33	49.96	0.63	COAL	Tenas_Lithology.csv
T94R-10C	49.96	54.53	4.57	MDST	Tenas_Lithology.csv
T94R-10C	54.53	56.36	1.83	COAL	Tenas_Lithology.csv
T94R-10C	56.36	71.15	14.79	MDST	Tenas_Lithology.csv
T94R-10C	71.15	73.66	2.51	COAL	Tenas_Lithology.csv
T94R-10C	73.66	74.94	1.28	MDST	Tenas_Lithology.csv
T94R-10C	74.94	79.05	4.11	COAL	Tenas_Lithology.csv
T94R-10C	79.05	81.51	2.46	MDST	Tenas_Lithology.csv
T94R-10C	81.51	82.6	1.09	COAL	Tenas_Lithology.csv
T94R-10C	82.6	84.08	1.48	MDST	Tenas_Lithology.csv
T94R-10C	84.08	84.52	0.44	COAL	Tenas_Lithology.csv
T94R-10C	84.52	89.6	5.08	MDST	Tenas_Lithology.csv
T94R-11	0	67	67	Overburden	Tenas_Lithology.csv
T94R-11	67	71.48	4.48	VOLC	Tenas_Lithology.csv
T94R-12	0	19.51	19.51	Overburden	Tenas_Lithology.csv
T94R-12	19.51	38.05	18.54	MDST	Tenas_Lithology.csv
T94R-12	38.05	38.42	0.37	COAL	Tenas_Lithology.csv
T94R-12	38.42	40.74	2.32	MDST	Tenas_Lithology.csv
T94R-12	40.74	42.81	2.07	COAL	Tenas_Lithology.csv
T94R-12	42.81	53.48	10.67	MDST	Tenas_Lithology.csv
T94R-12	53.48	54.02	0.54	COAL	Tenas_Lithology.csv
T94R-12	54.02	56.09	2.07	MDST	Tenas_Lithology.csv
T94R-12	56.09	56.21	0.12	COAL	Tenas_Lithology.csv
T94R-12	56.21	69.7	13.49	MDST	Tenas_Lithology.csv
T94R-12	69.7	73.2	3.5	SST	Tenas_Lithology.csv
T94R-12	73.2	94.8	21.6	VOLC	Tenas_Lithology.csv
T94R-13	0	2.14	2.14	Overburden	Tenas_Lithology.csv
T94R-13	2.14	41.9	39.76	VOLC	Tenas_Lithology.csv
T95R-06	0	92.9	92.9	Overburden	Tenas_Lithology.csv
T95R-06	92.9	116	23.1	VOLC	Tenas_Lithology.csv
T95R-07C	0	6.4	6.4	Overburden	Tenas_Lithology.csv
T95R-07C	6.4	6.95	0.55	MDST	Tenas_Lithology.csv
T95R-07C	6.95	7.57	0.62	COAL	Tenas_Lithology.csv
T95R-07C	7.57	10.94	3.37	MDST	Tenas_Lithology.csv
T95R-07C	10.94	13.01	2.07	COAL	Tenas_Lithology.csv
T95R-07C	13.01	19.5	6.49	MDST	Tenas_Lithology.csv
T95R-07C	19.5	19.85	0.35	COAL	Tenas_Lithology.csv
T95R-07C	19.85	23.59	3.74	MDST	Tenas_Lithology.csv
T95R-07C	23.59	28.94	5.35	COAL	Tenas_Lithology.csv
T95R-07C	28.94	30.22	1.28	MDST	Tenas_Lithology.csv
T95R-07C	30.22	30.7	0.48	COAL	Tenas_Lithology.csv
T95R-07C	30.7	30.83	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-07C	30.83	31.14	0.31	COAL	Tenas_Lithology.csv
T95R-07C	31.14	32.12	0.98	MDST	Tenas_Lithology.csv
T95R-07C	32.12	32.59	0.47	COAL	Tenas_Lithology.csv
T95R-07C	32.59	33.69	1.1	MDST	Tenas_Lithology.csv
T95R-07C	33.69	34.11	0.42	COAL	Tenas_Lithology.csv
T95R-07C	34.11	34.62	0.51	MDST	Tenas_Lithology.csv
T95R-07C	34.62	34.8	0.18	COAL	Tenas_Lithology.csv
T95R-07C	34.8	37.83	3.03	MDST	Tenas_Lithology.csv
T95R-07C	37.83	38.39	0.56	COAL	Tenas_Lithology.csv
T95R-07C	38.39	39.2	0.81	MDST	Tenas_Lithology.csv
T95R-07C	39.2	39.91	0.71	COAL	Tenas_Lithology.csv
T95R-07C	39.91	47.88	7.97	MDST	Tenas_Lithology.csv
T95R-07C	47.88	48.23	0.35	COAL	Tenas_Lithology.csv
T95R-07C	48.23	56	7.77	MDST	Tenas_Lithology.csv
T95R-09	0	151.5	151.5	Overburden	Tenas_Lithology.csv
T95R-09	151.5	153	1.5	MDST	Tenas_Lithology.csv
T95R-09	153	156	3	Overburden	Tenas_Lithology.csv
T95R-10	0	22.36	22.36	Overburden	Tenas_Lithology.csv
T95R-10	22.36	24.4	2.04	COAL	Tenas_Lithology.csv
T95R-10	24.4	26.7	2.3	MDST	Tenas_Lithology.csv
T95R-10	26.7	27.15	0.45	COAL	Tenas_Lithology.csv
T95R-10	27.15	27.89	0.74	MDST	Tenas_Lithology.csv
T95R-10	27.89	28.33	0.44	COAL	Tenas_Lithology.csv
T95R-10	28.33	36.05	7.72	MDST	Tenas_Lithology.csv
T95R-10	36.05	37.9	1.85	COAL	Tenas_Lithology.csv
T95R-10	37.9	38.66	0.76	MDST	Tenas_Lithology.csv
T95R-10	38.66	38.98	0.32	COAL	Tenas_Lithology.csv
T95R-10	38.98	51.31	12.33	MDST	Tenas_Lithology.csv
T95R-10	51.31	51.7	0.39	COAL	Tenas_Lithology.csv
T95R-10	51.7	53.85	2.15	MDST	Tenas_Lithology.csv
T95R-10	53.85	54.2	0.35	COAL	Tenas_Lithology.csv
T95R-10	54.2	63	8.8	SLTS	Tenas_Lithology.csv
T95R-10	63	110.3	47.3	SST	Tenas_Lithology.csv
T95R-10	110.3	138	27.7	VOLC	Tenas_Lithology.csv
T95R-11	0	4.51	4.51	Overburden	Tenas_Lithology.csv
T95R-11	4.51	22.95	18.44	SLTS	Tenas_Lithology.csv
T95R-11	22.95	23.6	0.65	COAL	Tenas_Lithology.csv
T95R-11	23.6	25.4	1.8	MDST	Tenas_Lithology.csv
T95R-11	25.4	25.6	0.2	COAL	Tenas_Lithology.csv
T95R-11	25.6	26.09	0.49	MDST	Tenas_Lithology.csv
T95R-11	26.09	26.8	0.71	COAL	Tenas_Lithology.csv
T95R-11	26.8	27.57	0.77	MDST	Tenas_Lithology.csv
T95R-11	27.57	28.4	0.83	COAL	Tenas_Lithology.csv
T95R-11	28.4	35.9	7.5	MDST	Tenas_Lithology.csv
T95R-11	35.9	36	0.1	COAL	Tenas_Lithology.csv
T95R-11	36	36.58	0.58	MDST	Tenas_Lithology.csv
T95R-11	36.58	36.86	0.28	COAL	Tenas_Lithology.csv
T95R-11	36.86	41.2	4.34	SST	Tenas_Lithology.csv
T95R-11	41.2	41.63	0.43	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-11	41.63	43.42	1.79	MDST	Tenas_Lithology.csv
T95R-11	43.42	43.66	0.24	COAL	Tenas_Lithology.csv
T95R-11	43.66	55	11.34	SLTS	Tenas_Lithology.csv
T95R-13	0	6.01	6.01	Overburden	Tenas_Lithology.csv
T95R-13	6.01	30.3	24.29	SLTS	Tenas_Lithology.csv
T95R-13	30.3	41.59	11.29	MDST	Tenas_Lithology.csv
T95R-13	41.59	42.16	0.57	COAL	Tenas_Lithology.csv
T95R-13	42.16	45	2.84	MDST	Tenas_Lithology.csv
T95R-13	45	56.6	11.6	SLTS	Tenas_Lithology.csv
T95R-13	56.6	56.9	0.3	COAL	Tenas_Lithology.csv
T95R-13	56.9	60.65	3.75	MDST	Tenas_Lithology.csv
T95R-13	60.65	62.64	1.99	COAL	Tenas_Lithology.csv
T95R-13	62.64	63.6	0.96	MDST	Tenas_Lithology.csv
T95R-13	63.6	67.32	3.72	COAL	Tenas_Lithology.csv
T95R-13	67.32	69.7	2.38	MDST	Tenas_Lithology.csv
T95R-13	69.7	71.3	1.6	COAL	Tenas_Lithology.csv
T95R-13	71.3	73.3	2	MDST	Tenas_Lithology.csv
T95R-13	73.3	73.6	0.3	COAL	Tenas_Lithology.csv
T95R-13	73.6	78.65	5.05	MDST	Tenas_Lithology.csv
T95R-13	78.65	79.4	0.75	COAL	Tenas_Lithology.csv
T95R-13	79.4	81.82	2.42	MDST	Tenas_Lithology.csv
T95R-13	81.82	82.36	0.54	COAL	Tenas_Lithology.csv
T95R-13	82.36	85.12	2.76	MDST	Tenas_Lithology.csv
T95R-13	85.12	85.33	0.21	COAL	Tenas_Lithology.csv
T95R-13	85.33	91.1	5.77	SLTS	Tenas_Lithology.csv
T95R-13	91.1	96	4.9	SST	Tenas_Lithology.csv
T95R-13	96	105.3	9.3	CGL	Tenas_Lithology.csv
T95R-14	0	9.01	9.01	Overburden	Tenas_Lithology.csv
T95R-14	9.01	30	20.99	SLTS	Tenas_Lithology.csv
T95R-14	30	54.3	24.3	MDST	Tenas_Lithology.csv
T95R-14	54.3	97.5	43.2	SLTS	Tenas_Lithology.csv
T95R-14	97.5	100.7	3.2	SST	Tenas_Lithology.csv
T95R-14	100.7	105.6	4.9	SLTS	Tenas_Lithology.csv
T95R-14	105.6	109.7	4.1	SST	Tenas_Lithology.csv
T95R-14	109.7	114.67	4.97	SLTS	Tenas_Lithology.csv
T95R-14	114.67	115.45	0.78	COAL	Tenas_Lithology.csv
T95R-14	115.45	119.17	3.72	MDST	Tenas_Lithology.csv
T95R-14	119.17	120.9	1.73	COAL	Tenas_Lithology.csv
T95R-14	120.9	133.9	13	SLTS	Tenas_Lithology.csv
T95R-14	133.9	135.95	2.05	COAL	Tenas_Lithology.csv
T95R-14	135.95	142.15	6.2	SLTS	Tenas_Lithology.csv
T95R-14	142.15	143.27	1.12	COAL	Tenas_Lithology.csv
T95R-14	143.27	143.48	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-14	143.48	144.68	1.2	COAL	Tenas_Lithology.csv
T95R-14	144.68	152.34	7.66	SLTS	Tenas_Lithology.csv
T95R-14	152.34	153.18	0.84	COAL	Tenas_Lithology.csv
T95R-14	153.18	155.2	2.02	SLTS	Tenas_Lithology.csv
T95R-14	155.2	162.6	7.4	CGL	Tenas_Lithology.csv
T95R-14	162.6	167	4.4	SLTS	Tenas_Lithology.csv
T95R-14	167	178	11	SST	Tenas_Lithology.csv
T95R-15C	0	6.51	6.51	Overburden	Tenas_Lithology.csv
T95R-15C	6.51	19.57	13.06	SLTS	Tenas_Lithology.csv
T95R-15C	19.57	27.84	8.27	MDST	Tenas_Lithology.csv
T95R-15C	27.84	29.91	2.07	SLTS	Tenas_Lithology.csv
T95R-15C	29.91	31.2	1.29	MDST	Tenas_Lithology.csv
T95R-15C	31.2	31.5	0.3	COAL	Tenas_Lithology.csv
T95R-15C	31.5	36.3	4.8	MDST	Tenas_Lithology.csv
T95R-15C	36.3	36.7	0.4	COAL	Tenas_Lithology.csv
T95R-15C	36.7	39.02	2.32	MDST	Tenas_Lithology.csv
T95R-15C	39.02	41.2	2.18	COAL	Tenas_Lithology.csv
T95R-15C	41.2	47.63	6.43	MDST	Tenas_Lithology.csv
T95R-15C	47.63	47.92	0.29	COAL	Tenas_Lithology.csv
T95R-15C	47.92	51.18	3.26	MDST	Tenas_Lithology.csv
T95R-15C	51.18	53.47	2.29	COAL	Tenas_Lithology.csv
T95R-15C	53.47	56.9	3.43	MDST	Tenas_Lithology.csv
T95R-15C	56.9	61.22	4.32	COAL	Tenas_Lithology.csv
T95R-15C	61.22	63.84	2.62	MDST	Tenas_Lithology.csv
T95R-15C	63.84	71.4	7.56	SST	Tenas_Lithology.csv
T95R-15C	71.4	75.35	3.95	MDST	Tenas_Lithology.csv
T95R-15C	75.35	75.62	0.27	COAL	Tenas_Lithology.csv
T95R-15C	75.62	77.1	1.48	MDST	Tenas_Lithology.csv
T95R-15C	77.1	77.42	0.32	COAL	Tenas_Lithology.csv
T95R-15C	77.42	80.2	2.78	MDST	Tenas_Lithology.csv
T95R-15C	80.2	80.65	0.45	COAL	Tenas_Lithology.csv
T95R-15C	80.65	81.95	1.3	MDST	Tenas_Lithology.csv
T95R-15C	81.95	82.21	0.26	COAL	Tenas_Lithology.csv
T95R-15C	82.21	100	17.79	SLTS	Tenas_Lithology.csv
T95R-17	0	5.51	5.51	Overburden	Tenas_Lithology.csv
T95R-17	5.51	40.7	35.19	SST	Tenas_Lithology.csv
T95R-17	40.7	46.8	6.1	SLTS	Tenas_Lithology.csv
T95R-17	46.8	50.3	3.5	SST	Tenas_Lithology.csv
T95R-17	50.3	118.5	68.2	MDST	Tenas_Lithology.csv
T95R-17	118.5	121	2.5	SST	Tenas_Lithology.csv
T95R-17	121	125.15	4.15	MDST	Tenas_Lithology.csv
T95R-17	125.15	125.57	0.42	COAL	Tenas_Lithology.csv
T95R-17	125.57	127.61	2.04	MDST	Tenas_Lithology.csv
T95R-17	127.61	128.31	0.7	COAL	Tenas_Lithology.csv
T95R-17	128.31	129.83	1.52	MDST	Tenas_Lithology.csv
T95R-17	129.83	130	0.17	COAL	Tenas_Lithology.csv
T95R-17	130	130.25	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-17	130.25	130.5	0.25	COAL	Tenas_Lithology.csv
T95R-17	130.5	131.9	1.4	MDST	Tenas_Lithology.csv
T95R-17	131.9	132.1	0.2	COAL	Tenas_Lithology.csv
T95R-17	132.1	133.8	1.7	MDST	Tenas_Lithology.csv
T95R-17	133.8	134.3	0.5	COAL	Tenas_Lithology.csv
T95R-17	134.3	135.1	0.8	MDST	Tenas_Lithology.csv
T95R-17	135.1	135.4	0.3	COAL	Tenas_Lithology.csv
T95R-17	135.4	142.4	7	MDST	Tenas_Lithology.csv
T95R-17	142.4	158.5	16.1	SLTS	Tenas_Lithology.csv
T95R-17	158.5	178	19.5	SST	Tenas_Lithology.csv
T95R-19C	0	7.01	7.01	Overburden	Tenas_Lithology.csv
T95R-19C	7.01	33.83	26.82	MDST	Tenas_Lithology.csv
T95R-19C	33.83	34.3	0.47	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-19C	34.3	37.8	3.5	MDST	Tenas_Lithology.csv
T95R-19C	37.8	38.15	0.35	COAL	Tenas_Lithology.csv
T95R-19C	38.15	40.11	1.96	MDST	Tenas_Lithology.csv
T95R-19C	40.11	40.27	0.16	COAL	Tenas_Lithology.csv
T95R-19C	40.27	43.27	3	MDST	Tenas_Lithology.csv
T95R-19C	43.27	43.47	0.2	COAL	Tenas_Lithology.csv
T95R-19C	43.47	44.46	0.99	MDST	Tenas_Lithology.csv
T95R-19C	44.46	46.37	1.91	COAL	Tenas_Lithology.csv
T95R-19C	46.37	53.34	6.97	MDST	Tenas_Lithology.csv
T95R-19C	53.34	53.78	0.44	COAL	Tenas_Lithology.csv
T95R-19C	53.78	59.76	5.98	MDST	Tenas_Lithology.csv
T95R-19C	59.76	61.85	2.09	COAL	Tenas_Lithology.csv
T95R-19C	61.85	61.9	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-19C	61.9	66.21	4.31	COAL	Tenas_Lithology.csv
T95R-19C	66.21	69.64	3.43	MDST	Tenas_Lithology.csv
T95R-19C	69.64	69.97	0.33	COAL	Tenas_Lithology.csv
T95R-19C	69.97	70.06	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-19C	70.06	71.19	1.13	COAL	Tenas_Lithology.csv
T95R-19C	71.19	71.68	0.49	MDST	Tenas_Lithology.csv
T95R-19C	71.68	72.43	0.75	COAL	Tenas_Lithology.csv
T95R-19C	72.43	77.32	4.89	MDST	Tenas_Lithology.csv
T95R-19C	77.32	77.63	0.31	COAL	Tenas_Lithology.csv
T95R-19C	77.63	77.9	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-19C	77.9	78.08	0.18	COAL	Tenas_Lithology.csv
T95R-19C	78.08	78.73	0.65	MDST	Tenas_Lithology.csv
T95R-19C	78.73	79.48	0.75	COAL	Tenas_Lithology.csv
T95R-19C	79.48	79.89	0.41	MDST	Tenas_Lithology.csv
T95R-19C	79.89	80.63	0.74	COAL	Tenas_Lithology.csv
T95R-19C	80.63	82.81	2.18	MDST	Tenas_Lithology.csv
T95R-19C	82.81	83.93	1.12	COAL	Tenas_Lithology.csv
T95R-19C	83.93	84.95	1.02	MDST	Tenas_Lithology.csv
T95R-19C	84.95	85.11	0.16	COAL	Tenas_Lithology.csv
T95R-19C	85.11	85.9	0.79	MDST	Tenas_Lithology.csv
T95R-20	0	12	12	Overburden	Tenas_Lithology.csv
T95R-21	0	6	6	Overburden	Tenas_Lithology.csv
T95R-21	6	13.78	7.78	SLTS	Tenas_Lithology.csv
T95R-21	13.78	13.98	0.2	COAL	Tenas_Lithology.csv
T95R-21	13.98	17.92	3.94	SLTS	Tenas_Lithology.csv
T95R-21	17.92	18.26	0.34	COAL	Tenas_Lithology.csv
T95R-21	18.26	21.18	2.92	SLTS	Tenas_Lithology.csv
T95R-21	21.18	21.85	0.67	COAL	Tenas_Lithology.csv
T95R-21	21.85	25.93	4.08	MDST	Tenas_Lithology.csv
T95R-21	25.93	26.17	0.24	COAL	Tenas_Lithology.csv
T95R-21	26.17	26.58	0.41	MDST	Tenas_Lithology.csv
T95R-21	26.58	28.4	1.82	COAL	Tenas_Lithology.csv
T95R-21	28.4	35.15	6.75	SLTS	Tenas_Lithology.csv
T95R-21	35.15	35.47	0.32	COAL	Tenas_Lithology.csv
T95R-21	35.47	40.47	5	SLTS	Tenas_Lithology.csv
T95R-21	40.47	46.35	5.88	COAL	Tenas_Lithology.csv
T95R-21	46.35	47.78	1.43	MDST	Tenas_Lithology.csv
T95R-21	47.78	48.28	0.5	COAL	Tenas_Lithology.csv
T95R-21	48.28	48.55	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-21	48.55	48.88	0.33	COAL	Tenas_Lithology.csv
T95R-21	48.88	61.76	12.88	SLTS	Tenas_Lithology.csv
T95R-21	61.76	62.4	0.64	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-21	62.4	63.85	1.45	MDST	Tenas_Lithology.csv
T95R-21	63.85	64.38	0.53	COAL	Tenas_Lithology.csv
T95R-21	64.38	67.59	3.21	SLTS	Tenas_Lithology.csv
T95R-21	67.59	68.01	0.42	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-21	68.01	69.76	1.75	SLTS	Tenas_Lithology.csv
T95R-21	69.76	70.13	0.37	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-21	70.13	73	2.87	SLTS	Tenas_Lithology.csv
T95R-22C	0	12.51	12.51	Overburden	Tenas_Lithology.csv
T95R-22C	12.51	12.8	0.29	MDST	Tenas_Lithology.csv
T95R-22C	12.8	15.25	2.45	COAL	Tenas_Lithology.csv
T95R-22C	15.25	15.65	0.4	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-22C	15.65	18.2	2.55	COAL	Tenas_Lithology.csv
T95R-22C	18.2	19.85	1.65	MDST	Tenas_Lithology.csv
T95R-22C	19.85	21.72	1.87	COAL	Tenas_Lithology.csv
T95R-22C	21.72	22.53	0.81	MDST	Tenas_Lithology.csv
T95R-22C	22.53	22.91	0.38	COAL	Tenas_Lithology.csv
T95R-22C	22.91	24.18	1.27	MDST	Tenas_Lithology.csv
T95R-22C	24.18	24.85	0.67	COAL	Tenas_Lithology.csv
T95R-22C	24.85	25.4	0.55	MDST	Tenas_Lithology.csv
T95R-22C	25.4	28.6	3.2	COAL	Tenas_Lithology.csv
T95R-22C	28.6	33.6	5	MDST	Tenas_Lithology.csv
T95R-22C	33.6	34.29	0.69	COAL	Tenas_Lithology.csv
T95R-22C	34.29	36.39	2.1	MDST	Tenas_Lithology.csv
T95R-22C	36.39	37.23	0.84	COAL	Tenas_Lithology.csv
T95R-22C	37.23	38.26	1.03	MDST	Tenas_Lithology.csv
T95R-22C	38.26	38.53	0.27	COAL	Tenas_Lithology.csv
T95R-22C	38.53	51.9	13.37	MDST	Tenas_Lithology.csv
T95R-22C	51.9	52.6	0.7	COAL	Tenas_Lithology.csv
T95R-22C	52.6	52.9	0.3	MDST	Tenas_Lithology.csv
T95R-22C	52.9	53	0.1	COAL	Tenas_Lithology.csv
T95R-22C	53	53.15	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-22C	53.15	54.13	0.98	COAL	Tenas_Lithology.csv
T95R-22C	54.13	62.34	8.21	MDST	Tenas_Lithology.csv
T95R-22C	62.34	63.12	0.78	COAL	Tenas_Lithology.csv
T95R-22C	63.12	96.5	33.38	MDST	Tenas_Lithology.csv
T95R-22C	96.5	97.4	0.9	SST	Tenas_Lithology.csv
T95R-22C	97.4	114.9	17.5	CGL	Tenas_Lithology.csv
T95R-24	0	5.31	5.31	Overburden	Tenas_Lithology.csv
T95R-24	5.31	14.5	9.19	MDST	Tenas_Lithology.csv
T95R-24	14.5	16.04	1.54	SST	Tenas_Lithology.csv
T95R-24	16.04	16.21	0.17	MDST	Tenas_Lithology.csv
T95R-24	16.21	16.54	0.33	COAL	Tenas_Lithology.csv
T95R-24	16.54	18.81	2.27	MDST	Tenas_Lithology.csv
T95R-24	18.81	19.37	0.56	COAL	Tenas_Lithology.csv
T95R-24	19.37	25.28	5.91	SLTS	Tenas_Lithology.csv
T95R-24	25.28	26.23	0.95	COAL	Tenas_Lithology.csv
T95R-24	26.23	37.38	11.15	SLTS	Tenas_Lithology.csv
T95R-24	37.38	39.22	1.84	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-24	39.22	40.75	1.53	MDST	Tenas_Lithology.csv
T95R-24	40.75	44.19	3.44	COAL	Tenas_Lithology.csv
T95R-24	44.19	44.69	0.5	MDST	Tenas_Lithology.csv
T95R-24	44.69	45.22	0.53	COAL	Tenas_Lithology.csv
T95R-24	45.22	45.37	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-24	45.37	45.77	0.4	COAL	Tenas_Lithology.csv
T95R-24	45.77	49	3.23	SST	Tenas_Lithology.csv
T95R-24	49	57.65	8.65	MDST	Tenas_Lithology.csv
T95R-24	57.65	58.08	0.43	COAL	Tenas_Lithology.csv
T95R-24	58.08	59.8	1.72	MDST	Tenas_Lithology.csv
T95R-24	59.8	60.3	0.5	COAL	Tenas_Lithology.csv
T95R-24	60.3	63.84	3.54	MDST	Tenas_Lithology.csv
T95R-24	63.84	64.27	0.43	COAL	Tenas_Lithology.csv
T95R-24	64.27	66.72	2.45	MDST	Tenas_Lithology.csv
T95R-24	66.72	67.03	0.31	COAL	Tenas_Lithology.csv
T95R-24	67.03	67.9	0.87	MDST	Tenas_Lithology.csv
T95R-25	0	5.21	5.21	Overburden	Tenas_Lithology.csv
T95R-25	5.21	5.5	0.29	COAL	Tenas_Lithology.csv
T95R-25	5.5	7.1	1.6	MDST	Tenas_Lithology.csv
T95R-25	7.1	7.37	0.27	COAL	Tenas_Lithology.csv
T95R-25	7.37	8.8	1.43	SLTS	Tenas_Lithology.csv
T95R-25	8.8	9	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-25	9	15	6	SST	Tenas_Lithology.csv
T95R-25	15	15.27	0.27	MDST	Tenas_Lithology.csv
T95R-25	15.27	15.72	0.45	COAL	Tenas_Lithology.csv
T95R-25	15.72	15.9	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-25	15.9	16.52	0.62	COAL	Tenas_Lithology.csv
T95R-25	16.52	18.58	2.06	MDST	Tenas_Lithology.csv
T95R-25	18.58	26.85	8.27	SST	Tenas_Lithology.csv
T95R-25	26.85	27.44	0.59	COAL	Tenas_Lithology.csv
T95R-25	27.44	31.7	4.26	SLTS	Tenas_Lithology.csv
T95R-25	31.7	37	5.3	SST	Tenas_Lithology.csv
T95R-25	37	43	6	CGL	Tenas_Lithology.csv
T95R-26	0	7	7	Overburden	Tenas_Lithology.csv
T95R-26	7	11	4	CGL	Tenas_Lithology.csv
T95R-26	11	15	4	MDST	Tenas_Lithology.csv
T95R-26	15	16	1	CGL	Tenas_Lithology.csv
T95R-26	16	19	3	MDST	Tenas_Lithology.csv
T95R-26	19	23	4	CGL	Tenas_Lithology.csv
T95R-26	23	26	3	MDST	Tenas_Lithology.csv
T95R-26	26	32	6	CGL	Tenas_Lithology.csv
T95R-26	32	57	25	MDST	Tenas_Lithology.csv
T95R-26	57	80	23	VOLC	Tenas_Lithology.csv
T95R-28C	0	5.81	5.81	Overburden	Tenas_Lithology.csv
T95R-28C	5.81	15.6	9.79	SLTS	Tenas_Lithology.csv
T95R-28C	15.6	30.56	14.96	MDST	Tenas_Lithology.csv
T95R-28C	30.56	33.76	3.2	SLTS	Tenas_Lithology.csv
T95R-28C	33.76	34.41	0.65	MDST	Tenas_Lithology.csv
T95R-28C	34.41	34.95	0.54	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-28C	34.95	40.3	5.35	MDST	Tenas_Lithology.csv
T95R-28C	40.3	40.67	0.37	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-28C	40.67	46.76	6.09	MDST	Tenas_Lithology.csv
T95R-28C	46.76	48.62	1.86	COAL	Tenas_Lithology.csv
T95R-28C	48.62	55.57	6.95	MDST	Tenas_Lithology.csv
T95R-28C	55.57	55.72	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-28C	55.72	59.5	3.78	MDST	Tenas_Lithology.csv
T95R-28C	59.5	61.29	1.79	COAL	Tenas_Lithology.csv
T95R-28C	61.29	62.39	1.1	MDST	Tenas_Lithology.csv
T95R-28C	62.39	63.7	1.31	COAL	Tenas_Lithology.csv
T95R-28C	63.7	64.99	1.29	MDST	Tenas_Lithology.csv
T95R-28C	64.99	67.37	2.38	COAL	Tenas_Lithology.csv
T95R-28C	67.37	67.6	0.23	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-28C	67.6	67.85	0.25	COAL	Tenas_Lithology.csv
T95R-28C	67.85	76.22	8.37	MDST	Tenas_Lithology.csv
T95R-28C	76.22	77.01	0.79	COAL	Tenas_Lithology.csv
T95R-28C	77.01	77.97	0.96	MDST	Tenas_Lithology.csv
T95R-28C	77.97	78.38	0.41	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-28C	78.38	86.43	8.05	MDST	Tenas_Lithology.csv
T95R-28C	86.43	86.78	0.35	COAL	Tenas_Lithology.csv
T95R-28C	86.78	87.28	0.5	MDST	Tenas_Lithology.csv
T95R-28C	87.28	88.14	0.86	COAL	Tenas_Lithology.csv
T95R-28C	88.14	89.17	1.03	MDST	Tenas_Lithology.csv
T95R-28C	89.17	89.42	0.25	COAL	Tenas_Lithology.csv
T95R-28C	89.42	89.76	0.34	MDST	Tenas_Lithology.csv
T95R-28C	89.76	90	0.24	COAL	Tenas_Lithology.csv
T95R-28C	90	91.25	1.25	MDST	Tenas_Lithology.csv
T95R-28C	91.25	91.91	0.66	COAL	Tenas_Lithology.csv
T95R-28C	91.91	99.7	7.79	MDST	Tenas_Lithology.csv
T95R-28C	99.7	115.9	16.2	SLTS	Tenas_Lithology.csv
T95R-30	0	12.01	12.01	Overburden	Tenas_Lithology.csv
T95R-30	12.01	53.3	41.29	VOLC	Tenas_Lithology.csv
T95R-31	0	9.01	9.01	Overburden	Tenas_Lithology.csv
T95R-31	9.01	25.3	16.29	SST	Tenas_Lithology.csv
T95R-31	25.3	34.2	8.9	MDST	Tenas_Lithology.csv
T95R-31	34.2	47.92	13.72	SLTS	Tenas_Lithology.csv
T95R-31	47.92	49.45	1.53	COAL	Tenas_Lithology.csv
T95R-31	49.45	56.55	7.1	SLTS	Tenas_Lithology.csv
T95R-31	56.55	56.88	0.33	COAL	Tenas_Lithology.csv
T95R-31	56.88	58.9	2.02	MDST	Tenas_Lithology.csv
T95R-31	58.9	61.5	2.6	SST	Tenas_Lithology.csv
T95R-31	61.5	64.02	2.52	MDST	Tenas_Lithology.csv
T95R-31	64.02	65.45	1.43	COAL	Tenas_Lithology.csv
T95R-31	65.45	65.75	0.3	MDST	Tenas_Lithology.csv
T95R-31	65.75	67.07	1.32	COAL	Tenas_Lithology.csv
T95R-31	67.07	67.75	0.68	MDST	Tenas_Lithology.csv
T95R-31	67.75	67.97	0.22	COAL	Tenas_Lithology.csv
T95R-31	67.97	69.44	1.47	MDST	Tenas_Lithology.csv
T95R-31	69.44	70.2	0.76	COAL	Tenas_Lithology.csv
T95R-31	70.2	70.35	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-31	70.35	71.4	1.05	COAL	Tenas_Lithology.csv
T95R-31	71.4	72.42	1.02	MDST	Tenas_Lithology.csv
T95R-31	72.42	73.03	0.61	COAL	Tenas_Lithology.csv
T95R-31	73.03	74.85	1.82	MDST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-31	74.85	75.65	0.8	COAL	Tenas_Lithology.csv
T95R-31	75.65	85.05	9.4	MDST	Tenas_Lithology.csv
T95R-31	85.05	85.45	0.4	COAL	Tenas_Lithology.csv
T95R-31	85.45	86.2	0.75	MDST	Tenas_Lithology.csv
T95R-31	86.2	87.93	1.73	COAL	Tenas_Lithology.csv
T95R-31	87.93	95.17	7.24	MDST	Tenas_Lithology.csv
T95R-31	95.17	95.7	0.53	COAL	Tenas_Lithology.csv
T95R-31	95.7	108.3	12.6	SLTS	Tenas_Lithology.csv
T95R-31	108.3	146	37.7	SST	Tenas_Lithology.csv
T95R-32	0	6	6	Overburden	Tenas_Lithology.csv
T95R-32	6	41.54	35.54	SLTS	Tenas_Lithology.csv
T95R-32	41.54	42.11	0.57	COAL	Tenas_Lithology.csv
T95R-32	42.11	43.49	1.38	MDST	Tenas_Lithology.csv
T95R-32	43.49	43.82	0.33	COAL	Tenas_Lithology.csv
T95R-32	43.82	44.66	0.84	MDST	Tenas_Lithology.csv
T95R-32	44.66	45.28	0.62	COAL	Tenas_Lithology.csv
T95R-32	45.28	47	1.72	MDST	Tenas_Lithology.csv
T95R-32	47	47.2	0.2	COAL	Tenas_Lithology.csv
T95R-32	47.2	49.5	2.3	MDST	Tenas_Lithology.csv
T95R-32	49.5	50.48	0.98	CGL	Tenas_Lithology.csv
T95R-32	50.48	50.61	0.13	COAL	Tenas_Lithology.csv
T95R-32	50.61	52.3	1.69	CGL	Tenas_Lithology.csv
T95R-32	52.3	58.3	6	SLTS	Tenas_Lithology.csv
T95R-32	58.3	58.7	0.4	COAL	Tenas_Lithology.csv
T95R-32	58.7	71.3	12.6	SLTS	Tenas_Lithology.csv
T95R-32	71.3	75.6	4.3	SST	Tenas_Lithology.csv
T95R-32	75.6	80.2	4.6	CGL	Tenas_Lithology.csv
T95R-32	80.2	89.1	8.9	SST	Tenas_Lithology.csv
T95R-32	89.1	95.6	6.5	MDST	Tenas_Lithology.csv
T95R-32	95.6	105.2	9.6	SST	Tenas_Lithology.csv
T95R-32	105.2	117.4	12.2	CGL	Tenas_Lithology.csv
T95R-32	117.4	142.05	24.65	MDST	Tenas_Lithology.csv
T95R-32	142.05	147	4.95	VOLC	Tenas_Lithology.csv
T95R-34	0	5.01	5.01	Overburden	Tenas_Lithology.csv
T95R-34	5.01	46.25	41.24	MDST	Tenas_Lithology.csv
T95R-34	46.25	48.2	1.95	COAL	Tenas_Lithology.csv
T95R-34	48.2	55.89	7.69	MDST	Tenas_Lithology.csv
T95R-34	55.89	56.28	0.39	COAL	Tenas_Lithology.csv
T95R-34	56.28	63.08	6.8	MDST	Tenas_Lithology.csv
T95R-34	63.08	64.23	1.15	COAL	Tenas_Lithology.csv
T95R-34	64.23	64.6	0.37	MDST	Tenas_Lithology.csv
T95R-34	64.6	65.01	0.41	COAL	Tenas_Lithology.csv
T95R-34	65.01	65.17	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-34	65.17	66.13	0.96	COAL	Tenas_Lithology.csv
T95R-34	66.13	66.41	0.28	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-34	66.41	69.88	3.47	COAL	Tenas_Lithology.csv
T95R-34	69.88	73.22	3.34	MDST	Tenas_Lithology.csv
T95R-34	73.22	73.68	0.46	COAL	Tenas_Lithology.csv
T95R-34	73.68	75.3	1.62	MDST	Tenas_Lithology.csv
T95R-34	75.3	75.99	0.69	COAL	Tenas_Lithology.csv
T95R-34	75.99	76.52	0.53	MDST	Tenas_Lithology.csv
T95R-34	76.52	76.75	0.23	COAL	Tenas_Lithology.csv
T95R-34	76.75	77.3	0.55	MDST	Tenas_Lithology.csv
T95R-34	77.3	77.7	0.4	COAL	Tenas_Lithology.csv
T95R-34	77.7	81.89	4.19	SLTS	Tenas_Lithology.csv
T95R-34	81.89	82.73	0.84	COAL	Tenas_Lithology.csv
T95R-34	82.73	84.15	1.42	MDST	Tenas_Lithology.csv
T95R-34	84.15	84.73	0.58	COAL	Tenas_Lithology.csv
T95R-34	84.73	88.2	3.47	SST	Tenas_Lithology.csv
T95R-34	88.2	91.8	3.6	SLTS	Tenas_Lithology.csv
T95R-34	91.8	92.4	0.6	COAL	Tenas_Lithology.csv
T95R-34	92.4	113	20.6	SLTS	Tenas_Lithology.csv
T95R-34	113	116	3	SST	Tenas_Lithology.csv
T95R-35C	0	10.61	10.61	Overburden	Tenas_Lithology.csv
T95R-35C	10.61	20.5	9.89	MDST	Tenas_Lithology.csv
T95R-35C	20.5	23.9	3.4	SST	Tenas_Lithology.csv
T95R-35C	23.9	31.4	7.5	SLTS	Tenas_Lithology.csv
T95R-35C	31.4	50	18.6	SST	Tenas_Lithology.csv
T95R-35C	50	62.4	12.4	MDST	Tenas_Lithology.csv
T95R-35C	62.4	67.6	5.2	SST	Tenas_Lithology.csv
T95R-35C	67.6	75.36	7.76	MDST	Tenas_Lithology.csv
T95R-35C	75.36	75.5	0.14	COAL	Tenas_Lithology.csv
T95R-35C	75.5	77.02	1.52	MDST	Tenas_Lithology.csv
T95R-35C	77.02	79.37	2.35	COAL	Tenas_Lithology.csv
T95R-35C	79.37	84.05	4.68	SLTS	Tenas_Lithology.csv
T95R-35C	84.05	84.23	0.18	MDST	Tenas_Lithology.csv
T95R-35C	84.23	84.54	0.31	COAL	Tenas_Lithology.csv
T95R-35C	84.54	89.1	4.56	MDST	Tenas_Lithology.csv
T95R-35C	89.1	89.2	0.1	COAL	Tenas_Lithology.csv
T95R-35C	89.2	98.99	9.79	SLTS	Tenas_Lithology.csv
T95R-35C	98.99	100.08	1.09	SST	Tenas_Lithology.csv
T95R-35C	100.08	102.14	2.06	SLTS	Tenas_Lithology.csv
T95R-35C	102.14	130	27.86	SST	Tenas_Lithology.csv
T95R-36	0	4.01	4.01	Overburden	Tenas_Lithology.csv
T95R-36	4.01	5.61	1.6	MDST	Tenas_Lithology.csv
T95R-36	5.61	5.82	0.21	COAL	Tenas_Lithology.csv
T95R-36	5.82	7.43	1.61	MDST	Tenas_Lithology.csv
T95R-36	7.43	7.71	0.28	COAL	Tenas_Lithology.csv
T95R-36	7.71	11.98	4.27	SLTS	Tenas_Lithology.csv
T95R-36	11.98	12.27	0.29	COAL	Tenas_Lithology.csv
T95R-36	12.27	12.6	0.33	SLTS	Tenas_Lithology.csv
T95R-36	12.6	14.71	2.11	SST	Tenas_Lithology.csv
T95R-36	14.71	15.1	0.39	COAL	Tenas_Lithology.csv
T95R-36	15.1	17.4	2.3	SST	Tenas_Lithology.csv
T95R-36	17.4	19.65	2.25	SLTS	Tenas_Lithology.csv
T95R-36	19.65	19.93	0.28	COAL	Tenas_Lithology.csv
T95R-36	19.93	20.72	0.79	MDST	Tenas_Lithology.csv
T95R-36	20.72	21.09	0.37	COAL	Tenas_Lithology.csv
T95R-36	21.09	40.1	19.01	SST	Tenas_Lithology.csv
T95R-36	40.1	55	14.9	MDST	Tenas_Lithology.csv
T95R-38C	0	7.01	7.01	Overburden	Tenas_Lithology.csv
T95R-38C	7.01	17.48	10.47	MDST	Tenas_Lithology.csv
T95R-38C	17.48	18.29	0.81	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-38C	18.29	28.25	9.96	MDST	Tenas_Lithology.csv
T95R-38C	28.25	38.66	10.41	COAL	Tenas_Lithology.csv
T95R-38C	38.66	44.62	5.96	MDST	Tenas_Lithology.csv
T95R-38C	44.62	45.47	0.85	COAL	Tenas_Lithology.csv
T95R-38C	45.47	45.62	0.15	MDST	Tenas_Lithology.csv
T95R-38C	45.62	45.77	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-38C	45.77	47.83	2.06	MDST	Tenas_Lithology.csv
T95R-38C	47.83	48.89	1.06	COAL	Tenas_Lithology.csv
T95R-38C	48.89	51.83	2.94	MDST	Tenas_Lithology.csv
T95R-38C	51.83	52.52	0.69	COAL	Tenas_Lithology.csv
T95R-38C	52.52	57	4.48	MDST	Tenas_Lithology.csv
T95R-38C	57	57.17	0.17	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-38C	57.17	59.62	2.45	MDST	Tenas_Lithology.csv
T95R-38C	59.62	60.25	0.63	COAL	Tenas_Lithology.csv
T95R-38C	60.25	61.96	1.71	MDST	Tenas_Lithology.csv
T95R-38C	61.96	62.55	0.59	COAL	Tenas_Lithology.csv
T95R-38C	62.55	70.1	7.55	MDST	Tenas_Lithology.csv
T95R-38C	70.1	83.05	12.95	SST	Tenas_Lithology.csv
T95R-38C	83.05	104.7	21.65	CGL	Tenas_Lithology.csv
T95R-39C	0	3.01	3.01	Overburden	Tenas_Lithology.csv
T95R-39C	3.01	17.49	14.48	SLTS	Tenas_Lithology.csv
T95R-39C	17.49	30.24	12.75	MDST	Tenas_Lithology.csv
T95R-39C	30.24	31.83	1.59	SST	Tenas_Lithology.csv
T95R-39C	31.83	32.08	0.25	SLTS	Tenas_Lithology.csv
T95R-39C	32.08	32.35	0.27	COAL	Tenas_Lithology.csv
T95R-39C	32.35	35.81	3.46	MDST	Tenas_Lithology.csv
T95R-39C	35.81	36.15	0.34	COAL	Tenas_Lithology.csv
T95R-39C	36.15	38.78	2.63	MDST	Tenas_Lithology.csv
T95R-39C	38.78	38.94	0.16	COAL	Tenas_Lithology.csv
T95R-39C	38.94	39.78	0.84	MDST	Tenas_Lithology.csv
T95R-39C	39.78	41.43	1.65	COAL	Tenas_Lithology.csv
T95R-39C	41.43	50.29	8.86	MDST	Tenas_Lithology.csv
T95R-39C	50.29	50.61	0.32	COAL	Tenas_Lithology.csv
T95R-39C	50.61	53.9	3.29	MDST	Tenas_Lithology.csv
T95R-39C	53.9	55.98	2.08	COAL	Tenas_Lithology.csv
T95R-39C	55.98	56.44	0.46	MDST	Tenas_Lithology.csv
T95R-39C	56.44	57.11	0.67	COAL	Tenas_Lithology.csv
T95R-39C	57.11	64.53	7.42	MDST	Tenas_Lithology.csv
T95R-39C	64.53	64.83	0.3	COAL	Tenas_Lithology.csv
T95R-39C	64.83	65.87	1.04	SLTS	Tenas_Lithology.csv
T95R-39C	65.87	66.74	0.87	COAL	Tenas_Lithology.csv
T95R-39C	66.74	70.1	3.36	MDST	Tenas_Lithology.csv
T95R-39C	70.1	71.22	1.12	SST	Tenas_Lithology.csv
T95R-39C	71.22	71.42	0.2	COAL	Tenas_Lithology.csv
T95R-39C	71.42	75.45	4.03	MDST	Tenas_Lithology.csv
T95R-39C	75.45	76.24	0.79	SLTS	Tenas_Lithology.csv
T95R-39C	76.24	76.66	0.42	SST	Tenas_Lithology.csv
T95R-39C	76.66	77.82	1.16	SLTS	Tenas_Lithology.csv
T95R-39C	77.82	80	2.18	SST	Tenas_Lithology.csv
T95R-40	0	38	38	Overburden	Tenas_Lithology.csv
T95R-40	38	43	5	MDST	Tenas_Lithology.csv
T95R-40	43	52.7	9.7	COAL	Tenas_Lithology.csv
T95R-40	52.7	57.52	4.82	MDST	Tenas_Lithology.csv
T95R-40	57.52	58.25	0.73	COAL	Tenas_Lithology.csv
T95R-40	58.25	60.33	2.08	MDST	Tenas_Lithology.csv
T95R-40	60.33	61	0.67	COAL	Tenas_Lithology.csv
T95R-40	61	63.1	2.1	MDST	Tenas_Lithology.csv
T95R-40	63.1	63.57	0.47	COAL	Tenas_Lithology.csv
T95R-40	63.57	64.05	0.48	MDST	Tenas_Lithology.csv
T95R-40	64.05	64.3	0.25	COAL	Tenas_Lithology.csv
T95R-40	64.3	70.29	5.99	MDST	Tenas_Lithology.csv
T95R-40	70.29	70.6	0.31	COAL	Tenas_Lithology.csv
T95R-40	70.6	70.9	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-40	70.9	72.22	1.32	COAL	Tenas_Lithology.csv
T95R-40	72.22	75.45	3.23	MDST	Tenas_Lithology.csv
T95R-40	75.45	75.72	0.27	COAL	Tenas_Lithology.csv
T95R-40	75.72	80	4.28	MDST	Tenas_Lithology.csv
T95R-43	0	22.5	22.5	Overburden	Tenas_Lithology.csv
T95R-43	22.5	52.35	29.85	SST	Tenas_Lithology.csv
T95R-43	52.35	53.12	0.77	COAL	Tenas_Lithology.csv
T95R-43	53.12	53.45	0.33	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-43	53.45	55.28	1.83	COAL	Tenas_Lithology.csv
T95R-43	55.28	56.7	1.42	MDST	Tenas_Lithology.csv
T95R-43	56.7	60.7	4	SLTS	Tenas_Lithology.csv
T95R-43	60.7	85.3	24.6	CGL	Tenas_Lithology.csv
T95R-43	85.3	86	0.7	MDST	Tenas_Lithology.csv
T95R-43	86	88.6	2.6	SST	Tenas_Lithology.csv
T95R-43	88.6	98.5	9.9	CGL	Tenas_Lithology.csv
T95R-44	0	136	136	Overburden	Tenas_Lithology.csv
T95R-44	136	138	2	VOLC	Tenas_Lithology.csv
T95R-45	0	1.01	1.01	Overburden	Tenas_Lithology.csv
T95R-45	1.01	56	54.99	VOLC	Tenas_Lithology.csv
T95R-46	0	3.01	3.01	Overburden	Tenas_Lithology.csv
T95R-46	3.01	28.28	25.27	SLTS	Tenas_Lithology.csv
T95R-46	28.28	28.67	0.39	COAL	Tenas_Lithology.csv
T95R-46	28.67	33.36	4.69	MDST	Tenas_Lithology.csv
T95R-46	33.36	33.55	0.19	COAL	Tenas_Lithology.csv
T95R-46	33.55	36.09	2.54	MDST	Tenas_Lithology.csv
T95R-46	36.09	37.75	1.66	COAL	Tenas_Lithology.csv
T95R-46	37.75	44.93	7.18	MDST	Tenas_Lithology.csv
T95R-46	44.93	45.24	0.31	COAL	Tenas_Lithology.csv
T95R-46	45.24	48.8	3.56	MDST	Tenas_Lithology.csv
T95R-46	48.8	50.72	1.92	COAL	Tenas_Lithology.csv
T95R-46	50.72	51.08	0.36	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-46	51.08	54.4	3.32	COAL	Tenas_Lithology.csv
T95R-46	54.4	55.22	0.82	MDST	Tenas_Lithology.csv
T95R-46	55.22	56.17	0.95	COAL	Tenas_Lithology.csv
T95R-46	56.17	65	8.83	SST	Tenas_Lithology.csv
T95R-46	65	66	1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-46	66	71.61	5.61	SLTS	Tenas_Lithology.csv
T95R-46	71.61	72.13	0.52	COAL	Tenas_Lithology.csv
T95R-46	72.13	74.1	1.97	SLTS	Tenas_Lithology.csv
T95R-46	74.1	75.15	1.05	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-46	75.15	77.23	2.08	SLTS	Tenas_Lithology.csv
T95R-46	77.23	77.65	0.42	COAL	Tenas_Lithology.csv
T95R-46	77.65	79.55	1.9	SLTS	Tenas_Lithology.csv
T95R-46	79.55	79.86	0.31	COAL	Tenas_Lithology.csv
T95R-46	79.86	82.06	2.2	MDST	Tenas_Lithology.csv
T95R-46	82.06	82.54	0.48	COAL	Tenas_Lithology.csv
T95R-46	82.54	97.5	14.96	SST	Tenas_Lithology.csv
T95R-50C	0	6.15	6.15	Overburden	Tenas_Lithology.csv
T95R-50C	6.15	6.34	0.19	MDST	Tenas_Lithology.csv
T95R-50C	6.34	6.87	0.53	COAL	Tenas_Lithology.csv
T95R-50C	6.87	8.87	2	MDST	Tenas_Lithology.csv
T95R-50C	8.87	8.98	0.11	COAL	Tenas_Lithology.csv
T95R-50C	8.98	9.25	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-50C	9.25	9.75	0.5	COAL	Tenas_Lithology.csv
T95R-50C	9.75	20.91	11.16	MDST	Tenas_Lithology.csv
T95R-50C	20.91	23.2	2.29	COAL	Tenas_Lithology.csv
T95R-50C	23.2	23.92	0.72	MDST	Tenas_Lithology.csv
T95R-50C	23.92	29.82	5.9	COAL	Tenas_Lithology.csv
T95R-50C	29.82	33.2	3.38	SLTS	Tenas_Lithology.csv
T95R-50C	33.2	33.7	0.5	COAL	Tenas_Lithology.csv
T95R-50C	33.7	35.39	1.69	MDST	Tenas_Lithology.csv
T95R-50C	35.39	35.61	0.22	COAL	Tenas_Lithology.csv
T95R-50C	35.61	83.8	48.19	SST	Tenas_Lithology.csv
T95R-60	0	7.01	7.01	Overburden	Tenas_Lithology.csv
T95R-60	7.01	13.13	6.12	MDST	Tenas_Lithology.csv
T95R-60	13.13	13.48	0.35	COAL	Tenas_Lithology.csv
T95R-60	13.48	18.94	5.46	MDST	Tenas_Lithology.csv
T95R-60	18.94	19.28	0.34	COAL	Tenas_Lithology.csv
T95R-60	19.28	19.7	0.42	MDST	Tenas_Lithology.csv
T95R-60	19.7	20.29	0.59	COAL	Tenas_Lithology.csv
T95R-60	20.29	31.23	10.94	SLTS	Tenas_Lithology.csv
T95R-60	31.23	33.81	2.58	COAL	Tenas_Lithology.csv
T95R-60	33.81	45.66	11.85	SLTS	Tenas_Lithology.csv
T95R-60	45.66	46.15	0.49	COAL	Tenas_Lithology.csv
T95R-60	46.15	57.87	11.72	SLTS	Tenas_Lithology.csv
T95R-60	57.87	66.64	8.77	COAL	Tenas_Lithology.csv
T95R-60	66.64	71.05	4.41	MDST	Tenas_Lithology.csv
T95R-60	71.05	71.85	0.8	COAL	Tenas_Lithology.csv
T95R-60	71.85	73.85	2	MDST	Tenas_Lithology.csv
T95R-60	73.85	74.95	1.1	COAL	Tenas_Lithology.csv
T95R-60	74.95	77.24	2.29	MDST	Tenas_Lithology.csv
T95R-60	77.24	77.6	0.36	COAL	Tenas_Lithology.csv
T95R-60	77.6	77.9	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-60	77.9	78.37	0.47	COAL	Tenas_Lithology.csv
T95R-60	78.37	83.43	5.06	MDST	Tenas_Lithology.csv
T95R-60	83.43	84.21	0.78	COAL	Tenas_Lithology.csv
T95R-60	84.21	85.43	1.22	MDST	Tenas_Lithology.csv
T95R-60	85.43	86.26	0.83	COAL	Tenas_Lithology.csv
T95R-60	86.26	96.06	9.8	SLTS	Tenas_Lithology.csv
T95R-60	96.06	96.89	0.83	COAL	Tenas_Lithology.csv
T95R-60	96.89	101.2	4.31	MDST	Tenas_Lithology.csv
T95R-60	101.2	115.7	14.5	SST	Tenas_Lithology.csv
T95R-61	0	13.41	13.41	Overburden	Tenas_Lithology.csv
T95R-61	13.41	20.6	7.19	SST	Tenas_Lithology.csv
T95R-61	20.6	31.9	11.3	SLTS	Tenas_Lithology.csv
T95R-61	31.9	51.23	19.33	SST	Tenas_Lithology.csv
T95R-61	51.23	52.31	1.08	COAL	Tenas_Lithology.csv
T95R-61	52.31	59.42	7.11	SLTS	Tenas_Lithology.csv
T95R-61	59.42	59.8	0.38	COAL	Tenas_Lithology.csv
T95R-61	59.8	66.6	6.8	SLTS	Tenas_Lithology.csv
T95R-61	66.6	69.05	2.45	COAL	Tenas_Lithology.csv
T95R-61	69.05	69.6	0.55	MDST	Tenas_Lithology.csv
T95R-61	69.6	69.93	0.33	COAL	Tenas_Lithology.csv
T95R-61	69.93	71.55	1.62	MDST	Tenas_Lithology.csv
T95R-61	71.55	73.67	2.12	COAL	Tenas_Lithology.csv
T95R-61	73.67	75.05	1.38	MDST	Tenas_Lithology.csv
T95R-61	75.05	75.64	0.59	COAL	Tenas_Lithology.csv
T95R-61	75.64	76.77	1.13	MDST	Tenas_Lithology.csv
T95R-61	76.77	77.75	0.98	COAL	Tenas_Lithology.csv
T95R-61	77.75	79.02	1.27	MDST	Tenas_Lithology.csv
T95R-61	79.02	79.48	0.46	COAL	Tenas_Lithology.csv
T95R-61	79.48	84.6	5.12	SLTS	Tenas_Lithology.csv
T95R-61	84.6	84.91	0.31	COAL	Tenas_Lithology.csv
T95R-61	84.91	86.6	1.69	MDST	Tenas_Lithology.csv
T95R-61	86.6	87.37	0.77	COAL	Tenas_Lithology.csv
T95R-61	87.37	93.06	5.69	MDST	Tenas_Lithology.csv
T95R-61	93.06	93.47	0.41	COAL	Tenas_Lithology.csv
T95R-61	93.47	104.7	11.23	SST	Tenas_Lithology.csv
T95R-62	0	5.01	5.01	Overburden	Tenas_Lithology.csv
T95R-62	5.01	34.25	29.24	SLTS	Tenas_Lithology.csv
T95R-62	34.25	34.65	0.4	COAL	Tenas_Lithology.csv
T95R-62	34.65	37.42	2.77	SST	Tenas_Lithology.csv
T95R-62	37.42	37.88	0.46	COAL	Tenas_Lithology.csv
T95R-62	37.88	42.36	4.48	SLTS	Tenas_Lithology.csv
T95R-62	42.36	43.77	1.41	COAL	Tenas_Lithology.csv
T95R-62	43.77	57.32	13.55	SLTS	Tenas_Lithology.csv
T95R-62	57.32	58.55	1.23	COAL	Tenas_Lithology.csv
T95R-62	58.55	60.2	1.65	MDST	Tenas_Lithology.csv
T95R-62	60.2	61.03	0.83	COAL	Tenas_Lithology.csv
T95R-62	61.03	66.27	5.24	SLTS	Tenas_Lithology.csv
T95R-62	66.27	66.64	0.37	COAL	Tenas_Lithology.csv
T95R-62	66.64	68.8	2.16	SST	Tenas_Lithology.csv
T95R-62	68.8	81.3	12.5	CGL	Tenas_Lithology.csv
T95R-62	81.3	90.7	9.4	SST	Tenas_Lithology.csv
T95R-63	0	19	19	Overburden	Tenas_Lithology.csv
T95R-63	19	20.51	1.51	MDST	Tenas_Lithology.csv
T95R-63	20.51	21.13	0.62	COAL	Tenas_Lithology.csv
T95R-63	21.13	24.89	3.76	MDST	Tenas_Lithology.csv
T95R-63	24.89	25	0.11	COAL	Tenas_Lithology.csv
T95R-63	25	25.83	0.83	MDST	Tenas_Lithology.csv
T95R-63	25.83	26.81	0.98	COAL	Tenas_Lithology.csv
T95R-63	26.81	30.2	3.39	MDST	Tenas_Lithology.csv
T95R-63	30.2	34.65	4.45	SST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-63	34.65	34.91	0.26	COAL	Tenas_Lithology.csv
T95R-63	34.91	39.29	4.38	MDST	Tenas_Lithology.csv
T95R-63	39.29	41.01	1.72	COAL	Tenas_Lithology.csv
T95R-63	41.01	41.14	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-63	41.14	44.94	3.8	COAL	Tenas_Lithology.csv
T95R-63	44.94	47.3	2.36	MDST	Tenas_Lithology.csv
T95R-63	47.3	48.2	0.9	COAL	Tenas_Lithology.csv
T95R-63	48.2	48.9	0.7	MDST	Tenas_Lithology.csv
T95R-63	48.9	49.63	0.73	COAL	Tenas_Lithology.csv
T95R-63	49.63	50.78	1.15	MDST	Tenas_Lithology.csv
T95R-63	50.78	51.28	0.5	COAL	Tenas_Lithology.csv
T95R-63	51.28	55.01	3.73	SLTS	Tenas_Lithology.csv
T95R-63	55.01	55.4	0.39	COAL	Tenas_Lithology.csv
T95R-63	55.4	57.5	2.1	SST	Tenas_Lithology.csv
T95R-63	57.5	58.15	0.65	COAL	Tenas_Lithology.csv
T95R-63	58.15	65.48	7.33	MDST	Tenas_Lithology.csv
T95R-63	65.48	65.78	0.3	COAL	Tenas_Lithology.csv
T95R-63	65.78	78.7	12.92	SLTS	Tenas_Lithology.csv
T95R-64	0	10.01	10.01	Overburden	Tenas_Lithology.csv
T95R-64	10.01	54.05	44.04	SST	Tenas_Lithology.csv
T95R-64	54.05	64.55	10.5	SLTS	Tenas_Lithology.csv
T95R-64	64.55	64.95	0.4	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-64	64.95	69.54	4.59	MDST	Tenas_Lithology.csv
T95R-64	69.54	69.9	0.36	COAL	Tenas_Lithology.csv
T95R-64	69.9	70.75	0.85	MDST	Tenas_Lithology.csv
T95R-64	70.75	71.08	0.33	COAL	Tenas_Lithology.csv
T95R-64	71.08	75.35	4.27	MDST	Tenas_Lithology.csv
T95R-64	75.35	76.14	0.79	COAL	Tenas_Lithology.csv
T95R-64	76.14	76.32	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-64	76.32	77.1	0.78	COAL	Tenas_Lithology.csv
T95R-64	77.1	82.25	5.15	SLTS	Tenas_Lithology.csv
T95R-64	82.25	82.49	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-64	82.49	86.13	3.64	SLTS	Tenas_Lithology.csv
T95R-64	86.13	89	2.87	COAL	Tenas_Lithology.csv
T95R-64	89	89.35	0.35	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-64	89.35	89.51	0.16	COAL	Tenas_Lithology.csv
T95R-64	89.51	89.75	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-64	89.75	92.3	2.55	COAL	Tenas_Lithology.csv
T95R-64	92.3	94.65	2.35	MDST	Tenas_Lithology.csv
T95R-64	94.65	95.05	0.4	COAL	Tenas_Lithology.csv
T95R-64	95.05	96.6	1.55	MDST	Tenas_Lithology.csv
T95R-64	96.6	97.43	0.83	COAL	Tenas_Lithology.csv
T95R-64	97.43	105.58	8.15	SLTS	Tenas_Lithology.csv
T95R-64	105.58	105.84	0.26	COAL	Tenas_Lithology.csv
T95R-64	105.84	107.3	1.46	MDST	Tenas_Lithology.csv
T95R-64	107.3	108.17	0.87	COAL	Tenas_Lithology.csv
T95R-64	108.17	116.47	8.3	SST	Tenas_Lithology.csv
T95R-64	116.47	116.87	0.4	COAL	Tenas_Lithology.csv
T95R-64	116.87	128.9	12.03	SST	Tenas_Lithology.csv
T95R-65	0	14	14	Overburden	Tenas_Lithology.csv
T95R-65	14	78.6	64.6	SLTS	Tenas_Lithology.csv
T95R-65	78.6	82.5	3.9	MDST	Tenas_Lithology.csv
T95R-65	82.5	98.12	15.62	SLTS	Tenas_Lithology.csv
T95R-65	98.12	99.19	1.07	COAL	Tenas_Lithology.csv
T95R-65	99.19	109.55	10.36	SLTS	Tenas_Lithology.csv
T95R-65	109.55	110.05	0.5	COAL	Tenas_Lithology.csv
T95R-65	110.05	117.67	7.62	SLTS	Tenas_Lithology.csv
T95R-65	117.67	120.15	2.48	COAL	Tenas_Lithology.csv
T95R-65	120.15	120.31	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-65	120.31	123.44	3.13	COAL	Tenas_Lithology.csv
T95R-65	123.44	125.45	2.01	MDST	Tenas_Lithology.csv
T95R-65	125.45	125.89	0.44	COAL	Tenas_Lithology.csv
T95R-65	125.89	127.22	1.33	MDST	Tenas_Lithology.csv
T95R-65	127.22	128.28	1.06	COAL	Tenas_Lithology.csv
T95R-65	128.28	128.45	0.17	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-65	128.45	129	0.55	COAL	Tenas_Lithology.csv
T95R-65	129	133.18	4.18	MDST	Tenas_Lithology.csv
T95R-65	133.18	133.55	0.37	COAL	Tenas_Lithology.csv
T95R-65	133.55	137.1	3.55	SLTS	Tenas_Lithology.csv
T95R-65	137.1	137.5	0.4	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-65	137.5	140.66	3.16	MDST	Tenas_Lithology.csv
T95R-65	140.66	141.05	0.39	COAL	Tenas_Lithology.csv
T95R-65	141.05	141.31	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-65	141.31	142.3	0.99	COAL	Tenas_Lithology.csv
T95R-65	142.3	144.94	2.64	SST	Tenas_Lithology.csv
T95R-65	144.94	145.67	0.73	COAL	Tenas_Lithology.csv
T95R-65	145.67	148.9	3.23	MDST	Tenas_Lithology.csv
T95R-65	148.9	159.2	10.3	SST	Tenas_Lithology.csv
T95R-66	0	15.01	15.01	Overburden	Tenas_Lithology.csv
T95R-66	15.01	21.1	6.09	MDST	Tenas_Lithology.csv
T95R-66	21.1	66.52	45.42	SST	Tenas_Lithology.csv
T95R-66	66.52	75.92	9.4	SLTS	Tenas_Lithology.csv
T95R-66	75.92	76.31	0.39	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-66	76.31	76.92	0.61	MDST	Tenas_Lithology.csv
T95R-66	76.92	77.23	0.31	COAL	Tenas_Lithology.csv
T95R-66	77.23	80.9	3.67	MDST	Tenas_Lithology.csv
T95R-66	80.9	81.33	0.43	COAL	Tenas_Lithology.csv
T95R-66	81.33	90.47	9.14	MDST	Tenas_Lithology.csv
T95R-66	90.47	90.92	0.45	COAL	Tenas_Lithology.csv
T95R-66	90.92	97.1	6.18	MDST	Tenas_Lithology.csv
T95R-66	97.1	97.2	0.1	COAL	Tenas_Lithology.csv
T95R-66	97.2	99.36	2.16	MDST	Tenas_Lithology.csv
T95R-66	99.36	100.87	1.51	COAL	Tenas_Lithology.csv
T95R-66	100.87	102.15	1.28	MDST	Tenas_Lithology.csv
T95R-66	102.15	102.75	0.6	COAL	Tenas_Lithology.csv
T95R-66	102.75	108.1	5.35	MDST	Tenas_Lithology.csv
T95R-66	108.1	108.25	0.15	COAL	Tenas_Lithology.csv
T95R-66	108.25	109.25	1	MDST	Tenas_Lithology.csv
T95R-66	109.25	109.7	0.45	COAL	Tenas_Lithology.csv
T95R-66	109.7	117.7	8	MDST	Tenas_Lithology.csv
T95R-66	117.7	151	33.3	SST	Tenas_Lithology.csv
T95R-67	0	2.01	2.01	Overburden	Tenas_Lithology.csv
T95R-67	2.01	5.35	3.34	MDST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-67	5.35	6.88	1.53	COAL	Tenas_Lithology.csv
T95R-67	6.88	12.85	5.97	MDST	Tenas_Lithology.csv
T95R-67	12.85	13.15	0.3	COAL	Tenas_Lithology.csv
T95R-67	13.15	15.32	2.17	MDST	Tenas_Lithology.csv
T95R-67	15.32	17.17	1.85	COAL	Tenas_Lithology.csv
T95R-67	17.17	18.25	1.08	MDST	Tenas_Lithology.csv
T95R-67	18.25	22.08	3.83	COAL	Tenas_Lithology.csv
T95R-67	22.08	23.37	1.29	MDST	Tenas_Lithology.csv
T95R-67	23.37	23.67	0.3	COAL	Tenas_Lithology.csv
T95R-67	23.67	33.11	9.44	SLTS	Tenas_Lithology.csv
T95R-67	33.11	33.54	0.43	COAL	Tenas_Lithology.csv
T95R-67	33.54	38.02	4.48	SLTS	Tenas_Lithology.csv
T95R-67	38.02	39.61	1.59	MDST	Tenas_Lithology.csv
T95R-67	39.61	39.92	0.31	COAL	Tenas_Lithology.csv
T95R-67	39.92	55	15.08	SST	Tenas_Lithology.csv
T95R-68	0	4.51	4.51	Overburden	Tenas_Lithology.csv
T95R-68	4.51	17.65	13.14	MDST	Tenas_Lithology.csv
T95R-68	17.65	23.1	5.45	SLTS	Tenas_Lithology.csv
T95R-68	23.1	24.9	1.8	SST	Tenas_Lithology.csv
T95R-68	24.9	26.64	1.74	MDST	Tenas_Lithology.csv
T95R-68	26.64	27.02	0.38	COAL	Tenas_Lithology.csv
T95R-68	27.02	30.11	3.09	MDST	Tenas_Lithology.csv
T95R-68	30.11	30.33	0.22	COAL	Tenas_Lithology.csv
T95R-68	30.33	30.8	0.47	MDST	Tenas_Lithology.csv
T95R-68	30.8	31.02	0.22	COAL	Tenas_Lithology.csv
T95R-68	31.02	32.9	1.88	MDST	Tenas_Lithology.csv
T95R-68	32.9	33.16	0.26	COAL	Tenas_Lithology.csv
T95R-68	33.16	34.75	1.59	MDST	Tenas_Lithology.csv
T95R-68	34.75	36.34	1.59	COAL	Tenas_Lithology.csv
T95R-68	36.34	43.48	7.14	MDST	Tenas_Lithology.csv
T95R-68	43.48	43.7	0.22	COAL	Tenas_Lithology.csv
T95R-68	43.7	50.31	6.61	MDST	Tenas_Lithology.csv
T95R-68	50.31	51.95	1.64	COAL	Tenas_Lithology.csv
T95R-68	51.95	52.15	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-68	52.15	56.25	4.1	COAL	Tenas_Lithology.csv
T95R-68	56.25	60.24	3.99	SLTS	Tenas_Lithology.csv
T95R-68	60.24	60.52	0.28	COAL	Tenas_Lithology.csv
T95R-68	60.52	60.67	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-68	60.67	60.82	0.15	COAL	Tenas_Lithology.csv
T95R-68	60.82	61.02	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-68	61.02	61.86	0.84	COAL	Tenas_Lithology.csv
T95R-68	61.86	62.5	0.64	MDST	Tenas_Lithology.csv
T95R-68	62.5	63.27	0.77	COAL	Tenas_Lithology.csv
T95R-68	63.27	64	0.73	MDST	Tenas_Lithology.csv
T95R-68	64	64.22	0.22	COAL	Tenas_Lithology.csv
T95R-68	64.22	67.38	3.16	MDST	Tenas_Lithology.csv
T95R-68	67.38	67.9	0.52	COAL	Tenas_Lithology.csv
T95R-68	67.9	73.69	5.79	MDST	Tenas_Lithology.csv
T95R-68	73.69	73.97	0.28	COAL	Tenas_Lithology.csv
T95R-68	73.97	96.6	22.63	SST	Tenas_Lithology.csv
T95R-68	96.6	107.57	10.97	SLTS	Tenas_Lithology.csv
T95R-68	107.57	120	12.43	SST	Tenas_Lithology.csv
T95R-69	0	6.3	6.3	Overburden	Tenas_Lithology.csv
T95R-69	6.3	15.15	8.85	MDST	Tenas_Lithology.csv
T95R-69	15.15	15.45	0.3	COAL	Tenas_Lithology.csv
T95R-69	15.45	19.58	4.13	SLTS	Tenas_Lithology.csv
T95R-69	19.58	20.11	0.53	COAL	Tenas_Lithology.csv
T95R-69	20.11	23.27	3.16	SLTS	Tenas_Lithology.csv
T95R-69	23.27	25.05	1.78	COAL	Tenas_Lithology.csv
T95R-69	25.05	32.25	7.2	SLTS	Tenas_Lithology.csv
T95R-69	32.25	32.55	0.3	COAL	Tenas_Lithology.csv
T95R-69	32.55	35.4	2.85	SLTS	Tenas_Lithology.csv
T95R-69	35.4	37.3	1.9	COAL	Tenas_Lithology.csv
T95R-69	37.3	38.25	0.95	MDST	Tenas_Lithology.csv
T95R-69	38.25	41.78	3.53	COAL	Tenas_Lithology.csv
T95R-69	41.78	42.13	0.35	MDST	Tenas_Lithology.csv
T95R-69	42.13	42.65	0.52	COAL	Tenas_Lithology.csv
T95R-69	42.65	43.69	1.04	MDST	Tenas_Lithology.csv
T95R-69	43.69	44.05	0.36	COAL	Tenas_Lithology.csv
T95R-69	44.05	53.2	9.15	SST	Tenas_Lithology.csv
T95R-69	53.2	55.38	2.18	SLTS	Tenas_Lithology.csv
T95R-69	55.38	56.03	0.65	COAL	Tenas_Lithology.csv
T95R-69	56.03	60.41	4.38	SST	Tenas_Lithology.csv
T95R-69	60.41	63.1	2.69	SLTS	Tenas_Lithology.csv
T95R-69	63.1	63.43	0.33	COAL	Tenas_Lithology.csv
T95R-69	63.43	80	16.57	SST	Tenas_Lithology.csv
T95R-70	0	9.01	9.01	Overburden	Tenas_Lithology.csv
T95R-70	9.01	16.7	7.69	SLTS	Tenas_Lithology.csv
T95R-70	16.7	20.53	3.83	SST	Tenas_Lithology.csv
T95R-70	20.53	28.49	7.96	CGL	Tenas_Lithology.csv
T95R-70	28.49	80.8	52.31	SST	Tenas_Lithology.csv
T95R-70	80.8	105	24.2	CGL	Tenas_Lithology.csv
T95R-71	0	12.01	12.01	Overburden	Tenas_Lithology.csv
T95R-71	12.01	20.51	8.5	SLTS	Tenas_Lithology.csv
T95R-71	20.51	24.5	3.99	MDST	Tenas_Lithology.csv
T95R-71	24.5	26	1.5	SST	Tenas_Lithology.csv
T95R-71	26	30.15	4.15	SLTS	Tenas_Lithology.csv
T95R-71	30.15	30.44	0.29	COAL	Tenas_Lithology.csv
T95R-71	30.44	34.65	4.21	SST	Tenas_Lithology.csv
T95R-71	34.65	35.31	0.66	COAL	Tenas_Lithology.csv
T95R-71	35.31	36.24	0.93	MDST	Tenas_Lithology.csv
T95R-71	36.24	38.35	2.11	COAL	Tenas_Lithology.csv
T95R-71	38.35	54.46	16.11	SST	Tenas_Lithology.csv
T95R-71	54.46	57.52	3.06	COAL	Tenas_Lithology.csv
T95R-71	57.52	57.66	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-71	57.66	60.56	2.9	COAL	Tenas_Lithology.csv
T95R-71	60.56	62.3	1.74	MDST	Tenas_Lithology.csv
T95R-71	62.3	62.85	0.55	COAL	Tenas_Lithology.csv
T95R-71	62.85	64.64	1.79	MDST	Tenas_Lithology.csv
T95R-71	64.64	65.29	0.65	COAL	Tenas_Lithology.csv
T95R-71	65.29	66.09	0.8	MDST	Tenas_Lithology.csv
T95R-71	66.09	66.84	0.75	COAL	Tenas_Lithology.csv
T95R-71	66.84	67.54	0.7	MDST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-71	67.54	67.92	0.38	COAL	Tenas_Lithology.csv
T95R-71	67.92	75.11	7.19	MDST	Tenas_Lithology.csv
T95R-71	75.11	75.9	0.79	COAL	Tenas_Lithology.csv
T95R-71	75.9	80	4.1	SLTS	Tenas_Lithology.csv
T95R-71	80	80.19	0.19	MDST	Tenas_Lithology.csv
T95R-71	80.19	82.57	2.38	SST	Tenas_Lithology.csv
T95R-71	82.57	82.78	0.21	COAL	Tenas_Lithology.csv
T95R-71	82.78	97.5	14.72	SST	Tenas_Lithology.csv
T95R-74	0	4.01	4.01	Overburden	Tenas_Lithology.csv
T95R-74	4.01	9.12	5.11	MDST	Tenas_Lithology.csv
T95R-74	9.12	14.4	5.28	COAL	Tenas_Lithology.csv
T95R-74	14.4	17.86	3.46	MDST	Tenas_Lithology.csv
T95R-74	17.86	18.15	0.29	COAL	Tenas_Lithology.csv
T95R-74	18.15	18.74	0.59	MDST	Tenas_Lithology.csv
T95R-74	18.74	19.29	0.55	COAL	Tenas_Lithology.csv
T95R-74	19.29	22.45	3.16	MDST	Tenas_Lithology.csv
T95R-74	22.45	22.74	0.29	COAL	Tenas_Lithology.csv
T95R-74	22.74	24.13	1.39	MDST	Tenas_Lithology.csv
T95R-74	24.13	24.76	0.63	COAL	Tenas_Lithology.csv
T95R-74	24.76	27.42	2.66	SST	Tenas_Lithology.csv
T95R-74	27.42	27.8	0.38	COAL	Tenas_Lithology.csv
T95R-74	27.8	34.29	6.49	SST	Tenas_Lithology.csv
T95R-74	34.29	34.65	0.36	COAL	Tenas_Lithology.csv
T95R-74	34.65	61.5	26.85	SST	Tenas_Lithology.csv
T95R-76	0	3.01	3.01	Overburden	Tenas_Lithology.csv
T95R-76	3.01	8.7	5.69	MDST	Tenas_Lithology.csv
T95R-76	8.7	10.73	2.03	COAL	Tenas_Lithology.csv
T95R-76	10.73	13.68	2.95	MDST	Tenas_Lithology.csv
T95R-76	13.68	16	2.32	COAL	Tenas_Lithology.csv
T95R-76	16	16.18	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-76	16.18	18.4	2.22	COAL	Tenas_Lithology.csv
T95R-76	18.4	18.98	0.58	MDST	Tenas_Lithology.csv
T95R-76	18.98	19.48	0.5	COAL	Tenas_Lithology.csv
T95R-76	19.48	19.91	0.43	MDST	Tenas_Lithology.csv
T95R-76	19.91	20.52	0.61	COAL	Tenas_Lithology.csv
T95R-76	20.52	26.6	6.08	MDST	Tenas_Lithology.csv
T95R-76	26.6	30.7	4.1	SST	Tenas_Lithology.csv
T95R-76	30.7	31.15	0.45	COAL	Tenas_Lithology.csv
T95R-76	31.15	32.46	1.31	MDST	Tenas_Lithology.csv
T95R-76	32.46	32.59	0.13	COAL	Tenas_Lithology.csv
T95R-76	32.59	35.24	2.65	SST	Tenas_Lithology.csv
T95R-76	35.24	35.42	0.18	COAL	Tenas_Lithology.csv
T95R-76	35.42	39.43	4.01	MDST	Tenas_Lithology.csv
T95R-76	39.43	39.74	0.31	COAL	Tenas_Lithology.csv
T95R-76	39.74	45.2	5.46	SST	Tenas_Lithology.csv
T95R-76	45.2	54.4	9.2	MDST	Tenas_Lithology.csv
T95R-76	54.4	62.05	7.65	CGL	Tenas_Lithology.csv
T95R-76	62.05	73	10.95	SST	Tenas_Lithology.csv
T95R-77	0	9.11	9.11	Overburden	Tenas_Lithology.csv
T95R-77	9.11	23.8	14.69	SLTS	Tenas_Lithology.csv
T95R-77	23.8	33.5	9.7	MDST	Tenas_Lithology.csv
T95R-77	33.5	34.1	0.6	SST	Tenas_Lithology.csv
T95R-77	34.1	39.3	5.2	MDST	Tenas_Lithology.csv
T95R-77	39.3	40.8	1.5	SST	Tenas_Lithology.csv
T95R-77	40.8	44.7	3.9	MDST	Tenas_Lithology.csv
T95R-77	44.7	46	1.3	SST	Tenas_Lithology.csv
T95R-77	46	55.3	9.3	CGL	Tenas_Lithology.csv
T95R-77	55.3	70	14.7	VOLC	Tenas_Lithology.csv
T95R-78	0	2.01	2.01	Overburden	Tenas_Lithology.csv
T95R-78	2.01	11.29	9.28	SLTS	Tenas_Lithology.csv
T95R-78	11.29	11.61	0.32	COAL	Tenas_Lithology.csv
T95R-78	11.61	12.78	1.17	MDST	Tenas_Lithology.csv
T95R-78	12.78	13.12	0.34	COAL	Tenas_Lithology.csv
T95R-78	13.12	17.59	4.47	MDST	Tenas_Lithology.csv
T95R-78	17.59	17.89	0.3	COAL	Tenas_Lithology.csv
T95R-78	17.89	20.45	2.56	SST	Tenas_Lithology.csv
T95R-78	20.45	22.75	2.3	MDST	Tenas_Lithology.csv
T95R-78	22.75	55	32.25	SST	Tenas_Lithology.csv
T95R-78	55	56.95	1.95	CGL	Tenas_Lithology.csv
T95R-78	56.95	74	17.05	SST	Tenas_Lithology.csv
T95R-79	0	13.7	13.7	Overburden	Tenas_Lithology.csv
T95R-79	13.7	14.45	0.75	MDST	Tenas_Lithology.csv
T95R-79	14.45	14.72	0.27	COAL	Tenas_Lithology.csv
T95R-79	14.72	16.34	1.62	MDST	Tenas_Lithology.csv
T95R-79	16.34	18.6	2.26	COAL	Tenas_Lithology.csv
T95R-79	18.6	28.79	10.19	MDST	Tenas_Lithology.csv
T95R-79	28.79	29.08	0.29	COAL	Tenas_Lithology.csv
T95R-79	29.08	29.89	0.81	MDST	Tenas_Lithology.csv
T95R-79	29.89	30.36	0.47	COAL	Tenas_Lithology.csv
T95R-79	30.36	31.2	0.84	MDST	Tenas_Lithology.csv
T95R-79	31.2	31.4	0.2	COAL	Tenas_Lithology.csv
T95R-79	31.4	33.33	1.93	MDST	Tenas_Lithology.csv
T95R-79	33.33	33.73	0.4	COAL	Tenas_Lithology.csv
T95R-79	33.73	36.5	2.77	MDST	Tenas_Lithology.csv
T95R-79	36.5	40.51	4.01	SLTS	Tenas_Lithology.csv
T95R-79	40.51	48.9	8.39	SST	Tenas_Lithology.csv
T95R-79	48.9	52	3.1	CGL	Tenas_Lithology.csv
T95R-79	52	53	1	SLTS	Tenas_Lithology.csv
T95R-79	53	55	2	SST	Tenas_Lithology.csv
T95R-80	0	5.01	5.01	Overburden	Tenas_Lithology.csv
T95R-80	5.01	6.25	1.24	MDST	Tenas_Lithology.csv
T95R-80	6.25	9.89	3.64	COAL	Tenas_Lithology.csv
T95R-80	9.89	10.26	0.37	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-80	10.26	10.8	0.54	COAL	Tenas_Lithology.csv
T95R-80	10.8	22.57	11.77	SLTS	Tenas_Lithology.csv
T95R-80	22.57	23.05	0.48	COAL	Tenas_Lithology.csv
T95R-80	23.05	23.55	0.5	MDST	Tenas_Lithology.csv
T95R-80	23.55	24.54	0.99	COAL	Tenas_Lithology.csv
T95R-80	24.54	28.85	4.31	SLTS	Tenas_Lithology.csv
T95R-80	28.85	29.13	0.28	COAL	Tenas_Lithology.csv
T95R-80	29.13	31.54	2.41	SLTS	Tenas_Lithology.csv
T95R-80	31.54	31.87	0.33	COAL	Tenas_Lithology.csv
T95R-80	31.87	46.75	14.88	SST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T95R-80	46.75	51	4.25	CGL	Tenas_Lithology.csv
T95R-80	51	62	11	SST	Tenas_Lithology.csv
T95R-81	0	9	9	Overburden	Tenas_Lithology.csv
T95R-81	9	20.4	11.4	MDST	Tenas_Lithology.csv
T95R-81	20.4	22.2	1.8	SLTS	Tenas_Lithology.csv
T95R-81	22.2	24.76	2.56	MDST	Tenas_Lithology.csv
T95R-81	24.76	24.98	0.22	COAL	Tenas_Lithology.csv
T95R-81	24.98	28.05	3.07	SLTS	Tenas_Lithology.csv
T95R-81	28.05	28.74	0.69	COAL	Tenas_Lithology.csv
T95R-81	28.74	35.49	6.75	SLTS	Tenas_Lithology.csv
T95R-81	35.49	37.26	1.77	COAL	Tenas_Lithology.csv
T95R-81	37.26	37.5	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T95R-81	37.5	38.49	0.99	COAL	Tenas_Lithology.csv
T95R-81	38.49	41	2.51	MDST	Tenas_Lithology.csv
T95R-81	41	41.2	0.2	COAL	Tenas_Lithology.csv
T95R-81	41.2	44.25	3.05	MDST	Tenas_Lithology.csv
T95R-81	44.25	44.49	0.24	COAL	Tenas_Lithology.csv
T95R-81	44.49	45.1	0.61	MDST	Tenas_Lithology.csv
T95R-81	45.1	45.4	0.3	COAL	Tenas_Lithology.csv
T95R-81	45.4	48.42	3.02	CGL	Tenas_Lithology.csv
T95R-81	48.42	48.79	0.37	COAL	Tenas_Lithology.csv
T95R-81	48.79	52.33	3.54	MDST	Tenas_Lithology.csv
T95R-81	52.33	52.75	0.42	COAL	Tenas_Lithology.csv
T95R-81	52.75	53.56	0.81	MDST	Tenas_Lithology.csv
T95R-81	53.56	53.85	0.29	COAL	Tenas_Lithology.csv
T95R-81	53.85	57.8	3.95	MDST	Tenas_Lithology.csv
T95R-81	57.8	60.2	2.4	SST	Tenas_Lithology.csv
T95R-81	60.2	67.85	7.65	CGL	Tenas_Lithology.csv
T95R-81	67.85	80	12.15	SST	Tenas_Lithology.csv
T96R-01	0	6.27	6.27	Overburden	Tenas_Lithology.csv
T96R-01	6.27	11	4.73	SLTS	Tenas_Lithology.csv
T96R-01	11	13.5	2.5	MDST	Tenas_Lithology.csv
T96R-01	13.5	16	2.5	SST	Tenas_Lithology.csv
T96R-01	16	26	10	SLTS	Tenas_Lithology.csv
T96R-01	26	34.6	8.6	MDST	Tenas_Lithology.csv
T96R-01	34.6	38	3.4	SST	Tenas_Lithology.csv
T96R-01	38	58	20	MDST	Tenas_Lithology.csv
T96R-01	58	67	9	SLTS	Tenas_Lithology.csv
T96R-01	67	70.2	3.2	SST	Tenas_Lithology.csv
T96R-01	70.2	85.95	15.75	SLTS	Tenas_Lithology.csv
T96R-01	85.95	86.97	1.02	COAL	Tenas_Lithology.csv
T96R-01	86.97	91.7	4.73	SST	Tenas_Lithology.csv
T96R-01	91.7	95.5	3.8	SLTS	Tenas_Lithology.csv
T96R-01	95.5	95.7	0.2	COAL	Tenas_Lithology.csv
T96R-01	95.7	103.33	7.63	SLTS	Tenas_Lithology.csv
T96R-01	103.33	105.37	2.04	COAL	Tenas_Lithology.csv
T96R-01	105.37	105.47	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-01	105.47	109.53	4.06	COAL	Tenas_Lithology.csv
T96R-01	109.53	114.15	4.62	SLTS	Tenas_Lithology.csv
T96R-01	114.15	114.7	0.55	COAL	Tenas_Lithology.csv
T96R-01	114.7	115.87	1.17	SLTS	Tenas_Lithology.csv
T96R-01	115.87	117.02	1.15	COAL	Tenas_Lithology.csv
T96R-01	117.02	119.58	2.56	SST	Tenas_Lithology.csv
T96R-01	119.58	120.02	0.44	COAL	Tenas_Lithology.csv
T96R-01	120.02	120.89	0.87	MDST	Tenas_Lithology.csv
T96R-01	120.89	121.1	0.21	COAL	Tenas_Lithology.csv
T96R-01	121.1	130.64	9.54	SLTS	Tenas_Lithology.csv
T96R-01	130.64	130.87	0.23	COAL	Tenas_Lithology.csv
T96R-01	130.87	131.17	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-01	131.17	132.25	1.08	COAL	Tenas_Lithology.csv
T96R-01	132.25	133.15	0.9	MDST	Tenas_Lithology.csv
T96R-01	133.15	133.31	0.16	COAL	Tenas_Lithology.csv
T96R-01	133.31	133.57	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-01	133.57	134.93	1.36	COAL	Tenas_Lithology.csv
T96R-01	134.93	137.71	2.78	SST	Tenas_Lithology.csv
T96R-01	137.71	138.23	0.52	COAL	Tenas_Lithology.csv
T96R-01	138.23	148.6	10.37	SLTS	Tenas_Lithology.csv
T96R-01	148.6	153.3	4.7	SST	Tenas_Lithology.csv
T96R-01	153.3	153.8	0.5	COAL	Tenas_Lithology.csv
T96R-01	153.8	168.8	15	SLTS	Tenas_Lithology.csv
T96R-01	168.8	195.2	26.4	SST	Tenas_Lithology.csv
T96R-02	0	6	6	Overburden	Tenas_Lithology.csv
T96R-02	6	32	26	SLTS	Tenas_Lithology.csv
T96R-02	32	35	3	SST	Tenas_Lithology.csv
T96R-02	35	66.03	31.03	MDST	Tenas_Lithology.csv
T96R-02	66.03	66.36	0.33	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-02	66.36	67.79	1.43	MDST	Tenas_Lithology.csv
T96R-02	67.79	69.06	1.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-02	69.06	70.5	1.44	SLTS	Tenas_Lithology.csv
T96R-02	70.5	71.5	1	SST	Tenas_Lithology.csv
T96R-02	71.5	77	5.5	CGL	Tenas_Lithology.csv
T96R-02	77	90.7	13.7	VOLC	Tenas_Lithology.csv
T96R-03	0	13.71	13.71	Overburden	Tenas_Lithology.csv
T96R-03	13.71	55.8	42.09	SLTS	Tenas_Lithology.csv
T96R-03	55.8	64.9	9.1	SST	Tenas_Lithology.csv
T96R-03	64.9	65.19	0.29	COAL	Tenas_Lithology.csv
T96R-03	65.19	69.88	4.69	SLTS	Tenas_Lithology.csv
T96R-03	69.88	70.02	0.14	COAL	Tenas_Lithology.csv
T96R-03	70.02	72.65	2.63	SLTS	Tenas_Lithology.csv
T96R-03	72.65	72.79	0.14	COAL	Tenas_Lithology.csv
T96R-03	72.79	78	5.21	SLTS	Tenas_Lithology.csv
T96R-03	78	80.98	2.98	MDST	Tenas_Lithology.csv
T96R-03	80.98	82.52	1.54	COAL	Tenas_Lithology.csv
T96R-03	82.52	83.14	0.62	MDST	Tenas_Lithology.csv
T96R-03	83.14	83.34	0.2	COAL	Tenas_Lithology.csv
T96R-03	83.34	84.8	1.46	MDST	Tenas_Lithology.csv
T96R-03	84.8	84.95	0.15	COAL	Tenas_Lithology.csv
T96R-03	84.95	85.31	0.36	MDST	Tenas_Lithology.csv
T96R-03	85.31	87.74	2.43	COAL	Tenas_Lithology.csv
T96R-03	87.74	90.08	2.34	MDST	Tenas_Lithology.csv
T96R-03	90.08	90.41	0.33	COAL	Tenas_Lithology.csv
T96R-03	90.41	91.3	0.89	MDST	Tenas_Lithology.csv
T96R-03	91.3	92.03	0.73	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-03	92.03	92.57	0.54	MDST	Tenas_Lithology.csv
T96R-03	92.57	93.28	0.71	COAL	Tenas_Lithology.csv
T96R-03	93.28	95.45	2.17	SLTS	Tenas_Lithology.csv
T96R-03	95.45	97.1	1.65	SST	Tenas_Lithology.csv
T96R-03	97.1	97.4	0.3	COAL	Tenas_Lithology.csv
T96R-03	97.4	102	4.6	SLTS	Tenas_Lithology.csv
T96R-03	102	106.5	4.5	SST	Tenas_Lithology.csv
T96R-03	106.5	106.8	0.3	COAL	Tenas_Lithology.csv
T96R-03	106.8	114.3	7.5	SLTS	Tenas_Lithology.csv
T96R-03	114.3	135.1	20.8	SST	Tenas_Lithology.csv
T96R-04C	0	3.05	3.05	Overburden	Tenas_Lithology.csv
T96R-04C	3.05	6	2.95	MDST	Tenas_Lithology.csv
T96R-04C	6	14.38	8.38	SST	Tenas_Lithology.csv
T96R-04C	14.38	14.63	0.25	SLTS	Tenas_Lithology.csv
T96R-04C	14.63	15.17	0.54	COAL	Tenas_Lithology.csv
T96R-04C	15.17	16.74	1.57	SLTS	Tenas_Lithology.csv
T96R-04C	16.74	16.92	0.18	COAL	Tenas_Lithology.csv
T96R-04C	16.92	17.46	0.54	MDST	Tenas_Lithology.csv
T96R-04C	17.46	18.98	1.52	COAL	Tenas_Lithology.csv
T96R-04C	18.98	26.14	7.16	MDST	Tenas_Lithology.csv
T96R-04C	26.14	26.45	0.31	COAL	Tenas_Lithology.csv
T96R-04C	26.45	29.11	2.66	MDST	Tenas_Lithology.csv
T96R-04C	29.11	30.8	1.69	COAL	Tenas_Lithology.csv
T96R-04C	30.8	31.09	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-04C	31.09	34.44	3.35	COAL	Tenas_Lithology.csv
T96R-04C	34.44	36.68	2.24	MDST	Tenas_Lithology.csv
T96R-04C	36.68	37.06	0.38	COAL	Tenas_Lithology.csv
T96R-04C	37.06	39	1.94	MDST	Tenas_Lithology.csv
T96R-05C	0	9.01	9.01	Overburden	Tenas_Lithology.csv
T96R-05C	9.01	12.88	3.87	MDST	Tenas_Lithology.csv
T96R-05C	12.88	21.8	8.92	SLTS	Tenas_Lithology.csv
T96R-05C	21.8	31.61	9.81	MDST	Tenas_Lithology.csv
T96R-05C	31.61	32.52	0.91	SLTS	Tenas_Lithology.csv
T96R-05C	32.52	33.86	1.34	SST	Tenas_Lithology.csv
T96R-05C	33.86	35.41	1.55	MDST	Tenas_Lithology.csv
T96R-05C	35.41	35.55	0.14	COAL	Tenas_Lithology.csv
T96R-05C	35.55	39.51	3.96	MDST	Tenas_Lithology.csv
T96R-05C	39.51	41.3	1.79	COAL	Tenas_Lithology.csv
T96R-05C	41.3	42.12	0.82	MDST	Tenas_Lithology.csv
T96R-05C	42.12	44.4	2.28	COAL	Tenas_Lithology.csv
T96R-05C	44.4	44.98	0.58	MDST	Tenas_Lithology.csv
T96R-05C	44.98	45.62	0.64	COAL	Tenas_Lithology.csv
T96R-05C	45.62	46.68	1.06	SLTS	Tenas_Lithology.csv
T96R-05C	46.68	50.84	4.16	COAL	Tenas_Lithology.csv
T96R-05C	50.84	55.15	4.31	MDST	Tenas_Lithology.csv
T96R-05C	55.15	56.1	0.95	COAL	Tenas_Lithology.csv
T96R-05C	56.1	58.06	1.96	SLTS	Tenas_Lithology.csv
T96R-05C	58.06	58.52	0.46	MDST	Tenas_Lithology.csv
T96R-05C	58.52	59.52	1	COAL	Tenas_Lithology.csv
T96R-05C	59.52	63.46	3.94	SLTS	Tenas_Lithology.csv
T96R-05C	63.46	64	0.54	MDST	Tenas_Lithology.csv
T96R-05C	64	72.2	8.2	SLTS	Tenas_Lithology.csv
T96R-05C	72.2	73.27	1.07	MDST	Tenas_Lithology.csv
T96R-05C	73.27	73.51	0.24	COAL	Tenas_Lithology.csv
T96R-05C	73.51	73.58	0.07	MDST	Tenas_Lithology.csv
T96R-05C	73.58	75.51	1.93	SLTS	Tenas_Lithology.csv
T96R-05C	75.51	76	0.49	COAL	Tenas_Lithology.csv
T96R-05C	76	76.31	0.31	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-05C	76.31	76.55	0.24	COAL	Tenas_Lithology.csv
T96R-05C	76.55	77.98	1.43	MDST	Tenas_Lithology.csv
T96R-05C	77.98	78.81	0.83	COAL	Tenas_Lithology.csv
T96R-05C	78.81	85.08	6.27	MDST	Tenas_Lithology.csv
T96R-05C	85.08	85.32	0.24	SST	Tenas_Lithology.csv
T96R-05C	85.32	85.52	0.2	COAL	Tenas_Lithology.csv
T96R-05C	85.52	85.78	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-05C	85.78	86.62	0.84	COAL	Tenas_Lithology.csv
T96R-05C	86.62	87.62	1	MDST	Tenas_Lithology.csv
T96R-06	0	17	17	Overburden	Tenas_Lithology.csv
T96R-06	17	22	5	SST	Tenas_Lithology.csv
T96R-06	22	35.1	13.1	SLTS	Tenas_Lithology.csv
T96R-06	35.1	51.01	15.91	SST	Tenas_Lithology.csv
T96R-06	51.01	51.1	0.09	COAL	Tenas_Lithology.csv
T96R-06	51.1	51.41	0.31	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-06	51.41	51.71	0.3	COAL	Tenas_Lithology.csv
T96R-06	51.71	53.65	1.94	MDST	Tenas_Lithology.csv
T96R-06	53.65	53.82	0.17	COAL	Tenas_Lithology.csv
T96R-06	53.82	54.08	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-06	54.08	55.81	1.73	COAL	Tenas_Lithology.csv
T96R-06	55.81	60.5	4.69	MDST	Tenas_Lithology.csv
T96R-06	60.5	63.03	2.53	SLTS	Tenas_Lithology.csv
T96R-06	63.03	63.4	0.37	COAL	Tenas_Lithology.csv
T96R-06	63.4	66.69	3.29	SLTS	Tenas_Lithology.csv
T96R-06	66.69	70.97	4.28	MDST	Tenas_Lithology.csv
T96R-06	70.97	72.85	1.88	COAL	Tenas_Lithology.csv
T96R-06	72.85	72.91	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-06	72.91	73.8	0.89	COAL	Tenas_Lithology.csv
T96R-06	73.8	74.14	0.34	MDST	Tenas_Lithology.csv
T96R-06	74.14	76.88	2.74	COAL	Tenas_Lithology.csv
T96R-06	76.88	77.92	1.04	MDST	Tenas_Lithology.csv
T96R-06	77.92	78	0.08	COAL	Tenas_Lithology.csv
T96R-06	78	78.15	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-06	78.15	78.47	0.32	COAL	Tenas_Lithology.csv
T96R-06	78.47	79.59	1.12	MDST	Tenas_Lithology.csv
T96R-06	79.59	80.29	0.7	COAL	Tenas_Lithology.csv
T96R-06	80.29	80.89	0.6	MDST	Tenas_Lithology.csv
T96R-06	80.89	81.45	0.56	COAL	Tenas_Lithology.csv
T96R-06	81.45	82.26	0.81	MDST	Tenas_Lithology.csv
T96R-06	82.26	82.5	0.24	COAL	Tenas_Lithology.csv
T96R-06	82.5	85	2.5	MDST	Tenas_Lithology.csv
T96R-06	85	89.19	4.19	SST	Tenas_Lithology.csv
T96R-06	89.19	89.8	0.61	COAL	Tenas_Lithology.csv
T96R-06	89.8	96.12	6.32	SLTS	Tenas_Lithology.csv
T96R-06	96.12	96.54	0.42	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-06	96.54	110.1	13.56	SST	Tenas_Lithology.csv
T96R-07C	0	1.52	1.52	Overburden	Tenas_Lithology.csv
T96R-07C	1.52	3.92	2.4	MDST	Tenas_Lithology.csv
T96R-07C	3.92	5.41	1.49	COAL	Tenas_Lithology.csv
T96R-07C	5.41	10.9	5.49	MDST	Tenas_Lithology.csv
T96R-07C	10.9	12.32	1.42	SLTS	Tenas_Lithology.csv
T96R-07C	12.32	12.61	0.29	COAL	Tenas_Lithology.csv
T96R-07C	12.61	13.9	1.29	MDST	Tenas_Lithology.csv
T96R-07C	13.9	15.35	1.45	SLTS	Tenas_Lithology.csv
T96R-07C	15.35	17.04	1.69	COAL	Tenas_Lithology.csv
T96R-07C	17.04	17.44	0.4	MDST	Tenas_Lithology.csv
T96R-07C	17.44	20.89	3.45	COAL	Tenas_Lithology.csv
T96R-07C	20.89	22.81	1.92	MDST	Tenas_Lithology.csv
T96R-07C	22.81	23.13	0.32	COAL	Tenas_Lithology.csv
T96R-07C	23.13	23.2	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-07C	23.2	23.5	0.3	COAL	Tenas_Lithology.csv
T96R-07C	23.5	25.6	2.1	MDST	Tenas_Lithology.csv
T96R-08	0	3.5	3.5	Overburden	Tenas_Lithology.csv
T96R-08	3.5	6.13	2.63	MDST	Tenas_Lithology.csv
T96R-08	6.13	7.05	0.92	COAL	Tenas_Lithology.csv
T96R-08	7.05	7.22	0.17	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-08	7.22	7.39	0.17	COAL	Tenas_Lithology.csv
T96R-08	7.39	7.73	0.34	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-08	7.73	8.32	0.59	COAL	Tenas_Lithology.csv
T96R-08	8.32	13.17	4.85	MDST	Tenas_Lithology.csv
T96R-08	13.17	13.32	0.15	COAL	Tenas_Lithology.csv
T96R-08	13.32	15.38	2.06	MDST	Tenas_Lithology.csv
T96R-08	15.38	15.61	0.23	COAL	Tenas_Lithology.csv
T96R-08	15.61	20.82	5.21	SLTS	Tenas_Lithology.csv
T96R-08	20.82	20.91	0.09	COAL	Tenas_Lithology.csv
T96R-08	20.91	22.21	1.3	SLTS	Tenas_Lithology.csv
T96R-08	22.21	22.38	0.17	COAL	Tenas_Lithology.csv
T96R-08	22.38	27.3	4.92	MDST	Tenas_Lithology.csv
T96R-08	27.3	37	9.7	SST	Tenas_Lithology.csv
T96R-08	37	47	10	CGL	Tenas_Lithology.csv
T96R-08	47	58	11	SST	Tenas_Lithology.csv
T96R-08	58	67.7	9.7	CGL	Tenas_Lithology.csv
T96R-10	0	5	5	Overburden	Tenas_Lithology.csv
T96R-10	5	7	2	SLTS	Tenas_Lithology.csv
T96R-10	7	11.64	4.64	SST	Tenas_Lithology.csv
T96R-10	11.64	12.04	0.4	COAL	Tenas_Lithology.csv
T96R-10	12.04	15.83	3.79	MDST	Tenas_Lithology.csv
T96R-10	15.83	16.51	0.68	COAL	Tenas_Lithology.csv
T96R-10	16.51	18.18	1.67	MDST	Tenas_Lithology.csv
T96R-10	18.18	18.57	0.39	COAL	Tenas_Lithology.csv
T96R-10	18.57	18.85	0.28	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-10	18.85	20.82	1.97	COAL	Tenas_Lithology.csv
T96R-10	20.82	26.71	5.89	SLTS	Tenas_Lithology.csv
T96R-10	26.71	27.55	0.84	COAL	Tenas_Lithology.csv
T96R-10	27.55	27.64	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-10	27.64	30.45	2.81	COAL	Tenas_Lithology.csv
T96R-10	30.45	32.14	1.69	SST	Tenas_Lithology.csv
T96R-10	32.14	32.54	0.4	COAL	Tenas_Lithology.csv
T96R-10	32.54	32.76	0.22	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-10	32.76	33	0.24	COAL	Tenas_Lithology.csv
T96R-10	33	37	4	SST	Tenas_Lithology.csv
T96R-10	37	41	4	CGL	Tenas_Lithology.csv
T96R-10	41	44.9	3.9	SST	Tenas_Lithology.csv
T96R-10	44.9	45.1	0.2	COAL	Tenas_Lithology.csv
T96R-10	45.1	46.31	1.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-10	46.31	46.71	0.4	COAL	Tenas_Lithology.csv
T96R-10	46.71	62	15.29	SST	Tenas_Lithology.csv
T96R-10	62	67.1	5.1	CGL	Tenas_Lithology.csv
T96R-105	0	53	53	Overburden	Tenas_Lithology.csv
T96R-105	53	54.5	1.5	SLTS	Tenas_Lithology.csv
T96R-105	54.5	95.5	41	SST	Tenas_Lithology.csv
T96R-105	95.5	100	4.5	CGL	Tenas_Lithology.csv
T96R-105	100	102.7	2.7	SST	Tenas_Lithology.csv
T96R-11	0	2	2	Overburden	Tenas_Lithology.csv
T96R-11	2	2.24	0.24	MDST	Tenas_Lithology.csv
T96R-11	2.24	4	1.76	COAL	Tenas_Lithology.csv
T96R-11	4	11.24	7.24	MDST	Tenas_Lithology.csv
T96R-11	11.24	11.47	0.23	COAL	Tenas_Lithology.csv
T96R-11	11.47	14.39	2.92	MDST	Tenas_Lithology.csv
T96R-11	14.39	14.81	0.42	COAL	Tenas_Lithology.csv
T96R-11	14.81	16.25	1.44	SLTS	Tenas_Lithology.csv
T96R-11	16.25	16.84	0.59	COAL	Tenas_Lithology.csv
T96R-11	16.84	23.88	7.04	SLTS	Tenas_Lithology.csv
T96R-11	23.88	24.09	0.21	COAL	Tenas_Lithology.csv
T96R-11	24.09	25.62	1.53	MDST	Tenas_Lithology.csv
T96R-11	25.62	25.9	0.28	COAL	Tenas_Lithology.csv
T96R-11	25.9	26.8	0.9	MDST	Tenas_Lithology.csv
T96R-11	26.8	27.15	0.35	COAL	Tenas_Lithology.csv
T96R-11	27.15	34.57	7.42	MDST	Tenas_Lithology.csv
T96R-11	34.57	34.8	0.23	COAL	Tenas_Lithology.csv
T96R-11	34.8	42	7.2	SST	Tenas_Lithology.csv
T96R-11	42	45	3	SLTS	Tenas_Lithology.csv
T96R-11	45	58.5	13.5	CGL	Tenas_Lithology.csv
T96R-11	58.5	93.55	35.05	SST	Tenas_Lithology.csv
T96R-11	93.55	94.3	0.75	COAL	Tenas_Lithology.csv
T96R-11	94.3	96.7	2.4	SST	Tenas_Lithology.csv
T96R-11	96.7	97.2	0.5	COAL	Tenas_Lithology.csv
T96R-11	97.2	101.4	4.2	SLTS	Tenas_Lithology.csv
T96R-11	101.4	125.7	24.3	VOLC	Tenas_Lithology.csv
T96R-110	0	37.5	37.5	Overburden	Tenas_Lithology.csv
T96R-110	37.5	38.18	0.68	SLTS	Tenas_Lithology.csv
T96R-110	38.18	42.3	4.12	COAL	Tenas_Lithology.csv
T96R-110	42.3	46	3.7	MDST	Tenas_Lithology.csv
T96R-110	46	47	1	COAL	Tenas_Lithology.csv
T96R-110	47	47.4	0.4	MDST	Tenas_Lithology.csv
T96R-110	47.4	47.65	0.25	COAL	Tenas_Lithology.csv
T96R-110	47.65	56.01	8.36	SLTS	Tenas_Lithology.csv
T96R-110	56.01	56.38	0.37	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-110	56.38	66.3	9.92	SLTS	Tenas_Lithology.csv
T96R-119	0	4	4	Overburden	Tenas_Lithology.csv
T96R-119	4	15	11	SLTS	Tenas_Lithology.csv
T96R-119	15	21	6	SST	Tenas_Lithology.csv
T96R-119	21	26	5	MDST	Tenas_Lithology.csv
T96R-119	26	53.96	27.96	SST	Tenas_Lithology.csv
T96R-119	53.96	54.44	0.48	COAL	Tenas_Lithology.csv
T96R-119	54.44	54.96	0.52	SLTS	Tenas_Lithology.csv
T96R-119	54.96	55.81	0.85	COAL	Tenas_Lithology.csv
T96R-119	55.81	59.52	3.71	MDST	Tenas_Lithology.csv
T96R-119	59.52	59.78	0.26	COAL	Tenas_Lithology.csv
T96R-119	59.78	59.85	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-119	59.85	60.03	0.18	COAL	Tenas_Lithology.csv
T96R-119	60.03	61.13	1.1	SLTS	Tenas_Lithology.csv
T96R-119	61.13	61.33	0.2	COAL	Tenas_Lithology.csv
T96R-119	61.33	72.89	11.56	SLTS	Tenas_Lithology.csv
T96R-119	72.89	73.46	0.57	COAL	Tenas_Lithology.csv
T96R-119	73.46	75.1	1.64	SLTS	Tenas_Lithology.csv
T96R-119	75.1	75.45	0.35	COAL	Tenas_Lithology.csv
T96R-119	75.45	80.7	5.25	MDST	Tenas_Lithology.csv
T96R-119	80.7	84	3.3	SST	Tenas_Lithology.csv
T96R-120	0	7	7	Overburden	Tenas_Lithology.csv
T96R-120	7	19.1	12.1	MDST	Tenas_Lithology.csv
T96R-120	19.1	25.32	6.22	SST	Tenas_Lithology.csv
T96R-120	25.32	25.49	0.17	COAL	Tenas_Lithology.csv
T96R-120	25.49	28.01	2.52	MDST	Tenas_Lithology.csv
T96R-120	28.01	28.6	0.59	COAL	Tenas_Lithology.csv
T96R-120	28.6	32.04	3.44	SLTS	Tenas_Lithology.csv
T96R-120	32.04	33.74	1.7	COAL	Tenas_Lithology.csv
T96R-120	33.74	33.84	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-120	33.84	34.84	1	COAL	Tenas_Lithology.csv
T96R-120	34.84	44.38	9.54	SLTS	Tenas_Lithology.csv
T96R-120	44.38	44.91	0.53	COAL	Tenas_Lithology.csv
T96R-120	44.91	47.9	2.99	SLTS	Tenas_Lithology.csv
T96R-120	47.9	48.42	0.52	COAL	Tenas_Lithology.csv
T96R-120	48.42	51.11	2.69	SLTS	Tenas_Lithology.csv
T96R-120	51.11	51.52	0.41	COAL	Tenas_Lithology.csv
T96R-120	51.52	60.04	8.52	SLTS	Tenas_Lithology.csv
T96R-120	60.04	60.56	0.52	COAL	Tenas_Lithology.csv
T96R-120	60.56	63	2.44	SST	Tenas_Lithology.csv
T96R-120	63	65	2	CGL	Tenas_Lithology.csv
T96R-120	65	73.7	8.7	SST	Tenas_Lithology.csv
T96R-121	0	7.3	7.3	Overburden	Tenas_Lithology.csv
T96R-121	7.3	41.18	33.88	SST	Tenas_Lithology.csv
T96R-121	41.18	41.43	0.25	COAL	Tenas_Lithology.csv
T96R-121	41.43	44.08	2.65	SLTS	Tenas_Lithology.csv
T96R-121	44.08	44.63	0.55	COAL	Tenas_Lithology.csv
T96R-121	44.63	47.81	3.18	SLTS	Tenas_Lithology.csv
T96R-121	47.81	49.72	1.91	COAL	Tenas_Lithology.csv
T96R-121	49.72	59.33	9.61	SLTS	Tenas_Lithology.csv
T96R-121	59.33	59.64	0.31	COAL	Tenas_Lithology.csv
T96R-121	59.64	62.93	3.29	SLTS	Tenas_Lithology.csv
T96R-121	62.93	65.01	2.08	COAL	Tenas_Lithology.csv
T96R-121	65.01	66.57	1.56	SLTS	Tenas_Lithology.csv
T96R-121	66.57	67.29	0.72	COAL	Tenas_Lithology.csv
T96R-121	67.29	67.62	0.33	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-121	67.62	70.47	2.85	COAL	Tenas_Lithology.csv
T96R-121	70.47	74.18	3.71	MDST	Tenas_Lithology.csv
T96R-121	74.18	75.32	1.14	COAL	Tenas_Lithology.csv
T96R-121	75.32	76.16	0.84	MDST	Tenas_Lithology.csv
T96R-121	76.16	76.29	0.13	COAL	Tenas_Lithology.csv
T96R-121	76.29	82.53	6.24	SLTS	Tenas_Lithology.csv
T96R-121	82.53	83.49	0.96	COAL	Tenas_Lithology.csv
T96R-121	83.49	85.91	2.42	SLTS	Tenas_Lithology.csv
T96R-121	85.91	86.37	0.46	COAL	Tenas_Lithology.csv
T96R-121	86.37	90.02	3.65	SLTS	Tenas_Lithology.csv
T96R-121	90.02	90.2	0.18	COAL	Tenas_Lithology.csv
T96R-121	90.2	91.86	1.66	SLTS	Tenas_Lithology.csv
T96R-121	91.86	92.2	0.34	COAL	Tenas_Lithology.csv
T96R-121	92.2	97	4.8	SLTS	Tenas_Lithology.csv
T96R-121	97	109.4	12.4	SST	Tenas_Lithology.csv
T96R-124	0	21.47	21.47	Overburden	Tenas_Lithology.csv
T96R-124	21.47	39.21	17.74	SLTS	Tenas_Lithology.csv
T96R-124	39.21	39.58	0.37	COAL	Tenas_Lithology.csv
T96R-124	39.58	42.73	3.15	SLTS	Tenas_Lithology.csv
T96R-124	42.73	43.4	0.67	COAL	Tenas_Lithology.csv
T96R-124	43.4	46.05	2.65	SLTS	Tenas_Lithology.csv
T96R-124	46.05	48.1	2.05	COAL	Tenas_Lithology.csv
T96R-124	48.1	56.49	8.39	SLTS	Tenas_Lithology.csv
T96R-124	56.49	56.88	0.39	COAL	Tenas_Lithology.csv
T96R-124	56.88	60.05	3.17	SLTS	Tenas_Lithology.csv
T96R-124	60.05	62.15	2.1	COAL	Tenas_Lithology.csv
T96R-124	62.15	62.98	0.83	SLTS	Tenas_Lithology.csv
T96R-124	62.98	67.04	4.06	COAL	Tenas_Lithology.csv
T96R-124	67.04	70.22	3.18	MDST	Tenas_Lithology.csv
T96R-124	70.22	71.17	0.95	COAL	Tenas_Lithology.csv
T96R-124	71.17	71.81	0.64	MDST	Tenas_Lithology.csv
T96R-124	71.81	71.87	0.06	COAL	Tenas_Lithology.csv
T96R-124	71.87	73	1.13	SLTS	Tenas_Lithology.csv
T96R-124	73	78.5	5.5	CGL	Tenas_Lithology.csv
T96R-124	78.5	78.89	0.39	SLTS	Tenas_Lithology.csv
T96R-124	78.89	79.67	0.78	COAL	Tenas_Lithology.csv
T96R-124	79.67	79.94	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-124	79.94	80.6	0.66	COAL	Tenas_Lithology.csv
T96R-124	80.6	85.61	5.01	SLTS	Tenas_Lithology.csv
T96R-124	85.61	85.72	0.11	COAL	Tenas_Lithology.csv
T96R-124	85.72	87.09	1.37	SLTS	Tenas_Lithology.csv
T96R-124	87.09	87.15	0.06	COAL	Tenas_Lithology.csv
T96R-124	87.15	91.7	4.55	SST	Tenas_Lithology.csv
T96R-125	0	6.35	6.35	Overburden	Tenas_Lithology.csv
T96R-125	6.35	7	0.65	COAL	Tenas_Lithology.csv
T96R-125	7	8.54	1.54	MDST	Tenas_Lithology.csv
T96R-125	8.54	8.83	0.29	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-125	8.83	9.1	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-125	9.1	10.72	1.62	COAL	Tenas_Lithology.csv
T96R-125	10.72	16.72	6	SST	Tenas_Lithology.csv
T96R-125	16.72	17.07	0.35	COAL	Tenas_Lithology.csv
T96R-125	17.07	20.79	3.72	MDST	Tenas_Lithology.csv
T96R-125	20.79	26	5.21	COAL	Tenas_Lithology.csv
T96R-125	26	27.44	1.44	MDST	Tenas_Lithology.csv
T96R-125	27.44	27.65	0.21	COAL	Tenas_Lithology.csv
T96R-125	27.65	28.13	0.48	SLTS	Tenas_Lithology.csv
T96R-125	28.13	28.33	0.2	COAL	Tenas_Lithology.csv
T96R-125	28.33	29.03	0.7	MDST	Tenas_Lithology.csv
T96R-125	29.03	29.45	0.42	COAL	Tenas_Lithology.csv
T96R-125	29.45	30.1	0.65	MDST	Tenas_Lithology.csv
T96R-125	30.1	30.53	0.43	COAL	Tenas_Lithology.csv
T96R-125	30.53	34.81	4.28	SLTS	Tenas_Lithology.csv
T96R-125	34.81	35.03	0.22	COAL	Tenas_Lithology.csv
T96R-125	35.03	36.38	1.35	SST	Tenas_Lithology.csv
T96R-125	36.38	37.02	0.64	COAL	Tenas_Lithology.csv
T96R-125	37.02	43.98	6.96	SST	Tenas_Lithology.csv
T96R-125	43.98	44.3	0.32	COAL	Tenas_Lithology.csv
T96R-125	44.3	49.3	5	SST	Tenas_Lithology.csv
T96R-126	0	18.55	18.55	Overburden	Tenas_Lithology.csv
T96R-126	18.55	23	4.45	MDST	Tenas_Lithology.csv
T96R-126	23	26.27	3.27	COAL	Tenas_Lithology.csv
T96R-126	26.27	28.41	2.14	MDST	Tenas_Lithology.csv
T96R-126	28.41	29	0.59	COAL	Tenas_Lithology.csv
T96R-126	29	29.61	0.61	MDST	Tenas_Lithology.csv
T96R-126	29.61	30.06	0.45	COAL	Tenas_Lithology.csv
T96R-126	30.06	32	1.94	SLTS	Tenas_Lithology.csv
T96R-126	32	32.1	0.1	COAL	Tenas_Lithology.csv
T96R-126	32.1	32.8	0.7	MDST	Tenas_Lithology.csv
T96R-126	32.8	32.9	0.1	COAL	Tenas_Lithology.csv
T96R-126	32.9	35.8	2.9	MDST	Tenas_Lithology.csv
T96R-126	35.8	36	0.2	COAL	Tenas_Lithology.csv
T96R-126	36	36.58	0.58	MDST	Tenas_Lithology.csv
T96R-126	36.58	37.04	0.46	COAL	Tenas_Lithology.csv
T96R-126	37.04	44.93	7.89	SST	Tenas_Lithology.csv
T96R-126	44.93	45.3	0.37	COAL	Tenas_Lithology.csv
T96R-126	45.3	55.3	10	SLTS	Tenas_Lithology.csv
T96R-127	0	26.5	26.5	Overburden	Tenas_Lithology.csv
T96R-127	26.5	27.17	0.67	COAL	Tenas_Lithology.csv
T96R-127	27.17	30.49	3.32	SLTS	Tenas_Lithology.csv
T96R-127	30.49	30.6	0.11	COAL	Tenas_Lithology.csv
T96R-127	30.6	33.91	3.31	SLTS	Tenas_Lithology.csv
T96R-127	33.91	35.93	2.02	COAL	Tenas_Lithology.csv
T96R-127	35.93	37.43	1.5	SLTS	Tenas_Lithology.csv
T96R-127	37.43	38.09	0.66	COAL	Tenas_Lithology.csv
T96R-127	38.09	38.27	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-127	38.27	41.13	2.86	COAL	Tenas_Lithology.csv
T96R-127	41.13	43.19	2.06	MDST	Tenas_Lithology.csv
T96R-127	43.19	43.44	0.25	COAL	Tenas_Lithology.csv
T96R-127	43.44	43.67	0.23	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-127	43.67	44.57	0.9	COAL	Tenas_Lithology.csv
T96R-127	44.57	45.53	0.96	MDST	Tenas_Lithology.csv
T96R-127	45.53	45.8	0.27	COAL	Tenas_Lithology.csv
T96R-127	45.8	46.14	0.34	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-127	46.14	46.26	0.12	COAL	Tenas_Lithology.csv
T96R-127	46.26	51.21	4.95	SLTS	Tenas_Lithology.csv
T96R-127	51.21	51.48	0.27	COAL	Tenas_Lithology.csv
T96R-127	51.48	53.31	1.83	SLTS	Tenas_Lithology.csv
T96R-127	53.31	53.93	0.62	COAL	Tenas_Lithology.csv
T96R-127	53.93	59.36	5.43	SST	Tenas_Lithology.csv
T96R-127	59.36	59.54	0.18	COAL	Tenas_Lithology.csv
T96R-127	59.54	61.06	1.52	SLTS	Tenas_Lithology.csv
T96R-127	61.06	61.28	0.22	COAL	Tenas_Lithology.csv
T96R-127	61.28	72.6	11.32	SST	Tenas_Lithology.csv
T96R-128	0	3.6	3.6	Overburden	Tenas_Lithology.csv
T96R-128	3.6	10.74	7.14	MDST	Tenas_Lithology.csv
T96R-128	10.74	10.9	0.16	COAL	Tenas_Lithology.csv
T96R-128	10.9	15.3	4.4	MDST	Tenas_Lithology.csv
T96R-128	15.3	43.3	28	SLTS	Tenas_Lithology.csv
T96R-128	43.3	45.1	1.8	CGL	Tenas_Lithology.csv
T96R-128	45.1	47.2	2.1	SLTS	Tenas_Lithology.csv
T96R-128	47.2	51.8	4.6	MDST	Tenas_Lithology.csv
T96R-128	51.8	53.5	1.7	SST	Tenas_Lithology.csv
T96R-129	0	7.2	7.2	Overburden	Tenas_Lithology.csv
T96R-129	7.2	11	3.8	SLTS	Tenas_Lithology.csv
T96R-129	11	14.2	3.2	MDST	Tenas_Lithology.csv
T96R-129	14.2	21.2	7	SLTS	Tenas_Lithology.csv
T96R-129	21.2	23	1.8	MDST	Tenas_Lithology.csv
T96R-129	23	23.3	0.3	COAL	Tenas_Lithology.csv
T96R-129	23.3	23.6	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-129	23.6	24.3	0.7	COAL	Tenas_Lithology.csv
T96R-129	24.3	32.52	8.22	SLTS	Tenas_Lithology.csv
T96R-129	32.52	32.7	0.18	COAL	Tenas_Lithology.csv
T96R-129	32.7	36.52	3.82	SLTS	Tenas_Lithology.csv
T96R-129	36.52	41.45	4.93	COAL	Tenas_Lithology.csv
T96R-129	41.45	45.01	3.56	MDST	Tenas_Lithology.csv
T96R-129	45.01	45.56	0.55	COAL	Tenas_Lithology.csv
T96R-129	45.56	45.86	0.3	MDST	Tenas_Lithology.csv
T96R-129	45.86	46.6	0.74	COAL	Tenas_Lithology.csv
T96R-129	46.6	47.05	0.45	MDST	Tenas_Lithology.csv
T96R-129	47.05	47.47	0.42	COAL	Tenas_Lithology.csv
T96R-129	47.47	48.3	0.83	SLTS	Tenas_Lithology.csv
T96R-129	48.3	48.5	0.2	COAL	Tenas_Lithology.csv
T96R-129	48.5	52.17	3.67	MDST	Tenas_Lithology.csv
T96R-129	52.17	52.76	0.59	COAL	Tenas_Lithology.csv
T96R-129	52.76	54.3	1.54	SLTS	Tenas_Lithology.csv
T96R-129	54.3	54.5	0.2	COAL	Tenas_Lithology.csv
T96R-129	54.5	65.5	11	n/a	Tenas_Lithology.csv
T96R-12C	0	0.76	0.76	Overburden	Tenas_Lithology.csv
T96R-12C	0.76	2.29	1.53	COAL	Tenas_Lithology.csv
T96R-12C	2.29	3.4	1.11	MDST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-12C	3.4	7.81	4.41	SLTS	Tenas_Lithology.csv
T96R-12C	7.81	9.07	1.26	MDST	Tenas_Lithology.csv
T96R-12C	9.07	9.37	0.3	COAL	Tenas_Lithology.csv
T96R-12C	9.37	12.35	2.98	MDST	Tenas_Lithology.csv
T96R-12C	12.35	14.06	1.71	COAL	Tenas_Lithology.csv
T96R-12C	14.06	14.48	0.42	MDST	Tenas_Lithology.csv
T96R-12C	14.48	17.75	3.27	COAL	Tenas_Lithology.csv
T96R-12C	17.75	19.44	1.69	MDST	Tenas_Lithology.csv
T96R-12C	19.44	19.84	0.4	COAL	Tenas_Lithology.csv
T96R-12C	19.84	19.95	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-12C	19.95	20.22	0.27	COAL	Tenas_Lithology.csv
T96R-12C	20.22	22.8	2.58	SLTS	Tenas_Lithology.csv
T96R-130	0	15	15	Overburden	Tenas_Lithology.csv
T96R-130	15	31	16	SLTS	Tenas_Lithology.csv
T96R-130	31	48	17	MDST	Tenas_Lithology.csv
T96R-130	48	53	5	SLTS	Tenas_Lithology.csv
T96R-130	53	76	23	SST	Tenas_Lithology.csv
T96R-130	76	79	3	SLTS	Tenas_Lithology.csv
T96R-130	79	92.54	13.54	MDST	Tenas_Lithology.csv
T96R-130	92.54	94.4	1.86	COAL	Tenas_Lithology.csv
T96R-130	94.4	96.17	1.77	MDST	Tenas_Lithology.csv
T96R-130	96.17	98.4	2.23	COAL	Tenas_Lithology.csv
T96R-130	98.4	111	12.6	SLTS	Tenas_Lithology.csv
T96R-130	111	112.08	1.08	COAL	Tenas_Lithology.csv
T96R-130	112.08	115	2.92	SST	Tenas_Lithology.csv
T96R-130	115	116	1	CGL	Tenas_Lithology.csv
T96R-130	116	118	2	SST	Tenas_Lithology.csv
T96R-130	118	139.1	21.1	CGL	Tenas_Lithology.csv
T96R-131	0	8.81	8.81	Overburden	Tenas_Lithology.csv
T96R-131	8.81	19	10.19	MDST	Tenas_Lithology.csv
T96R-131	19	22.3	3.3	SST	Tenas_Lithology.csv
T96R-131	22.3	49.2	26.9	SLTS	Tenas_Lithology.csv
T96R-131	49.2	57.7	8.5	SST	Tenas_Lithology.csv
T96R-131	57.7	58	0.3	COAL	Tenas_Lithology.csv
T96R-131	58	59.87	1.87	SLTS	Tenas_Lithology.csv
T96R-131	59.87	60.3	0.43	COAL	Tenas_Lithology.csv
T96R-131	60.3	62.24	1.94	MDST	Tenas_Lithology.csv
T96R-131	62.24	62.42	0.18	COAL	Tenas_Lithology.csv
T96R-131	62.42	63.09	0.67	MDST	Tenas_Lithology.csv
T96R-131	63.09	65.01	1.92	COAL	Tenas_Lithology.csv
T96R-131	65.01	73.43	8.42	SLTS	Tenas_Lithology.csv
T96R-131	73.43	76.91	3.48	COAL	Tenas_Lithology.csv
T96R-131	76.91	77.01	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-131	77.01	77.29	0.28	COAL	Tenas_Lithology.csv
T96R-131	77.29	77.41	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-131	77.41	80.83	3.42	COAL	Tenas_Lithology.csv
T96R-131	80.83	83.25	2.42	MDST	Tenas_Lithology.csv
T96R-131	83.25	83.8	0.55	COAL	Tenas_Lithology.csv
T96R-131	83.8	84.45	0.65	MDST	Tenas_Lithology.csv
T96R-131	84.45	85.29	0.84	COAL	Tenas_Lithology.csv
T96R-131	85.29	87.3	2.01	SLTS	Tenas_Lithology.csv
T96R-131	87.3	87.6	0.3	COAL	Tenas_Lithology.csv
T96R-131	87.6	88.15	0.55	MDST	Tenas_Lithology.csv
T96R-131	88.15	88.37	0.22	COAL	Tenas_Lithology.csv
T96R-131	88.37	90.7	2.33	MDST	Tenas_Lithology.csv
T96R-131	90.7	90.9	0.2	SLTS	Tenas_Lithology.csv
T96R-131	90.9	91.2	0.3	COAL	Tenas_Lithology.csv
T96R-131	91.2	91.8	0.6	MDST	Tenas_Lithology.csv
T96R-131	91.8	92	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-131	92	93.9	1.9	MDST	Tenas_Lithology.csv
T96R-131	93.9	94	0.1	COAL	Tenas_Lithology.csv
T96R-131	94	103.8	9.8	MDST	Tenas_Lithology.csv
T96R-137	0	2.1	2.1	Overburden	Tenas_Lithology.csv
T96R-137	2.1	8.42	6.32	MDST	Tenas_Lithology.csv
T96R-137	8.42	10.16	1.74	COAL	Tenas_Lithology.csv
T96R-137	10.16	10.49	0.33	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-137	10.49	10.63	0.14	COAL	Tenas_Lithology.csv
T96R-137	10.63	10.98	0.35	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-137	10.98	11.85	0.87	COAL	Tenas_Lithology.csv
T96R-137	11.85	12.53	0.68	MDST	Tenas_Lithology.csv
T96R-137	12.53	12.71	0.18	COAL	Tenas_Lithology.csv
T96R-137	12.71	12.92	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-137	12.92	13.16	0.24	COAL	Tenas_Lithology.csv
T96R-137	13.16	15.13	1.97	MDST	Tenas_Lithology.csv
T96R-137	15.13	15.25	0.12	COAL	Tenas_Lithology.csv
T96R-137	15.25	16.78	1.53	SLTS	Tenas_Lithology.csv
T96R-137	16.78	17.04	0.26	COAL	Tenas_Lithology.csv
T96R-137	17.04	18.03	0.99	SLTS	Tenas_Lithology.csv
T96R-137	18.03	18.39	0.36	COAL	Tenas_Lithology.csv
T96R-137	18.39	26.2	7.81	SLTS	Tenas_Lithology.csv
T96R-137	26.2	26.36	0.16	COAL	Tenas_Lithology.csv
T96R-137	26.36	27.4	1.04	MDST	Tenas_Lithology.csv
T96R-137	27.4	34.1	6.7	SLTS	Tenas_Lithology.csv
T96R-137	34.1	42.7	8.6	CGL	Tenas_Lithology.csv
T96R-13C	0	0.8	0.8	Overburden	Tenas_Lithology.csv
T96R-13C	0.8	2.05	1.25	SLTS	Tenas_Lithology.csv
T96R-13C	2.05	6.48	4.43	MDST	Tenas_Lithology.csv
T96R-13C	6.48	6.81	0.33	COAL	Tenas_Lithology.csv
T96R-13C	6.81	9.5	2.69	MDST	Tenas_Lithology.csv
T96R-13C	9.5	11	1.5	COAL	Tenas_Lithology.csv
T96R-13C	11	11.59	0.59	SLTS	Tenas_Lithology.csv
T96R-13C	11.59	14.73	3.14	COAL	Tenas_Lithology.csv
T96R-13C	14.73	16.2	1.47	MDST	Tenas_Lithology.csv
T96R-13C	16.2	16.99	0.79	COAL	Tenas_Lithology.csv
T96R-13C	16.99	20	3.01	SLTS	Tenas_Lithology.csv
T96R-14	0	9	9	Overburden	Tenas_Lithology.csv
T96R-14	9	14	5	MDST	Tenas_Lithology.csv
T96R-14	14	21.5	7.5	SST	Tenas_Lithology.csv
T96R-14	21.5	33.5	12	MDST	Tenas_Lithology.csv
T96R-14	33.5	45.5	12	SST	Tenas_Lithology.csv
T96R-14	45.5	57.93	12.43	SLTS	Tenas_Lithology.csv
T96R-14	57.93	59.46	1.53	COAL	Tenas_Lithology.csv
T96R-14	59.46	66.76	7.3	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-14	66.76	67.02	0.26	COAL	Tenas_Lithology.csv
T96R-14	67.02	72.6	5.58	MDST	Tenas_Lithology.csv
T96R-14	72.6	74.11	1.51	COAL	Tenas_Lithology.csv
T96R-14	74.11	74.47	0.36	SLTS	Tenas_Lithology.csv
T96R-14	74.47	75.79	1.32	COAL	Tenas_Lithology.csv
T96R-14	75.79	76.16	0.37	MDST	Tenas_Lithology.csv
T96R-14	76.16	76.42	0.26	COAL	Tenas_Lithology.csv
T96R-14	76.42	76.69	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-14	76.69	77.48	0.79	COAL	Tenas_Lithology.csv
T96R-14	77.48	77.71	0.23	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-14	77.71	78.31	0.6	COAL	Tenas_Lithology.csv
T96R-14	78.31	78.53	0.22	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-14	78.53	79.54	1.01	COAL	Tenas_Lithology.csv
T96R-14	79.54	81.86	2.32	MDST	Tenas_Lithology.csv
T96R-14	81.86	82.38	0.52	COAL	Tenas_Lithology.csv
T96R-14	82.38	83.77	1.39	SLTS	Tenas_Lithology.csv
T96R-14	83.77	83.98	0.21	COAL	Tenas_Lithology.csv
T96R-14	83.98	84.22	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-14	84.22	84.87	0.65	COAL	Tenas_Lithology.csv
T96R-14	84.87	88	3.13	SLTS	Tenas_Lithology.csv
T96R-14	88	91.6	3.6	MDST	Tenas_Lithology.csv
T96R-14	91.6	96.1	4.5	SST	Tenas_Lithology.csv
T96R-14	96.1	96.24	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-14	96.24	96.52	0.28	MDST	Tenas_Lithology.csv
T96R-14	96.52	97.2	0.68	COAL	Tenas_Lithology.csv
T96R-14	97.2	100	2.8	MDST	Tenas_Lithology.csv
T96R-14	100	103.34	3.34	SST	Tenas_Lithology.csv
T96R-14	103.34	103.7	0.36	COAL	Tenas_Lithology.csv
T96R-14	103.7	123	19.3	SLTS	Tenas_Lithology.csv
T96R-15	0	11.5	11.5	Overburden	Tenas_Lithology.csv
T96R-15	11.5	29	17.5	SLTS	Tenas_Lithology.csv
T96R-15	29	36	7	Overburden	Tenas_Lithology.csv
T96R-15	36	39.4	3.4	SST	Tenas_Lithology.csv
T96R-15	39.4	39.71	0.31	COAL	Tenas_Lithology.csv
T96R-15	39.71	47	7.29	SLTS	Tenas_Lithology.csv
T96R-15	47	52.59	5.59	SST	Tenas_Lithology.csv
T96R-15	52.59	53.57	0.98	COAL	Tenas_Lithology.csv
T96R-15	53.57	61.69	8.12	SST	Tenas_Lithology.csv
T96R-15	61.69	62.01	0.32	COAL	Tenas_Lithology.csv
T96R-15	62.01	65.99	3.98	SLTS	Tenas_Lithology.csv
T96R-15	65.99	67.6	1.61	COAL	Tenas_Lithology.csv
T96R-15	67.6	68.59	0.99	SLTS	Tenas_Lithology.csv
T96R-15	68.59	69.85	1.26	COAL	Tenas_Lithology.csv
T96R-15	69.85	70.11	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-15	70.11	72.89	2.78	COAL	Tenas_Lithology.csv
T96R-15	72.89	77.47	4.58	MDST	Tenas_Lithology.csv
T96R-15	77.47	77.89	0.42	COAL	Tenas_Lithology.csv
T96R-15	77.89	79.5	1.61	MDST	Tenas_Lithology.csv
T96R-15	79.5	80.14	0.64	COAL	Tenas_Lithology.csv
T96R-15	80.14	80.91	0.77	MDST	Tenas_Lithology.csv
T96R-15	80.91	81.15	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-15	81.15	81.57	0.42	MDST	Tenas_Lithology.csv
T96R-15	81.57	81.91	0.34	COAL	Tenas_Lithology.csv
T96R-15	81.91	83.35	1.44	MDST	Tenas_Lithology.csv
T96R-15	83.35	83.53	0.18	COAL	Tenas_Lithology.csv
T96R-15	83.53	87.64	4.11	MDST	Tenas_Lithology.csv
T96R-15	87.64	88.1	0.46	COAL	Tenas_Lithology.csv
T96R-15	88.1	88.18	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-15	88.18	88.33	0.15	COAL	Tenas_Lithology.csv
T96R-15	88.33	89.32	0.99	SLTS	Tenas_Lithology.csv
T96R-15	89.32	90.04	0.72	COAL	Tenas_Lithology.csv
T96R-15	90.04	96.14	6.1	SLTS	Tenas_Lithology.csv
T96R-15	96.14	96.65	0.51	COAL	Tenas_Lithology.csv
T96R-15	96.65	112.5	15.85	SST	Tenas_Lithology.csv
T96R-15	112.5	119.5	7	CGL	Tenas_Lithology.csv
T96R-15	119.5	128.2	8.7	SST	Tenas_Lithology.csv
T96R-16	0	0.25	0.25	Overburden	Tenas_Lithology.csv
T96R-16	0.25	1.2	0.95	COAL	Tenas_Lithology.csv
T96R-16	1.2	1.65	0.45	SLTS	Tenas_Lithology.csv
T96R-16	1.65	2.24	0.59	COAL	Tenas_Lithology.csv
T96R-16	2.24	6	3.76	SLTS	Tenas_Lithology.csv
T96R-16	6	7.47	1.47	MDST	Tenas_Lithology.csv
T96R-16	7.47	7.62	0.15	COAL	Tenas_Lithology.csv
T96R-16	7.62	9.56	1.94	MDST	Tenas_Lithology.csv
T96R-16	9.56	11.45	1.89	COAL	Tenas_Lithology.csv
T96R-16	11.45	14.32	2.87	SLTS	Tenas_Lithology.csv
T96R-16	14.32	16.3	1.98	COAL	Tenas_Lithology.csv
T96R-16	16.3	16.46	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-16	16.46	16.6	0.14	COAL	Tenas_Lithology.csv
T96R-16	16.6	16.95	0.35	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-16	16.95	17.8	0.85	COAL	Tenas_Lithology.csv
T96R-16	17.8	18.36	0.56	MDST	Tenas_Lithology.csv
T96R-16	18.36	18.6	0.24	COAL	Tenas_Lithology.csv
T96R-16	18.6	18.83	0.23	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-16	18.83	18.96	0.13	COAL	Tenas_Lithology.csv
T96R-16	18.96	25.15	6.19	SLTS	Tenas_Lithology.csv
T96R-16	25.15	25.3	0.15	COAL	Tenas_Lithology.csv
T96R-16	25.3	25.4	0.1	MDST	Tenas_Lithology.csv
T96R-16	25.4	25.52	0.12	COAL	Tenas_Lithology.csv
T96R-16	25.52	26.32	0.8	MDST	Tenas_Lithology.csv
T96R-16	26.32	26.62	0.3	COAL	Tenas_Lithology.csv
T96R-16	26.62	31.6	4.98	MDST	Tenas_Lithology.csv
T96R-16	31.6	31.7	0.1	COAL	Tenas_Lithology.csv
T96R-16	31.7	35.52	3.82	SLTS	Tenas_Lithology.csv
T96R-16	35.52	35.81	0.29	COAL	Tenas_Lithology.csv
T96R-16	35.81	44.5	8.69	SST	Tenas_Lithology.csv
T96R-16	44.5	45.9	1.4	CGL	Tenas_Lithology.csv
T96R-16	45.9	59	13.1	SST	Tenas_Lithology.csv
T96R-16	59	72	13	CGL	Tenas_Lithology.csv
T96R-16	72	78.8	6.8	SST	Tenas_Lithology.csv
T96R-17C	0	0.91	0.91	Overburden	Tenas_Lithology.csv
T96R-17C	0.91	3.47	2.56	MDST	Tenas_Lithology.csv
T96R-17C	3.47	3.75	0.28	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-17C	3.75	6.71	2.96	MDST	Tenas_Lithology.csv
T96R-17C	6.71	8.36	1.65	COAL	Tenas_Lithology.csv
T96R-17C	8.36	8.81	0.45	MDST	Tenas_Lithology.csv
T96R-17C	8.81	12.07	3.26	COAL	Tenas_Lithology.csv
T96R-17C	12.07	13.39	1.32	MDST	Tenas_Lithology.csv
T96R-17C	13.39	13.8	0.41	COAL	Tenas_Lithology.csv
T96R-17C	13.8	13.9	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-17C	13.9	14.31	0.41	COAL	Tenas_Lithology.csv
T96R-17C	14.31	17	2.69	MDST	Tenas_Lithology.csv
T96R-18C	0	0.91	0.91	Overburden	Tenas_Lithology.csv
T96R-18C	0.91	1.89	0.98	MDST	Tenas_Lithology.csv
T96R-18C	1.89	3.97	2.08	SLTS	Tenas_Lithology.csv
T96R-18C	3.97	5.59	1.62	COAL	Tenas_Lithology.csv
T96R-18C	5.59	6.05	0.46	MDST	Tenas_Lithology.csv
T96R-18C	6.05	9.38	3.33	COAL	Tenas_Lithology.csv
T96R-18C	9.38	10.78	1.4	SLTS	Tenas_Lithology.csv
T96R-18C	10.78	11.16	0.38	COAL	Tenas_Lithology.csv
T96R-18C	11.16	11.26	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-18C	11.26	11.58	0.32	COAL	Tenas_Lithology.csv
T96R-18C	11.58	13.5	1.92	SLTS	Tenas_Lithology.csv
T96R-19	0	2.3	2.3	Overburden	Tenas_Lithology.csv
T96R-19	2.3	5.2	2.9	MDST	Tenas_Lithology.csv
T96R-19	5.2	14.88	9.68	SLTS	Tenas_Lithology.csv
T96R-19	14.88	15.25	0.37	COAL	Tenas_Lithology.csv
T96R-19	15.25	19.13	3.88	SLTS	Tenas_Lithology.csv
T96R-19	19.13	19.58	0.45	COAL	Tenas_Lithology.csv
T96R-19	19.58	21.62	2.04	SLTS	Tenas_Lithology.csv
T96R-19	21.62	21.76	0.14	COAL	Tenas_Lithology.csv
T96R-19	21.76	22.64	0.88	SLTS	Tenas_Lithology.csv
T96R-19	22.64	24.07	1.43	COAL	Tenas_Lithology.csv
T96R-19	24.07	30.83	6.76	SLTS	Tenas_Lithology.csv
T96R-19	30.83	31.03	0.2	COAL	Tenas_Lithology.csv
T96R-19	31.03	33.62	2.59	SLTS	Tenas_Lithology.csv
T96R-19	33.62	35.23	1.61	COAL	Tenas_Lithology.csv
T96R-19	35.23	36.39	1.16	SLTS	Tenas_Lithology.csv
T96R-19	36.39	39.73	3.34	COAL	Tenas_Lithology.csv
T96R-19	39.73	40.7	0.97	MDST	Tenas_Lithology.csv
T96R-19	40.7	40.81	0.11	COAL	Tenas_Lithology.csv
T96R-19	40.81	41	0.19	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-19	41	41.17	0.17	COAL	Tenas_Lithology.csv
T96R-19	41.17	44.54	3.37	SST	Tenas_Lithology.csv
T96R-19	44.54	44.61	0.07	COAL	Tenas_Lithology.csv
T96R-19	44.61	44.88	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-19	44.88	44.94	0.06	COAL	Tenas_Lithology.csv
T96R-19	44.94	45.38	0.44	SLTS	Tenas_Lithology.csv
T96R-19	45.38	45.47	0.09	COAL	Tenas_Lithology.csv
T96R-19	45.47	46.33	0.86	SLTS	Tenas_Lithology.csv
T96R-19	46.33	46.6	0.27	COAL	Tenas_Lithology.csv
T96R-19	46.6	50.01	3.41	SLTS	Tenas_Lithology.csv
T96R-19	50.01	50.1	0.09	COAL	Tenas_Lithology.csv
T96R-19	50.1	65.5	15.4	SST	Tenas_Lithology.csv
T96R-19	65.5	70	4.5	CGL	Tenas_Lithology.csv
T96R-19	70	79.6	9.6	SST	Tenas_Lithology.csv
T96R-20C	0	3.04	3.04	Overburden	Tenas_Lithology.csv
T96R-20C	3.04	5.27	2.23	MDST	Tenas_Lithology.csv
T96R-20C	5.27	5.98	0.71	COAL	Tenas_Lithology.csv
T96R-20C	5.98	7.96	1.98	MDST	Tenas_Lithology.csv
T96R-20C	7.96	8.04	0.08	COAL	Tenas_Lithology.csv
T96R-20C	8.04	8.58	0.54	MDST	Tenas_Lithology.csv
T96R-20C	8.58	9.97	1.39	COAL	Tenas_Lithology.csv
T96R-20C	9.97	9.98	0.01	MDST	Tenas_Lithology.csv
T96R-21	0	11	11	Overburden	Tenas_Lithology.csv
T96R-21	11	29	18	SST	Tenas_Lithology.csv
T96R-21	29	44.31	15.31	SLTS	Tenas_Lithology.csv
T96R-21	44.31	44.5	0.19	COAL	Tenas_Lithology.csv
T96R-21	44.5	49.82	5.32	MDST	Tenas_Lithology.csv
T96R-21	49.82	50.06	0.24	COAL	Tenas_Lithology.csv
T96R-21	50.06	50.16	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-21	50.16	55.49	5.33	COAL	Tenas_Lithology.csv
T96R-21	55.49	58.9	3.41	MDST	Tenas_Lithology.csv
T96R-21	58.9	59.3	0.4	COAL	Tenas_Lithology.csv
T96R-21	59.3	59.8	0.5	MDST	Tenas_Lithology.csv
T96R-21	59.8	60.66	0.86	COAL	Tenas_Lithology.csv
T96R-21	60.66	62.58	1.92	MDST	Tenas_Lithology.csv
T96R-21	62.58	62.87	0.29	COAL	Tenas_Lithology.csv
T96R-21	62.87	63.32	0.45	MDST	Tenas_Lithology.csv
T96R-21	63.32	63.53	0.21	COAL	Tenas_Lithology.csv
T96R-21	63.53	69.6	6.07	SST	Tenas_Lithology.csv
T96R-21	69.6	70.2	0.6	COAL	Tenas_Lithology.csv
T96R-21	70.2	71.77	1.57	SLTS	Tenas_Lithology.csv
T96R-21	71.77	71.91	0.14	COAL	Tenas_Lithology.csv
T96R-21	71.91	77.54	5.63	SST	Tenas_Lithology.csv
T96R-21	77.54	77.93	0.39	COAL	Tenas_Lithology.csv
T96R-21	77.93	85.6	7.67	SLTS	Tenas_Lithology.csv
T96R-22	0	9.5	9.5	Overburden	Tenas_Lithology.csv
T96R-22	9.5	30.05	20.55	MDST	Tenas_Lithology.csv
T96R-22	30.05	30.58	0.53	COAL	Tenas_Lithology.csv
T96R-22	30.58	34.51	3.93	MDST	Tenas_Lithology.csv
T96R-22	34.51	36.08	1.57	COAL	Tenas_Lithology.csv
T96R-22	36.08	36.35	0.27	SLTS	Tenas_Lithology.csv
T96R-22	36.35	36.48	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-22	36.48	37.04	0.56	MDST	Tenas_Lithology.csv
T96R-22	37.04	39.18	2.14	COAL	Tenas_Lithology.csv
T96R-22	39.18	39.71	0.53	MDST	Tenas_Lithology.csv
T96R-22	39.71	40.08	0.37	COAL	Tenas_Lithology.csv
T96R-22	40.08	40.27	0.19	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-22	40.27	40.44	0.17	COAL	Tenas_Lithology.csv
T96R-22	40.44	41.47	1.03	MDST	Tenas_Lithology.csv
T96R-22	41.47	42.4	0.93	COAL	Tenas_Lithology.csv
T96R-22	42.4	42.7	0.3	MDST	Tenas_Lithology.csv
T96R-22	42.7	44.91	2.21	COAL	Tenas_Lithology.csv
T96R-22	44.91	47.12	2.21	MDST	Tenas_Lithology.csv
T96R-22	47.12	47.67	0.55	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-22	47.67	50.1	2.43	MDST	Tenas_Lithology.csv
T96R-22	50.1	50.32	0.22	COAL	Tenas_Lithology.csv
T96R-22	50.32	50.65	0.33	MDST	Tenas_Lithology.csv
T96R-22	50.65	51.25	0.6	COAL	Tenas_Lithology.csv
T96R-22	51.25	53.63	2.38	MDST	Tenas_Lithology.csv
T96R-22	53.63	54.61	0.98	COAL	Tenas_Lithology.csv
T96R-22	54.61	55.73	1.12	SLTS	Tenas_Lithology.csv
T96R-22	55.73	56.03	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-22	56.03	58.93	2.9	SLTS	Tenas_Lithology.csv
T96R-22	58.93	59.33	0.4	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-22	59.33	59.96	0.63	SLTS	Tenas_Lithology.csv
T96R-22	59.96	60.23	0.27	MDST	Tenas_Lithology.csv
T96R-22	60.23	61.13	0.9	SLTS	Tenas_Lithology.csv
T96R-22	61.13	61.52	0.39	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-22	61.52	67.6	6.08	SLTS	Tenas_Lithology.csv
T96R-22	67.6	68.65	1.05	COAL	Tenas_Lithology.csv
T96R-22	68.65	68.87	0.22	MDST	Tenas_Lithology.csv
T96R-22	68.87	70.1	1.23	COAL	Tenas_Lithology.csv
T96R-22	70.1	72.59	2.49	SLTS	Tenas_Lithology.csv
T96R-22	72.59	72.7	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-22	72.7	75.38	2.68	SLTS	Tenas_Lithology.csv
T96R-22	75.38	75.69	0.31	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-22	75.69	76.48	0.79	SLTS	Tenas_Lithology.csv
T96R-22	76.48	77.39	0.91	COAL	Tenas_Lithology.csv
T96R-22	77.39	95	17.61	SLTS	Tenas_Lithology.csv
T96R-22	95	106.5	11.5	SST	Tenas_Lithology.csv
T96R-22	106.5	110	3.5	CGL	Tenas_Lithology.csv
T96R-22	110	128.5	18.5	SST	Tenas_Lithology.csv
T96R-23C	0	11.3	11.3	Overburden	Tenas_Lithology.csv
T96R-23C	11.3	14.62	3.32	MDST	Tenas_Lithology.csv
T96R-23C	14.62	18.1	3.48	SLTS	Tenas_Lithology.csv
T96R-23C	18.1	18.83	0.73	SST	Tenas_Lithology.csv
T96R-23C	18.83	24.9	6.07	MDST	Tenas_Lithology.csv
T96R-23C	24.9	25.4	0.5	SST	Tenas_Lithology.csv
T96R-23C	25.4	44.89	19.49	SLTS	Tenas_Lithology.csv
T96R-23C	44.89	47.97	3.08	MDST	Tenas_Lithology.csv
T96R-23C	47.97	56.94	8.97	SLTS	Tenas_Lithology.csv
T96R-23C	56.94	64.56	7.62	MDST	Tenas_Lithology.csv
T96R-23C	64.56	68.3	3.74	SLTS	Tenas_Lithology.csv
T96R-23C	68.3	72.15	3.85	MDST	Tenas_Lithology.csv
T96R-23C	72.15	80.93	8.78	SLTS	Tenas_Lithology.csv
T96R-23C	80.93	83.45	2.52	MDST	Tenas_Lithology.csv
T96R-23C	83.45	83.71	0.26	COAL	Tenas_Lithology.csv
T96R-23C	83.71	84.44	0.73	MDST	Tenas_Lithology.csv
T96R-23C	84.44	85.46	1.02	COAL	Tenas_Lithology.csv
T96R-23C	85.46	89.05	3.59	MDST	Tenas_Lithology.csv
T96R-23C	89.05	90	0.95	SLTS	Tenas_Lithology.csv
T96R-23C	90	104.57	14.57	MDST	Tenas_Lithology.csv
T96R-23C	104.57	107.74	3.17	COAL	Tenas_Lithology.csv
T96R-23C	107.74	108.03	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-23C	108.03	108.15	0.12	COAL	Tenas_Lithology.csv
T96R-23C	108.15	108.49	0.34	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-23C	108.49	111.03	2.54	COAL	Tenas_Lithology.csv
T96R-23C	111.03	116.07	5.04	MDST	Tenas_Lithology.csv
T96R-23C	116.07	116.37	0.3	COAL	Tenas_Lithology.csv
T96R-23C	116.37	116.7	0.33	MDST	Tenas_Lithology.csv
T96R-24	0	2.8	2.8	Overburden	Tenas_Lithology.csv
T96R-24	2.8	22.37	19.57	SLTS	Tenas_Lithology.csv
T96R-24	22.37	22.69	0.32	COAL	Tenas_Lithology.csv
T96R-24	22.69	27.58	4.89	MDST	Tenas_Lithology.csv
T96R-24	27.58	27.82	0.24	COAL	Tenas_Lithology.csv
T96R-24	27.82	28.66	0.84	MDST	Tenas_Lithology.csv
T96R-24	28.66	29.26	0.6	COAL	Tenas_Lithology.csv
T96R-24	29.26	38.92	9.66	SLTS	Tenas_Lithology.csv
T96R-24	38.92	40.15	1.23	COAL	Tenas_Lithology.csv
T96R-24	40.15	40.3	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-24	40.3	41.9	1.6	COAL	Tenas_Lithology.csv
T96R-24	41.9	46.66	4.76	MDST	Tenas_Lithology.csv
T96R-24	46.66	47.27	0.61	COAL	Tenas_Lithology.csv
T96R-24	47.27	58.37	11.1	SLTS	Tenas_Lithology.csv
T96R-24	58.37	60.61	2.24	COAL	Tenas_Lithology.csv
T96R-24	60.61	60.72	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-24	60.72	63.8	3.08	COAL	Tenas_Lithology.csv
T96R-24	63.8	64	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-24	64	65.65	1.65	COAL	Tenas_Lithology.csv
T96R-24	65.65	65.82	0.17	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-24	65.82	67.11	1.29	COAL	Tenas_Lithology.csv
T96R-24	67.11	69.41	2.3	MDST	Tenas_Lithology.csv
T96R-24	69.41	70.53	1.12	COAL	Tenas_Lithology.csv
T96R-24	70.53	72.05	1.52	MDST	Tenas_Lithology.csv
T96R-24	72.05	72.26	0.21	COAL	Tenas_Lithology.csv
T96R-24	72.26	72.43	0.17	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-24	72.43	72.72	0.29	COAL	Tenas_Lithology.csv
T96R-24	72.72	73.82	1.1	SLTS	Tenas_Lithology.csv
T96R-24	73.82	74.7	0.88	COAL	Tenas_Lithology.csv
T96R-24	74.7	80.07	5.37	SLTS	Tenas_Lithology.csv
T96R-24	80.07	80.4	0.33	COAL	Tenas_Lithology.csv
T96R-24	80.4	80.53	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-24	80.53	81.33	0.8	COAL	Tenas_Lithology.csv
T96R-24	81.33	81.97	0.64	MDST	Tenas_Lithology.csv
T96R-24	81.97	82.18	0.21	COAL	Tenas_Lithology.csv
T96R-24	82.18	82.25	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-24	82.25	83.11	0.86	COAL	Tenas_Lithology.csv
T96R-24	83.11	92.88	9.77	SLTS	Tenas_Lithology.csv
T96R-24	92.88	93.64	0.76	COAL	Tenas_Lithology.csv
T96R-24	93.64	128.5	34.86	SST	Tenas_Lithology.csv
T96R-25	0	7	7	Overburden	Tenas_Lithology.csv
T96R-25	7	24.6	17.6	MDST	Tenas_Lithology.csv
T96R-25	24.6	31	6.4	SLTS	Tenas_Lithology.csv
T96R-25	31	37.5	6.5	MDST	Tenas_Lithology.csv
T96R-25	37.5	38.1	0.6	COAL	Tenas_Lithology.csv
T96R-25	38.1	39.8	1.7	MDST	Tenas_Lithology.csv
T96R-25	39.8	40	0.2	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-25	40	40.8	0.8	MDST	Tenas_Lithology.csv
T96R-25	40.8	42.5	1.7	COAL	Tenas_Lithology.csv
T96R-25	42.5	47.3	4.8	SLTS	Tenas_Lithology.csv
T96R-25	47.3	47.5	0.2	COAL	Tenas_Lithology.csv
T96R-25	47.5	52.8	5.3	MDST	Tenas_Lithology.csv
T96R-25	52.8	58.4	5.6	COAL	Tenas_Lithology.csv
T96R-25	58.4	61.2	2.8	MDST	Tenas_Lithology.csv
T96R-25	61.2	61.5	0.3	COAL	Tenas_Lithology.csv
T96R-25	61.5	61.65	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-25	61.65	62.8	1.15	COAL	Tenas_Lithology.csv
T96R-25	62.8	63.9	1.1	MDST	Tenas_Lithology.csv
T96R-25	63.9	64.5	0.6	COAL	Tenas_Lithology.csv
T96R-25	64.5	64.8	0.3	MDST	Tenas_Lithology.csv
T96R-25	64.8	65	0.2	COAL	Tenas_Lithology.csv
T96R-25	65	68.1	3.1	SLTS	Tenas_Lithology.csv
T96R-25	68.1	68.4	0.3	COAL	Tenas_Lithology.csv
T96R-25	68.4	68.5	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-25	68.5	68.75	0.25	COAL	Tenas_Lithology.csv
T96R-25	68.75	70.4	1.65	MDST	Tenas_Lithology.csv
T96R-25	70.4	71	0.6	COAL	Tenas_Lithology.csv
T96R-25	71	71.5	0.5	MDST	Tenas_Lithology.csv
T96R-25	71.5	71.7	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-25	71.7	78.5	6.8	MDST	Tenas_Lithology.csv
T96R-26	0	13.9	13.9	Overburden	Tenas_Lithology.csv
T96R-26	13.9	33.2	19.3	SLTS	Tenas_Lithology.csv
T96R-26	33.2	44.21	11.01	SST	Tenas_Lithology.csv
T96R-26	44.21	44.71	0.5	COAL	Tenas_Lithology.csv
T96R-26	44.71	49.09	4.38	SLTS	Tenas_Lithology.csv
T96R-26	49.09	49.42	0.33	COAL	Tenas_Lithology.csv
T96R-26	49.42	49.54	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-26	49.54	50.08	0.54	COAL	Tenas_Lithology.csv
T96R-26	50.08	56.86	6.78	SLTS	Tenas_Lithology.csv
T96R-26	56.86	58.17	1.31	COAL	Tenas_Lithology.csv
T96R-26	58.17	67.42	9.25	SLTS	Tenas_Lithology.csv
T96R-26	67.42	68.32	0.9	COAL	Tenas_Lithology.csv
T96R-26	68.32	68.7	0.38	SLTS	Tenas_Lithology.csv
T96R-26	68.7	69.36	0.66	COAL	Tenas_Lithology.csv
T96R-26	69.36	70.2	0.84	MDST	Tenas_Lithology.csv
T96R-26	70.2	70.4	0.2	COAL	Tenas_Lithology.csv
T96R-26	70.4	73.56	3.16	MDST	Tenas_Lithology.csv
T96R-26	73.56	74.54	0.98	COAL	Tenas_Lithology.csv
T96R-26	74.54	75.95	1.41	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-26	75.95	76.2	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-26	76.2	81.45	5.25	SLTS	Tenas_Lithology.csv
T96R-26	81.45	89.65	8.2	MDST	Tenas_Lithology.csv
T96R-26	89.65	90.18	0.53	COAL	Tenas_Lithology.csv
T96R-26	90.18	90.33	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-26	90.33	90.6	0.27	COAL	Tenas_Lithology.csv
T96R-26	90.6	91.08	0.48	MDST	Tenas_Lithology.csv
T96R-26	91.08	91.26	0.18	COAL	Tenas_Lithology.csv
T96R-26	91.26	91.35	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-26	91.35	92.06	0.71	COAL	Tenas_Lithology.csv
T96R-26	92.06	93.9	1.84	SST	Tenas_Lithology.csv
T96R-26	93.9	94	0.1	COAL	Tenas_Lithology.csv
T96R-26	94	106.2	12.2	SST	Tenas_Lithology.csv
T96R-27	0	1.23	1.23	Overburden	Tenas_Lithology.csv
T96R-27	1.23	1.68	0.45	COAL	Tenas_Lithology.csv
T96R-27	1.68	2.11	0.43	MDST	Tenas_Lithology.csv
T96R-27	2.11	3.93	1.82	SLTS	Tenas_Lithology.csv
T96R-27	3.93	4.5	0.57	COAL	Tenas_Lithology.csv
T96R-27	4.5	5.8	1.3	MDST	Tenas_Lithology.csv
T96R-27	5.8	7.55	1.75	COAL	Tenas_Lithology.csv
T96R-27	7.55	10.2	2.65	MDST	Tenas_Lithology.csv
T96R-27	10.2	10.4	0.2	COAL	Tenas_Lithology.csv
T96R-27	10.4	12.6	2.2	MDST	Tenas_Lithology.csv
T96R-27	12.6	13.52	0.92	COAL	Tenas_Lithology.csv
T96R-27	13.52	14.4	0.88	MDST	Tenas_Lithology.csv
T96R-27	14.4	14.75	0.35	COAL	Tenas_Lithology.csv
T96R-27	14.75	16.2	1.45	MDST	Tenas_Lithology.csv
T96R-27	16.2	16.68	0.48	COAL	Tenas_Lithology.csv
T96R-27	16.68	18.4	1.72	MDST	Tenas_Lithology.csv
T96R-27	18.4	18.61	0.21	COAL	Tenas_Lithology.csv
T96R-27	18.61	24.67	6.06	SLTS	Tenas_Lithology.csv
T96R-27	24.67	25.03	0.36	COAL	Tenas_Lithology.csv
T96R-27	25.03	33.33	8.3	SLTS	Tenas_Lithology.csv
T96R-27	33.33	33.58	0.25	COAL	Tenas_Lithology.csv
T96R-27	33.58	42	8.42	SST	Tenas_Lithology.csv
T96R-27	42	58	16	CGL	Tenas_Lithology.csv
T96R-27	58	62	4	SLTS	Tenas_Lithology.csv
T96R-27	62	71	9	SST	Tenas_Lithology.csv
T96R-27	71	73.5	2.5	CGL	Tenas_Lithology.csv
T96R-28C	0	10.68	10.68	Overburden	Tenas_Lithology.csv
T96R-28C	10.68	14.68	4	SLTS	Tenas_Lithology.csv
T96R-28C	14.68	15.08	0.4	SST	Tenas_Lithology.csv
T96R-28C	15.08	17.07	1.99	SLTS	Tenas_Lithology.csv
T96R-28C	17.07	17.73	0.66	MDST	Tenas_Lithology.csv
T96R-28C	17.73	55.72	37.99	SLTS	Tenas_Lithology.csv
T96R-28C	55.72	69.93	14.21	MDST	Tenas_Lithology.csv
T96R-28C	69.93	72.08	2.15	SST	Tenas_Lithology.csv
T96R-28C	72.08	73.19	1.11	MDST	Tenas_Lithology.csv
T96R-28C	73.19	73.61	0.42	COAL	Tenas_Lithology.csv
T96R-28C	73.61	81.9	8.29	SLTS	Tenas_Lithology.csv
T96R-28C	81.9	88.42	6.52	MDST	Tenas_Lithology.csv
T96R-28C	88.42	89	0.58	SLTS	Tenas_Lithology.csv
T96R-28C	89	89.13	0.13	COAL	Tenas_Lithology.csv
T96R-28C	89.13	89.97	0.84	MDST	Tenas_Lithology.csv
T96R-28C	89.97	91.21	1.24	COAL	Tenas_Lithology.csv
T96R-28C	91.21	99.03	7.82	MDST	Tenas_Lithology.csv
T96R-28C	99.03	99.44	0.41	COAL	Tenas_Lithology.csv
T96R-28C	99.44	104.76	5.32	MDST	Tenas_Lithology.csv
T96R-28C	104.76	106.95	2.19	COAL	Tenas_Lithology.csv
T96R-28C	106.95	107.01	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-28C	107.01	111.31	4.3	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-28C	111.31	115.46	4.15	MDST	Tenas_Lithology.csv
T96R-28C	115.46	115.81	0.35	COAL	Tenas_Lithology.csv
T96R-28C	115.81	115.96	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-28C	115.96	117.18	1.22	COAL	Tenas_Lithology.csv
T96R-28C	117.18	117.88	0.7	MDST	Tenas_Lithology.csv
T96R-28C	117.88	118.5	0.62	COAL	Tenas_Lithology.csv
T96R-28C	118.5	119.12	0.62	MDST	Tenas_Lithology.csv
T96R-28C	119.12	119.27	0.15	COAL	Tenas_Lithology.csv
T96R-28C	119.27	120.7	1.43	MDST	Tenas_Lithology.csv
T96R-29	0	4.5	4.5	Overburden	Tenas_Lithology.csv
T96R-29	4.5	7	2.5	SST	Tenas_Lithology.csv
T96R-29	7	27.55	20.55	SLTS	Tenas_Lithology.csv
T96R-29	27.55	27.81	0.26	COAL	Tenas_Lithology.csv
T96R-29	27.81	31.23	3.42	SLTS	Tenas_Lithology.csv
T96R-29	31.23	31.29	0.06	COAL	Tenas_Lithology.csv
T96R-29	31.29	32.26	0.97	MDST	Tenas_Lithology.csv
T96R-29	32.26	32.57	0.31	COAL	Tenas_Lithology.csv
T96R-29	32.57	37.66	5.09	SLTS	Tenas_Lithology.csv
T96R-29	37.66	38.93	1.27	COAL	Tenas_Lithology.csv
T96R-29	38.93	50.5	11.57	SST	Tenas_Lithology.csv
T96R-29	50.5	50.63	0.13	COAL	Tenas_Lithology.csv
T96R-29	50.63	56.14	5.51	SLTS	Tenas_Lithology.csv
T96R-29	56.14	61.35	5.21	COAL	Tenas_Lithology.csv
T96R-29	61.35	65.31	3.96	MDST	Tenas_Lithology.csv
T96R-29	65.31	65.57	0.26	COAL	Tenas_Lithology.csv
T96R-29	65.57	65.76	0.19	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-29	65.76	65.93	0.17	COAL	Tenas_Lithology.csv
T96R-29	65.93	66.25	0.32	MDST	Tenas_Lithology.csv
T96R-29	66.25	66.35	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-29	66.35	67.44	1.09	MDST	Tenas_Lithology.csv
T96R-29	67.44	68.07	0.63	COAL	Tenas_Lithology.csv
T96R-29	68.07	68.92	0.85	MDST	Tenas_Lithology.csv
T96R-29	68.92	69.36	0.44	COAL	Tenas_Lithology.csv
T96R-29	69.36	77.41	8.05	SST	Tenas_Lithology.csv
T96R-29	77.41	77.68	0.27	COAL	Tenas_Lithology.csv
T96R-29	77.68	79	1.32	SST	Tenas_Lithology.csv
T96R-30	0	6	6	Overburden	Tenas_Lithology.csv
T96R-30	6	19	13	SST	Tenas_Lithology.csv
T96R-30	19	31	12	MDST	Tenas_Lithology.csv
T96R-30	31	35.09	4.09	SLTS	Tenas_Lithology.csv
T96R-30	35.09	35.5	0.41	COAL	Tenas_Lithology.csv
T96R-30	35.5	40.94	5.44	MDST	Tenas_Lithology.csv
T96R-30	40.94	41.26	0.32	COAL	Tenas_Lithology.csv
T96R-30	41.26	41.52	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-30	41.52	42.19	0.67	COAL	Tenas_Lithology.csv
T96R-30	42.19	51.08	8.89	SLTS	Tenas_Lithology.csv
T96R-30	51.08	53.31	2.23	COAL	Tenas_Lithology.csv
T96R-30	53.31	65.79	12.48	SLTS	Tenas_Lithology.csv
T96R-30	65.79	66.2	0.41	COAL	Tenas_Lithology.csv
T96R-30	66.2	77.15	10.95	SLTS	Tenas_Lithology.csv
T96R-30	77.15	79.01	1.86	COAL	Tenas_Lithology.csv
T96R-30	79.01	79.46	0.45	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-30	79.46	79.88	0.42	COAL	Tenas_Lithology.csv
T96R-30	79.88	79.97	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-30	79.97	81.21	1.24	COAL	Tenas_Lithology.csv
T96R-30	81.21	81.42	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-30	81.42	82.72	1.3	COAL	Tenas_Lithology.csv
T96R-30	82.72	82.85	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-30	82.85	85.16	2.31	COAL	Tenas_Lithology.csv
T96R-30	85.16	87.54	2.38	MDST	Tenas_Lithology.csv
T96R-30	87.54	88.16	0.62	COAL	Tenas_Lithology.csv
T96R-30	88.16	91.14	2.98	SLTS	Tenas_Lithology.csv
T96R-30	91.14	92.41	1.27	COAL	Tenas_Lithology.csv
T96R-30	92.41	94.23	1.82	MDST	Tenas_Lithology.csv
T96R-30	94.23	94.42	0.19	COAL	Tenas_Lithology.csv
T96R-30	94.42	94.82	0.4	MDST	Tenas_Lithology.csv
T96R-30	94.82	95.29	0.47	COAL	Tenas_Lithology.csv
T96R-30	95.29	96.29	1	MDST	Tenas_Lithology.csv
T96R-30	96.29	96.49	0.2	COAL	Tenas_Lithology.csv
T96R-30	96.49	99.56	3.07	SLTS	Tenas_Lithology.csv
T96R-30	99.56	99.92	0.36	COAL	Tenas_Lithology.csv
T96R-30	99.92	100.02	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-30	100.02	100.5	0.48	COAL	Tenas_Lithology.csv
T96R-30	100.5	105.81	5.31	SST	Tenas_Lithology.csv
T96R-30	105.81	106.46	0.65	COAL	Tenas_Lithology.csv
T96R-30	106.46	109	2.54	MDST	Tenas_Lithology.csv
T96R-30	109	128.2	19.2	SST	Tenas_Lithology.csv
T96R-31	0	0.96	0.96	Overburden	Tenas_Lithology.csv
T96R-31	0.96	5.72	4.76	MDST	Tenas_Lithology.csv
T96R-31	5.72	6.13	0.41	COAL	Tenas_Lithology.csv
T96R-31	6.13	9.88	3.75	SLTS	Tenas_Lithology.csv
T96R-31	9.88	10.48	0.6	COAL	Tenas_Lithology.csv
T96R-31	10.48	10.95	0.47	MDST	Tenas_Lithology.csv
T96R-31	10.95	12.88	1.93	COAL	Tenas_Lithology.csv
T96R-31	12.88	13.06	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-31	13.06	13.3	0.24	COAL	Tenas_Lithology.csv
T96R-31	13.3	16.92	3.62	SST	Tenas_Lithology.csv
T96R-31	16.92	18.8	1.88	COAL	Tenas_Lithology.csv
T96R-31	18.8	19.1	0.3	SLTS	Tenas_Lithology.csv
T96R-31	19.1	19.96	0.86	COAL	Tenas_Lithology.csv
T96R-31	19.96	20.22	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-31	20.22	20.59	0.37	COAL	Tenas_Lithology.csv
T96R-31	20.59	21.46	0.87	MDST	Tenas_Lithology.csv
T96R-31	21.46	21.7	0.24	COAL	Tenas_Lithology.csv
T96R-31	21.7	22.15	0.45	MDST	Tenas_Lithology.csv
T96R-31	22.15	22.88	0.73	COAL	Tenas_Lithology.csv
T96R-31	22.88	27	4.12	SLTS	Tenas_Lithology.csv
T96R-31	27	31.08	4.08	SST	Tenas_Lithology.csv
T96R-31	31.08	31.3	0.22	COAL	Tenas_Lithology.csv
T96R-31	31.3	32.11	0.81	SLTS	Tenas_Lithology.csv
T96R-31	32.11	32.64	0.53	COAL	Tenas_Lithology.csv
T96R-31	32.64	37.5	4.86	SST	Tenas_Lithology.csv
T96R-31	37.5	37.66	0.16	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-31	37.66	41.11	3.45	SST	Tenas_Lithology.csv
T96R-31	41.11	41.41	0.3	COAL	Tenas_Lithology.csv
T96R-31	41.41	46	4.59	MDST	Tenas_Lithology.csv
T96R-31	46	63	17	CGL	Tenas_Lithology.csv
T96R-31	63	66	3	SST	Tenas_Lithology.csv
T96R-32	0	16.2	16.2	Overburden	Tenas_Lithology.csv
T96R-32	16.2	18.81	2.61	MDST	Tenas_Lithology.csv
T96R-32	18.81	19.28	0.47	COAL	Tenas_Lithology.csv
T96R-32	19.28	19.34	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-32	19.34	23.38	4.04	COAL	Tenas_Lithology.csv
T96R-32	23.38	27.19	3.81	MDST	Tenas_Lithology.csv
T96R-32	27.19	27.45	0.26	COAL	Tenas_Lithology.csv
T96R-32	27.45	28.18	0.73	MDST	Tenas_Lithology.csv
T96R-32	28.18	28.76	0.58	COAL	Tenas_Lithology.csv
T96R-32	28.76	30.12	1.36	SLTS	Tenas_Lithology.csv
T96R-32	30.12	30.68	0.56	COAL	Tenas_Lithology.csv
T96R-32	30.68	31.2	0.52	MDST	Tenas_Lithology.csv
T96R-32	31.2	31.36	0.16	COAL	Tenas_Lithology.csv
T96R-32	31.36	35.92	4.56	SST	Tenas_Lithology.csv
T96R-32	35.92	36.23	0.31	COAL	Tenas_Lithology.csv
T96R-32	36.23	36.46	0.23	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-32	36.46	36.55	0.09	COAL	Tenas_Lithology.csv
T96R-32	36.55	43.2	6.65	SLTS	Tenas_Lithology.csv
T96R-32	43.2	43.51	0.31	COAL	Tenas_Lithology.csv
T96R-32	43.51	49	5.49	SLTS	Tenas_Lithology.csv
T96R-32	49	57	8	SST	Tenas_Lithology.csv
T96R-32	57	64	7	CGL	Tenas_Lithology.csv
T96R-32	64	67.6	3.6	SST	Tenas_Lithology.csv
T96R-33	0	0.31	0.31	Overburden	Tenas_Lithology.csv
T96R-33	0.31	1	0.69	COAL	Tenas_Lithology.csv
T96R-33	1	3.28	2.28	MDST	Tenas_Lithology.csv
T96R-33	3.28	5.66	2.38	COAL	Tenas_Lithology.csv
T96R-33	5.66	6.6	0.94	MDST	Tenas_Lithology.csv
T96R-33	6.6	7.52	0.92	COAL	Tenas_Lithology.csv
T96R-33	7.52	9.22	1.7	MDST	Tenas_Lithology.csv
T96R-33	9.22	9.45	0.23	COAL	Tenas_Lithology.csv
T96R-33	9.45	10.74	1.29	MDST	Tenas_Lithology.csv
T96R-33	10.74	10.85	0.11	COAL	Tenas_Lithology.csv
T96R-33	10.85	11.83	0.98	MDST	Tenas_Lithology.csv
T96R-33	11.83	11.92	0.09	COAL	Tenas_Lithology.csv
T96R-33	11.92	21.1	9.18	MDST	Tenas_Lithology.csv
T96R-33	21.1	21.81	0.71	COAL	Tenas_Lithology.csv
T96R-33	21.81	22.3	0.49	MDST	Tenas_Lithology.csv
T96R-33	22.3	22.64	0.34	COAL	Tenas_Lithology.csv
T96R-33	22.64	31.74	9.1	MDST	Tenas_Lithology.csv
T96R-33	31.74	32.13	0.39	COAL	Tenas_Lithology.csv
T96R-33	32.13	40	7.87	SST	Tenas_Lithology.csv
T96R-33	40	48.8	8.8	CGL	Tenas_Lithology.csv
T96R-34	0	12	12	Overburden	Tenas_Lithology.csv
T96R-34	12	34	22	SST	Tenas_Lithology.csv
T96R-34	34	48	14	SLTS	Tenas_Lithology.csv
T96R-34	48	57.83	9.83	SST	Tenas_Lithology.csv
T96R-34	57.83	58.17	0.34	COAL	Tenas_Lithology.csv
T96R-34	58.17	61.04	2.87	MDST	Tenas_Lithology.csv
T96R-34	61.04	61.2	0.16	COAL	Tenas_Lithology.csv
T96R-34	61.2	61.69	0.49	MDST	Tenas_Lithology.csv
T96R-34	61.69	61.96	0.27	COAL	Tenas_Lithology.csv
T96R-34	61.96	65.81	3.85	SLTS	Tenas_Lithology.csv
T96R-34	65.81	66.4	0.59	COAL	Tenas_Lithology.csv
T96R-34	66.4	66.46	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-34	66.46	67.27	0.81	COAL	Tenas_Lithology.csv
T96R-34	67.27	75.34	8.07	SLTS	Tenas_Lithology.csv
T96R-34	75.34	75.64	0.3	COAL	Tenas_Lithology.csv
T96R-34	75.64	81.09	5.45	SLTS	Tenas_Lithology.csv
T96R-34	81.09	86.36	5.27	COAL	Tenas_Lithology.csv
T96R-34	86.36	88.59	2.23	MDST	Tenas_Lithology.csv
T96R-34	88.59	88.93	0.34	COAL	Tenas_Lithology.csv
T96R-34	88.93	89.33	0.4	MDST	Tenas_Lithology.csv
T96R-34	89.33	89.67	0.34	COAL	Tenas_Lithology.csv
T96R-34	89.67	96.2	6.53	SLTS	Tenas_Lithology.csv
T96R-34	96.2	96.51	0.31	COAL	Tenas_Lithology.csv
T96R-34	96.51	97.6	1.09	SLTS	Tenas_Lithology.csv
T96R-35	0	1.6	1.6	Overburden	Tenas_Lithology.csv
T96R-35	1.6	3.7	2.1	MDST	Tenas_Lithology.csv
T96R-35	3.7	3.97	0.27	COAL	Tenas_Lithology.csv
T96R-35	3.97	5.45	1.48	MDST	Tenas_Lithology.csv
T96R-35	5.45	5.61	0.16	COAL	Tenas_Lithology.csv
T96R-35	5.61	6.11	0.5	MDST	Tenas_Lithology.csv
T96R-35	6.11	6.27	0.16	COAL	Tenas_Lithology.csv
T96R-35	6.27	6.58	0.31	MDST	Tenas_Lithology.csv
T96R-35	6.58	6.91	0.33	COAL	Tenas_Lithology.csv
T96R-35	6.91	13.47	6.56	SLTS	Tenas_Lithology.csv
T96R-35	13.47	13.81	0.34	COAL	Tenas_Lithology.csv
T96R-35	13.81	23	9.19	MDST	Tenas_Lithology.csv
T96R-35	23	36	13	CGL	Tenas_Lithology.csv
T96R-35	36	39	3	SLTS	Tenas_Lithology.csv
T96R-35	39	46	7	SST	Tenas_Lithology.csv
T96R-35	46	59	13	CGL	Tenas_Lithology.csv
T96R-35	59	63.15	4.15	SLTS	Tenas_Lithology.csv
T96R-35	63.15	63.34	0.19	COAL	Tenas_Lithology.csv
T96R-35	63.34	64.02	0.68	MDST	Tenas_Lithology.csv
T96R-35	64.02	64.2	0.18	COAL	Tenas_Lithology.csv
T96R-35	64.2	65	0.8	SLTS	Tenas_Lithology.csv
T96R-35	65	73.6	8.6	VOLC	Tenas_Lithology.csv
T96R-37	0	2.5	2.5	Overburden	Tenas_Lithology.csv
T96R-37	2.5	8.6	6.1	MDST	Tenas_Lithology.csv
T96R-37	8.6	8.9	0.3	COAL	Tenas_Lithology.csv
T96R-37	8.9	11.72	2.82	MDST	Tenas_Lithology.csv
T96R-37	11.72	11.97	0.25	COAL	Tenas_Lithology.csv
T96R-37	11.97	15.7	3.73	SLTS	Tenas_Lithology.csv
T96R-37	15.7	15.89	0.19	COAL	Tenas_Lithology.csv
T96R-37	15.89	17.13	1.24	SLTS	Tenas_Lithology.csv
T96R-37	17.13	18.29	1.16	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-37	18.29	26.5	8.21	SLTS	Tenas_Lithology.csv
T96R-37	26.5	26.6	0.1	COAL	Tenas_Lithology.csv
T96R-37	26.6	30.74	4.14	SLTS	Tenas_Lithology.csv
T96R-37	30.74	35.67	4.93	COAL	Tenas_Lithology.csv
T96R-37	35.67	37.6	1.93	MDST	Tenas_Lithology.csv
T96R-37	37.6	38.3	0.7	COAL	Tenas_Lithology.csv
T96R-37	38.3	41.04	2.74	SLTS	Tenas_Lithology.csv
T96R-37	41.04	41.45	0.41	COAL	Tenas_Lithology.csv
T96R-37	41.45	43.1	1.65	SLTS	Tenas_Lithology.csv
T96R-37	43.1	43.3	0.2	COAL	Tenas_Lithology.csv
T96R-37	43.3	46.6	3.3	MDST	Tenas_Lithology.csv
T96R-37	46.6	46.9	0.3	COAL	Tenas_Lithology.csv
T96R-37	46.9	48.2	1.3	SLTS	Tenas_Lithology.csv
T96R-37	48.2	48.8	0.6	COAL	Tenas_Lithology.csv
T96R-37	48.8	55.16	6.36	SST	Tenas_Lithology.csv
T96R-37	55.16	55.54	0.38	COAL	Tenas_Lithology.csv
T96R-37	55.54	61.6	6.06	SST	Tenas_Lithology.csv
T96R-38	0	5.1	5.1	Overburden	Tenas_Lithology.csv
T96R-38	5.1	11.91	6.81	SLTS	Tenas_Lithology.csv
T96R-38	11.91	12.41	0.5	COAL	Tenas_Lithology.csv
T96R-38	12.41	19.49	7.08	SLTS	Tenas_Lithology.csv
T96R-38	19.49	19.92	0.43	COAL	Tenas_Lithology.csv
T96R-38	19.92	22.79	2.87	MDST	Tenas_Lithology.csv
T96R-38	22.79	22.98	0.19	COAL	Tenas_Lithology.csv
T96R-38	22.98	24.16	1.18	SLTS	Tenas_Lithology.csv
T96R-38	24.16	24.33	0.17	COAL	Tenas_Lithology.csv
T96R-38	24.33	24.46	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-38	24.46	24.63	0.17	COAL	Tenas_Lithology.csv
T96R-38	24.63	24.87	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-38	24.87	25.42	0.55	COAL	Tenas_Lithology.csv
T96R-38	25.42	29.45	4.03	SLTS	Tenas_Lithology.csv
T96R-38	29.45	29.94	0.49	COAL	Tenas_Lithology.csv
T96R-38	29.94	34.43	4.49	SST	Tenas_Lithology.csv
T96R-38	34.43	34.78	0.35	COAL	Tenas_Lithology.csv
T96R-38	34.78	47	12.22	SLTS	Tenas_Lithology.csv
T96R-38	47	53	6	CGL	Tenas_Lithology.csv
T96R-38	53	68	15	SST	Tenas_Lithology.csv
T96R-38	68	69	1	CGL	Tenas_Lithology.csv
T96R-38	69	76.1	7.1	SST	Tenas_Lithology.csv
T96R-39	0	2.83	2.83	Overburden	Tenas_Lithology.csv
T96R-39	2.83	10.87	8.04	SLTS	Tenas_Lithology.csv
T96R-39	10.87	11.07	0.2	COAL	Tenas_Lithology.csv
T96R-39	11.07	18	6.93	SLTS	Tenas_Lithology.csv
T96R-39	18	18.12	0.12	COAL	Tenas_Lithology.csv
T96R-39	18.12	19.99	1.87	MDST	Tenas_Lithology.csv
T96R-39	19.99	20.07	0.08	COAL	Tenas_Lithology.csv
T96R-39	20.07	25.76	5.69	SLTS	Tenas_Lithology.csv
T96R-39	25.76	26.29	0.53	COAL	Tenas_Lithology.csv
T96R-39	26.29	31	4.71	MDST	Tenas_Lithology.csv
T96R-39	31	61.5	30.5	SST	Tenas_Lithology.csv
T96R-41	0	23	23	Overburden	Tenas_Lithology.csv
T96R-41	23	34	11	SLTS	Tenas_Lithology.csv
T96R-41	34	49.1	15.1	SST	Tenas_Lithology.csv
T96R-41	49.1	49.37	0.27	COAL	Tenas_Lithology.csv
T96R-41	49.37	51.05	1.68	SLTS	Tenas_Lithology.csv
T96R-41	51.05	51.3	0.25	COAL	Tenas_Lithology.csv
T96R-41	51.3	51.54	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-41	51.54	51.68	0.14	COAL	Tenas_Lithology.csv
T96R-41	51.68	52.54	0.86	SLTS	Tenas_Lithology.csv
T96R-41	52.54	53.07	0.53	COAL	Tenas_Lithology.csv
T96R-41	53.07	57.85	4.78	SLTS	Tenas_Lithology.csv
T96R-41	57.85	59.03	1.18	COAL	Tenas_Lithology.csv
T96R-41	59.03	59.13	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-41	59.13	60.06	0.93	COAL	Tenas_Lithology.csv
T96R-41	60.06	70.48	10.42	SLTS	Tenas_Lithology.csv
T96R-41	70.48	71.81	1.33	COAL	Tenas_Lithology.csv
T96R-41	71.81	76.38	4.57	MDST	Tenas_Lithology.csv
T96R-41	76.38	76.6	0.22	COAL	Tenas_Lithology.csv
T96R-41	76.6	77.86	1.26	SLTS	Tenas_Lithology.csv
T96R-41	77.86	78.47	0.61	COAL	Tenas_Lithology.csv
T96R-41	78.47	79	0.53	SLTS	Tenas_Lithology.csv
T96R-41	79	85	6	SST	Tenas_Lithology.csv
T96R-41	85	105	20	CGL	Tenas_Lithology.csv
T96R-41	105	121.4	16.4	SST	Tenas_Lithology.csv
T96R-42C	0	6.4	6.4	Overburden	Tenas_Lithology.csv
T96R-42C	6.4	12.5	6.1	MDST	Tenas_Lithology.csv
T96R-42C	12.5	14.26	1.76	SST	Tenas_Lithology.csv
T96R-42C	14.26	18.86	4.6	SLTS	Tenas_Lithology.csv
T96R-42C	18.86	31.53	12.67	MDST	Tenas_Lithology.csv
T96R-42C	31.53	36.04	4.51	SLTS	Tenas_Lithology.csv
T96R-42C	36.04	37.18	1.14	SST	Tenas_Lithology.csv
T96R-42C	37.18	39.46	2.28	SLTS	Tenas_Lithology.csv
T96R-42C	39.46	41.34	1.88	MDST	Tenas_Lithology.csv
T96R-42C	41.34	82.28	40.94	SLTS	Tenas_Lithology.csv
T96R-42C	82.28	90.76	8.48	MDST	Tenas_Lithology.csv
T96R-42C	90.76	91.56	0.8	SST	Tenas_Lithology.csv
T96R-42C	91.56	96.63	5.07	MDST	Tenas_Lithology.csv
T96R-42C	96.63	102	5.37	SLTS	Tenas_Lithology.csv
T96R-42C	102	103.24	1.24	MDST	Tenas_Lithology.csv
T96R-42C	103.24	105.99	2.75	SLTS	Tenas_Lithology.csv
T96R-42C	105.99	107.75	1.76	MDST	Tenas_Lithology.csv
T96R-42C	107.75	108.12	0.37	COAL	Tenas_Lithology.csv
T96R-42C	108.12	110.16	2.04	SLTS	Tenas_Lithology.csv
T96R-42C	110.16	110.81	0.65	COAL	Tenas_Lithology.csv
T96R-42C	110.81	115	4.19	MDST	Tenas_Lithology.csv
T96R-42C	115	116.69	1.69	SLTS	Tenas_Lithology.csv
T96R-42C	116.69	116.77	0.08	MDST	Tenas_Lithology.csv
T96R-42C	116.77	117.3	0.53	COAL	Tenas_Lithology.csv
T96R-42C	117.3	118.04	0.74	MDST	Tenas_Lithology.csv
T96R-42C	118.04	118.6	0.56	COAL	Tenas_Lithology.csv
T96R-42C	118.6	121.3	2.7	MDST	Tenas_Lithology.csv
T96R-42C	121.3	123.12	1.82	SST	Tenas_Lithology.csv
T96R-42C	123.12	126.45	3.33	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-42C	126.45	127.1	0.65	MDST	Tenas_Lithology.csv
T96R-42C	127.1	128	0.9	COAL	Tenas_Lithology.csv
T96R-42C	128	133.9	5.9	SLTS	Tenas_Lithology.csv
T96R-42C	133.9	135.21	1.31	MDST	Tenas_Lithology.csv
T96R-42C	135.21	135.57	0.36	COAL	Tenas_Lithology.csv
T96R-42C	135.57	141.78	6.21	SLTS	Tenas_Lithology.csv
T96R-42C	141.78	145.87	4.09	MDST	Tenas_Lithology.csv
T96R-42C	145.87	147.83	1.96	SLTS	Tenas_Lithology.csv
T96R-42C	147.83	150.1	2.27	SST	Tenas_Lithology.csv
T96R-43	0	15.5	15.5	Overburden	Tenas_Lithology.csv
T96R-43	15.5	27.75	12.25	SLTS	Tenas_Lithology.csv
T96R-43	27.75	29.36	1.61	COAL	Tenas_Lithology.csv
T96R-43	29.36	37.32	7.96	SLTS	Tenas_Lithology.csv
T96R-43	37.32	37.63	0.31	COAL	Tenas_Lithology.csv
T96R-43	37.63	45.74	8.11	SLTS	Tenas_Lithology.csv
T96R-43	45.74	52.76	7.02	COAL	Tenas_Lithology.csv
T96R-43	52.76	54.5	1.74	MDST	Tenas_Lithology.csv
T96R-43	54.5	55.15	0.65	COAL	Tenas_Lithology.csv
T96R-43	55.15	57.18	2.03	SLTS	Tenas_Lithology.csv
T96R-43	57.18	58.17	0.99	COAL	Tenas_Lithology.csv
T96R-43	58.17	63.5	5.33	SLTS	Tenas_Lithology.csv
T96R-43	63.5	68.06	4.56	MDST	Tenas_Lithology.csv
T96R-43	68.06	70.48	2.42	COAL	Tenas_Lithology.csv
T96R-43	70.48	70.64	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-43	70.64	72.69	2.05	COAL	Tenas_Lithology.csv
T96R-43	72.69	82.75	10.06	SLTS	Tenas_Lithology.csv
T96R-43	82.75	83.4	0.65	COAL	Tenas_Lithology.csv
T96R-43	83.4	91.2	7.8	SLTS	Tenas_Lithology.csv
T96R-45	0	22.9	22.9	Overburden	Tenas_Lithology.csv
T96R-45	22.9	44.5	21.6	SLTS	Tenas_Lithology.csv
T96R-45	44.5	49	4.5	CGL	Tenas_Lithology.csv
T96R-45	49	51.5	2.5	MDST	Tenas_Lithology.csv
T96R-45	51.5	54	2.5	SST	Tenas_Lithology.csv
T96R-45	54	68	14	CGL	Tenas_Lithology.csv
T96R-45	68	75.8	7.8	SLTS	Tenas_Lithology.csv
T96R-45	75.8	78	2.2	CGL	Tenas_Lithology.csv
T96R-45	78	79.6	1.6	VOLC	Tenas_Lithology.csv
T96R-46	0	3.8	3.8	Overburden	Tenas_Lithology.csv
T96R-46	3.8	50	46.2	SLTS	Tenas_Lithology.csv
T96R-46	50	83.6	33.6	SST	Tenas_Lithology.csv
T96R-46	83.6	86.28	2.68	SLTS	Tenas_Lithology.csv
T96R-46	86.28	87.46	1.18	COAL	Tenas_Lithology.csv
T96R-46	87.46	100.03	12.57	SLTS	Tenas_Lithology.csv
T96R-46	100.03	104.17	4.14	COAL	Tenas_Lithology.csv
T96R-46	104.17	107.16	2.99	MDST	Tenas_Lithology.csv
T96R-46	107.16	108.29	1.13	COAL	Tenas_Lithology.csv
T96R-46	108.29	115.38	7.09	SLTS	Tenas_Lithology.csv
T96R-46	115.38	115.86	0.48	COAL	Tenas_Lithology.csv
T96R-46	115.86	118.48	2.62	SST	Tenas_Lithology.csv
T96R-46	118.48	118.98	0.5	COAL	Tenas_Lithology.csv
T96R-46	118.98	121.91	2.93	SST	Tenas_Lithology.csv
T96R-46	121.91	122.16	0.25	COAL	Tenas_Lithology.csv
T96R-46	122.16	123.8	1.64	SST	Tenas_Lithology.csv
T96R-46	123.8	124	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-46	124	140.4	16.4	SST	Tenas_Lithology.csv
T96R-47	0	11.5	11.5	Overburden	Tenas_Lithology.csv
T96R-47	11.5	55	43.5	SLTS	Tenas_Lithology.csv
T96R-47	55	101.41	46.41	SST	Tenas_Lithology.csv
T96R-47	101.41	101.53	0.12	COAL	Tenas_Lithology.csv
T96R-47	101.53	102.47	0.94	SLTS	Tenas_Lithology.csv
T96R-47	102.47	102.74	0.27	COAL	Tenas_Lithology.csv
T96R-47	102.74	107.11	4.37	SLTS	Tenas_Lithology.csv
T96R-47	107.11	107.77	0.66	COAL	Tenas_Lithology.csv
T96R-47	107.77	110.83	3.06	SLTS	Tenas_Lithology.csv
T96R-47	110.83	111.03	0.2	COAL	Tenas_Lithology.csv
T96R-47	111.03	124.66	13.63	SLTS	Tenas_Lithology.csv
T96R-47	124.66	127.24	2.58	COAL	Tenas_Lithology.csv
T96R-47	127.24	127.29	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-47	127.29	128.55	1.26	COAL	Tenas_Lithology.csv
T96R-47	128.55	128.66	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-47	128.66	128.94	0.28	COAL	Tenas_Lithology.csv
T96R-47	128.94	129.36	0.42	MDST	Tenas_Lithology.csv
T96R-47	129.36	132.44	3.08	COAL	Tenas_Lithology.csv
T96R-47	132.44	137.98	5.54	MDST	Tenas_Lithology.csv
T96R-47	137.98	139.34	1.36	COAL	Tenas_Lithology.csv
T96R-47	139.34	141.26	1.92	SLTS	Tenas_Lithology.csv
T96R-47	141.26	141.8	0.54	COAL	Tenas_Lithology.csv
T96R-47	141.8	144.91	3.11	SLTS	Tenas_Lithology.csv
T96R-47	144.91	145.04	0.13	COAL	Tenas_Lithology.csv
T96R-47	145.04	145.98	0.94	SLTS	Tenas_Lithology.csv
T96R-47	145.98	147.19	1.21	COAL	Tenas_Lithology.csv
T96R-47	147.19	149.5	2.31	SLTS	Tenas_Lithology.csv
T96R-47	149.5	152.1	2.6	SST	Tenas_Lithology.csv
T96R-49	0	10.97	10.97	Overburden	Tenas_Lithology.csv
T96R-49	10.97	17.98	7.01	SST	Tenas_Lithology.csv
T96R-49	17.98	28.95	10.97	MDST	Tenas_Lithology.csv
T96R-49	28.95	32	3.05	SST	Tenas_Lithology.csv
T96R-49	32	70.51	38.51	MDST	Tenas_Lithology.csv
T96R-49	70.51	70.83	0.32	COAL	Tenas_Lithology.csv
T96R-49	70.83	85.43	14.6	MDST	Tenas_Lithology.csv
T96R-49	85.43	85.63	0.2	COAL	Tenas_Lithology.csv
T96R-49	85.63	91.49	5.86	SLTS	Tenas_Lithology.csv
T96R-49	91.49	91.63	0.14	COAL	Tenas_Lithology.csv
T96R-49	91.63	108.2	16.57	SST	Tenas_Lithology.csv
T96R-49	108.2	109.6	1.4	VOLC	Tenas_Lithology.csv
T96R-50	0	7.8	7.8	Overburden	Tenas_Lithology.csv
T96R-50	7.8	13.33	5.53	SLTS	Tenas_Lithology.csv
T96R-50	13.33	13.91	0.58	COAL	Tenas_Lithology.csv
T96R-50	13.91	13.99	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-50	13.99	17.16	3.17	COAL	Tenas_Lithology.csv
T96R-50	17.16	19.21	2.05	SLTS	Tenas_Lithology.csv
T96R-50	19.21	20.08	0.87	COAL	Tenas_Lithology.csv
T96R-50	20.08	20.26	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-50	20.26	22.71	2.45	COAL	Tenas_Lithology.csv
T96R-50	22.71	24.2	1.49	MDST	Tenas_Lithology.csv
T96R-50	24.2	24.86	0.66	COAL	Tenas_Lithology.csv
T96R-50	24.86	27.01	2.15	SLTS	Tenas_Lithology.csv
T96R-50	27.01	27.81	0.8	COAL	Tenas_Lithology.csv
T96R-50	27.81	28.1	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-50	28.1	31.87	3.77	COAL	Tenas_Lithology.csv
T96R-50	31.87	32.21	0.34	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-50	32.21	33.24	1.03	COAL	Tenas_Lithology.csv
T96R-50	33.24	39.28	6.04	SLTS	Tenas_Lithology.csv
T96R-50	39.28	40.38	1.1	COAL	Tenas_Lithology.csv
T96R-50	40.38	42.8	2.42	SLTS	Tenas_Lithology.csv
T96R-50	42.8	43	0.2	COAL	Tenas_Lithology.csv
T96R-50	43	44.28	1.28	MDST	Tenas_Lithology.csv
T96R-50	44.28	45.26	0.98	COAL	Tenas_Lithology.csv
T96R-50	45.26	63.56	18.3	SST	Tenas_Lithology.csv
T96R-50	63.56	63.95	0.39	COAL	Tenas_Lithology.csv
T96R-50	63.95	64.16	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-50	64.16	64.37	0.21	COAL	Tenas_Lithology.csv
T96R-50	64.37	64.67	0.3	MDST	Tenas_Lithology.csv
T96R-50	64.67	65.47	0.8	COAL	Tenas_Lithology.csv
T96R-50	65.47	67	1.53	SLTS	Tenas_Lithology.csv
T96R-50	67	73.5	6.5	SST	Tenas_Lithology.csv
T96R-51	0	7	7	Overburden	Tenas_Lithology.csv
T96R-51	7	16.7	9.7	MDST	Tenas_Lithology.csv
T96R-51	16.7	20.7	4	SLTS	Tenas_Lithology.csv
T96R-51	20.7	36.6	15.9	SST	Tenas_Lithology.csv
T96R-51	36.6	71.52	34.92	SLTS	Tenas_Lithology.csv
T96R-51	71.52	71.68	0.16	COAL	Tenas_Lithology.csv
T96R-51	71.68	75.67	3.99	SLTS	Tenas_Lithology.csv
T96R-51	75.67	75.88	0.21	COAL	Tenas_Lithology.csv
T96R-51	75.88	76.07	0.19	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-51	76.07	76.55	0.48	COAL	Tenas_Lithology.csv
T96R-51	76.55	83.68	7.13	SLTS	Tenas_Lithology.csv
T96R-51	83.68	85.61	1.93	COAL	Tenas_Lithology.csv
T96R-51	85.61	99.89	14.28	SLTS	Tenas_Lithology.csv
T96R-51	99.89	100.71	0.82	COAL	Tenas_Lithology.csv
T96R-51	100.71	101.72	1.01	SLTS	Tenas_Lithology.csv
T96R-51	101.72	101.96	0.24	COAL	Tenas_Lithology.csv
T96R-51	101.96	102.35	0.39	MDST	Tenas_Lithology.csv
T96R-51	102.35	102.72	0.37	COAL	Tenas_Lithology.csv
T96R-51	102.72	103.5	0.78	MDST	Tenas_Lithology.csv
T96R-51	103.5	103.65	0.15	COAL	Tenas_Lithology.csv
T96R-51	103.65	105.92	2.27	MDST	Tenas_Lithology.csv
T96R-51	105.92	106.2	0.28	COAL	Tenas_Lithology.csv
T96R-51	106.2	106.34	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-51	106.34	106.78	0.44	COAL	Tenas_Lithology.csv
T96R-51	106.78	108.2	1.42	SLTS	Tenas_Lithology.csv
T96R-51	108.2	112.8	4.6	SST	Tenas_Lithology.csv
T96R-51	112.8	116	3.2	SLTS	Tenas_Lithology.csv
T96R-51	116	127.9	11.9	SST	Tenas_Lithology.csv
T96R-52	0	22.2	22.2	Overburden	Tenas_Lithology.csv
T96R-52	22.2	24	1.8	MDST	Tenas_Lithology.csv
T96R-52	24	59.75	35.75	SST	Tenas_Lithology.csv
T96R-52	59.75	64.53	4.78	MDST	Tenas_Lithology.csv
T96R-52	64.53	64.61	0.08	COAL	Tenas_Lithology.csv
T96R-52	64.61	71.88	7.27	SLTS	Tenas_Lithology.csv
T96R-52	71.88	72.11	0.23	COAL	Tenas_Lithology.csv
T96R-52	72.11	78.65	6.54	SLTS	Tenas_Lithology.csv
T96R-52	78.65	80.35	1.7	COAL	Tenas_Lithology.csv
T96R-52	80.35	100.74	20.39	SLTS	Tenas_Lithology.csv
T96R-52	100.74	107.84	7.1	COAL	Tenas_Lithology.csv
T96R-52	107.84	113.92	6.08	MDST	Tenas_Lithology.csv
T96R-52	113.92	115.19	1.27	COAL	Tenas_Lithology.csv
T96R-52	115.19	117.31	2.12	SLTS	Tenas_Lithology.csv
T96R-52	117.31	117.75	0.44	COAL	Tenas_Lithology.csv
T96R-52	117.75	121.95	4.2	MDST	Tenas_Lithology.csv
T96R-52	121.95	123.05	1.1	COAL	Tenas_Lithology.csv
T96R-52	123.05	123.76	0.71	MDST	Tenas_Lithology.csv
T96R-52	123.76	124.48	0.72	COAL	Tenas_Lithology.csv
T96R-52	124.48	127.2	2.72	SLTS	Tenas_Lithology.csv
T96R-56C	0	11.3	11.3	Overburden	Tenas_Lithology.csv
T96R-56C	11.3	12.5	1.2	SST	Tenas_Lithology.csv
T96R-56C	12.5	19.47	6.97	MDST	Tenas_Lithology.csv
T96R-56C	19.47	19.83	0.36	SLTS	Tenas_Lithology.csv
T96R-56C	19.83	23.47	3.64	MDST	Tenas_Lithology.csv
T96R-56C	23.47	24.56	1.09	SLTS	Tenas_Lithology.csv
T96R-56C	24.56	24.86	0.3	SST	Tenas_Lithology.csv
T96R-56C	24.86	27.8	2.94	MDST	Tenas_Lithology.csv
T96R-56C	27.8	29.44	1.64	SLTS	Tenas_Lithology.csv
T96R-56C	29.44	36.42	6.98	MDST	Tenas_Lithology.csv
T96R-56C	36.42	38.65	2.23	SST	Tenas_Lithology.csv
T96R-56C	38.65	60.34	21.69	SLTS	Tenas_Lithology.csv
T96R-56C	60.34	65.71	5.37	MDST	Tenas_Lithology.csv
T96R-56C	65.71	66.22	0.51	SST	Tenas_Lithology.csv
T96R-56C	66.22	69.09	2.87	MDST	Tenas_Lithology.csv
T96R-56C	69.09	69.23	0.14	COAL	Tenas_Lithology.csv
T96R-56C	69.23	74.94	5.71	MDST	Tenas_Lithology.csv
T96R-56C	74.94	76.71	1.77	COAL	Tenas_Lithology.csv
T96R-56C	76.71	77.27	0.56	MDST	Tenas_Lithology.csv
T96R-56C	77.27	78.89	1.62	COAL	Tenas_Lithology.csv
T96R-56C	78.89	79.18	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-56C	79.18	82.63	3.45	COAL	Tenas_Lithology.csv
T96R-56C	82.63	85.52	2.89	MDST	Tenas_Lithology.csv
T96R-56C	85.52	85.67	0.15	COAL	Tenas_Lithology.csv
T96R-56C	85.67	85.77	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-56C	85.77	86.18	0.41	COAL	Tenas_Lithology.csv
T96R-56C	86.18	87.68	1.5	SLTS	Tenas_Lithology.csv
T96R-56C	87.68	88.13	0.45	COAL	Tenas_Lithology.csv
T96R-56C	88.13	88.98	0.85	MDST	Tenas_Lithology.csv
T96R-56C	88.98	89.23	0.25	COAL	Tenas_Lithology.csv
T96R-56C	89.23	90.31	1.08	SLTS	Tenas_Lithology.csv
T96R-56C	90.31	90.68	0.37	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-56C	90.68	93.1	2.42	SLTS	Tenas_Lithology.csv
T96R-58	0	2	2	Overburden	Tenas_Lithology.csv
T96R-58	2	17.3	15.3	SLTS	Tenas_Lithology.csv
T96R-58	17.3	20.2	2.9	MDST	Tenas_Lithology.csv
T96R-58	20.2	29.6	9.4	SLTS	Tenas_Lithology.csv
T96R-58	29.6	29.8	0.2	COAL	Tenas_Lithology.csv
T96R-58	29.8	32.02	2.22	SLTS	Tenas_Lithology.csv
T96R-58	32.02	32.47	0.45	COAL	Tenas_Lithology.csv
T96R-58	32.47	35.25	2.78	SLTS	Tenas_Lithology.csv
T96R-58	35.25	35.4	0.15	COAL	Tenas_Lithology.csv
T96R-58	35.4	35.93	0.53	SLTS	Tenas_Lithology.csv
T96R-58	35.93	37.41	1.48	COAL	Tenas_Lithology.csv
T96R-58	37.41	40	2.59	SLTS	Tenas_Lithology.csv
T96R-58	40	51.26	11.26	SST	Tenas_Lithology.csv
T96R-58	51.26	56.45	5.19	COAL	Tenas_Lithology.csv
T96R-58	56.45	58.36	1.91	MDST	Tenas_Lithology.csv
T96R-58	58.36	58.71	0.35	COAL	Tenas_Lithology.csv
T96R-58	58.71	58.85	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-58	58.85	59.19	0.34	COAL	Tenas_Lithology.csv
T96R-58	59.19	65.71	6.52	SLTS	Tenas_Lithology.csv
T96R-58	65.71	65.96	0.25	COAL	Tenas_Lithology.csv
T96R-58	65.96	70.23	4.27	SLTS	Tenas_Lithology.csv
T96R-58	70.23	70.49	0.26	COAL	Tenas_Lithology.csv
T96R-58	70.49	73.62	3.13	SLTS	Tenas_Lithology.csv
T96R-58	73.62	74.1	0.48	COAL	Tenas_Lithology.csv
T96R-58	74.1	77.5	3.4	SLTS	Tenas_Lithology.csv
T96R-58	77.5	77.8	0.3	COAL	Tenas_Lithology.csv
T96R-58	77.8	79.03	1.23	MDST	Tenas_Lithology.csv
T96R-58	79.03	79.3	0.27	COAL	Tenas_Lithology.csv
T96R-58	79.3	79.9	0.6	SLTS	Tenas_Lithology.csv
T96R-59	0	21	21	Overburden	Tenas_Lithology.csv
T96R-59	21	26.57	5.57	MDST	Tenas_Lithology.csv
T96R-59	26.57	27.68	1.11	COAL	Tenas_Lithology.csv
T96R-59	27.68	29.24	1.56	MDST	Tenas_Lithology.csv
T96R-59	29.24	29.81	0.57	COAL	Tenas_Lithology.csv
T96R-59	29.81	36.28	6.47	SLTS	Tenas_Lithology.csv
T96R-59	36.28	36.92	0.64	COAL	Tenas_Lithology.csv
T96R-59	36.92	54.5	17.58	SST	Tenas_Lithology.csv
T96R-59	54.5	59	4.5	CGL	Tenas_Lithology.csv
T96R-59	59	61	2	SST	Tenas_Lithology.csv
T96R-59	61	62.7	1.7	MDST	Tenas_Lithology.csv
T96R-59	62.7	64.5	1.8	CGL	Tenas_Lithology.csv
T96R-59	64.5	73.6	9.1	SST	Tenas_Lithology.csv
T96R-60	0	0.9	0.9	Overburden	Tenas_Lithology.csv
T96R-60	0.9	7	6.1	SLTS	Tenas_Lithology.csv
T96R-60	7	7.23	0.23	COAL	Tenas_Lithology.csv
T96R-60	7.23	7.66	0.43	MDST	Tenas_Lithology.csv
T96R-60	7.66	13.18	5.52	COAL	Tenas_Lithology.csv
T96R-60	13.18	14.07	0.89	MDST	Tenas_Lithology.csv
T96R-60	14.07	14.78	0.71	COAL	Tenas_Lithology.csv
T96R-60	14.78	15.64	0.86	MDST	Tenas_Lithology.csv
T96R-60	15.64	16.11	0.47	COAL	Tenas_Lithology.csv
T96R-60	16.11	17.4	1.29	SLTS	Tenas_Lithology.csv
T96R-60	17.4	17.6	0.2	COAL	Tenas_Lithology.csv
T96R-60	17.6	18.1	0.5	MDST	Tenas_Lithology.csv
T96R-60	18.1	18.3	0.2	COAL	Tenas_Lithology.csv
T96R-60	18.3	22.28	3.98	MDST	Tenas_Lithology.csv
T96R-60	22.28	22.55	0.27	COAL	Tenas_Lithology.csv
T96R-60	22.55	22.81	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-60	22.81	23	0.19	COAL	Tenas_Lithology.csv
T96R-60	23	23.95	0.95	MDST	Tenas_Lithology.csv
T96R-60	23.95	24.36	0.41	COAL	Tenas_Lithology.csv
T96R-60	24.36	30.68	6.32	SLTS	Tenas_Lithology.csv
T96R-60	30.68	30.93	0.25	COAL	Tenas_Lithology.csv
T96R-60	30.93	34	3.07	MDST	Tenas_Lithology.csv
T96R-60	34	49.2	15.2	SST	Tenas_Lithology.csv
T96R-61	0	6.5	6.5	Overburden	Tenas_Lithology.csv
T96R-61	6.5	42.5	36	SLTS	Tenas_Lithology.csv
T96R-61	42.5	53.65	11.15	SST	Tenas_Lithology.csv
T96R-61	53.65	53.93	0.28	COAL	Tenas_Lithology.csv
T96R-61	53.93	57.19	3.26	SST	Tenas_Lithology.csv
T96R-61	57.19	57.29	0.1	COAL	Tenas_Lithology.csv
T96R-61	57.29	58.07	0.78	MDST	Tenas_Lithology.csv
T96R-61	58.07	58.36	0.29	COAL	Tenas_Lithology.csv
T96R-61	58.36	63.94	5.58	SLTS	Tenas_Lithology.csv
T96R-61	63.94	65.41	1.47	COAL	Tenas_Lithology.csv
T96R-61	65.41	73.3	7.89	SLTS	Tenas_Lithology.csv
T96R-61	73.3	73.61	0.31	COAL	Tenas_Lithology.csv
T96R-61	73.61	80.34	6.73	SLTS	Tenas_Lithology.csv
T96R-61	80.34	83.99	3.65	COAL	Tenas_Lithology.csv
T96R-61	83.99	84.05	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-61	84.05	86.03	1.98	COAL	Tenas_Lithology.csv
T96R-61	86.03	88.71	2.68	MDST	Tenas_Lithology.csv
T96R-61	88.71	88.95	0.24	COAL	Tenas_Lithology.csv
T96R-61	88.95	89.28	0.33	MDST	Tenas_Lithology.csv
T96R-61	89.28	90.26	0.98	COAL	Tenas_Lithology.csv
T96R-61	90.26	90.68	0.42	MDST	Tenas_Lithology.csv
T96R-61	90.68	91.16	0.48	COAL	Tenas_Lithology.csv
T96R-61	91.16	95.18	4.02	SLTS	Tenas_Lithology.csv
T96R-61	95.18	95.48	0.3	COAL	Tenas_Lithology.csv
T96R-61	95.48	96.82	1.34	SLTS	Tenas_Lithology.csv
T96R-61	96.82	97.35	0.53	COAL	Tenas_Lithology.csv
T96R-61	97.35	101.3	3.95	SST	Tenas_Lithology.csv
T96R-61	101.3	106.38	5.08	SLTS	Tenas_Lithology.csv
T96R-61	106.38	106.65	0.27	COAL	Tenas_Lithology.csv
T96R-61	106.65	109.7	3.05	SLTS	Tenas_Lithology.csv
T96R-63	0	3	3	Overburden	Tenas_Lithology.csv
T96R-63	3	24.71	21.71	SLTS	Tenas_Lithology.csv
T96R-63	24.71	24.96	0.25	COAL	Tenas_Lithology.csv
T96R-63	24.96	30.81	5.85	SLTS	Tenas_Lithology.csv
T96R-63	30.81	31	0.19	COAL	Tenas_Lithology.csv
T96R-63	31	34.61	3.61	SLTS	Tenas_Lithology.csv
T96R-63	34.61	35.92	1.31	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-63	35.92	42.9	6.98	SLTS	Tenas_Lithology.csv
T96R-63	42.9	43.1	0.2	COAL	Tenas_Lithology.csv
T96R-63	43.1	46.14	3.04	SLTS	Tenas_Lithology.csv
T96R-63	46.14	47.77	1.63	COAL	Tenas_Lithology.csv
T96R-63	47.77	48.04	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-63	48.04	51.36	3.32	COAL	Tenas_Lithology.csv
T96R-63	51.36	51.96	0.6	MDST	Tenas_Lithology.csv
T96R-63	51.96	52.2	0.24	COAL	Tenas_Lithology.csv
T96R-63	52.2	52.36	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-63	52.36	52.68	0.32	COAL	Tenas_Lithology.csv
T96R-63	52.68	55.31	2.63	SLTS	Tenas_Lithology.csv
T96R-63	55.31	55.5	0.19	COAL	Tenas_Lithology.csv
T96R-63	55.5	59.31	3.81	SST	Tenas_Lithology.csv
T96R-63	59.31	59.53	0.22	COAL	Tenas_Lithology.csv
T96R-63	59.53	65.42	5.89	SST	Tenas_Lithology.csv
T96R-63	65.42	65.81	0.39	COAL	Tenas_Lithology.csv
T96R-63	65.81	79.6	13.79	SST	Tenas_Lithology.csv
T96R-64	0	22.43	22.43	Overburden	Tenas_Lithology.csv
T96R-64	22.43	81.13	58.7	SST	Tenas_Lithology.csv
T96R-64	81.13	82.67	1.54	SLTS	Tenas_Lithology.csv
T96R-64	82.67	82.97	0.3	COAL	Tenas_Lithology.csv
T96R-64	82.97	87.16	4.19	SLTS	Tenas_Lithology.csv
T96R-64	87.16	87.9	0.74	COAL	Tenas_Lithology.csv
T96R-64	87.9	92.58	4.68	SLTS	Tenas_Lithology.csv
T96R-64	92.58	92.8	0.22	COAL	Tenas_Lithology.csv
T96R-64	92.8	95.32	2.52	MDST	Tenas_Lithology.csv
T96R-64	95.32	96.76	1.44	COAL	Tenas_Lithology.csv
T96R-64	96.76	104.89	8.13	SST	Tenas_Lithology.csv
T96R-64	104.89	105.15	0.26	COAL	Tenas_Lithology.csv
T96R-64	105.15	111.15	6	SST	Tenas_Lithology.csv
T96R-64	111.15	118.69	7.54	COAL	Tenas_Lithology.csv
T96R-64	118.69	119.2	0.51	MDST	Tenas_Lithology.csv
T96R-64	119.2	119.6	0.4	COAL	Tenas_Lithology.csv
T96R-64	119.6	121.42	1.82	MDST	Tenas_Lithology.csv
T96R-64	121.42	122.2	0.78	COAL	Tenas_Lithology.csv
T96R-64	122.2	122.32	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-64	122.32	122.53	0.21	COAL	Tenas_Lithology.csv
T96R-64	122.53	123.28	0.75	MDST	Tenas_Lithology.csv
T96R-64	123.28	123.48	0.2	COAL	Tenas_Lithology.csv
T96R-64	123.48	128.2	4.72	SLTS	Tenas_Lithology.csv
T96R-64	128.2	128.82	0.62	COAL	Tenas_Lithology.csv
T96R-64	128.82	130.54	1.72	MDST	Tenas_Lithology.csv
T96R-64	130.54	130.7	0.16	COAL	Tenas_Lithology.csv
T96R-64	130.7	130.82	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-64	130.82	131.1	0.28	COAL	Tenas_Lithology.csv
T96R-64	131.1	134.73	3.63	MDST	Tenas_Lithology.csv
T96R-64	134.73	134.81	0.08	COAL	Tenas_Lithology.csv
T96R-64	134.81	138	3.19	SLTS	Tenas_Lithology.csv
T96R-64	138	138.36	0.36	COAL	Tenas_Lithology.csv
T96R-64	138.36	140.4	2.04	SLTS	Tenas_Lithology.csv
T96R-65C	0	18.3	18.3	Overburden	Tenas_Lithology.csv
T96R-65C	18.3	21.12	2.82	MDST	Tenas_Lithology.csv
T96R-65C	21.12	44.16	23.04	SLTS	Tenas_Lithology.csv
T96R-65C	44.16	53.2	9.04	MDST	Tenas_Lithology.csv
T96R-65C	53.2	55.96	2.76	SLTS	Tenas_Lithology.csv
T96R-65C	55.96	56.46	0.5	MDST	Tenas_Lithology.csv
T96R-65C	56.46	56.56	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-65C	56.56	61.98	5.42	MDST	Tenas_Lithology.csv
T96R-65C	61.98	64.09	2.11	COAL	Tenas_Lithology.csv
T96R-65C	64.09	65.72	1.63	MDST	Tenas_Lithology.csv
T96R-65C	65.72	83.38	17.66	SLTS	Tenas_Lithology.csv
T96R-65C	83.38	86.32	2.94	COAL	Tenas_Lithology.csv
T96R-65C	86.32	86.48	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-65C	86.48	92.34	5.86	COAL	Tenas_Lithology.csv
T96R-65C	92.34	98.86	6.52	MDST	Tenas_Lithology.csv
T96R-65C	98.86	100.16	1.3	SST	Tenas_Lithology.csv
T96R-65C	100.16	100.46	0.3	COAL	Tenas_Lithology.csv
T96R-65C	100.46	101.17	0.71	MDST	Tenas_Lithology.csv
T96R-65C	101.17	102.51	1.34	COAL	Tenas_Lithology.csv
T96R-65C	102.51	105.3	2.79	MDST	Tenas_Lithology.csv
T96R-65C	105.3	105.48	0.18	COAL	Tenas_Lithology.csv
T96R-65C	105.48	109.9	4.42	MDST	Tenas_Lithology.csv
T96R-65C	109.9	110.27	0.37	COAL	Tenas_Lithology.csv
T96R-65C	110.27	110.4	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-65C	110.4	110.86	0.46	COAL	Tenas_Lithology.csv
T96R-65C	110.86	111.1	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-65C	111.1	111.43	0.33	COAL	Tenas_Lithology.csv
T96R-65C	111.43	112.65	1.22	MDST	Tenas_Lithology.csv
T96R-65C	112.65	113.03	0.38	COAL	Tenas_Lithology.csv
T96R-65C	113.03	113.33	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-65C	113.33	113.69	0.36	COAL	Tenas_Lithology.csv
T96R-65C	113.69	121.6	7.91	SLTS	Tenas_Lithology.csv
T96R-65C	121.6	122.18	0.58	MDST	Tenas_Lithology.csv
T96R-67	0	1.2	1.2	Overburden	Tenas_Lithology.csv
T96R-67	1.2	21.5	20.3	SLTS	Tenas_Lithology.csv
T96R-67	21.5	81.7	60.2	SST	Tenas_Lithology.csv
T96R-67	81.7	83.24	1.54	COAL	Tenas_Lithology.csv
T96R-67	83.24	102.51	19.27	SLTS	Tenas_Lithology.csv
T96R-67	102.51	108.66	6.15	COAL	Tenas_Lithology.csv
T96R-67	108.66	111.73	3.07	MDST	Tenas_Lithology.csv
T96R-67	111.73	112.04	0.31	COAL	Tenas_Lithology.csv
T96R-67	112.04	112.17	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-67	112.17	112.54	0.37	COAL	Tenas_Lithology.csv
T96R-67	112.54	112.72	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-67	112.72	113.4	0.68	COAL	Tenas_Lithology.csv
T96R-67	113.4	114.9	1.5	MDST	Tenas_Lithology.csv
T96R-67	114.9	115.27	0.37	COAL	Tenas_Lithology.csv
T96R-67	115.27	119.99	4.72	SLTS	Tenas_Lithology.csv
T96R-67	119.99	120.08	0.09	COAL	Tenas_Lithology.csv
T96R-67	120.08	121.61	1.53	MDST	Tenas_Lithology.csv
T96R-67	121.61	122.2	0.59	COAL	Tenas_Lithology.csv
T96R-67	122.2	126.84	4.64	SLTS	Tenas_Lithology.csv
T96R-67	126.84	127.14	0.3	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-67	127.14	129.16	2.02	SST	Tenas_Lithology.csv
T96R-67	129.16	129.45	0.29	COAL	Tenas_Lithology.csv
T96R-67	129.45	134.5	5.05	SST	Tenas_Lithology.csv
T96R-69	0	2.5	2.5	Overburden	Tenas_Lithology.csv
T96R-69	2.5	34.6	32.1	SLTS	Tenas_Lithology.csv
T96R-69	34.6	44.3	9.7	SST	Tenas_Lithology.csv
T96R-69	44.3	53	8.7	SLTS	Tenas_Lithology.csv
T96R-69	53	59.5	6.5	SST	Tenas_Lithology.csv
T96R-69	59.5	74.8	15.3	SLTS	Tenas_Lithology.csv
T96R-69	74.8	75	0.2	COAL	Tenas_Lithology.csv
T96R-69	75	78.05	3.05	SLTS	Tenas_Lithology.csv
T96R-69	78.05	80	1.95	COAL	Tenas_Lithology.csv
T96R-69	80	80.3	0.3	MDST	Tenas_Lithology.csv
T96R-69	80.3	83.76	3.46	COAL	Tenas_Lithology.csv
T96R-69	83.76	86.2	2.44	MDST	Tenas_Lithology.csv
T96R-69	86.2	86.48	0.28	COAL	Tenas_Lithology.csv
T96R-69	86.48	90.85	4.37	SLTS	Tenas_Lithology.csv
T96R-69	90.85	91	0.15	COAL	Tenas_Lithology.csv
T96R-69	91	100.81	9.81	SLTS	Tenas_Lithology.csv
T96R-69	100.81	100.94	0.13	COAL	Tenas_Lithology.csv
T96R-69	100.94	103.44	2.5	SLTS	Tenas_Lithology.csv
T96R-69	103.44	103.57	0.13	COAL	Tenas_Lithology.csv
T96R-69	103.57	114.35	10.78	SLTS	Tenas_Lithology.csv
T96R-69	114.35	114.45	0.1	COAL	Tenas_Lithology.csv
T96R-69	114.45	115.6	1.15	SLTS	Tenas_Lithology.csv
T96R-70	0	15	15	Overburden	Tenas_Lithology.csv
T96R-70	15	44.5	29.5	SST	Tenas_Lithology.csv
T96R-70	44.5	48	3.5	SLTS	Tenas_Lithology.csv
T96R-70	48	75	27	SST	Tenas_Lithology.csv
T96R-70	75	81.89	6.89	SLTS	Tenas_Lithology.csv
T96R-70	81.89	82.23	0.34	COAL	Tenas_Lithology.csv
T96R-70	82.23	85.63	3.4	SLTS	Tenas_Lithology.csv
T96R-70	85.63	86.38	0.75	COAL	Tenas_Lithology.csv
T96R-70	86.38	93.26	6.88	SST	Tenas_Lithology.csv
T96R-70	93.26	94.95	1.69	COAL	Tenas_Lithology.csv
T96R-70	94.95	113.22	18.27	SLTS	Tenas_Lithology.csv
T96R-70	113.22	117.27	4.05	COAL	Tenas_Lithology.csv
T96R-70	117.27	117.33	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-70	117.33	121.01	3.68	COAL	Tenas_Lithology.csv
T96R-70	121.01	123.31	2.3	MDST	Tenas_Lithology.csv
T96R-70	123.31	123.5	0.19	COAL	Tenas_Lithology.csv
T96R-70	123.5	129.87	6.37	SLTS	Tenas_Lithology.csv
T96R-70	129.87	130.07	0.2	COAL	Tenas_Lithology.csv
T96R-70	130.07	130.18	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-70	130.18	130.93	0.75	COAL	Tenas_Lithology.csv
T96R-70	130.93	133.2	2.27	SLTS	Tenas_Lithology.csv
T96R-70	133.2	133.4	0.2	COAL	Tenas_Lithology.csv
T96R-70	133.4	133.6	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-70	133.6	133.9	0.3	COAL	Tenas_Lithology.csv
T96R-70	133.9	134.7	0.8	MDST	Tenas_Lithology.csv
T96R-70	134.7	135	0.3	COAL	Tenas_Lithology.csv
T96R-70	135	136.8	1.8	SLTS	Tenas_Lithology.csv
T96R-70	136.8	137	0.2	COAL	Tenas_Lithology.csv
T96R-70	137	141.1	4.1	MDST	Tenas_Lithology.csv
T96R-70	141.1	141.4	0.3	COAL	Tenas_Lithology.csv
T96R-70	141.4	146.6	5.2	SST	Tenas_Lithology.csv
T96R-72	0	7	7	Overburden	Tenas_Lithology.csv
T96R-72	7	31	24	SLTS	Tenas_Lithology.csv
T96R-72	31	48	17	MDST	Tenas_Lithology.csv
T96R-72	48	59	11	SST	Tenas_Lithology.csv
T96R-72	59	100	41	SLTS	Tenas_Lithology.csv
T96R-72	100	138	38	SST	Tenas_Lithology.csv
T96R-72	138	145.77	7.77	SLTS	Tenas_Lithology.csv
T96R-72	145.77	146.01	0.24	COAL	Tenas_Lithology.csv
T96R-72	146.01	148.36	2.35	SLTS	Tenas_Lithology.csv
T96R-72	148.36	157	8.64	MDST	Tenas_Lithology.csv
T96R-72	157	168	11	SLTS	Tenas_Lithology.csv
T96R-72	168	178	10	SST	Tenas_Lithology.csv
T96R-72	178	182.8	4.8	SLTS	Tenas_Lithology.csv
T96R-73	0	7.8	7.8	Overburden	Tenas_Lithology.csv
T96R-73	7.8	15	7.2	SLTS	Tenas_Lithology.csv
T96R-73	15	20.6	5.6	SST	Tenas_Lithology.csv
T96R-73	20.6	33	12.4	SLTS	Tenas_Lithology.csv
T96R-73	33	105.83	72.83	SST	Tenas_Lithology.csv
T96R-73	105.83	106.36	0.53	COAL	Tenas_Lithology.csv
T96R-73	106.36	106.43	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-73	106.43	109.83	3.4	COAL	Tenas_Lithology.csv
T96R-73	109.83	110.2	0.37	MDST	Tenas_Lithology.csv
T96R-73	110.2	113.06	2.86	COAL	Tenas_Lithology.csv
T96R-73	113.06	114.5	1.44	MDST	Tenas_Lithology.csv
T96R-73	114.5	115.6	1.1	SLTS	Tenas_Lithology.csv
T96R-73	115.6	119.29	3.69	MDST	Tenas_Lithology.csv
T96R-73	119.29	119.6	0.31	COAL	Tenas_Lithology.csv
T96R-73	119.6	119.91	0.31	MDST	Tenas_Lithology.csv
T96R-73	119.91	120.27	0.36	COAL	Tenas_Lithology.csv
T96R-73	120.27	121.02	0.75	SLTS	Tenas_Lithology.csv
T96R-73	121.02	121.76	0.74	COAL	Tenas_Lithology.csv
T96R-73	121.76	125.79	4.03	MDST	Tenas_Lithology.csv
T96R-73	125.79	126.03	0.24	COAL	Tenas_Lithology.csv
T96R-73	126.03	126.62	0.59	MDST	Tenas_Lithology.csv
T96R-73	126.62	127.18	0.56	COAL	Tenas_Lithology.csv
T96R-73	127.18	133.57	6.39	SST	Tenas_Lithology.csv
T96R-73	133.57	133.77	0.2	COAL	Tenas_Lithology.csv
T96R-73	133.77	134.5	0.73	SST	Tenas_Lithology.csv
T96R-75	0	14.5	14.5	Overburden	Tenas_Lithology.csv
T96R-75	14.5	30.16	15.66	SST	Tenas_Lithology.csv
T96R-75	30.16	36.28	6.12	COAL	Tenas_Lithology.csv
T96R-75	36.28	39.47	3.19	MDST	Tenas_Lithology.csv
T96R-75	39.47	40.4	0.93	COAL	Tenas_Lithology.csv
T96R-75	40.4	40.68	0.28	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-75	40.68	41.61	0.93	COAL	Tenas_Lithology.csv
T96R-75	41.61	51.77	10.16	SLTS	Tenas_Lithology.csv
T96R-75	51.77	53.23	1.46	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-75	53.23	58.16	4.93	SLTS	Tenas_Lithology.csv
T96R-75	58.16	58.84	0.68	COAL	Tenas_Lithology.csv
T96R-75	58.84	63.05	4.21	SLTS	Tenas_Lithology.csv
T96R-75	63.05	63.68	0.63	COAL	Tenas_Lithology.csv
T96R-75	63.68	67.6	3.92	SST	Tenas_Lithology.csv
T96R-76	0	0.02	0.02	Overburden	Tenas_Lithology.csv
T96R-76	0.02	1.23	1.21	SLTS	Tenas_Lithology.csv
T96R-76	1.23	2.85	1.62	COAL	Tenas_Lithology.csv
T96R-76	2.85	3.26	0.41	MDST	Tenas_Lithology.csv
T96R-76	3.26	6.75	3.49	COAL	Tenas_Lithology.csv
T96R-76	6.75	8.24	1.49	SLTS	Tenas_Lithology.csv
T96R-76	8.24	8.76	0.52	COAL	Tenas_Lithology.csv
T96R-76	8.76	17.9	9.14	SLTS	Tenas_Lithology.csv
T96R-77	0	7	7	Overburden	Tenas_Lithology.csv
T96R-77	7	43	36	SLTS	Tenas_Lithology.csv
T96R-77	43	50	7	MDST	Tenas_Lithology.csv
T96R-77	50	54.5	4.5	SST	Tenas_Lithology.csv
T96R-77	54.5	60	5.5	MDST	Tenas_Lithology.csv
T96R-77	60	127.29	67.29	SST	Tenas_Lithology.csv
T96R-77	127.29	127.51	0.22	COAL	Tenas_Lithology.csv
T96R-77	127.51	131.4	3.89	SLTS	Tenas_Lithology.csv
T96R-77	131.4	133.26	1.86	COAL	Tenas_Lithology.csv
T96R-77	133.26	133.93	0.67	MDST	Tenas_Lithology.csv
T96R-77	133.93	134.03	0.1	COAL	Tenas_Lithology.csv
T96R-77	134.03	134.24	0.21	MDST	Tenas_Lithology.csv
T96R-77	134.24	137.93	3.69	COAL	Tenas_Lithology.csv
T96R-77	137.93	140.25	2.32	MDST	Tenas_Lithology.csv
T96R-77	140.25	140.6	0.35	COAL	Tenas_Lithology.csv
T96R-77	140.6	164.7	24.1	SST	Tenas_Lithology.csv
T96R-78	0	3	3	Overburden	Tenas_Lithology.csv
T96R-78	3	6.4	3.4	SST	Tenas_Lithology.csv
T96R-78	6.4	33.25	26.85	SLTS	Tenas_Lithology.csv
T96R-78	33.25	36.3	3.05	SST	Tenas_Lithology.csv
T96R-78	36.3	38.1	1.8	SLTS	Tenas_Lithology.csv
T96R-78	38.1	41.4	3.3	MDST	Tenas_Lithology.csv
T96R-78	41.4	43.6	2.2	SLTS	Tenas_Lithology.csv
T96R-78	43.6	44.9	1.3	MDST	Tenas_Lithology.csv
T96R-78	44.9	45.08	0.18	COAL	Tenas_Lithology.csv
T96R-78	45.08	49.56	4.48	MDST	Tenas_Lithology.csv
T96R-78	49.56	49.8	0.24	COAL	Tenas_Lithology.csv
T96R-78	49.8	49.94	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-78	49.94	50.28	0.34	COAL	Tenas_Lithology.csv
T96R-78	50.28	53.26	2.98	SLTS	Tenas_Lithology.csv
T96R-78	53.26	54.45	1.19	COAL	Tenas_Lithology.csv
T96R-78	54.45	54.57	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-78	54.57	55.26	0.69	COAL	Tenas_Lithology.csv
T96R-78	55.26	67.43	12.17	SLTS	Tenas_Lithology.csv
T96R-78	67.43	69.51	2.08	COAL	Tenas_Lithology.csv
T96R-78	69.51	73.1	3.59	SLTS	Tenas_Lithology.csv
T96R-78	73.1	75.42	2.32	COAL	Tenas_Lithology.csv
T96R-78	75.42	76.47	1.05	MDST	Tenas_Lithology.csv
T96R-78	76.47	76.66	0.19	COAL	Tenas_Lithology.csv
T96R-78	76.66	76.8	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-78	76.8	77.1	0.3	COAL	Tenas_Lithology.csv
T96R-78	77.1	77.4	0.3	MDST	Tenas_Lithology.csv
T96R-78	77.4	77.66	0.26	COAL	Tenas_Lithology.csv
T96R-78	77.66	78.02	0.36	MDST	Tenas_Lithology.csv
T96R-78	78.02	78.07	0.05	COAL	Tenas_Lithology.csv
T96R-78	78.07	80.17	2.1	MDST	Tenas_Lithology.csv
T96R-78	80.17	80.42	0.25	COAL	Tenas_Lithology.csv
T96R-78	80.42	83.22	2.8	MDST	Tenas_Lithology.csv
T96R-78	83.22	83.29	0.07	COAL	Tenas_Lithology.csv
T96R-78	83.29	84.77	1.48	MDST	Tenas_Lithology.csv
T96R-78	84.77	84.93	0.16	COAL	Tenas_Lithology.csv
T96R-78	84.93	87.8	2.87	SLTS	Tenas_Lithology.csv
T96R-78	87.8	96.6	8.8	SST	Tenas_Lithology.csv
T96R-78	96.6	103.1	6.5	VOLC	Tenas_Lithology.csv
T96R-79	0	15	15	Overburden	Tenas_Lithology.csv
T96R-79	15	29.52	14.52	SST	Tenas_Lithology.csv
T96R-79	29.52	29.83	0.31	COAL	Tenas_Lithology.csv
T96R-79	29.83	32.79	2.96	SLTS	Tenas_Lithology.csv
T96R-79	32.79	33	0.21	COAL	Tenas_Lithology.csv
T96R-79	33	43.84	10.84	SLTS	Tenas_Lithology.csv
T96R-79	43.84	44.71	0.87	COAL	Tenas_Lithology.csv
T96R-79	44.71	47	2.29	SLTS	Tenas_Lithology.csv
T96R-79	47	73.5	26.5	SST	Tenas_Lithology.csv
T96R-82	0	10	10	Overburden	Tenas_Lithology.csv
T96R-82	10	23	13	SLTS	Tenas_Lithology.csv
T96R-82	23	34	11	SST	Tenas_Lithology.csv
T96R-82	34	37.04	3.04	SLTS	Tenas_Lithology.csv
T96R-82	37.04	37.36	0.32	COAL	Tenas_Lithology.csv
T96R-82	37.36	43.23	5.87	SLTS	Tenas_Lithology.csv
T96R-82	43.23	43.6	0.37	COAL	Tenas_Lithology.csv
T96R-82	43.6	49.21	5.61	SLTS	Tenas_Lithology.csv
T96R-82	49.21	50.94	1.73	COAL	Tenas_Lithology.csv
T96R-82	50.94	61.7	10.76	SLTS	Tenas_Lithology.csv
T96R-82	61.7	62	0.3	COAL	Tenas_Lithology.csv
T96R-82	62	68.47	6.47	SLTS	Tenas_Lithology.csv
T96R-82	68.47	71.03	2.56	COAL	Tenas_Lithology.csv
T96R-82	71.03	72.37	1.34	SLTS	Tenas_Lithology.csv
T96R-82	72.37	76.96	4.59	COAL	Tenas_Lithology.csv
T96R-82	76.96	82.21	5.25	MDST	Tenas_Lithology.csv
T96R-82	82.21	82.31	0.1	COAL	Tenas_Lithology.csv
T96R-82	82.31	82.74	0.43	MDST	Tenas_Lithology.csv
T96R-82	82.74	84.02	1.28	COAL	Tenas_Lithology.csv
T96R-82	84.02	85.83	1.81	MDST	Tenas_Lithology.csv
T96R-82	85.83	86.06	0.23	COAL	Tenas_Lithology.csv
T96R-82	86.06	93.12	7.06	SLTS	Tenas_Lithology.csv
T96R-82	93.12	93.6	0.48	COAL	Tenas_Lithology.csv
T96R-82	93.6	95.26	1.66	SLTS	Tenas_Lithology.csv
T96R-82	95.26	95.7	0.44	COAL	Tenas_Lithology.csv
T96R-82	95.7	102.49	6.79	SLTS	Tenas_Lithology.csv
T96R-82	102.49	102.8	0.31	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-82	102.8	104.2	1.4	SLTS	Tenas_Lithology.csv
T96R-83	0	12.92	12.92	Overburden	Tenas_Lithology.csv
T96R-83	12.92	25	12.08	n/a	Tenas_Lithology.csv
T96R-84	0	26.5	26.5	Overburden	Tenas_Lithology.csv
T96R-84	26.5	38.43	11.93	SST	Tenas_Lithology.csv
T96R-84	38.43	38.75	0.32	COAL	Tenas_Lithology.csv
T96R-84	38.75	39.3	0.55	MDST	Tenas_Lithology.csv
T96R-84	39.3	39.69	0.39	COAL	Tenas_Lithology.csv
T96R-84	39.69	40.54	0.85	MDST	Tenas_Lithology.csv
T96R-84	40.54	41.26	0.72	COAL	Tenas_Lithology.csv
T96R-84	41.26	49	7.74	SLTS	Tenas_Lithology.csv
T96R-84	49	52.2	3.2	VOLC	Tenas_Lithology.csv
T96R-86	0	17	17	Overburden	Tenas_Lithology.csv
T96R-86	17	22.53	5.53	MDST	Tenas_Lithology.csv
T96R-86	22.53	23.3	0.77	COAL	Tenas_Lithology.csv
T96R-86	23.3	26.78	3.48	SLTS	Tenas_Lithology.csv
T96R-86	26.78	28.77	1.99	COAL	Tenas_Lithology.csv
T96R-86	28.77	31.62	2.85	SLTS	Tenas_Lithology.csv
T96R-86	31.62	32.27	0.65	COAL	Tenas_Lithology.csv
T96R-86	32.27	32.43	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-86	32.43	35.66	3.23	COAL	Tenas_Lithology.csv
T96R-86	35.66	35.95	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-86	35.95	36.24	0.29	COAL	Tenas_Lithology.csv
T96R-86	36.24	36.45	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-86	36.45	36.74	0.29	COAL	Tenas_Lithology.csv
T96R-86	36.74	37.19	0.45	MDST	Tenas_Lithology.csv
T96R-86	37.19	37.75	0.56	COAL	Tenas_Lithology.csv
T96R-86	37.75	40.8	3.05	MDST	Tenas_Lithology.csv
T96R-86	40.8	43	2.2	SST	Tenas_Lithology.csv
T96R-86	43	46.23	3.23	MDST	Tenas_Lithology.csv
T96R-86	46.23	46.42	0.19	COAL	Tenas_Lithology.csv
T96R-86	46.42	46.59	0.17	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-86	46.59	46.78	0.19	COAL	Tenas_Lithology.csv
T96R-86	46.78	48.02	1.24	MDST	Tenas_Lithology.csv
T96R-86	48.02	48.54	0.52	COAL	Tenas_Lithology.csv
T96R-86	48.54	51.54	3	MDST	Tenas_Lithology.csv
T96R-86	51.54	51.76	0.22	COAL	Tenas_Lithology.csv
T96R-86	51.76	53.19	1.43	SLTS	Tenas_Lithology.csv
T96R-86	53.19	53.37	0.18	COAL	Tenas_Lithology.csv
T96R-86	53.37	55.5	2.13	MDST	Tenas_Lithology.csv
T96R-86	55.5	60.9	5.4	SST	Tenas_Lithology.csv
T96R-87	0	18	18	Overburden	Tenas_Lithology.csv
T96R-87	18	26.47	8.47	MDST	Tenas_Lithology.csv
T96R-87	26.47	27.1	0.63	COAL	Tenas_Lithology.csv
T96R-87	27.1	27.92	0.82	SLTS	Tenas_Lithology.csv
T96R-87	27.92	31.74	3.82	COAL	Tenas_Lithology.csv
T96R-87	31.74	37.1	5.36	MDST	Tenas_Lithology.csv
T96R-87	37.1	37.4	0.3	COAL	Tenas_Lithology.csv
T96R-87	37.4	38.18	0.78	MDST	Tenas_Lithology.csv
T96R-87	38.18	38.35	0.17	COAL	Tenas_Lithology.csv
T96R-87	38.35	47.3	8.95	SLTS	Tenas_Lithology.csv
T96R-87	47.3	71.8	24.5	SST	Tenas_Lithology.csv
T96R-91	0	1.8	1.8	Overburden	Tenas_Lithology.csv
T96R-91	1.8	9.1	7.3	SLTS	Tenas_Lithology.csv
T96R-91	9.1	28.6	19.5	SST	Tenas_Lithology.csv
T96R-91	28.6	35.85	7.25	SLTS	Tenas_Lithology.csv
T96R-91	35.85	36.02	0.17	COAL	Tenas_Lithology.csv
T96R-91	36.02	36.99	0.97	MDST	Tenas_Lithology.csv
T96R-91	36.99	37.6	0.61	COAL	Tenas_Lithology.csv
T96R-91	37.6	37.83	0.23	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-91	37.83	38.01	0.18	COAL	Tenas_Lithology.csv
T96R-91	38.01	44.2	6.19	SST	Tenas_Lithology.csv
T96R-91	44.2	44.5	0.3	MDST	Tenas_Lithology.csv
T96R-91	44.5	46.3	1.8	SST	Tenas_Lithology.csv
T96R-91	46.3	46.41	0.11	COAL	Tenas_Lithology.csv
T96R-91	46.41	47.93	1.52	MDST	Tenas_Lithology.csv
T96R-91	47.93	48.04	0.11	COAL	Tenas_Lithology.csv
T96R-91	48.04	48.16	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-91	48.16	48.26	0.1	COAL	Tenas_Lithology.csv
T96R-91	48.26	49.48	1.22	SLTS	Tenas_Lithology.csv
T96R-91	49.48	49.81	0.33	COAL	Tenas_Lithology.csv
T96R-91	49.81	53.88	4.07	SST	Tenas_Lithology.csv
T96R-91	53.88	54.03	0.15	COAL	Tenas_Lithology.csv
T96R-91	54.03	56.23	2.2	SLTS	Tenas_Lithology.csv
T96R-91	56.23	56.4	0.17	COAL	Tenas_Lithology.csv
T96R-91	56.4	59.4	3	SST	Tenas_Lithology.csv
T96R-91	59.4	65.5	6.1	MDST	Tenas_Lithology.csv
T96R-91	65.5	76.2	10.7	SST	Tenas_Lithology.csv
T96R-92	0	23.8	23.8	Overburden	Tenas_Lithology.csv
T96R-92	23.8	24.74	0.94	MDST	Tenas_Lithology.csv
T96R-92	24.74	30.3	5.56	COAL	Tenas_Lithology.csv
T96R-92	30.3	34.93	4.63	MDST	Tenas_Lithology.csv
T96R-92	34.93	35.15	0.22	COAL	Tenas_Lithology.csv
T96R-92	35.15	35.31	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-92	35.31	36.9	1.59	COAL	Tenas_Lithology.csv
T96R-92	36.9	38.5	1.6	MDST	Tenas_Lithology.csv
T96R-92	38.5	47.49	8.99	SLTS	Tenas_Lithology.csv
T96R-92	47.49	48.2	0.71	COAL	Tenas_Lithology.csv
T96R-92	48.2	48.75	0.55	SLTS	Tenas_Lithology.csv
T96R-92	48.75	49.44	0.69	COAL	Tenas_Lithology.csv
T96R-92	49.44	51.79	2.35	SLTS	Tenas_Lithology.csv
T96R-92	51.79	52.1	0.31	COAL	Tenas_Lithology.csv
T96R-92	52.1	54.06	1.96	SLTS	Tenas_Lithology.csv
T96R-92	54.06	54.34	0.28	COAL	Tenas_Lithology.csv
T96R-92	54.34	56.76	2.42	SLTS	Tenas_Lithology.csv
T96R-92	56.76	56.85	0.09	COAL	Tenas_Lithology.csv
T96R-92	56.85	61.2	4.35	SLTS	Tenas_Lithology.csv
T96R-92	61.2	79.7	18.5	SST	Tenas_Lithology.csv
T96R-99	0	32.92	32.92	Overburden	Tenas_Lithology.csv
T96R-99	32.92	36.3	3.38	COAL	Tenas_Lithology.csv
T96R-99	36.3	39.66	3.36	MDST	Tenas_Lithology.csv
T96R-99	39.66	39.92	0.26	COAL	Tenas_Lithology.csv
T96R-99	39.92	40.04	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T96R-99	40.04	40.42	0.38	COAL	Tenas_Lithology.csv
T96R-99	40.42	40.6	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T96R-99	40.6	41.23	0.63	COAL	Tenas_Lithology.csv
T96R-99	41.23	42.16	0.93	MDST	Tenas_Lithology.csv
T96R-99	42.16	42.44	0.28	COAL	Tenas_Lithology.csv
T96R-99	42.44	48.02	5.58	MDST	Tenas_Lithology.csv
T96R-99	48.02	48.2	0.18	COAL	Tenas_Lithology.csv
T96R-99	48.2	50.08	1.88	SLTS	Tenas_Lithology.csv
T96R-99	50.08	50.45	0.37	COAL	Tenas_Lithology.csv
T96R-99	50.45	54	3.55	SLTS	Tenas_Lithology.csv
T96R-99	54	55.5	1.5	CGL	Tenas_Lithology.csv
T96R-99	55.5	55.52	0.02	SLTS	Tenas_Lithology.csv
T96R-99	55.52	55.67	0.15	COAL	Tenas_Lithology.csv
T96R-99	55.67	56.9	1.23	SLTS	Tenas_Lithology.csv
T96R-99	56.9	57.1	0.2	COAL	Tenas_Lithology.csv
T96R-99	57.1	79.6	22.5	SST	Tenas_Lithology.csv
T97R-100C	0	3	3	Overburden	Tenas_Lithology.csv
T97R-100C	3	23.42	20.42	SLTS	Tenas_Lithology.csv
T97R-100C	23.42	30.85	7.43	MDST	Tenas_Lithology.csv
T97R-100C	30.85	31.41	0.56	COAL	Tenas_Lithology.csv
T97R-100C	31.41	31.59	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-100C	31.59	35.24	3.65	COAL	Tenas_Lithology.csv
T97R-100C	35.24	35.71	0.47	MDST	Tenas_Lithology.csv
T97R-100C	35.71	36.73	1.02	COAL	Tenas_Lithology.csv
T97R-100C	36.73	38.32	1.59	MDST	Tenas_Lithology.csv
T97R-100C	38.32	39.1	0.78	SLTS	Tenas_Lithology.csv
T97R-100C	39.1	42.68	3.58	SST	Tenas_Lithology.csv
T97R-100C	42.68	46	3.32	MDST	Tenas_Lithology.csv
T97R-101	0	10	10	Overburden	Tenas_Lithology.csv
T97R-101	10	12.9	2.9	SLTS	Tenas_Lithology.csv
T97R-101	12.9	13.5	0.6	COAL	Tenas_Lithology.csv
T97R-101	13.5	22.7	9.2	SLTS	Tenas_Lithology.csv
T97R-101	22.7	28.56	5.86	SST	Tenas_Lithology.csv
T97R-101	28.56	29.63	1.07	COAL	Tenas_Lithology.csv
T97R-101	29.63	39.84	10.21	SLTS	Tenas_Lithology.csv
T97R-101	39.84	40.22	0.38	COAL	Tenas_Lithology.csv
T97R-101	40.22	40.5	0.28	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-101	40.5	41.06	0.56	COAL	Tenas_Lithology.csv
T97R-101	41.06	44.61	3.55	SLTS	Tenas_Lithology.csv
T97R-101	44.61	44.75	0.14	COAL	Tenas_Lithology.csv
T97R-101	44.75	46.05	1.3	MDST	Tenas_Lithology.csv
T97R-101	46.05	46.2	0.15	COAL	Tenas_Lithology.csv
T97R-101	46.2	46.45	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-101	46.45	46.97	0.52	COAL	Tenas_Lithology.csv
T97R-101	46.97	48.72	1.75	MDST	Tenas_Lithology.csv
T97R-101	48.72	48.98	0.26	COAL	Tenas_Lithology.csv
T97R-101	48.98	49.06	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-101	49.06	49.35	0.29	COAL	Tenas_Lithology.csv
T97R-101	49.35	50.24	0.89	MDST	Tenas_Lithology.csv
T97R-101	50.24	50.35	0.11	COAL	Tenas_Lithology.csv
T97R-101	50.35	52.23	1.88	SLTS	Tenas_Lithology.csv
T97R-101	52.23	52.38	0.15	COAL	Tenas_Lithology.csv
T97R-101	52.38	52.44	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-101	52.44	52.71	0.27	COAL	Tenas_Lithology.csv
T97R-101	52.71	54.13	1.42	SLTS	Tenas_Lithology.csv
T97R-101	54.13	54.41	0.28	COAL	Tenas_Lithology.csv
T97R-101	54.41	65.2	10.79	SLTS	Tenas_Lithology.csv
T97R-101	65.2	74.4	9.2	SST	Tenas_Lithology.csv
T97R-102	0	3	3	Overburden	Tenas_Lithology.csv
T97R-102	3	27.3	24.3	SLTS	Tenas_Lithology.csv
T97R-102	27.3	37.7	10.4	SST	Tenas_Lithology.csv
T97R-102	37.7	41.49	3.79	SLTS	Tenas_Lithology.csv
T97R-102	41.49	42.28	0.79	COAL	Tenas_Lithology.csv
T97R-102	42.28	44.52	2.24	SLTS	Tenas_Lithology.csv
T97R-102	44.52	44.81	0.29	COAL	Tenas_Lithology.csv
T97R-102	44.81	45.92	1.11	SLTS	Tenas_Lithology.csv
T97R-102	45.92	46.81	0.89	COAL	Tenas_Lithology.csv
T97R-102	46.81	48.04	1.23	MDST	Tenas_Lithology.csv
T97R-102	48.04	51.45	3.41	COAL	Tenas_Lithology.csv
T97R-102	51.45	51.88	0.43	MDST	Tenas_Lithology.csv
T97R-102	51.88	52.48	0.6	COAL	Tenas_Lithology.csv
T97R-102	52.48	52.71	0.23	MDST	Tenas_Lithology.csv
T97R-102	52.71	53.1	0.39	COAL	Tenas_Lithology.csv
T97R-102	53.1	61	7.9	SLTS	Tenas_Lithology.csv
T97R-103	0	7.5	7.5	Overburden	Tenas_Lithology.csv
T97R-103	7.5	50.8	43.3	SLTS	Tenas_Lithology.csv
T97R-103	50.8	63.6	12.8	MDST	Tenas_Lithology.csv
T97R-103	63.6	70.5	6.9	SLTS	Tenas_Lithology.csv
T97R-103	70.5	81.6	11.1	MDST	Tenas_Lithology.csv
T97R-103	81.6	110.69	29.09	SLTS	Tenas_Lithology.csv
T97R-103	110.69	113.83	3.14	COAL	Tenas_Lithology.csv
T97R-103	113.83	114.36	0.53	MDST	Tenas_Lithology.csv
T97R-103	114.36	115.67	1.31	COAL	Tenas_Lithology.csv
T97R-103	115.67	115.72	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-103	115.72	116.07	0.35	COAL	Tenas_Lithology.csv
T97R-103	116.07	121.88	5.81	SLTS	Tenas_Lithology.csv
T97R-103	121.88	122.79	0.91	COAL	Tenas_Lithology.csv
T97R-103	122.79	123.74	0.95	MDST	Tenas_Lithology.csv
T97R-103	123.74	124.81	1.07	COAL	Tenas_Lithology.csv
T97R-103	124.81	126.04	1.23	MDST	Tenas_Lithology.csv
T97R-103	126.04	128.66	2.62	SLTS	Tenas_Lithology.csv
T97R-103	128.66	129.43	0.77	COAL	Tenas_Lithology.csv
T97R-103	129.43	129.61	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-103	129.61	129.72	0.11	COAL	Tenas_Lithology.csv
T97R-103	129.72	131.14	1.42	SLTS	Tenas_Lithology.csv
T97R-103	131.14	131.45	0.31	COAL	Tenas_Lithology.csv
T97R-103	131.45	135	3.55	SLTS	Tenas_Lithology.csv
T97R-104	0	5	5	Overburden	Tenas_Lithology.csv
T97R-104	5	9.88	4.88	SLTS	Tenas_Lithology.csv
T97R-104	9.88	10.07	0.19	COAL	Tenas_Lithology.csv
T97R-104	10.07	12.68	2.61	MDST	Tenas_Lithology.csv
T97R-104	12.68	13.3	0.62	COAL	Tenas_Lithology.csv
T97R-104	13.3	18.42	5.12	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-104	18.42	18.82	0.4	COAL	Tenas_Lithology.csv
T97R-104	18.82	18.85	0.03	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-104	18.85	19.48	0.63	COAL	Tenas_Lithology.csv
T97R-104	19.48	24.1	4.62	SLTS	Tenas_Lithology.csv
T97R-104	24.1	24.31	0.21	COAL	Tenas_Lithology.csv
T97R-104	24.31	27.73	3.42	MDST	Tenas_Lithology.csv
T97R-104	27.73	29.8	2.07	COAL	Tenas_Lithology.csv
T97R-104	29.8	30.5	0.7	MDST	Tenas_Lithology.csv
T97R-104	30.5	31.17	0.67	COAL	Tenas_Lithology.csv
T97R-104	31.17	36.05	4.88	SLTS	Tenas_Lithology.csv
T97R-104	36.05	36.33	0.28	COAL	Tenas_Lithology.csv
T97R-104	36.33	37.04	0.71	MDST	Tenas_Lithology.csv
T97R-104	37.04	37.88	0.84	COAL	Tenas_Lithology.csv
T97R-104	37.88	41.8	3.92	SLTS	Tenas_Lithology.csv
T97R-105	0	2	2	Overburden	Tenas_Lithology.csv
T97R-105	2	4.7	2.7	SST	Tenas_Lithology.csv
T97R-105	4.7	5	0.3	COAL	Tenas_Lithology.csv
T97R-105	5	6.7	1.7	SLTS	Tenas_Lithology.csv
T97R-105	6.7	8.02	1.32	MDST	Tenas_Lithology.csv
T97R-105	8.02	9.82	1.8	COAL	Tenas_Lithology.csv
T97R-105	9.82	12.88	3.06	SLTS	Tenas_Lithology.csv
T97R-105	12.88	14.97	2.09	COAL	Tenas_Lithology.csv
T97R-105	14.97	15.05	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-105	15.05	16.8	1.75	COAL	Tenas_Lithology.csv
T97R-105	16.8	20.4	3.6	SST	Tenas_Lithology.csv
T97R-105	20.4	24.5	4.1	SLTS	Tenas_Lithology.csv
T97R-105	24.5	25	0.5	COAL	Tenas_Lithology.csv
T97R-105	25	26.15	1.15	SLTS	Tenas_Lithology.csv
T97R-105	26.15	26.6	0.45	COAL	Tenas_Lithology.csv
T97R-105	26.6	31	4.4	SLTS	Tenas_Lithology.csv
T97R-106	0	3.5	3.5	Overburden	Tenas_Lithology.csv
T97R-106	3.5	14.1	10.6	MDST	Tenas_Lithology.csv
T97R-106	14.1	61.4	47.3	SLTS	Tenas_Lithology.csv
T97R-106	61.4	68.4	7	MDST	Tenas_Lithology.csv
T97R-106	68.4	97.4	29	SLTS	Tenas_Lithology.csv
T97R-106	97.4	100.3	2.9	MDST	Tenas_Lithology.csv
T97R-106	100.3	102.8	2.5	SLTS	Tenas_Lithology.csv
T97R-106	102.8	110	7.2	MDST	Tenas_Lithology.csv
T97R-106	110	114.25	4.25	SLTS	Tenas_Lithology.csv
T97R-106	114.25	121.01	6.76	MDST	Tenas_Lithology.csv
T97R-106	121.01	121.25	0.24	COAL	Tenas_Lithology.csv
T97R-106	121.25	122.05	0.8	MDST	Tenas_Lithology.csv
T97R-106	122.05	122.74	0.69	COAL	Tenas_Lithology.csv
T97R-106	122.74	123.59	0.85	MDST	Tenas_Lithology.csv
T97R-106	123.59	123.79	0.2	COAL	Tenas_Lithology.csv
T97R-106	123.79	125.24	1.45	MDST	Tenas_Lithology.csv
T97R-106	125.24	125.44	0.2	COAL	Tenas_Lithology.csv
T97R-106	125.44	127.05	1.61	MDST	Tenas_Lithology.csv
T97R-106	127.05	127.77	0.72	COAL	Tenas_Lithology.csv
T97R-106	127.77	129.11	1.34	MDST	Tenas_Lithology.csv
T97R-106	129.11	129.46	0.35	COAL	Tenas_Lithology.csv
T97R-106	129.46	138.25	8.79	SLTS	Tenas_Lithology.csv
T97R-106	138.25	152.2	13.95	SST	Tenas_Lithology.csv
T97R-107	0	15	15	Overburden	Tenas_Lithology.csv
T97R-107	15	22.3	7.3	SLTS	Tenas_Lithology.csv
T97R-107	22.3	22.8	0.5	SST	Tenas_Lithology.csv
T97R-107	22.8	27.3	4.5	MDST	Tenas_Lithology.csv
T97R-107	27.3	34	6.7	SLTS	Tenas_Lithology.csv
T97R-107	34	35.2	1.2	SST	Tenas_Lithology.csv
T97R-107	35.2	40.9	5.7	SLTS	Tenas_Lithology.csv
T97R-107	40.9	41.6	0.7	SST	Tenas_Lithology.csv
T97R-107	41.6	49.1	7.5	SLTS	Tenas_Lithology.csv
T97R-107	49.1	49.6	0.5	SST	Tenas_Lithology.csv
T97R-107	49.6	61.3	11.7	MDST	Tenas_Lithology.csv
T97R-107	61.3	74.7	13.4	SST	Tenas_Lithology.csv
T97R-107	74.7	89.2	14.5	SLTS	Tenas_Lithology.csv
T97R-107	89.2	90.1	0.9	COAL	Tenas_Lithology.csv
T97R-107	90.1	98.68	8.58	SLTS	Tenas_Lithology.csv
T97R-107	98.68	99.09	0.41	COAL	Tenas_Lithology.csv
T97R-107	99.09	102.13	3.04	SLTS	Tenas_Lithology.csv
T97R-107	102.13	103.85	1.72	COAL	Tenas_Lithology.csv
T97R-107	103.85	103.9	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-107	103.9	105.1	1.2	COAL	Tenas_Lithology.csv
T97R-107	105.1	106.07	0.97	MDST	Tenas_Lithology.csv
T97R-107	106.07	109.16	3.09	COAL	Tenas_Lithology.csv
T97R-107	109.16	112.4	3.24	MDST	Tenas_Lithology.csv
T97R-107	112.4	112.8	0.4	COAL	Tenas_Lithology.csv
T97R-107	112.8	113.1	0.3	MDST	Tenas_Lithology.csv
T97R-107	113.1	113.87	0.77	COAL	Tenas_Lithology.csv
T97R-107	113.87	117.34	3.47	SLTS	Tenas_Lithology.csv
T97R-107	117.34	117.56	0.22	COAL	Tenas_Lithology.csv
T97R-107	117.56	117.72	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-107	117.72	118.23	0.51	COAL	Tenas_Lithology.csv
T97R-107	118.23	118.48	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-107	118.48	118.67	0.19	COAL	Tenas_Lithology.csv
T97R-107	118.67	119.42	0.75	MDST	Tenas_Lithology.csv
T97R-107	119.42	120.32	0.9	COAL	Tenas_Lithology.csv
T97R-107	120.32	124.77	4.45	SLTS	Tenas_Lithology.csv
T97R-107	124.77	124.93	0.16	COAL	Tenas_Lithology.csv
T97R-107	124.93	128	3.07	SLTS	Tenas_Lithology.csv
T97R-108C	0	28.2	28.2	Overburden	Tenas_Lithology.csv
T97R-108C	28.2	45.53	17.33	SLTS	Tenas_Lithology.csv
T97R-108C	45.53	46.6	1.07	MDST	Tenas_Lithology.csv
T97R-108C	46.6	47.98	1.38	COAL	Tenas_Lithology.csv
T97R-108C	47.98	51.38	3.4	MDST	Tenas_Lithology.csv
T97R-108C	51.38	56.61	5.23	SLTS	Tenas_Lithology.csv
T97R-108C	56.61	56.91	0.3	COAL	Tenas_Lithology.csv
T97R-108C	56.91	62.05	5.14	SLTS	Tenas_Lithology.csv
T97R-108C	62.05	62.46	0.41	COAL	Tenas_Lithology.csv
T97R-108C	62.46	62.49	0.03	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-108C	62.49	64.35	1.86	COAL	Tenas_Lithology.csv
T97R-108C	64.35	64.41	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-108C	64.41	64.57	0.16	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-108C	64.57	65.72	1.15	MDST	Tenas_Lithology.csv
T97R-108C	65.72	67.86	2.14	COAL	Tenas_Lithology.csv
T97R-108C	67.86	67.9	0.04	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-108C	67.9	70.2	2.3	COAL	Tenas_Lithology.csv
T97R-108C	70.2	70.7	0.5	MDST	Tenas_Lithology.csv
T97R-108C	70.7	73.5	2.8	SLTS	Tenas_Lithology.csv
T97R-108C	73.5	73.9	0.4	COAL	Tenas_Lithology.csv
T97R-108C	73.9	74.26	0.36	MDST	Tenas_Lithology.csv
T97R-108C	74.26	74.48	0.22	SLTS	Tenas_Lithology.csv
T97R-108C	74.48	75.87	1.39	MDST	Tenas_Lithology.csv
T97R-108C	75.87	76.4	0.53	COAL	Tenas_Lithology.csv
T97R-108C	76.4	76.65	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-108C	76.65	77.1	0.45	COAL	Tenas_Lithology.csv
T97R-108C	77.1	79.1	2	MDST	Tenas_Lithology.csv
T97R-108C	79.1	80.9	1.8	SLTS	Tenas_Lithology.csv
T97R-109	0	8.5	8.5	Overburden	Tenas_Lithology.csv
T97R-109	8.5	16.3	7.8	SLTS	Tenas_Lithology.csv
T97R-109	16.3	27.6	11.3	MDST	Tenas_Lithology.csv
T97R-109	27.6	32.8	5.2	SLTS	Tenas_Lithology.csv
T97R-109	32.8	39.2	6.4	MDST	Tenas_Lithology.csv
T97R-109	39.2	39.8	0.6	SST	Tenas_Lithology.csv
T97R-109	39.8	44.8	5	MDST	Tenas_Lithology.csv
T97R-109	44.8	47.3	2.5	SLTS	Tenas_Lithology.csv
T97R-109	47.3	47.9	0.6	SST	Tenas_Lithology.csv
T97R-109	47.9	62.4	14.5	SLTS	Tenas_Lithology.csv
T97R-109	62.4	63.3	0.9	SST	Tenas_Lithology.csv
T97R-109	63.3	74.2	10.9	SLTS	Tenas_Lithology.csv
T97R-109	74.2	74.6	0.4	SST	Tenas_Lithology.csv
T97R-109	74.6	80.4	5.8	SLTS	Tenas_Lithology.csv
T97R-109	80.4	90.6	10.2	SST	Tenas_Lithology.csv
T97R-109	90.6	92.06	1.46	SLTS	Tenas_Lithology.csv
T97R-109	92.06	92.39	0.33	COAL	Tenas_Lithology.csv
T97R-109	92.39	98.27	5.88	SLTS	Tenas_Lithology.csv
T97R-109	98.27	98.61	0.34	COAL	Tenas_Lithology.csv
T97R-109	98.61	102.19	3.58	SLTS	Tenas_Lithology.csv
T97R-109	102.19	102.42	0.23	COAL	Tenas_Lithology.csv
T97R-109	102.42	104.87	2.45	SLTS	Tenas_Lithology.csv
T97R-109	104.87	106.64	1.77	COAL	Tenas_Lithology.csv
T97R-109	106.64	115.61	8.97	SST	Tenas_Lithology.csv
T97R-109	115.61	115.95	0.34	COAL	Tenas_Lithology.csv
T97R-109	115.95	121.81	5.86	SLTS	Tenas_Lithology.csv
T97R-109	121.81	122.21	0.4	COAL	Tenas_Lithology.csv
T97R-109	122.21	122.33	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-109	122.33	125.52	3.19	COAL	Tenas_Lithology.csv
T97R-109	125.52	126	0.48	MDST	Tenas_Lithology.csv
T97R-109	126	126.25	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-109	126.25	126.67	0.42	MDST	Tenas_Lithology.csv
T97R-109	126.67	129.42	2.75	COAL	Tenas_Lithology.csv
T97R-109	129.42	134.3	4.88	MDST	Tenas_Lithology.csv
T97R-109	134.3	134.67	0.37	COAL	Tenas_Lithology.csv
T97R-109	134.67	134.92	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-109	134.92	136.27	1.35	COAL	Tenas_Lithology.csv
T97R-109	136.27	142.5	6.23	SLTS	Tenas_Lithology.csv
T97R-110	0	8	8	Overburden	Tenas_Lithology.csv
T97R-110	8	27.63	19.63	SLTS	Tenas_Lithology.csv
T97R-110	27.63	27.93	0.3	COAL	Tenas_Lithology.csv
T97R-110	27.93	28.6	0.67	SLTS	Tenas_Lithology.csv
T97R-110	28.6	29.07	0.47	COAL	Tenas_Lithology.csv
T97R-110	29.07	29.14	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-110	29.14	29.29	0.15	COAL	Tenas_Lithology.csv
T97R-110	29.29	37.35	8.06	SLTS	Tenas_Lithology.csv
T97R-110	37.35	38.61	1.26	COAL	Tenas_Lithology.csv
T97R-110	38.61	51.06	12.45	SLTS	Tenas_Lithology.csv
T97R-110	51.06	51.83	0.77	COAL	Tenas_Lithology.csv
T97R-110	51.83	56.15	4.32	SLTS	Tenas_Lithology.csv
T97R-110	56.15	64.74	8.59	COAL	Tenas_Lithology.csv
T97R-110	64.74	68.31	3.57	MDST	Tenas_Lithology.csv
T97R-110	68.31	68.45	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-110	68.45	69.09	0.64	MDST	Tenas_Lithology.csv
T97R-110	69.09	69.65	0.56	COAL	Tenas_Lithology.csv
T97R-110	69.65	70.55	0.9	SLTS	Tenas_Lithology.csv
T97R-110	70.55	70.68	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-110	70.68	70.85	0.17	MDST	Tenas_Lithology.csv
T97R-110	70.85	72.89	2.04	COAL	Tenas_Lithology.csv
T97R-110	72.89	74.59	1.7	SLTS	Tenas_Lithology.csv
T97R-110	74.59	75.84	1.25	COAL	Tenas_Lithology.csv
T97R-110	75.84	78.6	2.76	SLTS	Tenas_Lithology.csv
T97R-111	0	8	8	Overburden	Tenas_Lithology.csv
T97R-111	8	25.1	17.1	MDST	Tenas_Lithology.csv
T97R-111	25.1	36.6	11.5	SLTS	Tenas_Lithology.csv
T97R-111	36.6	51.3	14.7	MDST	Tenas_Lithology.csv
T97R-111	51.3	61.1	9.8	SLTS	Tenas_Lithology.csv
T97R-111	61.1	61.7	0.6	MDST	Tenas_Lithology.csv
T97R-111	61.7	76.15	14.45	SLTS	Tenas_Lithology.csv
T97R-111	76.15	77.33	1.18	COAL	Tenas_Lithology.csv
T97R-111	77.33	87.71	10.38	SLTS	Tenas_Lithology.csv
T97R-111	87.71	88.15	0.44	COAL	Tenas_Lithology.csv
T97R-111	88.15	92.69	4.54	SLTS	Tenas_Lithology.csv
T97R-111	92.69	94.55	1.86	COAL	Tenas_Lithology.csv
T97R-111	94.55	94.6	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-111	94.6	98.58	3.98	COAL	Tenas_Lithology.csv
T97R-111	98.58	101.48	2.9	MDST	Tenas_Lithology.csv
T97R-111	101.48	101.83	0.35	COAL	Tenas_Lithology.csv
T97R-111	101.83	101.98	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-111	101.98	102.28	0.3	COAL	Tenas_Lithology.csv
T97R-111	102.28	104.18	1.9	SLTS	Tenas_Lithology.csv
T97R-111	104.18	104.82	0.64	COAL	Tenas_Lithology.csv
T97R-111	104.82	106.77	1.95	SLTS	Tenas_Lithology.csv
T97R-111	106.77	107.17	0.4	COAL	Tenas_Lithology.csv
T97R-111	107.17	108.6	1.43	SLTS	Tenas_Lithology.csv
T97R-111	108.6	109.8	1.2	MDST	Tenas_Lithology.csv
T97R-111	109.8	113.25	3.45	SLTS	Tenas_Lithology.csv
T97R-111	113.25	113.43	0.18	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-111	113.43	113.47	0.04	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-111	113.47	113.83	0.36	COAL	Tenas_Lithology.csv
T97R-111	113.83	115.27	1.44	SLTS	Tenas_Lithology.csv
T97R-111	115.27	116.19	0.92	COAL	Tenas_Lithology.csv
T97R-111	116.19	117.08	0.89	SLTS	Tenas_Lithology.csv
T97R-111	117.08	117.23	0.15	COAL	Tenas_Lithology.csv
T97R-111	117.23	118.79	1.56	SLTS	Tenas_Lithology.csv
T97R-111	118.79	119	0.21	COAL	Tenas_Lithology.csv
T97R-111	119	119.13	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-111	119.13	119.47	0.34	COAL	Tenas_Lithology.csv
T97R-111	119.47	121.6	2.13	SLTS	Tenas_Lithology.csv
T97R-112	0	5	5	Overburden	Tenas_Lithology.csv
T97R-112	5	13.4	8.4	SLTS	Tenas_Lithology.csv
T97R-112	13.4	29.8	16.4	MDST	Tenas_Lithology.csv
T97R-112	29.8	30.9	1.1	SST	Tenas_Lithology.csv
T97R-112	30.9	54.6	23.7	MDST	Tenas_Lithology.csv
T97R-112	54.6	60.8	6.2	SLTS	Tenas_Lithology.csv
T97R-112	60.8	73.8	13	MDST	Tenas_Lithology.csv
T97R-112	73.8	74.8	1	SST	Tenas_Lithology.csv
T97R-112	74.8	94.2	19.4	MDST	Tenas_Lithology.csv
T97R-112	94.2	107.1	12.9	SLTS	Tenas_Lithology.csv
T97R-112	107.1	108	0.9	SST	Tenas_Lithology.csv
T97R-112	108	131.75	23.75	MDST	Tenas_Lithology.csv
T97R-112	131.75	144.76	13.01	SLTS	Tenas_Lithology.csv
T97R-112	144.76	145.06	0.3	MDST	Tenas_Lithology.csv
T97R-112	145.06	145.56	0.5	COAL	Tenas_Lithology.csv
T97R-112	145.56	149.95	4.39	MDST	Tenas_Lithology.csv
T97R-112	149.95	150.24	0.29	COAL	Tenas_Lithology.csv
T97R-112	150.24	153.19	2.95	SLTS	Tenas_Lithology.csv
T97R-112	153.19	153.45	0.26	COAL	Tenas_Lithology.csv
T97R-112	153.45	156.1	2.65	MDST	Tenas_Lithology.csv
T97R-112	156.1	158.05	1.95	COAL	Tenas_Lithology.csv
T97R-112	158.05	162.77	4.72	SLTS	Tenas_Lithology.csv
T97R-112	162.77	163.25	0.48	COAL	Tenas_Lithology.csv
T97R-112	163.25	165.78	2.53	MDST	Tenas_Lithology.csv
T97R-112	165.78	165.98	0.2	COAL	Tenas_Lithology.csv
T97R-112	165.98	167.91	1.93	SLTS	Tenas_Lithology.csv
T97R-112	167.91	169.98	2.07	MDST	Tenas_Lithology.csv
T97R-112	169.98	170.34	0.36	COAL	Tenas_Lithology.csv
T97R-112	170.34	171.11	0.77	MDST	Tenas_Lithology.csv
T97R-112	171.11	171.32	0.21	COAL	Tenas_Lithology.csv
T97R-112	171.32	174.2	2.88	SST	Tenas_Lithology.csv
T97R-112	174.2	174.67	0.47	COAL	Tenas_Lithology.csv
T97R-112	174.67	182.7	8.03	SST	Tenas_Lithology.csv
T97R-112	182.7	183	0.3	COAL	Tenas_Lithology.csv
T97R-112	183	184.8	1.8	SLTS	Tenas_Lithology.csv
T97R-112	184.8	185.03	0.23	COAL	Tenas_Lithology.csv
T97R-112	185.03	191.75	6.72	SLTS	Tenas_Lithology.csv
T97R-112	191.75	207.3	15.55	SST	Tenas_Lithology.csv
T97R-113	0	4	4	Overburden	Tenas_Lithology.csv
T97R-113	4	71.2	67.2	SLTS	Tenas_Lithology.csv
T97R-113	71.2	75.6	4.4	SST	Tenas_Lithology.csv
T97R-113	75.6	76.4	0.8	MDST	Tenas_Lithology.csv
T97R-113	76.4	85	8.6	SLTS	Tenas_Lithology.csv
T97R-113	85	86.98	1.98	COAL	Tenas_Lithology.csv
T97R-113	86.98	89.8	2.82	SLTS	Tenas_Lithology.csv
T97R-113	89.8	95.81	6.01	SST	Tenas_Lithology.csv
T97R-113	95.81	96.08	0.27	COAL	Tenas_Lithology.csv
T97R-113	96.08	102.2	6.12	SLTS	Tenas_Lithology.csv
T97R-113	102.2	103.7	1.5	COAL	Tenas_Lithology.csv
T97R-113	103.7	104	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-113	104	108.13	4.13	COAL	Tenas_Lithology.csv
T97R-113	108.13	110.88	2.75	MDST	Tenas_Lithology.csv
T97R-113	110.88	111.21	0.33	COAL	Tenas_Lithology.csv
T97R-113	111.21	111.34	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-113	111.34	112.1	0.76	COAL	Tenas_Lithology.csv
T97R-113	112.1	112.4	0.3	MDST	Tenas_Lithology.csv
T97R-113	112.4	113.14	0.74	COAL	Tenas_Lithology.csv
T97R-113	113.14	118.12	4.98	SST	Tenas_Lithology.csv
T97R-113	118.12	122.3	4.18	SLTS	Tenas_Lithology.csv
T97R-114	0	1.8	1.8	Overburden	Tenas_Lithology.csv
T97R-114	1.8	61.8	60	SLTS	Tenas_Lithology.csv
T97R-114	61.8	69.8	8	MDST	Tenas_Lithology.csv
T97R-114	69.8	74.8	5	SLTS	Tenas_Lithology.csv
T97R-114	74.8	81.3	6.5	MDST	Tenas_Lithology.csv
T97R-114	81.3	87.34	6.04	SST	Tenas_Lithology.csv
T97R-114	87.34	87.55	0.21	COAL	Tenas_Lithology.csv
T97R-114	87.55	89.9	2.35	SLTS	Tenas_Lithology.csv
T97R-114	89.9	94.7	4.8	MDST	Tenas_Lithology.csv
T97R-114	94.7	95.05	0.35	COAL	Tenas_Lithology.csv
T97R-114	95.05	95.33	0.28	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-114	95.33	95.84	0.51	COAL	Tenas_Lithology.csv
T97R-114	95.84	103.04	7.2	SST	Tenas_Lithology.csv
T97R-114	103.04	103.2	0.16	COAL	Tenas_Lithology.csv
T97R-114	103.2	105.38	2.18	SLTS	Tenas_Lithology.csv
T97R-114	105.38	105.78	0.4	COAL	Tenas_Lithology.csv
T97R-114	105.78	107.13	1.35	MDST	Tenas_Lithology.csv
T97R-114	107.13	109.28	2.15	SST	Tenas_Lithology.csv
T97R-114	109.28	109.38	0.1	COAL	Tenas_Lithology.csv
T97R-114	109.38	109.46	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-114	109.46	109.71	0.25	COAL	Tenas_Lithology.csv
T97R-114	109.71	123	13.29	SLTS	Tenas_Lithology.csv
T97R-115	0	3	3	Overburden	Tenas_Lithology.csv
T97R-115	3	18.3	15.3	SLTS	Tenas_Lithology.csv
T97R-115	18.3	34.3	16	MDST	Tenas_Lithology.csv
T97R-115	34.3	38.78	4.48	SLTS	Tenas_Lithology.csv
T97R-115	38.78	39.24	0.46	COAL	Tenas_Lithology.csv
T97R-115	39.24	42.13	2.89	SLTS	Tenas_Lithology.csv
T97R-115	42.13	42.82	0.69	COAL	Tenas_Lithology.csv
T97R-115	42.82	46.08	3.26	SLTS	Tenas_Lithology.csv
T97R-115	46.08	47.82	1.74	COAL	Tenas_Lithology.csv
T97R-115	47.82	54.84	7.02	SLTS	Tenas_Lithology.csv
T97R-115	54.84	55.15	0.31	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-115	55.15	58.66	3.51	SLTS	Tenas_Lithology.csv
T97R-115	58.66	60.35	1.69	COAL	Tenas_Lithology.csv
T97R-115	60.35	61.08	0.73	SLTS	Tenas_Lithology.csv
T97R-115	61.08	64.86	3.78	COAL	Tenas_Lithology.csv
T97R-115	64.86	66.64	1.78	MDST	Tenas_Lithology.csv
T97R-115	66.64	67.11	0.47	COAL	Tenas_Lithology.csv
T97R-115	67.11	67.27	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-115	67.27	67.55	0.28	COAL	Tenas_Lithology.csv
T97R-115	67.55	75	7.45	SST	Tenas_Lithology.csv
T97R-116	0	0.8	0.8	Overburden	Tenas_Lithology.csv
T97R-116	0.8	3.5	2.7	MDST	Tenas_Lithology.csv
T97R-116	3.5	80.2	76.7	SLTS	Tenas_Lithology.csv
T97R-116	80.2	87.4	7.2	MDST	Tenas_Lithology.csv
T97R-116	87.4	88.1	0.7	SST	Tenas_Lithology.csv
T97R-116	88.1	100.7	12.6	MDST	Tenas_Lithology.csv
T97R-116	100.7	124.8	24.1	SLTS	Tenas_Lithology.csv
T97R-116	124.8	128.4	3.6	MDST	Tenas_Lithology.csv
T97R-116	128.4	139.25	10.85	SLTS	Tenas_Lithology.csv
T97R-116	139.25	139.5	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-116	139.5	142.18	2.68	SLTS	Tenas_Lithology.csv
T97R-116	142.18	142.33	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-116	142.33	151.4	9.07	SLTS	Tenas_Lithology.csv
T97R-117	0	3	3	Overburden	Tenas_Lithology.csv
T97R-117	3	7	4	SST	Tenas_Lithology.csv
T97R-117	7	48.6	41.6	SLTS	Tenas_Lithology.csv
T97R-117	48.6	69.5	20.9	MDST	Tenas_Lithology.csv
T97R-117	69.5	112.23	42.73	SLTS	Tenas_Lithology.csv
T97R-117	112.23	112.46	0.23	COAL	Tenas_Lithology.csv
T97R-117	112.46	115.2	2.74	SLTS	Tenas_Lithology.csv
T97R-117	115.2	115.79	0.59	COAL	Tenas_Lithology.csv
T97R-117	115.79	117.33	1.54	SLTS	Tenas_Lithology.csv
T97R-117	117.33	117.88	0.55	COAL	Tenas_Lithology.csv
T97R-117	117.88	120.43	2.55	SLTS	Tenas_Lithology.csv
T97R-117	120.43	120.96	0.53	COAL	Tenas_Lithology.csv
T97R-117	120.96	133.3	12.34	SLTS	Tenas_Lithology.csv
T97R-117	133.3	141	7.7	SST	Tenas_Lithology.csv
T97R-118	0	29	29	Overburden	Tenas_Lithology.csv
T97R-118	29	37.86	8.86	SLTS	Tenas_Lithology.csv
T97R-118	37.86	39.17	1.31	COAL	Tenas_Lithology.csv
T97R-118	39.17	39.32	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-118	39.32	40.12	0.8	COAL	Tenas_Lithology.csv
T97R-118	40.12	42.74	2.62	SLTS	Tenas_Lithology.csv
T97R-118	42.74	43.79	1.05	COAL	Tenas_Lithology.csv
T97R-118	43.79	43.89	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-118	43.89	43.98	0.09	COAL	Tenas_Lithology.csv
T97R-118	43.98	44.07	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-118	44.07	44.8	0.73	COAL	Tenas_Lithology.csv
T97R-118	44.8	51.48	6.68	SLTS	Tenas_Lithology.csv
T97R-118	51.48	52.04	0.56	COAL	Tenas_Lithology.csv
T97R-118	52.04	54.04	2	SLTS	Tenas_Lithology.csv
T97R-118	54.04	54.39	0.35	COAL	Tenas_Lithology.csv
T97R-118	54.39	63.8	9.41	SLTS	Tenas_Lithology.csv
T97R-118	63.8	80.8	17	SST	Tenas_Lithology.csv
T97R-118	80.8	91.9	11.1	SLTS	Tenas_Lithology.csv
T97R-119	0	6.3	6.3	Overburden	Tenas_Lithology.csv
T97R-119	6.3	19.1	12.8	MDST	Tenas_Lithology.csv
T97R-119	19.1	23.1	4	SLTS	Tenas_Lithology.csv
T97R-119	23.1	35.3	12.2	MDST	Tenas_Lithology.csv
T97R-119	35.3	42.1	6.8	SLTS	Tenas_Lithology.csv
T97R-119	42.1	58	15.9	MDST	Tenas_Lithology.csv
T97R-119	58	59.2	1.2	SST	Tenas_Lithology.csv
T97R-119	59.2	76.6	17.4	MDST	Tenas_Lithology.csv
T97R-119	76.6	93.8	17.2	SLTS	Tenas_Lithology.csv
T97R-119	93.8	94.6	0.8	MDST	Tenas_Lithology.csv
T97R-119	94.6	94.8	0.2	COAL	Tenas_Lithology.csv
T97R-119	94.8	100.7	5.9	SLTS	Tenas_Lithology.csv
T97R-119	100.7	102.15	1.45	COAL	Tenas_Lithology.csv
T97R-119	102.15	109.17	7.02	SLTS	Tenas_Lithology.csv
T97R-119	109.17	109.43	0.26	COAL	Tenas_Lithology.csv
T97R-119	109.43	112.66	3.23	SLTS	Tenas_Lithology.csv
T97R-119	112.66	114.45	1.79	COAL	Tenas_Lithology.csv
T97R-119	114.45	115.41	0.96	MDST	Tenas_Lithology.csv
T97R-119	115.41	115.52	0.11	COAL	Tenas_Lithology.csv
T97R-119	115.52	115.69	0.17	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-119	115.69	119.16	3.47	COAL	Tenas_Lithology.csv
T97R-119	119.16	120.69	1.53	MDST	Tenas_Lithology.csv
T97R-119	120.69	121.07	0.38	COAL	Tenas_Lithology.csv
T97R-119	121.07	121.18	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-119	121.18	121.33	0.15	COAL	Tenas_Lithology.csv
T97R-119	121.33	126.9	5.57	SST	Tenas_Lithology.csv
T97R-119	126.9	127.44	0.54	COAL	Tenas_Lithology.csv
T97R-119	127.44	133.6	6.16	SST	Tenas_Lithology.csv
T97R-120	0	1.44	1.44	Overburden	Tenas_Lithology.csv
T97R-120	1.44	2	0.56	COAL	Tenas_Lithology.csv
T97R-120	2	3.57	1.57	SLTS	Tenas_Lithology.csv
T97R-120	3.57	5.53	1.96	COAL	Tenas_Lithology.csv
T97R-120	5.53	12.8	7.27	SLTS	Tenas_Lithology.csv
T97R-120	12.8	13.33	0.53	COAL	Tenas_Lithology.csv
T97R-120	13.33	14.13	0.8	MDST	Tenas_Lithology.csv
T97R-120	14.13	14.78	0.65	COAL	Tenas_Lithology.csv
T97R-120	14.78	16.54	1.76	SLTS	Tenas_Lithology.csv
T97R-120	16.54	16.81	0.27	COAL	Tenas_Lithology.csv
T97R-120	16.81	23.54	6.73	SLTS	Tenas_Lithology.csv
T97R-120	23.54	23.78	0.24	COAL	Tenas_Lithology.csv
T97R-120	23.78	24.25	0.47	MDST	Tenas_Lithology.csv
T97R-120	24.25	24.66	0.41	COAL	Tenas_Lithology.csv
T97R-120	24.66	30	5.34	SLTS	Tenas_Lithology.csv
T97R-121	0	3	3	Overburden	Tenas_Lithology.csv
T97R-121	3	19.8	16.8	MDST	Tenas_Lithology.csv
T97R-121	19.8	30.48	10.68	SLTS	Tenas_Lithology.csv
T97R-121	30.48	30.99	0.51	COAL	Tenas_Lithology.csv
T97R-121	30.99	33.83	2.84	SLTS	Tenas_Lithology.csv
T97R-121	33.83	34.04	0.21	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-121	34.04	35.29	1.25	MDST	Tenas_Lithology.csv
T97R-121	35.29	36.48	1.19	COAL	Tenas_Lithology.csv
T97R-121	36.48	44.17	7.69	SLTS	Tenas_Lithology.csv
T97R-121	44.17	46.06	1.89	COAL	Tenas_Lithology.csv
T97R-121	46.06	49.61	3.55	SLTS	Tenas_Lithology.csv
T97R-121	49.61	54.44	4.83	SST	Tenas_Lithology.csv
T97R-121	54.44	54.62	0.18	COAL	Tenas_Lithology.csv
T97R-121	54.62	54.67	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-121	54.67	55.02	0.35	COAL	Tenas_Lithology.csv
T97R-121	55.02	59.35	4.33	SLTS	Tenas_Lithology.csv
T97R-121	59.35	59.8	0.45	COAL	Tenas_Lithology.csv
T97R-121	59.8	60.05	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-121	60.05	60.15	0.1	COAL	Tenas_Lithology.csv
T97R-121	60.15	61.19	1.04	SLTS	Tenas_Lithology.csv
T97R-121	61.19	61.35	0.16	COAL	Tenas_Lithology.csv
T97R-121	61.35	61.41	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-121	61.41	61.98	0.57	COAL	Tenas_Lithology.csv
T97R-121	61.98	67.55	5.57	SST	Tenas_Lithology.csv
T97R-121	67.55	67.94	0.39	COAL	Tenas_Lithology.csv
T97R-121	67.94	78.6	10.66	SLTS	Tenas_Lithology.csv
T97R-65	0	0.85	0.85	Overburden	Tenas_Lithology.csv
T97R-65	0.85	1.49	0.64	COAL	Tenas_Lithology.csv
T97R-65	1.49	4	2.51	SLTS	Tenas_Lithology.csv
T97R-65	4	4.3	0.3	COAL	Tenas_Lithology.csv
T97R-65	4.3	7.3	3	MDST	Tenas_Lithology.csv
T97R-65	7.3	11.46	4.16	SST	Tenas_Lithology.csv
T97R-65	11.46	12.04	0.58	COAL	Tenas_Lithology.csv
T97R-65	12.04	12.75	0.71	MDST	Tenas_Lithology.csv
T97R-65	12.75	12.85	0.1	COAL	Tenas_Lithology.csv
T97R-65	12.85	12.97	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-65	12.97	13.4	0.43	COAL	Tenas_Lithology.csv
T97R-65	13.4	13.66	0.26	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-65	13.66	13.77	0.11	COAL	Tenas_Lithology.csv
T97R-65	13.77	14.66	0.89	MDST	Tenas_Lithology.csv
T97R-65	14.66	14.84	0.18	COAL	Tenas_Lithology.csv
T97R-65	14.84	22.38	7.54	SST	Tenas_Lithology.csv
T97R-65	22.38	22.47	0.09	COAL	Tenas_Lithology.csv
T97R-65	22.47	22.6	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-65	22.6	22.99	0.39	COAL	Tenas_Lithology.csv
T97R-65	22.99	29.8	6.81	SST	Tenas_Lithology.csv
T97R-66	0	3	3	Overburden	Tenas_Lithology.csv
T97R-66	3	5.44	2.44	SLTS	Tenas_Lithology.csv
T97R-66	5.44	5.76	0.32	COAL	Tenas_Lithology.csv
T97R-66	5.76	6.21	0.45	MDST	Tenas_Lithology.csv
T97R-66	6.21	8.1	1.89	COAL	Tenas_Lithology.csv
T97R-66	8.1	8.28	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-66	8.28	9	0.72	COAL	Tenas_Lithology.csv
T97R-66	9	9.72	0.72	MDST	Tenas_Lithology.csv
T97R-66	9.72	10.15	0.43	COAL	Tenas_Lithology.csv
T97R-66	10.15	24	13.85	MDST	Tenas_Lithology.csv
T97R-66	24	24.5	0.5	COAL	Tenas_Lithology.csv
T97R-66	24.5	25	0.5	MDST	Tenas_Lithology.csv
T97R-66	25	25.85	0.85	COAL	Tenas_Lithology.csv
T97R-66	25.85	33.25	7.4	SLTS	Tenas_Lithology.csv
T97R-66	33.25	33.85	0.6	COAL	Tenas_Lithology.csv
T97R-66	33.85	36.5	2.65	SLTS	Tenas_Lithology.csv
T97R-67	0	5	5	Overburden	Tenas_Lithology.csv
T97R-67	5	8.6	3.6	SLTS	Tenas_Lithology.csv
T97R-67	8.6	14	5.4	SST	Tenas_Lithology.csv
T97R-67	14	14.25	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	14.25	17.72	3.47	SST	Tenas_Lithology.csv
T97R-67	17.72	18.17	0.45	COAL	Tenas_Lithology.csv
T97R-67	18.17	20.97	2.8	SLTS	Tenas_Lithology.csv
T97R-67	20.97	21.6	0.63	COAL	Tenas_Lithology.csv
T97R-67	21.6	26.57	4.97	SLTS	Tenas_Lithology.csv
T97R-67	26.57	27.44	0.87	COAL	Tenas_Lithology.csv
T97R-67	27.44	27.49	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	27.49	28.21	0.72	COAL	Tenas_Lithology.csv
T97R-67	28.21	35.1	6.89	SST	Tenas_Lithology.csv
T97R-67	35.1	35.4	0.3	COAL	Tenas_Lithology.csv
T97R-67	35.4	40.98	5.58	SLTS	Tenas_Lithology.csv
T97R-67	40.98	42.93	1.95	COAL	Tenas_Lithology.csv
T97R-67	42.93	43.03	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	43.03	43.88	0.85	COAL	Tenas_Lithology.csv
T97R-67	43.88	43.94	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	43.94	45.85	1.91	COAL	Tenas_Lithology.csv
T97R-67	45.85	46.03	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	46.03	46.83	0.8	COAL	Tenas_Lithology.csv
T97R-67	46.83	48.62	1.79	MDST	Tenas_Lithology.csv
T97R-67	48.62	49.56	0.94	COAL	Tenas_Lithology.csv
T97R-67	49.56	56	6.44	SST	Tenas_Lithology.csv
T97R-67	56	56.3	0.3	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	56.3	60.04	3.74	SLTS	Tenas_Lithology.csv
T97R-67	60.04	60.4	0.36	COAL	Tenas_Lithology.csv
T97R-67	60.4	60.86	0.46	MDST	Tenas_Lithology.csv
T97R-67	60.86	61.04	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	61.04	62.24	1.2	MDST	Tenas_Lithology.csv
T97R-67	62.24	62.9	0.66	COAL	Tenas_Lithology.csv
T97R-67	62.9	67.2	4.3	MDST	Tenas_Lithology.csv
T97R-67	67.2	67.49	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-67	67.49	68.34	0.85	MDST	Tenas_Lithology.csv
T97R-67	68.34	68.63	0.29	COAL	Tenas_Lithology.csv
T97R-67	68.63	79.4	10.77	SLTS	Tenas_Lithology.csv
T97R-69	0	12.75	12.75	Overburden	Tenas_Lithology.csv
T97R-69	12.75	55.6	42.85	SLTS	Tenas_Lithology.csv
T97R-69	55.6	65.53	9.93	SST	Tenas_Lithology.csv
T97R-69	65.53	82.66	17.13	SLTS	Tenas_Lithology.csv
T97R-69	82.66	83.38	0.72	COAL	Tenas_Lithology.csv
T97R-69	83.38	90.45	7.07	SLTS	Tenas_Lithology.csv
T97R-69	90.45	90.7	0.25	COAL	Tenas_Lithology.csv
T97R-69	90.7	98.18	7.48	SLTS	Tenas_Lithology.csv
T97R-69	98.18	99.9	1.72	COAL	Tenas_Lithology.csv
T97R-69	99.9	100.2	0.3	MDST	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-69	100.2	100.66	0.46	COAL	Tenas_Lithology.csv
T97R-69	100.66	100.72	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-69	100.72	101.75	1.03	COAL	Tenas_Lithology.csv
T97R-69	101.75	101.88	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-69	101.88	104.11	2.23	COAL	Tenas_Lithology.csv
T97R-69	104.11	104.18	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-69	104.18	104.86	0.68	COAL	Tenas_Lithology.csv
T97R-69	104.86	109.52	4.66	MDST	Tenas_Lithology.csv
T97R-69	109.52	109.9	0.38	COAL	Tenas_Lithology.csv
T97R-69	109.9	111.71	1.81	MDST	Tenas_Lithology.csv
T97R-69	111.71	111.84	0.13	COAL	Tenas_Lithology.csv
T97R-69	111.84	111.96	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-69	111.96	112.93	0.97	COAL	Tenas_Lithology.csv
T97R-69	112.93	115.53	2.6	MDST	Tenas_Lithology.csv
T97R-69	115.53	115.82	0.29	COAL	Tenas_Lithology.csv
T97R-69	115.82	116.92	1.1	MDST	Tenas_Lithology.csv
T97R-69	116.92	117.55	0.63	COAL	Tenas_Lithology.csv
T97R-69	117.55	119.12	1.57	MDST	Tenas_Lithology.csv
T97R-69	119.12	119.43	0.31	COAL	Tenas_Lithology.csv
T97R-69	119.43	119.76	0.33	MDST	Tenas_Lithology.csv
T97R-69	119.76	120.55	0.79	COAL	Tenas_Lithology.csv
T97R-69	120.55	121.27	0.72	MDST	Tenas_Lithology.csv
T97R-69	121.27	122.14	0.87	COAL	Tenas_Lithology.csv
T97R-69	122.14	128	5.86	MDST	Tenas_Lithology.csv
T97R-70	0	11	11	Overburden	Tenas_Lithology.csv
T97R-70	11	14.38	3.38	SLTS	Tenas_Lithology.csv
T97R-70	14.38	14.6	0.22	COAL	Tenas_Lithology.csv
T97R-70	14.6	18.57	3.97	SLTS	Tenas_Lithology.csv
T97R-70	18.57	21.31	2.74	COAL	Tenas_Lithology.csv
T97R-70	21.31	22.88	1.57	SLTS	Tenas_Lithology.csv
T97R-70	22.88	25.36	2.48	COAL	Tenas_Lithology.csv
T97R-70	25.36	25.96	0.6	MDST	Tenas_Lithology.csv
T97R-70	25.96	26.63	0.67	COAL	Tenas_Lithology.csv
T97R-70	26.63	27.74	1.11	MDST	Tenas_Lithology.csv
T97R-70	27.74	32.75	5.01	COAL	Tenas_Lithology.csv
T97R-70	32.75	38.41	5.66	MDST	Tenas_Lithology.csv
T97R-70	38.41	39.32	0.91	COAL	Tenas_Lithology.csv
T97R-70	39.32	39.66	0.34	MDST	Tenas_Lithology.csv
T97R-70	39.66	39.75	0.09	COAL	Tenas_Lithology.csv
T97R-70	39.75	42.15	2.4	SLTS	Tenas_Lithology.csv
T97R-70	42.15	42.5	0.35	COAL	Tenas_Lithology.csv
T97R-70	42.5	42.7	0.2	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-70	42.7	42.95	0.25	COAL	Tenas_Lithology.csv
T97R-70	42.95	43.2	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-70	43.2	43.5	0.3	COAL	Tenas_Lithology.csv
T97R-70	43.5	43.85	0.35	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-70	43.85	44.1	0.25	COAL	Tenas_Lithology.csv
T97R-70	44.1	61	16.9	SLTS	Tenas_Lithology.csv
T97R-71	0	14	14	Overburden	Tenas_Lithology.csv
T97R-71	14	39.6	25.6	SLTS	Tenas_Lithology.csv
T97R-71	39.6	48.28	8.68	SST	Tenas_Lithology.csv
T97R-71	48.28	48.75	0.47	COAL	Tenas_Lithology.csv
T97R-71	48.75	52.98	4.23	SLTS	Tenas_Lithology.csv
T97R-71	52.98	54.07	1.09	COAL	Tenas_Lithology.csv
T97R-71	54.07	60.14	6.07	SLTS	Tenas_Lithology.csv
T97R-71	60.14	60.36	0.22	COAL	Tenas_Lithology.csv
T97R-71	60.36	60.42	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-71	60.42	61.99	1.57	COAL	Tenas_Lithology.csv
T97R-71	61.99	67.8	5.81	SST	Tenas_Lithology.csv
T97R-71	67.8	70.6	2.8	SLTS	Tenas_Lithology.csv
T97R-71	70.6	71	0.4	COAL	Tenas_Lithology.csv
T97R-71	71	75.59	4.59	SLTS	Tenas_Lithology.csv
T97R-71	75.59	77.53	1.94	COAL	Tenas_Lithology.csv
T97R-71	77.53	78.49	0.96	MDST	Tenas_Lithology.csv
T97R-71	78.49	78.89	0.4	COAL	Tenas_Lithology.csv
T97R-71	78.89	78.94	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-71	78.94	79.96	1.02	COAL	Tenas_Lithology.csv
T97R-71	79.96	80.44	0.48	MDST	Tenas_Lithology.csv
T97R-71	80.44	80.85	0.41	COAL	Tenas_Lithology.csv
T97R-71	80.85	81.52	0.67	MDST	Tenas_Lithology.csv
T97R-71	81.52	82.27	0.75	COAL	Tenas_Lithology.csv
T97R-71	82.27	82.43	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-71	82.43	84.06	1.63	COAL	Tenas_Lithology.csv
T97R-71	84.06	84.55	0.49	MDST	Tenas_Lithology.csv
T97R-71	84.55	85	0.45	COAL	Tenas_Lithology.csv
T97R-71	85	87.12	2.12	MDST	Tenas_Lithology.csv
T97R-71	87.12	87.71	0.59	COAL	Tenas_Lithology.csv
T97R-71	87.71	89.67	1.96	SLTS	Tenas_Lithology.csv
T97R-71	89.67	90.51	0.84	COAL	Tenas_Lithology.csv
T97R-71	90.51	91.26	0.75	SLTS	Tenas_Lithology.csv
T97R-71	91.26	91.51	0.25	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-71	91.51	92.31	0.8	MDST	Tenas_Lithology.csv
T97R-71	92.31	92.69	0.38	COAL	Tenas_Lithology.csv
T97R-71	92.69	93.62	0.93	SLTS	Tenas_Lithology.csv
T97R-71	93.62	93.84	0.22	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-71	93.84	94.74	0.9	SLTS	Tenas_Lithology.csv
T97R-71	94.74	94.83	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-71	94.83	99.5	4.67	SLTS	Tenas_Lithology.csv
T97R-71	99.5	100.36	0.86	COAL	Tenas_Lithology.csv
T97R-71	100.36	100.72	0.36	SLTS	Tenas_Lithology.csv
T97R-71	100.72	101.56	0.84	COAL	Tenas_Lithology.csv
T97R-71	101.56	103.7	2.14	SLTS	Tenas_Lithology.csv
T97R-75	0	15	15	Overburden	Tenas_Lithology.csv
T97R-75	15	35.4	20.4	SLTS	Tenas_Lithology.csv
T97R-75	35.4	40.4	5	SST	Tenas_Lithology.csv
T97R-75	40.4	55.3	14.9	MDST	Tenas_Lithology.csv
T97R-75	55.3	94.33	39.03	SLTS	Tenas_Lithology.csv
T97R-75	94.33	96.02	1.69	COAL	Tenas_Lithology.csv
T97R-75	96.02	100.8	4.78	SST	Tenas_Lithology.csv
T97R-75	100.8	104.3	3.5	SLTS	Tenas_Lithology.csv
T97R-75	104.3	104.55	0.25	COAL	Tenas_Lithology.csv
T97R-75	104.55	110.01	5.46	SLTS	Tenas_Lithology.csv
T97R-75	110.01	111.75	1.74	COAL	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-75	111.75	112.56	0.81	SLTS	Tenas_Lithology.csv
T97R-75	112.56	112.98	0.42	COAL	Tenas_Lithology.csv
T97R-75	112.98	113.05	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-75	113.05	114.15	1.1	COAL	Tenas_Lithology.csv
T97R-75	114.15	114.28	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-75	114.28	117.45	3.17	COAL	Tenas_Lithology.csv
T97R-75	117.45	120.01	2.56	SLTS	Tenas_Lithology.csv
T97R-75	120.01	121.72	1.71	SST	Tenas_Lithology.csv
T97R-75	121.72	123.43	1.71	SLTS	Tenas_Lithology.csv
T97R-75	123.43	124.37	0.94	COAL	Tenas_Lithology.csv
T97R-75	124.37	127.9	3.53	SLTS	Tenas_Lithology.csv
T97R-75	127.9	128.37	0.47	COAL	Tenas_Lithology.csv
T97R-75	128.37	128.68	0.31	MDST	Tenas_Lithology.csv
T97R-75	128.68	128.91	0.23	COAL	Tenas_Lithology.csv
T97R-75	128.91	129.64	0.73	MDST	Tenas_Lithology.csv
T97R-75	129.64	129.96	0.32	COAL	Tenas_Lithology.csv
T97R-75	129.96	130.72	0.76	MDST	Tenas_Lithology.csv
T97R-75	130.72	132.87	2.15	SLTS	Tenas_Lithology.csv
T97R-75	132.87	133.13	0.26	COAL	Tenas_Lithology.csv
T97R-75	133.13	135.1	1.97	SST	Tenas_Lithology.csv
T97R-78	0	9.5	9.5	Overburden	Tenas_Lithology.csv
T97R-78	9.5	21.5	12	SLTS	Tenas_Lithology.csv
T97R-78	21.5	31.11	9.61	SST	Tenas_Lithology.csv
T97R-78	31.11	45.5	14.39	SLTS	Tenas_Lithology.csv
T97R-78	45.5	47.24	1.74	COAL	Tenas_Lithology.csv
T97R-78	47.24	55.01	7.77	SLTS	Tenas_Lithology.csv
T97R-78	55.01	55.4	0.39	COAL	Tenas_Lithology.csv
T97R-78	55.4	58.66	3.26	SLTS	Tenas_Lithology.csv
T97R-78	58.66	60.28	1.62	COAL	Tenas_Lithology.csv
T97R-78	60.28	61.3	1.02	SLTS	Tenas_Lithology.csv
T97R-78	61.3	62.63	1.33	COAL	Tenas_Lithology.csv
T97R-78	62.63	62.92	0.29	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-78	62.92	63.19	0.27	COAL	Tenas_Lithology.csv
T97R-78	63.19	63.41	0.22	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-78	63.41	63.72	0.31	COAL	Tenas_Lithology.csv
T97R-78	63.72	63.9	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-78	63.9	66.19	2.29	COAL	Tenas_Lithology.csv
T97R-78	66.19	70.75	4.56	MDST	Tenas_Lithology.csv
T97R-78	70.75	71.07	0.32	COAL	Tenas_Lithology.csv
T97R-78	71.07	72.41	1.34	MDST	Tenas_Lithology.csv
T97R-78	72.41	72.49	0.08	COAL	Tenas_Lithology.csv
T97R-78	72.49	72.64	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-78	72.64	73.44	0.8	COAL	Tenas_Lithology.csv
T97R-78	73.44	76.41	2.97	SLTS	Tenas_Lithology.csv
T97R-78	76.41	76.57	0.16	COAL	Tenas_Lithology.csv
T97R-78	76.57	81.91	5.34	MDST	Tenas_Lithology.csv
T97R-78	81.91	82.54	0.63	SLTS	Tenas_Lithology.csv
T97R-78	82.54	82.72	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-78	82.72	83.18	0.46	MDST	Tenas_Lithology.csv
T97R-78	83.18	83.67	0.49	COAL	Tenas_Lithology.csv
T97R-78	83.67	84.6	0.93	MDST	Tenas_Lithology.csv
T97R-78	84.6	85.8	1.2	SLTS	Tenas_Lithology.csv
T97R-80	0	10.5	10.5	Overburden	Tenas_Lithology.csv
T97R-80	10.5	29.8	19.3	MDST	Tenas_Lithology.csv
T97R-80	29.8	48.15	18.35	SLTS	Tenas_Lithology.csv
T97R-80	48.15	51.2	3.05	SST	Tenas_Lithology.csv
T97R-80	51.2	55	3.8	SLTS	Tenas_Lithology.csv
T97R-80	55	55.85	0.85	MDST	Tenas_Lithology.csv
T97R-80	55.85	57.36	1.51	COAL	Tenas_Lithology.csv
T97R-80	57.36	57.97	0.61	SLTS	Tenas_Lithology.csv
T97R-80	57.97	58.37	0.4	COAL	Tenas_Lithology.csv
T97R-80	58.37	58.43	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-80	58.43	59.35	0.92	COAL	Tenas_Lithology.csv
T97R-80	59.35	59.44	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-80	59.44	59.72	0.28	COAL	Tenas_Lithology.csv
T97R-80	59.72	59.79	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-80	59.79	62.45	2.66	COAL	Tenas_Lithology.csv
T97R-80	62.45	66.91	4.46	SLTS	Tenas_Lithology.csv
T97R-80	66.91	67.18	0.27	COAL	Tenas_Lithology.csv
T97R-80	67.18	69.19	2.01	SLTS	Tenas_Lithology.csv
T97R-80	69.19	70.07	0.88	COAL	Tenas_Lithology.csv
T97R-80	70.07	74.84	4.77	SLTS	Tenas_Lithology.csv
T97R-80	74.84	75.22	0.38	COAL	Tenas_Lithology.csv
T97R-80	75.22	78.87	3.65	SLTS	Tenas_Lithology.csv
T97R-80	78.87	79.54	0.67	COAL	Tenas_Lithology.csv
T97R-80	79.54	79.61	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-80	79.61	79.78	0.17	COAL	Tenas_Lithology.csv
T97R-80	79.78	80.68	0.9	MDST	Tenas_Lithology.csv
T97R-80	80.68	80.79	0.11	COAL	Tenas_Lithology.csv
T97R-80	80.79	80.85	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-80	80.85	81.73	0.88	COAL	Tenas_Lithology.csv
T97R-80	81.73	87.65	5.92	SLTS	Tenas_Lithology.csv
T97R-80	87.65	88.17	0.52	COAL	Tenas_Lithology.csv
T97R-80	88.17	91.3	3.13	SLTS	Tenas_Lithology.csv
T97R-84	0	13.5	13.5	Overburden	Tenas_Lithology.csv
T97R-84	13.5	29.7	16.2	SLTS	Tenas_Lithology.csv
T97R-84	29.7	37.43	7.73	SST	Tenas_Lithology.csv
T97R-84	37.43	40.3	2.87	SLTS	Tenas_Lithology.csv
T97R-84	40.3	41.54	1.24	MDST	Tenas_Lithology.csv
T97R-84	41.54	42.15	0.61	COAL	Tenas_Lithology.csv
T97R-84	42.15	44.31	2.16	SLTS	Tenas_Lithology.csv
T97R-84	44.31	44.56	0.25	COAL	Tenas_Lithology.csv
T97R-84	44.56	44.87	0.31	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-84	44.87	46.59	1.72	COAL	Tenas_Lithology.csv
T97R-84	46.59	54.88	8.29	SLTS	Tenas_Lithology.csv
T97R-84	54.88	55.28	0.4	COAL	Tenas_Lithology.csv
T97R-84	55.28	60.88	5.6	SLTS	Tenas_Lithology.csv
T97R-84	60.88	62.74	1.86	COAL	Tenas_Lithology.csv
T97R-84	62.74	62.86	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-84	62.86	63.8	0.94	COAL	Tenas_Lithology.csv
T97R-84	63.8	63.91	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-84	63.91	64.88	0.97	COAL	Tenas_Lithology.csv
T97R-84	64.88	65.01	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-84	65.01	66.75	1.74	COAL	Tenas_Lithology.csv
T97R-84	66.75	68.73	1.98	MDST	Tenas_Lithology.csv
T97R-84	68.73	69.24	0.51	COAL	Tenas_Lithology.csv
T97R-84	69.24	70.43	1.19	SLTS	Tenas_Lithology.csv
T97R-84	70.43	71.29	0.86	COAL	Tenas_Lithology.csv
T97R-84	71.29	71.52	0.23	MDST	Tenas_Lithology.csv
T97R-84	71.52	72.09	0.57	COAL	Tenas_Lithology.csv
T97R-84	72.09	72.84	0.75	MDST	Tenas_Lithology.csv
T97R-84	72.84	73.14	0.3	COAL	Tenas_Lithology.csv
T97R-84	73.14	76	2.86	SLTS	Tenas_Lithology.csv
T97R-84	76	76.29	0.29	COAL	Tenas_Lithology.csv
T97R-84	76.29	78.4	2.11	SLTS	Tenas_Lithology.csv
T97R-84	78.4	79.11	0.71	COAL	Tenas_Lithology.csv
T97R-84	79.11	86.12	7.01	SLTS	Tenas_Lithology.csv
T97R-84	86.12	86.54	0.42	COAL	Tenas_Lithology.csv
T97R-84	86.54	90	3.46	SLTS	Tenas_Lithology.csv
T97R-87	0	9.5	9.5	Overburden	Tenas_Lithology.csv
T97R-87	9.5	18.4	8.9	MDST	Tenas_Lithology.csv
T97R-87	18.4	41.9	23.5	SLTS	Tenas_Lithology.csv
T97R-87	41.9	48.2	6.3	MDST	Tenas_Lithology.csv
T97R-87	48.2	62.56	14.36	SLTS	Tenas_Lithology.csv
T97R-87	62.56	62.69	0.13	COAL	Tenas_Lithology.csv
T97R-87	62.69	63.6	0.91	MDST	Tenas_Lithology.csv
T97R-87	63.6	63.98	0.38	COAL	Tenas_Lithology.csv
T97R-87	63.98	72.26	8.28	SLTS	Tenas_Lithology.csv
T97R-87	72.26	73.74	1.48	COAL	Tenas_Lithology.csv
T97R-87	73.74	90.28	16.54	SLTS	Tenas_Lithology.csv
T97R-87	90.28	92.4	2.12	COAL	Tenas_Lithology.csv
T97R-87	92.4	92.48	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-87	92.48	93.55	1.07	COAL	Tenas_Lithology.csv
T97R-87	93.55	93.68	0.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-87	93.68	93.98	0.3	COAL	Tenas_Lithology.csv
T97R-87	93.98	94.05	0.07	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-87	94.05	96.54	2.49	COAL	Tenas_Lithology.csv
T97R-87	96.54	100.14	3.6	SLTS	Tenas_Lithology.csv
T97R-87	100.14	100.26	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-87	100.26	100.76	0.5	MDST	Tenas_Lithology.csv
T97R-87	100.76	101.8	1.04	COAL	Tenas_Lithology.csv
T97R-87	101.8	105.76	3.96	SLTS	Tenas_Lithology.csv
T97R-87	105.76	106.13	0.37	COAL	Tenas_Lithology.csv
T97R-87	106.13	108.15	2.02	SLTS	Tenas_Lithology.csv
T97R-87	108.15	108.36	0.21	COAL	Tenas_Lithology.csv
T97R-87	108.36	108.54	0.18	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-87	108.54	109	0.46	COAL	Tenas_Lithology.csv
T97R-87	109	109.1	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-87	109.1	109.39	0.29	COAL	Tenas_Lithology.csv
T97R-87	109.39	110.47	1.08	SLTS	Tenas_Lithology.csv
T97R-87	110.47	111.23	0.76	COAL	Tenas_Lithology.csv
T97R-87	111.23	116.8	5.57	SLTS	Tenas_Lithology.csv
T97R-88	0	16	16	Overburden	Tenas_Lithology.csv
T97R-88	16	20	4	MDST	Tenas_Lithology.csv
T97R-88	20	20.3	0.3	COAL	Tenas_Lithology.csv
T97R-88	20.3	22.7	2.4	MDST	Tenas_Lithology.csv
T97R-88	22.7	33.95	11.25	SLTS	Tenas_Lithology.csv
T97R-88	33.95	34.58	0.63	COAL	Tenas_Lithology.csv
T97R-88	34.58	34.64	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-88	34.64	35.43	0.79	COAL	Tenas_Lithology.csv
T97R-88	35.43	41.57	6.14	SLTS	Tenas_Lithology.csv
T97R-90	0	21	21	Overburden	Tenas_Lithology.csv
T97R-90	21	26.95	5.95	MDST	Tenas_Lithology.csv
T97R-90	26.95	27.38	0.43	COAL	Tenas_Lithology.csv
T97R-90	27.38	33.8	6.42	SLTS	Tenas_Lithology.csv
T97R-90	33.8	34.25	0.45	COAL	Tenas_Lithology.csv
T97R-90	34.25	37.89	3.64	SLTS	Tenas_Lithology.csv
T97R-90	37.89	38.12	0.23	COAL	Tenas_Lithology.csv
T97R-90	38.12	40.72	2.6	SLTS	Tenas_Lithology.csv
T97R-90	40.72	41.75	1.03	COAL	Tenas_Lithology.csv
T97R-90	41.75	41.85	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-90	41.85	42.82	0.97	COAL	Tenas_Lithology.csv
T97R-90	42.82	55.44	12.62	SLTS	Tenas_Lithology.csv
T97R-90	55.44	55.61	0.17	COAL	Tenas_Lithology.csv
T97R-90	55.61	60.4	4.79	SLTS	Tenas_Lithology.csv
T97R-90	60.4	60.48	0.08	COAL	Tenas_Lithology.csv
T97R-90	60.48	60.64	0.16	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-90	60.64	63.38	2.74	COAL	Tenas_Lithology.csv
T97R-90	63.38	63.52	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-90	63.52	63.78	0.26	COAL	Tenas_Lithology.csv
T97R-90	63.78	64.97	1.19	MDST	Tenas_Lithology.csv
T97R-90	64.97	68.9	3.93	COAL	Tenas_Lithology.csv
T97R-90	68.9	68.94	0.04	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-90	68.94	69.94	1	COAL	Tenas_Lithology.csv
T97R-90	69.94	73.8	3.86	SLTS	Tenas_Lithology.csv
T97R-90	73.8	74.15	0.35	COAL	Tenas_Lithology.csv
T97R-90	74.15	74.29	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-90	74.29	75.79	1.5	COAL	Tenas_Lithology.csv
T97R-90	75.79	83.2	7.41	SLTS	Tenas_Lithology.csv
T97R-90	83.2	85.4	2.2	SST	Tenas_Lithology.csv
T97R-90	85.4	88	2.6	SLTS	Tenas_Lithology.csv
T97R-90	88	88.2	0.2	COAL	Tenas_Lithology.csv
T97R-90	88.2	98.5	10.3	SST	Tenas_Lithology.csv
T97R-91	0	9	9	Overburden	Tenas_Lithology.csv
T97R-91	9	12.4	3.4	SLTS	Tenas_Lithology.csv
T97R-91	12.4	19.01	6.61	SST	Tenas_Lithology.csv
T97R-91	19.01	19.5	0.49	COAL	Tenas_Lithology.csv
T97R-91	19.5	22.48	2.98	SLTS	Tenas_Lithology.csv
T97R-91	22.48	22.68	0.2	COAL	Tenas_Lithology.csv
T97R-91	22.68	23.45	0.77	MDST	Tenas_Lithology.csv
T97R-91	23.45	23.76	0.31	COAL	Tenas_Lithology.csv
T97R-91	23.76	29.7	5.94	SLTS	Tenas_Lithology.csv
T97R-91	29.7	31.34	1.64	COAL	Tenas_Lithology.csv
T97R-91	31.34	38.58	7.24	SLTS	Tenas_Lithology.csv
T97R-91	38.58	38.97	0.39	COAL	Tenas_Lithology.csv
T97R-91	38.97	44.23	5.26	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-91	44.23	46.43	2.2	COAL	Tenas_Lithology.csv
T97R-91	46.43	46.48	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-91	46.48	47.41	0.93	COAL	Tenas_Lithology.csv
T97R-91	47.41	47.49	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-91	47.49	51.05	3.56	COAL	Tenas_Lithology.csv
T97R-91	51.05	54.14	3.09	MDST	Tenas_Lithology.csv
T97R-91	54.14	54.56	0.42	COAL	Tenas_Lithology.csv
T97R-91	54.56	54.8	0.24	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-91	54.8	55.04	0.24	COAL	Tenas_Lithology.csv
T97R-91	55.04	55.63	0.59	MDST	Tenas_Lithology.csv
T97R-91	55.63	56.14	0.51	COAL	Tenas_Lithology.csv
T97R-91	56.14	56.87	0.73	MDST	Tenas_Lithology.csv
T97R-91	56.87	57.3	0.43	COAL	Tenas_Lithology.csv
T97R-91	57.3	59.1	1.8	MDST	Tenas_Lithology.csv
T97R-91	59.1	67.5	8.4	SLTS	Tenas_Lithology.csv
T97R-94	0	1	1	Overburden	Tenas_Lithology.csv
T97R-94	1	3	2	COAL	Tenas_Lithology.csv
T97R-94	3	9.21	6.21	SLTS	Tenas_Lithology.csv
T97R-94	9.21	9.49	0.28	COAL	Tenas_Lithology.csv
T97R-94	9.49	11.82	2.33	SLTS	Tenas_Lithology.csv
T97R-94	11.82	13.71	1.89	COAL	Tenas_Lithology.csv
T97R-94	13.71	14.57	0.86	MDST	Tenas_Lithology.csv
T97R-94	14.57	16.05	1.48	COAL	Tenas_Lithology.csv
T97R-94	16.05	16.14	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-94	16.14	16.65	0.51	COAL	Tenas_Lithology.csv
T97R-94	16.65	16.7	0.05	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-94	16.7	16.94	0.24	COAL	Tenas_Lithology.csv
T97R-94	16.94	17.04	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-94	17.04	17.91	0.87	COAL	Tenas_Lithology.csv
T97R-94	17.91	19.42	1.51	MDST	Tenas_Lithology.csv
T97R-94	19.42	19.87	0.45	COAL	Tenas_Lithology.csv
T97R-94	19.87	19.95	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-94	19.95	20.19	0.24	COAL	Tenas_Lithology.csv
T97R-94	20.19	26.14	5.95	SST	Tenas_Lithology.csv
T97R-94	26.14	26.43	0.29	COAL	Tenas_Lithology.csv
T97R-94	26.43	26.64	0.21	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-94	26.64	26.89	0.25	COAL	Tenas_Lithology.csv
T97R-94	26.89	27.79	0.9	MDST	Tenas_Lithology.csv
T97R-94	27.79	27.88	0.09	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-94	27.88	30	2.12	SLTS	Tenas_Lithology.csv
T97R-95C	0	1	1	Overburden	Tenas_Lithology.csv
T97R-95C	1	2.03	1.03	MDST	Tenas_Lithology.csv
T97R-95C	2.03	2.81	0.78	SLTS	Tenas_Lithology.csv
T97R-95C	2.81	3.9	1.09	MDST	Tenas_Lithology.csv
T97R-95C	3.9	4.17	0.27	COAL	Tenas_Lithology.csv
T97R-95C	4.17	6.48	2.31	SLTS	Tenas_Lithology.csv
T97R-95C	6.48	8.05	1.57	COAL	Tenas_Lithology.csv
T97R-95C	8.05	8.18	0.13	MDST	Tenas_Lithology.csv
T97R-95C	8.18	8.93	0.75	SLTS	Tenas_Lithology.csv
T97R-95C	8.93	9.69	0.76	MDST	Tenas_Lithology.csv
T97R-95C	9.69	11.2	1.51	SLTS	Tenas_Lithology.csv
T97R-95C	11.2	11.42	0.22	COAL	Tenas_Lithology.csv
T97R-95C	11.42	12.1	0.68	MDST	Tenas_Lithology.csv
T97R-95C	12.1	13.27	1.17	COAL	Tenas_Lithology.csv
T97R-95C	13.27	13.54	0.27	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-95C	13.54	13.72	0.18	COAL	Tenas_Lithology.csv
T97R-95C	13.72	14.23	0.51	MDST	Tenas_Lithology.csv
T97R-95C	14.23	15.35	1.12	COAL	Tenas_Lithology.csv
T97R-95C	15.35	16.14	0.79	MDST	Tenas_Lithology.csv
T97R-95C	16.14	16.4	0.26	COAL	Tenas_Lithology.csv
T97R-95C	16.4	17.11	0.71	MDST	Tenas_Lithology.csv
T97R-95C	17.11	17.67	0.56	COAL	Tenas_Lithology.csv
T97R-95C	17.67	18.51	0.84	MDST	Tenas_Lithology.csv
T97R-95C	18.51	18.73	0.22	COAL	Tenas_Lithology.csv
T97R-95C	18.73	19.36	0.63	MDST	Tenas_Lithology.csv
T97R-95C	19.36	19.66	0.3	SST	Tenas_Lithology.csv
T97R-95C	19.66	21.33	1.67	MDST	Tenas_Lithology.csv
T97R-95C	21.33	23.7	2.37	SLTS	Tenas_Lithology.csv
T97R-95C	23.7	26.5	2.8	SST	Tenas_Lithology.csv
T97R-95C	26.5	26.97	0.47	COAL	Tenas_Lithology.csv
T97R-95C	26.97	29.31	2.34	SLTS	Tenas_Lithology.csv
T97R-95C	29.31	29.52	0.21	COAL	Tenas_Lithology.csv
T97R-95C	29.52	36	6.48	SLTS	Tenas_Lithology.csv
T97R-96	0	14	14	Overburden	Tenas_Lithology.csv
T97R-96	14	23.1	9.1	SLTS	Tenas_Lithology.csv
T97R-96	23.1	38.8	15.7	MDST	Tenas_Lithology.csv
T97R-96	38.8	42.4	3.6	SLTS	Tenas_Lithology.csv
T97R-96	42.4	55.7	13.3	MDST	Tenas_Lithology.csv
T97R-96	55.7	60.1	4.4	SLTS	Tenas_Lithology.csv
T97R-96	60.1	62.1	2	MDST	Tenas_Lithology.csv
T97R-96	62.1	81.04	18.94	SLTS	Tenas_Lithology.csv
T97R-96	81.04	81.39	0.35	COAL	Tenas_Lithology.csv
T97R-96	81.39	82.96	1.57	SLTS	Tenas_Lithology.csv
T97R-96	82.96	83.51	0.55	COAL	Tenas_Lithology.csv
T97R-96	83.51	86.18	2.67	SLTS	Tenas_Lithology.csv
T97R-96	86.18	87.46	1.28	COAL	Tenas_Lithology.csv
T97R-96	87.46	91.78	4.32	SLTS	Tenas_Lithology.csv
T97R-96	91.78	92.18	0.4	COAL	Tenas_Lithology.csv
T97R-96	92.18	93.7	1.52	MDST	Tenas_Lithology.csv
T97R-96	93.7	94.32	0.62	COAL	Tenas_Lithology.csv
T97R-96	94.32	101.6	7.28	SST	Tenas_Lithology.csv
T97R-96	101.6	101.94	0.34	COAL	Tenas_Lithology.csv
T97R-96	101.94	104.06	2.12	SST	Tenas_Lithology.csv
T97R-96	104.06	104.43	0.37	COAL	Tenas_Lithology.csv
T97R-96	104.43	124	19.57	SLTS	Tenas_Lithology.csv
T97R-97	0	11.6	11.6	Overburden	Tenas_Lithology.csv
T97R-97	11.6	12.6	1	MDST	Tenas_Lithology.csv
T97R-97	12.6	16.6	4	COAL	Tenas_Lithology.csv
T97R-97	16.6	17.75	1.15	MDST	Tenas_Lithology.csv
T97R-97	17.75	18.14	0.39	COAL	Tenas_Lithology.csv
T97R-97	18.14	18.9	0.76	MDST	Tenas_Lithology.csv
T97R-97	18.9	19.61	0.71	COAL	Tenas_Lithology.csv
T97R-97	19.61	23.8	4.19	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T97R-99	0	7	7	Overburden	Tenas_Lithology.csv
T97R-99	7	19.9	12.9	MDST	Tenas_Lithology.csv
T97R-99	19.9	31.4	11.5	SLTS	Tenas_Lithology.csv
T97R-99	31.4	31.63	0.23	COAL	Tenas_Lithology.csv
T97R-99	31.63	42.61	10.98	SLTS	Tenas_Lithology.csv
T97R-99	42.61	44.76	2.15	COAL	Tenas_Lithology.csv
T97R-99	44.76	53.14	8.38	SLTS	Tenas_Lithology.csv
T97R-99	53.14	53.44	0.3	COAL	Tenas_Lithology.csv
T97R-99	53.44	56.02	2.58	SLTS	Tenas_Lithology.csv
T97R-99	56.02	57.7	1.68	COAL	Tenas_Lithology.csv
T97R-99	57.7	60.18	2.48	SLTS	Tenas_Lithology.csv
T97R-99	60.18	63.79	3.61	COAL	Tenas_Lithology.csv
T97R-99	63.79	65.38	1.59	MDST	Tenas_Lithology.csv
T97R-99	65.38	65.53	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-99	65.53	66.35	0.82	SLTS	Tenas_Lithology.csv
T97R-99	66.35	68.04	1.69	COAL	Tenas_Lithology.csv
T97R-99	68.04	70.69	2.65	SLTS	Tenas_Lithology.csv
T97R-99	70.69	70.83	0.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T97R-99	70.83	80	9.17	SLTS	Tenas_Lithology.csv
T98R-03C	0	6	6	Overburden	Tenas_Lithology.csv
T98R-03C	6	8.35	2.35	MDST	Tenas_Lithology.csv
T98R-03C	8.35	8.45	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-03C	8.45	9.75	1.3	SLTS	Tenas_Lithology.csv
T98R-03C	9.75	11.4	1.65	COAL	Tenas_Lithology.csv
T98R-03C	11.4	11.96	0.56	SLTS	Tenas_Lithology.csv
T98R-03C	11.96	18.1	6.14	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-03C	18.1	18.35	0.25	COAL	Tenas_Lithology.csv
T98R-03C	18.35	19.9	1.55	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-03C	19.9	20.6	0.7	SLTS	Tenas_Lithology.csv
T98R-03C	20.6	22.7	2.1	COAL	Tenas_Lithology.csv
T98R-03C	22.7	23.55	0.85	MDST	Tenas_Lithology.csv
T98R-03C	23.55	26.8	3.25	COAL	Tenas_Lithology.csv
T98R-03C	26.8	27.1	0.3	MDST	Tenas_Lithology.csv
T98R-03C	27.1	27.65	0.55	COAL	Tenas_Lithology.csv
T98R-03C	27.65	28.1	0.45	MDST	Tenas_Lithology.csv
T98R-03C	28.1	28.28	0.18	SLTS	Tenas_Lithology.csv
T98R-03C	28.28	28.63	0.35	MDST	Tenas_Lithology.csv
T98R-03C	28.63	28.88	0.25	COAL	Tenas_Lithology.csv
T98R-03C	28.88	28.96	0.08	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-07C	0	19	19	Overburden	Tenas_Lithology.csv
T98R-07C	19	61.04	42.04	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-07C	61.04	61.13	0.09	SLTS	Tenas_Lithology.csv
T98R-07C	61.13	61.32	0.19	SST	Tenas_Lithology.csv
T98R-07C	61.32	61.45	0.13	MDST	Tenas_Lithology.csv
T98R-07C	61.45	61.73	0.28	SST	Tenas_Lithology.csv
T98R-07C	61.73	62.03	0.3	MDST	Tenas_Lithology.csv
T98R-07C	62.03	62.57	0.54	SLTS	Tenas_Lithology.csv
T98R-07C	62.57	63.07	0.5	MDST	Tenas_Lithology.csv
T98R-07C	63.07	63.94	0.87	SLTS	Tenas_Lithology.csv
T98R-07C	63.94	64.02	0.08	MDST	Tenas_Lithology.csv
T98R-07C	64.02	66.12	2.1	COAL	Tenas_Lithology.csv
T98R-07C	66.12	67.1	0.98	SLTS	Tenas_Lithology.csv
T98R-07C	67.1	83.5	16.4	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-07C	83.5	84.87	1.37	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-07C	84.87	91.86	6.99	COAL	Tenas_Lithology.csv
T98R-07C	91.86	92	0.14	MDST	Tenas_Lithology.csv
T98R-07C	92	92.87	0.87	SLTS	Tenas_Lithology.csv
T98R-07C	92.87	97.5	4.63	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-09C	0	15.06	15.06	Overburden	Tenas_Lithology.csv
T98R-09C	15.06	18.28	3.22	SLTS	Tenas_Lithology.csv
T98R-09C	18.28	18.74	0.46	SST	Tenas_Lithology.csv
T98R-09C	18.74	32.75	14.01	SLTS	Tenas_Lithology.csv
T98R-09C	32.75	44.81	12.06	MDST	Tenas_Lithology.csv
T98R-09C	44.81	45.83	1.02	SLTS	Tenas_Lithology.csv
T98R-09C	45.83	46.26	0.43	COAL	Tenas_Lithology.csv
T98R-09C	46.26	48.86	2.6	MDST	Tenas_Lithology.csv
T98R-09C	48.86	49.09	0.23	COAL	Tenas_Lithology.csv
T98R-09C	49.09	49.31	0.22	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-09C	49.31	49.61	0.3	COAL	Tenas_Lithology.csv
T98R-09C	49.61	50.21	0.6	MDST	Tenas_Lithology.csv
T98R-09C	50.21	52.52	2.31	SLTS	Tenas_Lithology.csv
T98R-09C	52.52	52.82	0.3	COAL	Tenas_Lithology.csv
T98R-09C	52.82	52.92	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-09C	52.92	54.53	1.61	COAL	Tenas_Lithology.csv
T98R-09C	54.53	56.71	2.18	MDST	Tenas_Lithology.csv
T98R-09C	56.71	58.89	2.18	SLTS	Tenas_Lithology.csv
T98R-09C	58.89	61.1	2.21	MDST	Tenas_Lithology.csv
T98R-09C	61.1	61.29	0.19	COAL	Tenas_Lithology.csv
T98R-09C	61.29	62.97	1.68	MDST	Tenas_Lithology.csv
T98R-09C	62.97	68.87	5.9	SLTS	Tenas_Lithology.csv
T98R-09C	68.87	74.42	5.55	COAL	Tenas_Lithology.csv
T98R-09C	74.42	75.12	0.7	MDST	Tenas_Lithology.csv
T98R-09C	75.12	77.18	2.06	SLTS	Tenas_Lithology.csv
T98R-09C	77.18	77.63	0.45	COAL	Tenas_Lithology.csv
T98R-09C	77.63	77.75	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-09C	77.75	78.2	0.45	COAL	Tenas_Lithology.csv
T98R-13C	0	12	12	Overburden	Tenas_Lithology.csv
T98R-13C	12	72.93	60.93	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-13C	72.93	75.04	2.11	MDST	Tenas_Lithology.csv
T98R-13C	75.04	76	0.96	COAL	Tenas_Lithology.csv
T98R-13C	76	76.06	0.06	MDST	Tenas_Lithology.csv
T98R-13C	76.06	76.83	0.77	SLTS	Tenas_Lithology.csv
T98R-13C	76.83	85.74	8.91	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-13C	85.74	86.05	0.31	COAL	Tenas_Lithology.csv
T98R-13C	86.05	88.6	2.55	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-13C	88.6	89.65	1.05	SLTS	Tenas_Lithology.csv
T98R-13C	89.65	89.95	0.3	SST	Tenas_Lithology.csv
T98R-13C	89.95	91.28	1.33	SLTS	Tenas_Lithology.csv
T98R-13C	91.28	91.35	0.07	MDST	Tenas_Lithology.csv
T98R-13C	91.35	91.63	0.28	SLTS	Tenas_Lithology.csv
T98R-13C	91.63	97.58	5.95	COAL	Tenas_Lithology.csv
T98R-13C	97.58	97.73	0.15	MDST	Tenas_Lithology.csv
T98R-13C	97.73	97.89	0.16	SLTS	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T98R-13C	97.89	103.6	5.71	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-14	0	3.8	3.8	Overburden	Tenas_Lithology.csv
T98R-14	3.8	11.25	7.45	SLTS	Tenas_Lithology.csv
T98R-14	11.25	16.5	5.25	MDST	Tenas_Lithology.csv
T98R-14	16.5	18.25	1.75	SLTS	Tenas_Lithology.csv
T98R-14	18.25	21	2.75	MDST	Tenas_Lithology.csv
T98R-14	21	24	3	SLTS	Tenas_Lithology.csv
T98R-14	24	26.75	2.75	MDST	Tenas_Lithology.csv
T98R-14	26.75	30.25	3.5	SLTS	Tenas_Lithology.csv
T98R-14	30.25	30.75	0.5	MDST	Tenas_Lithology.csv
T98R-14	30.75	35.5	4.75	SLTS	Tenas_Lithology.csv
T98R-14	35.5	38	2.5	MDST	Tenas_Lithology.csv
T98R-14	38	41	3	SLTS	Tenas_Lithology.csv
T98R-14	41	46.25	5.25	MDST	Tenas_Lithology.csv
T98R-14	46.25	48	1.75	SLTS	Tenas_Lithology.csv
T98R-14	48	49.5	1.5	MDST	Tenas_Lithology.csv
T98R-14	49.5	60	10.5	SLTS	Tenas_Lithology.csv
T98R-14	60	61.25	1.25	MDST	Tenas_Lithology.csv
T98R-14	61.25	63	1.75	SLTS	Tenas_Lithology.csv
T98R-14	63	63.25	0.25	MDST	Tenas_Lithology.csv
T98R-14	63.25	78	14.75	SLTS	Tenas_Lithology.csv
T98R-14	78	84.4	6.4	MDST	Tenas_Lithology.csv
T98R-16	0	22	22	Overburden	Tenas_Lithology.csv
T98R-16	22	25.16	3.16	MDST	Tenas_Lithology.csv
T98R-16	25.16	26.98	1.82	COAL	Tenas_Lithology.csv
T98R-16	26.98	35.2	8.22	SST	Tenas_Lithology.csv
T98R-16	35.2	35.57	0.37	COAL	Tenas_Lithology.csv
T98R-16	35.57	47.12	11.55	MDST	Tenas_Lithology.csv
T98R-16	47.12	49.75	2.63	COAL	Tenas_Lithology.csv
T98R-16	49.75	49.86	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-16	49.86	55.3	5.44	COAL	Tenas_Lithology.csv
T98R-16	55.3	56.55	1.25	MDST	Tenas_Lithology.csv
T98R-16	56.55	57.34	0.79	COAL	Tenas_Lithology.csv
T98R-16	57.34	65.5	8.16	SLTS	Tenas_Lithology.csv
T98R-18	0	3	3	Overburden	Tenas_Lithology.csv
T98R-18	3	3.29	0.29	SLTS	Tenas_Lithology.csv
T98R-18	3.29	3.83	0.54	COAL	Tenas_Lithology.csv
T98R-18	3.83	6.6	2.77	SLTS	Tenas_Lithology.csv
T98R-18	6.6	7.23	0.63	MDST	Tenas_Lithology.csv
T98R-18	7.23	7.34	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-18	7.34	8.11	0.77	SLTS	Tenas_Lithology.csv
T98R-18	8.11	9.52	1.41	COAL	Tenas_Lithology.csv
T98R-18	9.52	15.9	6.38	SLTS	Tenas_Lithology.csv
T98R-18	15.9	16.45	0.55	COAL	Tenas_Lithology.csv
T98R-18	16.45	19.5	3.05	SLTS	Tenas_Lithology.csv
T98R-18	19.5	20.39	0.89	MDST	Tenas_Lithology.csv
T98R-18	20.39	22.09	1.7	COAL	Tenas_Lithology.csv
T98R-18	22.09	22.21	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-18	22.21	23.8	1.59	COAL	Tenas_Lithology.csv
T98R-18	23.8	23.91	0.11	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-18	23.91	25.75	1.84	COAL	Tenas_Lithology.csv
T98R-18	25.75	27.85	2.1	SLTS	Tenas_Lithology.csv
T98R-18	27.85	28.69	0.84	COAL	Tenas_Lithology.csv
T98R-18	28.69	29.82	1.13	MDST	Tenas_Lithology.csv
T98R-18	29.82	30.15	0.33	COAL	Tenas_Lithology.csv
T98R-18	30.15	30.83	0.68	MDST	Tenas_Lithology.csv
T98R-18	30.83	31.29	0.46	COAL	Tenas_Lithology.csv
T98R-18	31.29	34.7	3.41	SLTS	Tenas_Lithology.csv
T98R-20	0	3	3	Overburden	Tenas_Lithology.csv
T98R-20	3	4.55	1.55	MDST	Tenas_Lithology.csv
T98R-20	4.55	6.33	1.78	COAL	Tenas_Lithology.csv
T98R-20	6.33	7.59	1.26	SLTS	Tenas_Lithology.csv
T98R-20	7.59	10.92	3.33	COAL	Tenas_Lithology.csv
T98R-20	10.92	11.5	0.58	MDST	Tenas_Lithology.csv
T98R-20	11.5	12.1	0.6	SLTS	Tenas_Lithology.csv
T98R-20	12.1	12.84	0.74	COAL	Tenas_Lithology.csv
T98R-20	12.84	13	0.16	MDST	Tenas_Lithology.csv
T98R-20	13	14.8	1.8	SLTS	Tenas_Lithology.csv
T98R-20	14.8	15.18	0.38	COAL	Tenas_Lithology.csv
T98R-20	15.18	16	0.82	SLTS	Tenas_Lithology.csv
T98R-20	16	16.28	0.28	COAL	Tenas_Lithology.csv
T98R-20	16.28	21.3	5.02	SLTS	Tenas_Lithology.csv
T98R-20	21.3	22.1	0.8	COAL	Tenas_Lithology.csv
T98R-20	22.1	23.3	1.2	SLTS	Tenas_Lithology.csv
T98R-20	23.3	23.7	0.4	COAL	Tenas_Lithology.csv
T98R-20	23.7	26.5	2.8	SLTS	Tenas_Lithology.csv
T98R-20	26.5	42.5	16	MDST	Tenas_Lithology.csv
T98R-21C	0	12	12	Overburden	Tenas_Lithology.csv
T98R-21C	12	59.32	47.32	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	59.32	59.37	0.05	COAL	Tenas_Lithology.csv
T98R-21C	59.37	61.02	1.65	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	61.02	61.12	0.1	SLTS	Tenas_Lithology.csv
T98R-21C	61.12	61.25	0.13	MDST	Tenas_Lithology.csv
T98R-21C	61.25	61.75	0.5	COAL	Tenas_Lithology.csv
T98R-21C	61.75	62.31	0.56	MDST	Tenas_Lithology.csv
T98R-21C	62.31	63.26	0.95	SLTS	Tenas_Lithology.csv
T98R-21C	63.26	63.34	0.08	MDST	Tenas_Lithology.csv
T98R-21C	63.34	63.59	0.25	COAL	Tenas_Lithology.csv
T98R-21C	63.59	63.63	0.04	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	63.63	63.72	0.09	COAL	Tenas_Lithology.csv
T98R-21C	63.72	63.9	0.18	MDST	Tenas_Lithology.csv
T98R-21C	63.9	64.29	0.39	SLTS	Tenas_Lithology.csv
T98R-21C	64.29	64.35	0.06	MDST	Tenas_Lithology.csv
T98R-21C	64.35	66.23	1.88	COAL	Tenas_Lithology.csv
T98R-21C	66.23	66.31	0.08	MDST	Tenas_Lithology.csv
T98R-21C	66.31	66.85	0.54	SLTS	Tenas_Lithology.csv
T98R-21C	66.85	73.54	6.69	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	73.54	75.08	1.54	SLTS	Tenas_Lithology.csv
T98R-21C	75.08	75.15	0.07	MDST	Tenas_Lithology.csv
T98R-21C	75.15	77.34	2.19	COAL	Tenas_Lithology.csv
T98R-21C	77.34	77.4	0.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	77.4	78.92	1.52	COAL	Tenas_Lithology.csv
T98R-21C	78.92	79.07	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv

Table modified from original : merged successive intervals with same lithology descriptor

Hole ID	From (m)	To (m)	Length (m)	LITHO_SMPLFD	Source
T98R-21C	79.07	79.32	0.25	COAL	Tenas_Lithology.csv
T98R-21C	79.32	79.51	0.19	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	79.51	82.72	3.21	COAL	Tenas_Lithology.csv
T98R-21C	82.72	82.86	0.14	MDST	Tenas_Lithology.csv
T98R-21C	82.86	83.26	0.4	SLTS	Tenas_Lithology.csv
T98R-21C	83.26	84.94	1.68	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	84.94	85.86	0.92	COAL	Tenas_Lithology.csv
T98R-21C	85.86	86.09	0.23	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	86.09	87.15	1.06	COAL	Tenas_Lithology.csv
T98R-21C	87.15	89.28	2.13	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-21C	89.28	89.45	0.17	COAL	Tenas_Lithology.csv
T98R-21C	89.45	91.8	2.35	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-23	0	1.6	1.6	Overburden	Tenas_Lithology.csv
T98R-23	1.6	2.87	1.27	COAL	Tenas_Lithology.csv
T98R-23	2.87	4.76	1.89	MDST	Tenas_Lithology.csv
T98R-23	4.76	5.8	1.04	COAL	Tenas_Lithology.csv
T98R-23	5.8	7	1.2	MDST	Tenas_Lithology.csv
T98R-23	7	7.55	0.55	SLTS	Tenas_Lithology.csv
T98R-23	7.55	7.85	0.3	COAL	Tenas_Lithology.csv
T98R-23	7.85	8.31	0.46	MDST	Tenas_Lithology.csv
T98R-23	8.31	8.88	0.57	COAL	Tenas_Lithology.csv
T98R-23	8.88	15	6.12	SLTS	Tenas_Lithology.csv
T98R-23	15	16.5	1.5	MDST	Tenas_Lithology.csv
T98R-23	16.5	24.8	8.3	SLTS	Tenas_Lithology.csv
T98R-24	0	1.8	1.8	Overburden	Tenas_Lithology.csv
T98R-24	1.8	2.53	0.73	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-24	2.53	3.3	0.77	COAL	Tenas_Lithology.csv
T98R-24	3.3	4.7	1.4	MDST	Tenas_Lithology.csv
T98R-24	4.7	6.3	1.6	COAL	Tenas_Lithology.csv
T98R-24	6.3	9.16	2.86	MDST	Tenas_Lithology.csv
T98R-24	9.16	9.33	0.17	COAL	Tenas_Lithology.csv
T98R-24	9.33	10.63	1.3	MDST	Tenas_Lithology.csv
T98R-24	10.63	12.63	2	COAL	Tenas_Lithology.csv
T98R-24	12.63	15.04	2.41	SLTS	Tenas_Lithology.csv
T98R-24	15.04	17.71	2.67	COAL	Tenas_Lithology.csv
T98R-24	17.71	18.14	0.43	MDST	Tenas_Lithology.csv
T98R-24	18.14	18.34	0.2	COAL	Tenas_Lithology.csv
T98R-24	18.34	18.66	0.32	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-24	18.66	18.74	0.08	COAL	Tenas_Lithology.csv
T98R-24	18.74	19.8	1.06	MDST	Tenas_Lithology.csv
T98R-24	19.8	20.28	0.48	COAL	Tenas_Lithology.csv
T98R-24	20.28	20.43	0.15	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-24	20.43	21.51	1.08	COAL	Tenas_Lithology.csv
T98R-24	21.51	30.5	8.99	MDST	Tenas_Lithology.csv
T98R-25	0	4.34	4.34	Overburden	Tenas_Lithology.csv
T98R-25	4.34	5.51	1.17	COAL	Tenas_Lithology.csv
T98R-25	5.51	6.53	1.02	MDST	Tenas_Lithology.csv
T98R-25	6.53	9.92	3.39	COAL	Tenas_Lithology.csv
T98R-25	9.92	10.41	0.49	MDST	Tenas_Lithology.csv
T98R-25	10.41	11.05	0.64	COAL	Tenas_Lithology.csv
T98R-25	11.05	11.17	0.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-25	11.17	11.63	0.46	COAL	Tenas_Lithology.csv
T98R-25	11.63	18.5	6.87	MDST	Tenas_Lithology.csv
T98R-31C	0	6.7	6.7	Overburden	Tenas_Lithology.csv
T98R-31C	6.7	16.82	10.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-31C	16.82	17.22	0.4	COAL	Tenas_Lithology.csv
T98R-31C	17.22	19.62	2.4	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-31C	19.62	20.2	0.58	COAL	Tenas_Lithology.csv
T98R-31C	20.2	24.55	4.35	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-31C	24.55	26.2	1.65	SLTS	Tenas_Lithology.csv
T98R-31C	26.2	26.3	0.1	MDST	Tenas_Lithology.csv
T98R-31C	26.3	27.2	0.9	COAL	Tenas_Lithology.csv
T98R-31C	27.2	27.26	0.06	MDST	Tenas_Lithology.csv
T98R-31C	27.26	27.71	0.45	SLTS	Tenas_Lithology.csv
T98R-31C	27.71	36.77	9.06	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-31C	36.77	38.05	1.28	SLTS	Tenas_Lithology.csv
T98R-31C	38.05	38.1	0.05	MDST	Tenas_Lithology.csv
T98R-31C	38.1	40.09	1.99	COAL	Tenas_Lithology.csv
T98R-31C	40.09	40.47	0.38	MDST	Tenas_Lithology.csv
T98R-31C	40.47	41.26	0.79	SLTS	Tenas_Lithology.csv
T98R-31C	41.26	41.36	0.1	MDST	Tenas_Lithology.csv
T98R-31C	41.36	45.05	3.69	COAL	Tenas_Lithology.csv
T98R-31C	45.05	45.09	0.04	MDST	Tenas_Lithology.csv
T98R-31C	45.09	45.7	0.61	SLTS	Tenas_Lithology.csv
T98R-31C	45.7	45.77	0.07	MDST	Tenas_Lithology.csv
T98R-31C	45.77	46.34	0.57	COAL	Tenas_Lithology.csv
T98R-31C	46.34	46.44	0.1	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
T98R-31C	46.44	46.71	0.27	COAL	Tenas_Lithology.csv
T98R-31C	46.71	47.08	0.37	SLTS	Tenas_Lithology.csv
T98R-31C	47.08	51.2	4.12	? (BENT, OBR, P, SHC, UNDF	Tenas_Lithology.csv
TOB96-01-05	0	4.6	4.6	Overburden	Tenas_Lithology.csv
TOB96-01-05	4.6	10.55	5.95	MDST	Tenas_Lithology.csv
TOB96-02-06	0	32.7	32.7	Overburden	Tenas_Lithology.csv
TOB96-02-06	32.7	33.7	1	MDST	Tenas_Lithology.csv
TOB96-04	0	117.5	117.5	Overburden	Tenas_Lithology.csv
TOB96-04	117.5	123	5.5	VOLC	Tenas_Lithology.csv
TOB96-11-04	0	4.92	4.92	Overburden	Tenas_Lithology.csv
TOB96-12-04	0	3.64	3.64	Overburden	Tenas_Lithology.csv
TOB96-12-04	3.64	7	3.36	VOLC	Tenas_Lithology.csv
TOB96-13	0	13.15	13.15	Overburden	Tenas_Lithology.csv
TOB96-13	13.15	20	6.85	VOLC	Tenas_Lithology.csv
TOB96-18	0	18.2	18.2	Overburden	Tenas_Lithology.csv
TOB96-18	18.2	20.25	2.05	MDST	Tenas_Lithology.csv
TOB97-07-24	0	10.2	10.2	Overburden	Tenas_Lithology.csv
W01	0	11.5	11.5	Overburden	Tenas_Lithology.csv
W01	11.5	70	58.5	VOLC	Tenas_Lithology.csv
W02	0	117.8	117.8	Overburden	Tenas_Lithology.csv
W02	117.8	120.65	2.85	VOLC	Tenas_Lithology.csv
W03	0	44.2	44.2	Overburden	Tenas_Lithology.csv
W03	44.2	53.2	9	VOLC	Tenas_Lithology.csv

Hole ID	B1	K1	B1 x K1	Bn / K1	B2	K2	B2 x K2	B4 / K4	B3	K3	B3 x K3	B3 / K3	B4	K4	B4 x K4	B4 / K4
	COAL	-	-	-	SST	-	-		SLTS	-	-	-	MDST	-	-	-
T18-01D	6.8	5E-07	3.39E-06	1.36E+07	0.0	3E-07	0.00E+00	0.00E+00	6.4	3E-08	1.93E-07	2.14E+08	19.8	3E-08	5.94E-07	6.60E+08
T18-01S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-01TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-02D	13.1	5E-07	6.57E-06	2.63E+07	12.0	3E-07	3.60E-06	4.00E+07	32.5	3E-08	9.74E-07	1.08E+09	54.3	3E-08	1.63E-06	1.81E+09
T18-02S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-02TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-03S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-03TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-04S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-04TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-05D	15.2	5E-07	7.61E-06	3.04E+07	0.0	3E-07	0.00E+00	0.00E+00	118.4	3E-08	3.55E-06	3.95E+09	29.9	3E-08	8.96E-07	9.95E+08
T18-05S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-05TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-06TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-07S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-07TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-08S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-08TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-09S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-09TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-10S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-10TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-11S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-11TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-12S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-12TP	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T18-13S	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T81R-108	0.0	5E-07	0.00E+00	0.00E+00	10.2	3E-07	3.05E-06	3.38E+07	53.5	3E-08	1.60E-06	1.78E+09	22.7	3E-08	6.81E-07	7.57E+08
T92R-39C	7.4	5E-07	3.72E-06	1.49E+07	30.4	3E-07	9.12E-06	1.01E+08	18.7	3E-08	5.61E-07	6.23E+08	3.7	3E-08	1.10E-07	1.22E+08
T92R-42	0.0	5E-07	0.00E+00	0.00E+00	8.0	3E-07	2.40E-06	2.67E+07	7.0	3E-08	2.09E-07	2.32E+08	5.9	3E-08	1.77E-07	1.96E+08
T92R-43	10.0	5E-07	4.99E-06	1.99E+07	18.9	3E-07	5.68E-06	6.31E+07	22.2	3E-08	6.66E-07	7.40E+08	27.5	3E-08	8.25E-07	9.16E+08
T93D-45	6.7	5E-07	3.35E-06	1.34E+07	47.7	3E-07	1.43E-05	1.59E+08	21.0	3E-08	6.30E-07	7.00E+08	19.7	3E-08	5.90E-07	6.55E+08
T93D-47	1.3	5E-07	6.40E-07	2.56E+06	60.2	3E-07	1.81E-05	2.01E+08	101.4	3E-08	3.04E-06	3.38E+09	1.9	3E-08	5.79E-08	6.43E+07
T93D-53	12.2	5E-07	6.09E-06	2.44E+07	9.8	3E-07	2.93E-06	3.26E+07	49.2	3E-08	1.48E-06	1.64E+09	12.5	3E-08	3.74E-07	4.16E+08
T93R-02	7.8	5E-07	3.91E-06	1.56E+07	27.8	3E-07	8.34E-06	9.27E+07	17.9	3E-08	5.37E-07	5.96E+08	25.4	3E-08	7.63E-07	8.47E+08
T93R-03	9.0	5E-07	4.48E-06	1.79E+07	4.8	3E-07	1.44E-06	1.60E+07	60.7	3E-08	1.82E-06	2.02E+09	21.1	3E-08	6.33E-07	7.03E+08
T93R-04	0.0	5E-07	0.00E+00	0.00E+00	23.1	3E-07	6.94E-06	7.71E+07	0.0	3E-08	0.00E+00	0.00E+00	43.6	3E-08	1.31E-06	1.45E+09
T93R-05	11.5	5E-07	5.74E-06	2.30E+07	4.0	3E-07	1.19E-06	1.32E+07	19.1	3E-08	5.72E-07	6.35E+08	53.8	3E-08	1.61E-06	1.79E+09
T93R-06C	9.3	5E-07	4.64E-06	1.86E+07	4.6	3E-07	1.38E-06	1.53E+07	0.9	3E-08	2.73E-08	3.03E+07	39.8	3E-08	1.19E-06	1.33E+09
T93R-08C	7.3	5E-07	3.66E-06	1.46E+07	15.4	3E-07	4.63E-06	5.15E+07	13.1	3E-08	3.93E-07	4.37E+08	5.3	3E-08	1.59E-07	1.76E+08
T93R-09	1.2	5E-07	6.20E-07	2.48E+06	45.4	3E-07	1.36E-05	1.51E+08	38.1	3E-08	1.14E-06	1.27E+09	85.3	3E-08	2.56E-06	2.84E+09
T93R-10	2.2	5E-07	1.11E-06	4.42E+06	25.4	3E-07	7.63E-06	8.47E+07	20.2	3E-08	6.05E-07	6.72E+08	2.2	3E-08	6.54E-08	7.27E+07
T93R-12	16.6	5E-07	8.30E-06	3.32E+07	1.8	3E-07	5.49E-07	6.10E+06	17.7	3E-08	5.30E-07	5.88E+08	77.1	3E-08	2.31E-06	2.57E+09
T93R-13	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	9.5	3E-08	2.84E-07	3.15E+08	30.7	3E-08	9.22E-07	1.02E+09
T93R-14	0.0	5E-07	0.00E+00	0.00E+00	22.0	3E-07	6.59E-06	7.32E+07	26.2	3E-08	7.86E-07	8.74E+08	0.0	3E-08	0.00E+00	0.00E+00
T93R-15	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T93R-16	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T93R-17	9.6	5E-07	4.80E-06	1.92E+07	15.5	3E-07	4.65E-06	5.17E+07	25.5	3E-08	7.66E-07	8.51E+08	73.9	3E-08	2.22E-06	2.46E+09

Hole ID	B1	K1	B1 x K1	Bn / K1	B2	K2	B2 x K2	B4 / K4	B3	K3	B3 x K3	B3 / K3	B4	K4	B4 x K4	B4 / K4
	COAL	-	-	-	SST	-	-		SLTS	-	-	-	MDST	-	-	-
T93R-18	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	13.5	3E-08	4.04E-07	4.48E+08
T93R-19	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T93R-51	0.0	5E-07	0.00E+00	0.00E+00	10.4	3E-07	3.13E-06	3.48E+07	20.8	3E-08	6.23E-07	6.92E+08	36.5	3E-08	1.09E-06	1.22E+09
T94R-01	9.0	5E-07	4.52E-06	1.81E+07	35.7	3E-07	1.07E-05	1.19E+08	27.1	3E-08	8.12E-07	9.03E+08	7.6	3E-08	2.29E-07	2.54E+08
T94R-02	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T94R-03	9.1	5E-07	4.53E-06	1.81E+07	46.6	3E-07	1.40E-05	1.55E+08	21.0	3E-08	6.30E-07	7.00E+08	7.2	3E-08	2.15E-07	2.39E+08
T94R-04C	9.8	5E-07	4.88E-06	1.95E+07	13.2	3E-07	3.95E-06	4.39E+07	26.6	3E-08	7.98E-07	8.87E+08	15.0	3E-08	4.51E-07	5.01E+08
T94R-05	5.3	5E-07	2.67E-06	1.07E+07	57.5	3E-07	1.72E-05	1.92E+08	43.2	3E-08	1.30E-06	1.44E+09	9.4	3E-08	2.82E-07	3.13E+08
T94R-06	2.1	5E-07	1.06E-06	4.26E+06	15.0	3E-07	4.49E-06	4.99E+07	114.6	3E-08	3.44E-06	3.82E+09	19.0	3E-08	5.69E-07	6.33E+08
T94R-07	11.4	5E-07	5.69E-06	2.28E+07	8.0	3E-07	2.40E-06	2.67E+07	70.2	3E-08	2.11E-06	2.34E+09	25.2	3E-08	7.57E-07	8.41E+08
T94R-08	1.0	5E-07	5.10E-07	2.04E+06	10.2	3E-07	3.07E-06	3.41E+07	57.8	3E-08	1.73E-06	1.93E+09	57.8	3E-08	1.73E-06	1.93E+09
T94R-09	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T94R-10C	11.2	5E-07	5.61E-06	2.24E+07	0.0	3E-07	0.00E+00	0.00E+00	2.8	3E-08	8.49E-08	9.43E+07	69.4	3E-08	2.08E-06	2.31E+09
T94R-11	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T94R-12	3.1	5E-07	1.55E-06	6.20E+06	3.5	3E-07	1.05E-06	1.17E+07	0.0	3E-08	0.00E+00	0.00E+00	47.1	3E-08	1.41E-06	1.57E+09
T94R-13	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T95R-06	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T95R-07C	11.9	5E-07	5.94E-06	2.37E+07	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	37.6	3E-08	1.13E-06	1.25E+09
T95R-09	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	1.5	3E-08	4.50E-08	5.00E+07
T95R-10	5.8	5E-07	2.92E-06	1.17E+07	47.3	3E-07	1.42E-05	1.58E+08	8.8	3E-08	2.64E-07	2.93E+08	26.0	3E-08	7.80E-07	8.67E+08
T95R-11	3.4	5E-07	1.72E-06	6.88E+06	4.3	3E-07	1.30E-06	1.45E+07	29.8	3E-08	8.93E-07	9.93E+08	12.9	3E-08	3.88E-07	4.31E+08
T95R-13	10.0	5E-07	4.99E-06	2.00E+07	4.9	3E-07	1.47E-06	1.63E+07	41.7	3E-08	1.25E-06	1.39E+09	33.5	3E-08	1.00E-06	1.12E+09
T95R-14	7.7	5E-07	3.86E-06	1.54E+07	18.3	3E-07	5.49E-06	6.10E+07	107.3	3E-08	3.22E-06	3.58E+09	28.0	3E-08	8.41E-07	9.34E+08
T95R-15C	11.1	5E-07	5.54E-06	2.22E+07	7.6	3E-07	2.27E-06	2.52E+07	32.9	3E-08	9.88E-07	1.10E+09	41.9	3E-08	1.26E-06	1.40E+09
T95R-17	2.5	5E-07	1.27E-06	5.08E+06	60.7	3E-07	1.82E-05	2.02E+08	22.2	3E-08	6.66E-07	7.40E+08	86.8	3E-08	2.60E-06	2.89E+09
T95R-19C	15.4	5E-07	7.70E-06	3.08E+07	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	63.1	3E-08	1.89E-06	2.10E+09
T95R-20	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T95R-21	10.8	5E-07	5.42E-06	2.17E+07	0.0	3E-07	0.00E+00	0.00E+00	47.1	3E-08	1.41E-06	1.57E+09	7.4	3E-08	2.21E-07	2.46E+08
T95R-22C	15.5	5E-07	7.74E-06	3.10E+07	0.9	3E-07	2.70E-07	3.00E+06	0.0	3E-08	0.00E+00	0.00E+00	68.0	3E-08	2.04E-06	2.27E+09
T95R-24	9.7	5E-07	4.86E-06	1.94E+07	4.8	3E-07	1.43E-06	1.59E+07	17.1	3E-08	5.12E-07	5.69E+08	30.9	3E-08	9.27E-07	1.03E+09
T95R-25	2.2	5E-07	1.11E-06	4.44E+06	19.6	3E-07	5.87E-06	6.52E+07	5.7	3E-08	1.71E-07	1.90E+08	3.9	3E-08	1.18E-07	1.31E+08
T95R-26	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	35.0	3E-08	1.05E-06	1.17E+09
T95R-28C	10.7	5E-07	5.37E-06	2.15E+07	0.0	3E-07	0.00E+00	0.00E+00	29.2	3E-08	8.76E-07	9.73E+08	68.5	3E-08	2.05E-06	2.28E+09
T95R-30	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T95R-31	10.7	5E-07	5.36E-06	2.14E+07	56.6	3E-07	1.70E-05	1.89E+08	33.4	3E-08	1.00E-06	1.11E+09	36.1	3E-08	1.08E-06	1.20E+09
T95R-32	2.3	5E-07	1.13E-06	4.50E+06	22.8	3E-07	6.84E-06	7.60E+07	54.1	3E-08	1.62E-06	1.80E+09	37.4	3E-08	1.12E-06	1.25E+09
T95R-34	12.1	5E-07	6.07E-06	2.43E+07	6.5	3E-07	1.94E-06	2.16E+07	28.4	3E-08	8.52E-07	9.46E+08	63.6	3E-08	1.91E-06	2.12E+09
T95R-35C	2.9	5E-07	1.45E-06	5.80E+06	56.2	3E-07	1.68E-05	1.87E+08	24.0	3E-08	7.21E-07	8.01E+08	36.3	3E-08	1.09E-06	1.21E+09
T95R-36	1.8	5E-07	9.10E-07	3.64E+06	23.4	3E-07	7.03E-06	7.81E+07	6.9	3E-08	2.06E-07	2.28E+08	18.9	3E-08	5.67E-07	6.30E+08
T95R-38C	15.0	5E-07	7.52E-06	3.01E+07	13.0	3E-07	3.89E-06	4.32E+07	0.0	3E-08	0.00E+00	0.00E+00	47.7	3E-08	1.43E-06	1.59E+09
T95R-39C	6.9	5E-07	3.43E-06	1.37E+07	5.3	3E-07	1.59E-06	1.77E+07	17.7	3E-08	5.32E-07	5.91E+08	47.1	3E-08	1.41E-06	1.57E+09
T95R-40	13.7	5E-07	6.86E-06	2.74E+07	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	28.0	3E-08	8.39E-07	9.33E+08
T95R-43	2.6	5E-07	1.30E-06	5.20E+06	32.5	3E-07	9.74E-06	1.08E+08	4.0	3E-08	1.20E-07	1.33E+08	2.1	3E-08	6.36E-08	7.07E+07
T95R-44	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00

Hole ID	B1	K1	B1 x K1	Bn / K1	B2	K2	B2 x K2	B4 / K4	B3	K3	B3 x K3	B3 / K3	B4	K4	B4 x K4	B4 / K4
	COAL	-	-	-	SST	-	-		SLTS	-	-	-	MDST	-	-	-
T95R-45	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T95R-46	11.5	5E-07	5.76E-06	2.30E+07	23.8	3E-07	7.14E-06	7.93E+07	36.8	3E-08	1.10E-06	1.23E+09	21.0	3E-08	6.30E-07	7.00E+08
T95R-50C	10.1	5E-07	5.03E-06	2.01E+07	48.2	3E-07	1.45E-05	1.61E+08	3.4	3E-08	1.01E-07	1.13E+08	15.8	3E-08	4.73E-07	5.25E+08
T95R-60	18.3	5E-07	9.15E-06	3.66E+07	14.5	3E-07	4.35E-06	4.83E+07	44.3	3E-08	1.33E-06	1.48E+09	31.3	3E-08	9.39E-07	1.04E+09
T95R-61	9.9	5E-07	4.94E-06	1.98E+07	37.8	3E-07	1.13E-05	1.26E+08	30.3	3E-08	9.10E-07	1.01E+09	13.3	3E-08	4.00E-07	4.44E+08
T95R-62	4.7	5E-07	2.35E-06	9.40E+06	14.3	3E-07	4.30E-06	4.78E+07	52.5	3E-08	1.58E-06	1.75E+09	1.7	3E-08	4.95E-08	5.50E+07
T95R-63	11.0	5E-07	5.48E-06	2.19E+07	6.6	3E-07	1.97E-06	2.18E+07	16.7	3E-08	5.00E-07	5.55E+08	25.4	3E-08	7.62E-07	8.47E+08
T95R-64	10.6	5E-07	5.30E-06	2.12E+07	64.4	3E-07	1.93E-05	2.15E+08	27.4	3E-08	8.23E-07	9.15E+08	15.1	3E-08	4.52E-07	5.02E+08
T95R-65	11.7	5E-07	5.86E-06	2.34E+07	12.9	3E-07	3.88E-06	4.31E+07	101.8	3E-08	3.05E-06	3.39E+09	17.8	3E-08	5.34E-07	5.94E+08
T95R-66	4.0	5E-07	2.00E-06	8.00E+06	78.7	3E-07	2.36E-05	2.62E+08	9.4	3E-08	2.82E-07	3.13E+08	43.5	3E-08	1.30E-06	1.45E+09
T95R-67	8.6	5E-07	4.28E-06	1.71E+07	15.1	3E-07	4.52E-06	5.03E+07	13.9	3E-08	4.18E-07	4.64E+08	15.4	3E-08	4.63E-07	5.15E+08
T95R-68	11.7	5E-07	5.85E-06	2.34E+07	36.9	3E-07	1.11E-05	1.23E+08	20.4	3E-08	6.12E-07	6.80E+08	46.0	3E-08	1.38E-06	1.53E+09
T95R-69	10.2	5E-07	5.10E-06	2.04E+07	30.1	3E-07	9.03E-06	1.00E+08	22.2	3E-08	6.66E-07	7.40E+08	11.2	3E-08	3.36E-07	3.73E+08
T95R-70	0.0	5E-07	0.00E+00	0.00E+00	56.1	3E-07	1.68E-05	1.87E+08	7.7	3E-08	2.31E-07	2.56E+08	0.0	3E-08	0.00E+00	0.00E+00
T95R-71	12.4	5E-07	6.18E-06	2.47E+07	38.9	3E-07	1.17E-05	1.30E+08	16.8	3E-08	5.03E-07	5.58E+08	17.3	3E-08	5.20E-07	5.78E+08
T95R-74	7.8	5E-07	3.89E-06	1.56E+07	36.0	3E-07	1.08E-05	1.20E+08	0.0	3E-08	0.00E+00	0.00E+00	13.7	3E-08	4.11E-07	4.57E+08
T95R-76	8.8	5E-07	4.38E-06	1.75E+07	23.2	3E-07	6.95E-06	7.72E+07	0.0	3E-08	0.00E+00	0.00E+00	30.3	3E-08	9.08E-07	1.01E+09
T95R-77	0.0	5E-07	0.00E+00	0.00E+00	3.4	3E-07	1.02E-06	1.13E+07	14.7	3E-08	4.41E-07	4.90E+08	18.8	3E-08	5.64E-07	6.27E+08
T95R-78	1.0	5E-07	4.80E-07	1.92E+06	51.9	3E-07	1.56E-05	1.73E+08	9.3	3E-08	2.78E-07	3.09E+08	7.9	3E-08	2.38E-07	2.65E+08
T95R-79	3.9	5E-07	1.95E-06	7.78E+06	10.4	3E-07	3.12E-06	3.46E+07	5.0	3E-08	1.50E-07	1.67E+08	18.9	3E-08	5.67E-07	6.30E+08
T95R-80	6.3	5E-07	3.13E-06	1.25E+07	25.9	3E-07	7.76E-06	8.63E+07	18.5	3E-08	5.55E-07	6.16E+08	1.7	3E-08	5.22E-08	5.80E+07
T95R-81	5.5	5E-07	2.75E-06	1.10E+07	14.6	3E-07	4.37E-06	4.85E+07	11.6	3E-08	3.49E-07	3.87E+08	28.4	3E-08	8.53E-07	9.48E+08
T96R-01	13.5	5E-07	6.76E-06	2.70E+07	50.3	3E-07	1.51E-05	1.68E+08	91.6	3E-08	2.75E-06	3.05E+09	32.9	3E-08	9.86E-07	1.10E+09
T96R-02	0.0	5E-07	0.00E+00	0.00E+00	4.0	3E-07	1.20E-06	1.33E+07	27.4	3E-08	8.23E-07	9.15E+08	32.5	3E-08	9.74E-07	1.08E+09
T96R-03	7.3	5E-07	3.63E-06	1.45E+07	36.1	3E-07	1.08E-05	1.20E+08	68.9	3E-08	2.07E-06	2.30E+09	9.2	3E-08	2.76E-07	3.06E+08
T96R-04C	8.0	5E-07	3.99E-06	1.59E+07	8.4	3E-07	2.51E-06	2.79E+07	1.8	3E-08	5.46E-08	6.07E+07	17.5	3E-08	5.25E-07	5.83E+08
T96R-05C	13.8	5E-07	6.90E-06	2.76E+07	1.6	3E-07	4.74E-07	5.27E+06	26.9	3E-08	8.08E-07	8.97E+08	35.7	3E-08	1.07E-06	1.19E+09
T96R-06	11.1	5E-07	5.55E-06	2.22E+07	38.7	3E-07	1.16E-05	1.29E+08	25.2	3E-08	7.57E-07	8.41E+08	17.3	3E-08	5.20E-07	5.77E+08
T96R-07C	7.5	5E-07	3.77E-06	1.51E+07	0.0	3E-07	0.00E+00	0.00E+00	2.9	3E-08	8.61E-08	9.57E+07	13.6	3E-08	4.08E-07	4.53E+08
T96R-08	2.3	5E-07	1.16E-06	4.64E+06	20.7	3E-07	6.21E-06	6.90E+07	6.5	3E-08	1.95E-07	2.17E+08	14.5	3E-08	4.34E-07	4.82E+08
T96R-10	8.3	5E-07	4.17E-06	1.67E+07	29.5	3E-07	8.86E-06	9.84E+07	7.9	3E-08	2.37E-07	2.63E+08	5.5	3E-08	1.64E-07	1.82E+08
T96R-105	0.0	5E-07	0.00E+00	0.00E+00	43.7	3E-07	1.31E-05	1.46E+08	1.5	3E-08	4.50E-08	5.00E+07	0.0	3E-08	0.00E+00	0.00E+00
T96R-11	5.3	5E-07	2.66E-06	1.06E+07	44.7	3E-07	1.34E-05	1.49E+08	15.7	3E-08	4.70E-07	5.23E+08	20.3	3E-08	6.08E-07	6.75E+08
T96R-110	5.7	5E-07	2.87E-06	1.15E+07	0.0	3E-07	0.00E+00	0.00E+00	19.0	3E-08	5.69E-07	6.32E+08	4.1	3E-08	1.23E-07	1.37E+08
T96R-119	2.9	5E-07	1.45E-06	5.78E+06	37.3	3E-07	1.12E-05	1.24E+08	25.8	3E-08	7.75E-07	8.61E+08	14.0	3E-08	4.19E-07	4.65E+08
T96R-120	5.4	5E-07	2.72E-06	1.09E+07	17.4	3E-07	5.21E-06	5.79E+07	27.2	3E-08	8.15E-07	9.06E+08	14.6	3E-08	4.39E-07	4.87E+08
T96R-121	11.9	5E-07	5.94E-06	2.38E+07	46.3	3E-07	1.39E-05	1.54E+08	39.1	3E-08	1.17E-06	1.30E+09	4.6	3E-08	1.37E-07	1.52E+08
T96R-124	12.3	5E-07	6.13E-06	2.45E+07	4.6	3E-07	1.37E-06	1.52E+07	43.8	3E-08	1.31E-06	1.46E+09	3.8	3E-08	1.15E-07	1.27E+08
T96R-125	10.6	5E-07	5.28E-06	2.11E+07	19.3	3E-07	5.79E-06	6.44E+07	4.8	3E-08	1.43E-07	1.59E+08	8.1	3E-08	2.42E-07	2.68E+08
T96R-126	5.5	5E-07	2.77E-06	1.11E+07	7.9	3E-07	2.37E-06	2.63E+07	11.9	3E-08	3.58E-07	3.98E+08	11.4	3E-08	3.41E-07	3.79E+08
T96R-127	9.2	5E-07	4.58E-06	1.83E+07	16.8	3E-07	5.03E-06	5.58E+07	16.4	3E-08	4.93E-07	5.48E+08	3.0	3E-08	9.06E-08	1.01E+08
T96R-128	0.2	5E-07	8.00E-08	3.20E+05	1.7	3E-07	5.10E-07	5.67E+06	30.1	3E-08	9.03E-07	1.00E+09	16.1	3E-08	4.84E-07	5.38E+08
T96R-129	8.8	5E-07	4.41E-06	1.76E+07	0.0	3E-07	0.00E+00	0.00E+00	25.2	3E-08	7.56E-07	8.40E+08	13.0	3E-08	3.89E-07	4.33E+08
T96R-12C	7.5	5E-07	3.74E-06	1.50E+07	0.0	3E-07	0.00E+00	0.00E+00	7.0	3E-08	2.10E-07	2.33E+08	7.5	3E-08	2.24E-07	2.49E+08
T96R-130	5.2	5E-07	2.59E-06	1.03E+07	27.9	3E-07	8.38E-06	9.31E+07	36.6	3E-08	1.10E-06	1.22E+09	32.3	3E-08	9.69E-07	1.08E+09
T96R-131	12.3	5E-07	6.16E-06	2.46E+07	11.8	3E-07	3.54E-06	3.93E+07	39.4	3E-08	1.18E-06	1.31E+09	31.1	3E-08	9.32E-07	1.04E+09
T96R-137	4.1	5E-07	2.04E-06	8.14E+06	0.0	3E-07	0.00E+00	0.00E+00	17.0	3E-08	5.11E-07	5.68E+08	10.0	3E-08	3.00E-07	3.34E+08
T96R-13C	5.8	5E-07	2.88E-06	1.15E+07	0.0	3E-07	0.00E+00	0.00E+00	4.9	3E-08	1.46E-07	1.62E+08	8.6	3E-08	2.58E-07	2.86E+08

Hole ID	B1	K1	B1 x K1	Bn / K1	B2	K2	B2 x K2	B4 / K4	B3	K3	B3 x K3	B3 / K3	B4	K4	B4 x K4	B4 / K4
	COAL	-	-	-	SST	-	-		SLTS	-	-	-	MDST	-	-	-
T96R-14	9.7	5E-07	4.85E-06	1.94E+07	27.3	3E-07	8.20E-06	9.11E+07	43.9	3E-08	1.32E-06	1.46E+09	32.0	3E-08	9.58E-07	1.07E+09
T96R-15	10.7	5E-07	5.34E-06	2.14E+07	41.7	3E-07	1.25E-05	1.39E+08	36.9	3E-08	1.11E-06	1.23E+09	12.9	3E-08	3.88E-07	4.31E+08
T96R-16	7.9	5E-07	3.94E-06	1.58E+07	28.6	3E-07	8.58E-06	9.53E+07	17.1	3E-08	5.13E-07	5.70E+08	9.9	3E-08	2.96E-07	3.28E+08
T96R-17C	6.0	5E-07	3.01E-06	1.20E+07	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	10.0	3E-08	2.99E-07	3.33E+08
T96R-18C	5.7	5E-07	2.83E-06	1.13E+07	0.0	3E-07	0.00E+00	0.00E+00	5.4	3E-08	1.62E-07	1.80E+08	1.4	3E-08	4.32E-08	4.80E+07
T96R-19	8.4	5E-07	4.20E-06	1.68E+07	28.4	3E-07	8.51E-06	9.46E+07	31.7	3E-08	9.51E-07	1.06E+09	3.9	3E-08	1.16E-07	1.29E+08
T96R-20C	2.2	5E-07	1.09E-06	4.36E+06	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	4.8	3E-08	1.43E-07	1.59E+08
T96R-21	8.7	5E-07	4.33E-06	1.73E+07	29.7	3E-07	8.91E-06	9.90E+07	24.6	3E-08	7.36E-07	8.18E+08	11.6	3E-08	3.48E-07	3.87E+08
T96R-22	13.5	5E-07	6.73E-06	2.69E+07	30.0	3E-07	9.00E-06	1.00E+08	35.5	3E-08	1.06E-06	1.18E+09	34.7	3E-08	1.04E-06	1.16E+09
T96R-23C	7.4	5E-07	3.71E-06	1.48E+07	1.2	3E-07	3.69E-07	4.10E+06	45.4	3E-08	1.36E-06	1.51E+09	50.7	3E-08	1.52E-06	1.69E+09
T96R-24	18.3	5E-07	9.16E-06	3.66E+07	34.9	3E-07	1.05E-05	1.16E+08	56.6	3E-08	1.70E-06	1.89E+09	15.0	3E-08	4.49E-07	4.98E+08
T96R-25	11.7	5E-07	5.85E-06	2.34E+07	0.0	3E-07	0.00E+00	0.00E+00	14.3	3E-08	4.29E-07	4.77E+08	45.1	3E-08	1.35E-06	1.50E+09
T96R-26	7.2	5E-07	3.61E-06	1.44E+07	25.1	3E-07	7.52E-06	8.35E+07	45.3	3E-08	1.36E-06	1.51E+09	12.7	3E-08	3.80E-07	4.23E+08
T96R-27	5.5	5E-07	2.77E-06	1.11E+07	17.4	3E-07	5.23E-06	5.81E+07	20.2	3E-08	6.05E-07	6.73E+08	10.6	3E-08	3.19E-07	3.54E+08
T96R-28C	11.0	5E-07	5.52E-06	2.21E+07	2.5	3E-07	7.65E-07	8.50E+06	52.9	3E-08	1.59E-06	1.76E+09	43.4	3E-08	1.30E-06	1.45E+09
T96R-29	9.0	5E-07	4.51E-06	1.80E+07	23.4	3E-07	7.03E-06	7.81E+07	34.6	3E-08	1.04E-06	1.15E+09	7.2	3E-08	2.16E-07	2.40E+08
T96R-30	15.4	5E-07	7.70E-06	3.08E+07	37.5	3E-07	1.13E-05	1.25E+08	42.5	3E-08	1.27E-06	1.42E+09	25.6	3E-08	7.67E-07	8.53E+08
T96R-31	8.5	5E-07	4.24E-06	1.69E+07	19.0	3E-07	5.70E-06	6.34E+07	9.0	3E-08	2.69E-07	2.99E+08	11.1	3E-08	3.34E-07	3.71E+08
T96R-32	6.8	5E-07	3.39E-06	1.36E+07	16.2	3E-07	4.85E-06	5.39E+07	13.5	3E-08	4.05E-07	4.50E+08	7.7	3E-08	2.30E-07	2.56E+08
T96R-33	5.9	5E-07	2.93E-06	1.17E+07	7.9	3E-07	2.36E-06	2.62E+07	0.0	3E-08	0.00E+00	0.00E+00	26.0	3E-08	7.79E-07	8.65E+08
T96R-34	8.7	5E-07	4.37E-06	1.75E+07	31.8	3E-07	9.55E-06	1.06E+08	39.0	3E-08	1.17E-06	1.30E+09	6.0	3E-08	1.80E-07	2.00E+08
T96R-35	1.6	5E-07	8.15E-07	3.26E+06	7.0	3E-07	2.10E-06	2.33E+07	14.5	3E-08	4.35E-07	4.84E+08	14.3	3E-08	4.28E-07	4.75E+08
T96R-37	9.5	5E-07	4.76E-06	1.90E+07	12.4	3E-07	3.73E-06	4.14E+07	23.0	3E-08	6.90E-07	7.67E+08	14.2	3E-08	4.25E-07	4.72E+08
T96R-38	2.9	5E-07	1.43E-06	5.70E+06	26.6	3E-07	7.98E-06	8.86E+07	31.3	3E-08	9.40E-07	1.04E+09	2.9	3E-08	8.61E-08	9.57E+07
T96R-39	0.9	5E-07	4.65E-07	1.86E+06	30.5	3E-07	9.15E-06	1.02E+08	20.7	3E-08	6.20E-07	6.89E+08	6.6	3E-08	1.97E-07	2.19E+08
T96R-41	5.5	5E-07	2.73E-06	1.09E+07	37.5	3E-07	1.13E-05	1.25E+08	30.5	3E-08	9.16E-07	1.02E+09	4.6	3E-08	1.37E-07	1.52E+08
T96R-42C	3.4	5E-07	1.69E-06	6.74E+06	7.8	3E-07	2.34E-06	2.60E+07	81.6	3E-08	2.45E-06	2.72E+09	51.0	3E-08	1.53E-06	1.70E+09
T96R-43	15.7	5E-07	7.85E-06	3.14E+07	0.0	3E-07	0.00E+00	0.00E+00	53.5	3E-08	1.61E-06	1.78E+09	6.3	3E-08	1.89E-07	2.10E+08
T96R-45	0.0	5E-07	0.00E+00	0.00E+00	2.5	3E-07	7.50E-07	8.33E+06	29.4	3E-08	8.82E-07	9.80E+08	2.5	3E-08	7.50E-08	8.33E+07
T96R-46	7.7	5E-07	3.84E-06	1.54E+07	57.2	3E-07	1.72E-05	1.91E+08	68.5	3E-08	2.06E-06	2.28E+09	3.0	3E-08	8.97E-08	9.97E+07
T96R-47	11.7	5E-07	5.85E-06	2.34E+07	49.0	3E-07	1.47E-05	1.63E+08	73.8	3E-08	2.21E-06	2.46E+09	6.0	3E-08	1.79E-07	1.99E+08
T96R-49	0.7	5E-07	3.30E-07	1.32E+06	26.6	3E-07	7.99E-06	8.88E+07	5.9	3E-08	1.76E-07	1.95E+08	64.1	3E-08	1.92E-06	2.14E+09
T96R-50	17.0	5E-07	8.51E-06	3.40E+07	24.8	3E-07	7.44E-06	8.27E+07	19.7	3E-08	5.92E-07	6.57E+08	3.1	3E-08	9.21E-08	1.02E+08
T96R-51	5.1	5E-07	2.54E-06	1.02E+07	32.4	3E-07	9.72E-06	1.08E+08	70.0	3E-08	2.10E-06	2.33E+09	13.1	3E-08	3.94E-07	4.38E+08
T96R-52	12.6	5E-07	6.32E-06	2.53E+07	35.8	3E-07	1.07E-05	1.19E+08	39.0	3E-08	1.17E-06	1.30E+09	17.6	3E-08	5.27E-07	5.86E+08
T96R-56C	8.6	5E-07	4.31E-06	1.72E+07	4.2	3E-07	1.27E-06	1.41E+07	29.8	3E-08	8.93E-07	9.93E+08	38.8	3E-08	1.16E-06	1.29E+09
T96R-58	9.7	5E-07	4.86E-06	1.94E+07	11.3	3E-07	3.38E-06	3.75E+07	50.7	3E-08	1.52E-06	1.69E+09	6.0	3E-08	1.81E-07	2.01E+08
T96R-59	2.3	5E-07	1.16E-06	4.64E+06	28.7	3E-07	8.60E-06	9.56E+07	6.5	3E-08	1.94E-07	2.16E+08	8.8	3E-08	2.65E-07	2.94E+08
T96R-60	8.5	5E-07	4.23E-06	1.69E+07	15.2	3E-07	4.56E-06	5.07E+07	13.7	3E-08	4.11E-07	4.57E+08	10.7	3E-08	3.20E-07	3.56E+08
T96R-61	10.9	5E-07	5.44E-06	2.18E+07	18.4	3E-07	5.51E-06	6.12E+07	69.7	3E-08	2.09E-06	2.32E+09	4.2	3E-08	1.26E-07	1.40E+08
T96R-63	8.3	5E-07	4.13E-06	1.65E+07	23.5	3E-07	7.05E-06	7.83E+07	43.8	3E-08	1.31E-06	1.46E+09	0.6	3E-08	1.80E-08	2.00E+07
T96R-64	13.6	5E-07	6.80E-06	2.72E+07	72.8	3E-07	2.18E-05	2.43E+08	20.4	3E-08	6.11E-07	6.79E+08	11.0	3E-08	3.29E-07	3.65E+08
T96R-65C	14.6	5E-07	7.32E-06	2.93E+07	1.3	3E-07	3.90E-07	4.33E+06	51.4	3E-08	1.54E-06	1.71E+09	35.7	3E-08	1.07E-06	1.19E+09
T96R-67	10.7	5E-07	5.34E-06	2.14E+07	67.3	3E-07	2.02E-05	2.24E+08	48.9	3E-08	1.47E-06	1.63E+09	6.1	3E-08	1.83E-07	2.03E+08
T96R-69	6.4	5E-07	3.20E-06	1.28E+07	16.2	3E-07	4.86E-06	5.40E+07	87.8	3E-08	2.63E-06	2.93E+09	2.7	3E-08	8.22E-08	9.13E+07
T96R-70	13.0	5E-07	6.48E-06	2.59E+07	68.6	3E-07	2.06E-05	2.29E+08	42.5	3E-08	1.28E-06	1.42E+09	7.2	3E-08	2.16E-07	2.40E+08
T96R-72	0.2	5E-07	1.20E-07	4.80E+05	59.0	3E-07	1.77E-05	1.97E+08	90.9	3E-08	2.73E-06	3.03E+09	25.6	3E-08	7.69E-07	8.55E+08
T96R-73	9.2	5E-07	4.60E-06	1.84E+07	85.6	3E-07	2.57E-05	2.85E+08	21.5	3E-08	6.44E-07	7.15E+08	10.4	3E-08	3.13E-07	3.48E+08

Hole ID	B1	K1	B1 x K1	Bn / K1	B2	K2	B2 x K2	B4 / K4	B3	K3	B3 x K3	B3 / K3	B4	K4	B4 x K4	B4 / K4
	COAL	-	-	-	SST	-	-		SLTS	-	-	-	MDST	-	-	-
T96R-75	10.8	5E-07	5.38E-06	2.15E+07	19.6	3E-07	5.87E-06	6.53E+07	19.3	3E-08	5.79E-07	6.43E+08	3.2	3E-08	9.57E-08	1.06E+08
T96R-76	5.6	5E-07	2.82E-06	1.13E+07	0.0	3E-07	0.00E+00	0.00E+00	11.8	3E-08	3.55E-07	3.95E+08	0.4	3E-08	1.23E-08	1.37E+07
T96R-77	6.2	5E-07	3.11E-06	1.24E+07	95.9	3E-07	2.88E-05	3.20E+08	39.9	3E-08	1.20E-06	1.33E+09	15.7	3E-08	4.71E-07	5.23E+08
T96R-78	8.3	5E-07	4.16E-06	1.66E+07	15.3	3E-07	4.58E-06	5.08E+07	52.5	3E-08	1.57E-06	1.75E+09	17.2	3E-08	5.15E-07	5.72E+08
T96R-79	1.4	5E-07	6.95E-07	2.78E+06	41.0	3E-07	1.23E-05	1.37E+08	16.1	3E-08	4.83E-07	5.36E+08	0.0	3E-08	0.00E+00	0.00E+00
T96R-82	12.7	5E-07	6.36E-06	2.54E+07	11.0	3E-07	3.30E-06	3.67E+07	63.0	3E-08	1.89E-06	2.10E+09	7.5	3E-08	2.25E-07	2.50E+08
T96R-83	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
T96R-84	1.4	5E-07	7.15E-07	2.86E+06	11.9	3E-07	3.58E-06	3.98E+07	7.7	3E-08	2.32E-07	2.58E+08	1.4	3E-08	4.20E-08	4.67E+07
T96R-86	9.1	5E-07	4.54E-06	1.82E+07	7.6	3E-07	2.28E-06	2.53E+07	7.8	3E-08	2.33E-07	2.59E+08	18.6	3E-08	5.59E-07	6.21E+08
T96R-87	4.9	5E-07	2.46E-06	9.84E+06	24.5	3E-07	7.35E-06	8.17E+07	9.8	3E-08	2.93E-07	3.26E+08	14.6	3E-08	4.38E-07	4.87E+08
T96R-91	1.9	5E-07	9.65E-07	3.86E+06	45.3	3E-07	1.36E-05	1.51E+08	18.0	3E-08	5.39E-07	5.99E+08	8.9	3E-08	2.67E-07	2.96E+08
T96R-92	9.5	5E-07	4.73E-06	1.89E+07	18.5	3E-07	5.55E-06	6.17E+07	20.6	3E-08	6.19E-07	6.87E+08	7.2	3E-08	2.15E-07	2.39E+08
T96R-99	5.8	5E-07	2.92E-06	1.17E+07	22.5	3E-07	6.75E-06	7.50E+07	6.7	3E-08	2.00E-07	2.23E+08	9.9	3E-08	2.96E-07	3.29E+08
T97R-100C	5.2	5E-07	2.62E-06	1.05E+07	3.6	3E-07	1.07E-06	1.19E+07	21.2	3E-08	6.36E-07	7.07E+08	12.8	3E-08	3.84E-07	4.27E+08
T97R-101	4.8	5E-07	2.39E-06	9.56E+06	15.1	3E-07	4.52E-06	5.02E+07	40.0	3E-08	1.20E-06	1.33E+09	3.9	3E-08	1.18E-07	1.31E+08
T97R-102	6.4	5E-07	3.19E-06	1.27E+07	10.4	3E-07	3.12E-06	3.47E+07	39.3	3E-08	1.18E-06	1.31E+09	1.9	3E-08	5.67E-08	6.30E+07
T97R-103	8.0	5E-07	3.99E-06	1.59E+07	0.0	3E-07	0.00E+00	0.00E+00	92.7	3E-08	2.78E-06	3.09E+09	26.6	3E-08	7.98E-07	8.87E+08
T97R-104	5.9	5E-07	2.96E-06	1.18E+07	0.0	3E-07	0.00E+00	0.00E+00	23.4	3E-08	7.03E-07	7.81E+08	7.4	3E-08	2.23E-07	2.48E+08
T97R-105	6.9	5E-07	3.45E-06	1.38E+07	6.3	3E-07	1.89E-06	2.10E+07	14.4	3E-08	4.32E-07	4.80E+08	1.3	3E-08	3.96E-08	4.40E+07
T97R-106	2.4	5E-07	1.20E-06	4.80E+06	14.0	3E-07	4.19E-06	4.65E+07	91.8	3E-08	2.76E-06	3.06E+09	40.5	3E-08	1.22E-06	1.35E+09
T97R-107	10.5	5E-07	5.23E-06	2.09E+07	16.3	3E-07	4.89E-06	5.43E+07	64.3	3E-08	1.93E-06	2.14E+09	21.5	3E-08	6.44E-07	7.15E+08
T97R-108C	9.9	5E-07	4.96E-06	1.99E+07	0.0	3E-07	0.00E+00	0.00E+00	32.5	3E-08	9.76E-07	1.08E+09	9.9	3E-08	2.96E-07	3.29E+08
T97R-109	11.1	5E-07	5.53E-06	2.21E+07	21.7	3E-07	6.50E-06	7.22E+07	72.2	3E-08	2.16E-06	2.41E+09	28.5	3E-08	8.54E-07	9.49E+08
T97R-110	15.4	5E-07	7.70E-06	3.08E+07	0.0	3E-07	0.00E+00	0.00E+00	50.5	3E-08	1.51E-06	1.68E+09	4.4	3E-08	1.31E-07	1.46E+08
T97R-111	11.3	5E-07	5.66E-06	2.26E+07	0.0	3E-07	0.00E+00	0.00E+00	65.4	3E-08	1.96E-06	2.18E+09	36.5	3E-08	1.10E-06	1.22E+09
T97R-112	5.3	5E-07	2.63E-06	1.05E+07	29.5	3E-07	8.84E-06	9.82E+07	58.6	3E-08	1.76E-06	1.95E+09	109.0	3E-08	3.27E-06	3.63E+09
T97R-113	9.7	5E-07	4.85E-06	1.94E+07	15.4	3E-07	4.62E-06	5.13E+07	88.9	3E-08	2.67E-06	2.96E+09	3.9	3E-08	1.16E-07	1.28E+08
T97R-114	2.0	5E-07	9.90E-07	3.96E+06	15.4	3E-07	4.62E-06	5.13E+07	82.8	3E-08	2.48E-06	2.76E+09	20.7	3E-08	6.20E-07	6.88E+08
T97R-115	9.4	5E-07	4.71E-06	1.88E+07	7.5	3E-07	2.24E-06	2.48E+07	37.2	3E-08	1.12E-06	1.24E+09	17.8	3E-08	5.33E-07	5.93E+08
T97R-116	0.0	5E-07	0.00E+00	0.00E+00	0.7	3E-07	2.10E-07	2.33E+06	123.4	3E-08	3.70E-06	4.11E+09	26.1	3E-08	7.83E-07	8.70E+08
T97R-117	1.9	5E-07	9.50E-07	3.80E+06	11.7	3E-07	3.51E-06	3.90E+07	103.5	3E-08	3.11E-06	3.45E+09	20.9	3E-08	6.27E-07	6.97E+08
T97R-118	4.9	5E-07	2.45E-06	9.78E+06	17.0	3E-07	5.10E-06	5.67E+07	40.7	3E-08	1.22E-06	1.36E+09	0.0	3E-08	0.00E+00	0.00E+00
T97R-119	8.3	5E-07	4.18E-06	1.67E+07	12.9	3E-07	3.88E-06	4.31E+07	44.2	3E-08	1.32E-06	1.47E+09	61.6	3E-08	1.85E-06	2.05E+09
T97R-120	4.6	5E-07	2.31E-06	9.24E+06	0.0	3E-07	0.00E+00	0.00E+00	22.7	3E-08	6.80E-07	7.56E+08	1.3	3E-08	3.81E-08	4.23E+07
T97R-121	6.0	5E-07	3.00E-06	1.20E+07	10.4	3E-07	3.12E-06	3.47E+07	40.8	3E-08	1.22E-06	1.36E+09	18.1	3E-08	5.42E-07	6.02E+08
T97R-65	2.8	5E-07	1.41E-06	5.64E+06	18.5	3E-07	5.55E-06	6.17E+07	2.5	3E-08	7.53E-08	8.37E+07	4.6	3E-08	1.38E-07	1.53E+08
T97R-66	5.3	5E-07	2.66E-06	1.06E+07	0.0	3E-07	0.00E+00	0.00E+00	12.5	3E-08	3.75E-07	4.16E+08	15.5	3E-08	4.66E-07	5.17E+08
T97R-67	10.7	5E-07	5.37E-06	2.15E+07	22.2	3E-07	6.66E-06	7.40E+07	31.5	3E-08	9.44E-07	1.05E+09	8.6	3E-08	2.58E-07	2.87E+08
T97R-69	11.5	5E-07	5.73E-06	2.29E+07	9.9	3E-07	2.98E-06	3.31E+07	74.5	3E-08	2.24E-06	2.48E+09	19.0	3E-08	5.69E-07	6.32E+08
T97R-70	13.3	5E-07	6.64E-06	2.65E+07	0.0	3E-07	0.00E+00	0.00E+00	28.2	3E-08	8.47E-07	9.41E+08	7.7	3E-08	2.31E-07	2.57E+08
T97R-71	13.9	5E-07	6.93E-06	2.77E+07	14.5	3E-07	4.35E-06	4.83E+07	55.0	3E-08	1.65E-06	1.83E+09	5.5	3E-08	1.66E-07	1.84E+08
T97R-75	10.6	5E-07	5.30E-06	2.12E+07	13.5	3E-07	4.04E-06	4.49E+07	79.2	3E-08	2.37E-06	2.64E+09	16.7	3E-08	5.01E-07	5.57E+08
T97R-78	9.8	5E-07	4.90E-06	1.96E+07	9.6	3E-07	2.88E-06	3.20E+07	43.2	3E-08	1.30E-06	1.44E+09	12.6	3E-08	3.79E-07	4.21E+08
T97R-80	9.7	5E-07	4.83E-06	1.93E+07	3.1	3E-07	9.15E-07	1.02E+07	46.7	3E-08	1.40E-06	1.56E+09	21.1	3E-08	6.32E-07	7.02E+08
T97R-84	12.2	5E-07	6.08E-06	2.43E+07	7.7	3E-07	2.32E-06	2.58E+07	51.8	3E-08	1.55E-06	1.73E+09	4.2	3E-08	1.26E-07	1.40E+08
T97R-87	11.1	5E-07	5.55E-06	2.22E+07	0.0	3E-07	0.00E+00	0.00E+00	78.9	3E-08	2.37E-06	2.63E+09	16.6	3E-08	4.98E-07	5.54E+08
T97R-88	1.7	5E-07	8.60E-07	3.44E+06	0.0	3E-07	0.00E+00	0.00E+00	17.4	3E-08	5.22E-07	5.80E+08	6.4	3E-08	1.92E-07	2.13E+08
T97R-90	13.3	5E-07	6.67E-06	2.67E+07	12.5	3E-07	3.75E-06	4.17E+07	43.9	3E-08	1.32E-06	1.46E+09	7.1	3E-08	2.14E-07	2.38E+08

Calc

Hole ID	B1	K1	B1 x K1	Bn / K1	B2	K2	B2 x K2	B4 / K4	B3	K3	B3 x K3	B3 / K3	B4	K4	B4 x K4	B4 / K4
	COAL	-	-	-	SST	-	-		SLTS	-	-	-	MDST	-	-	-
T97R-91	11.3	5E-07	5.66E-06	2.26E+07	6.6	3E-07	1.98E-06	2.20E+07	33.2	3E-08	9.97E-07	1.11E+09	7.0	3E-08	2.09E-07	2.33E+08
T97R-94	8.5	5E-07	4.25E-06	1.70E+07	6.0	3E-07	1.79E-06	1.98E+07	10.7	3E-08	3.20E-07	3.55E+08	3.3	3E-08	9.81E-08	1.09E+08
T97R-95C	6.3	5E-07	3.13E-06	1.25E+07	3.1	3E-07	9.30E-07	1.03E+07	16.5	3E-08	4.96E-07	5.51E+08	8.8	3E-08	2.65E-07	2.95E+08
T97R-96	3.9	5E-07	1.96E-06	7.82E+06	9.4	3E-07	2.82E-06	3.13E+07	64.2	3E-08	1.93E-06	2.14E+09	32.5	3E-08	9.76E-07	1.08E+09
T97R-97	5.1	5E-07	2.55E-06	1.02E+07	0.0	3E-07	0.00E+00	0.00E+00	4.2	3E-08	1.26E-07	1.40E+08	2.9	3E-08	8.73E-08	9.70E+07
T97R-99	9.7	5E-07	4.83E-06	1.93E+07	0.0	3E-07	0.00E+00	0.00E+00	48.6	3E-08	1.46E-06	1.62E+09	14.5	3E-08	4.35E-07	4.83E+08
T98R-03C	8.1	5E-07	4.03E-06	1.61E+07	0.0	3E-07	0.00E+00	0.00E+00	2.7	3E-08	8.22E-08	9.13E+07	4.3	3E-08	1.29E-07	1.43E+08
T98R-07C	9.1	5E-07	4.55E-06	1.82E+07	0.5	3E-07	1.41E-07	1.57E+06	3.3	3E-08	1.01E-07	1.12E+08	1.2	3E-08	3.45E-08	3.83E+07
T98R-09C	9.5	5E-07	4.75E-06	1.90E+07	0.5	3E-07	1.38E-07	1.53E+06	30.7	3E-08	9.21E-07	1.02E+09	22.0	3E-08	6.61E-07	7.34E+08
T98R-13C	7.2	5E-07	3.61E-06	1.44E+07	0.3	3E-07	9.00E-08	1.00E+06	3.6	3E-08	1.08E-07	1.20E+08	2.4	3E-08	7.17E-08	7.97E+07
T98R-14	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	52.2	3E-08	1.57E-06	1.74E+09	28.4	3E-08	8.52E-07	9.47E+08
T98R-16	11.1	5E-07	5.53E-06	2.21E+07	8.2	3E-07	2.47E-06	2.74E+07	8.2	3E-08	2.45E-07	2.72E+08	16.0	3E-08	4.79E-07	5.32E+08
T98R-18	9.3	5E-07	4.63E-06	1.85E+07	0.0	3E-07	0.00E+00	0.00E+00	18.8	3E-08	5.63E-07	6.26E+08	3.3	3E-08	9.99E-08	1.11E+08
T98R-20	7.7	5E-07	3.86E-06	1.54E+07	0.0	3E-07	0.00E+00	0.00E+00	13.5	3E-08	4.05E-07	4.50E+08	18.3	3E-08	5.49E-07	6.10E+08
T98R-21C	12.1	5E-07	6.05E-06	2.42E+07	0.0	3E-07	0.00E+00	0.00E+00	3.9	3E-08	1.18E-07	1.31E+08	1.3	3E-08	3.90E-08	4.33E+07
T98R-23	3.2	5E-07	1.59E-06	6.36E+06	0.0	3E-07	0.00E+00	0.00E+00	15.0	3E-08	4.49E-07	4.99E+08	5.1	3E-08	1.52E-07	1.68E+08
T98R-24	9.1	5E-07	4.53E-06	1.81E+07	0.0	3E-07	0.00E+00	0.00E+00	2.4	3E-08	7.23E-08	8.03E+07	16.0	3E-08	4.81E-07	5.35E+08
T98R-25	5.7	5E-07	2.83E-06	1.13E+07	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	8.4	3E-08	2.51E-07	2.79E+08
T98R-31C	8.4	5E-07	4.20E-06	1.68E+07	0.0	3E-07	0.00E+00	0.00E+00	5.1	3E-08	1.55E-07	1.72E+08	0.8	3E-08	2.40E-08	2.67E+07
TOB96-01-05	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	6.0	3E-08	1.79E-07	1.98E+08
TOB96-02-06	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	1.0	3E-08	3.00E-08	3.33E+07
TOB96-04	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
TOB96-11-04	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
TOB96-12-04	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
TOB96-13	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
TOB96-18	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	2.1	3E-08	6.15E-08	6.83E+07
TOB97-07-24	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
W01	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
W02	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00
W03	0.0	5E-07	0.00E+00	0.00E+00	0.0	3E-07	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00	0.0	3E-08	0.00E+00	0.00E+00

Hole ID	Kxy	Kz	Kxy/Kv
	sum(Bn*Kn)/Bt	Bt/sum(Bn/Kn)	
T18-01D	1.3E-07	3.7E-08	3.4
T18-01S	n/a	n/a	n/a
T18-01TP	n/a	n/a	n/a
T18-02D	1.1E-07	3.8E-08	3.0
T18-02S	n/a	n/a	n/a
T18-02TP	n/a	n/a	n/a
T18-03S	n/a	n/a	n/a
T18-03TP	n/a	n/a	n/a
T18-04S	n/a	n/a	n/a
T18-04TP	n/a	n/a	n/a
T18-05D	7.4E-08	3.3E-08	2.2
T18-05S	n/a	n/a	n/a
T18-05TP	n/a	n/a	n/a
T18-06TP	n/a	n/a	n/a
T18-07S	n/a	n/a	n/a
T18-07TP	n/a	n/a	n/a
T18-08S	n/a	n/a	n/a
T18-08TP	n/a	n/a	n/a
T18-09S	n/a	n/a	n/a
T18-09TP	n/a	n/a	n/a
T18-10S	n/a	n/a	n/a
T18-10TP	n/a	n/a	n/a
T18-11S	n/a	n/a	n/a
T18-11TP	n/a	n/a	n/a
T18-12S	n/a	n/a	n/a
T18-12TP	n/a	n/a	n/a
T18-13S	n/a	n/a	n/a
T81R-108	6.2E-08	3.4E-08	1.8
T92R-39C	2.2E-07	7.0E-08	3.2
T92R-42	1.3E-07	4.6E-08	2.9
T92R-43	1.5E-07	4.5E-08	3.4
T93D-45	2.0E-07	6.2E-08	3.2
T93D-47	1.3E-07	4.5E-08	2.9
T93D-53	1.3E-07	4.0E-08	3.3
T93R-02	1.7E-07	5.1E-08	3.4
T93R-03	8.8E-08	3.5E-08	2.5
T93R-04	1.2E-07	4.4E-08	2.8
T93R-05	1.0E-07	3.6E-08	2.9
T93R-06C	1.3E-07	3.9E-08	3.4
T93R-08C	2.1E-07	6.1E-08	3.5
T93R-09	1.1E-07	4.0E-08	2.6
T93R-10	1.9E-07	6.0E-08	3.1
T93R-12	1.0E-07	3.5E-08	2.9
T93R-13	3.0E-08	3.0E-08	1.0
T93R-14	1.5E-07	5.1E-08	3.0
T93R-15	n/a	n/a	n/a
T93R-16	n/a	n/a	n/a
T93R-17	1.0E-07	3.7E-08	2.7
T93R-18	3.0E-08	3.0E-08	1.0
T93R-19	n/a	n/a	n/a
T93R-51	7.2E-08	3.5E-08	2.1
T94R-01	2.0E-07	6.1E-08	3.3
T94R-02	n/a	n/a	n/a
T94R-03	2.3E-07	7.5E-08	3.1
T94R-04C	1.6E-07	4.4E-08	3.5
T94R-05	1.9E-07	5.9E-08	3.2
T94R-06	6.3E-08	3.3E-08	1.9
T94R-07	9.5E-08	3.6E-08	2.7
T94R-08	5.6E-08	3.3E-08	1.7
T94R-09	n/a	n/a	n/a
T94R-10C	9.3E-08	3.4E-08	2.7
T94R-11	n/a	n/a	n/a
T94R-12	7.5E-08	3.4E-08	2.2
T94R-13	n/a	n/a	n/a
T95R-06	n/a	n/a	n/a
T95R-07C	1.4E-07	3.9E-08	3.7
T95R-09	3.0E-08	3.0E-08	1.0
T95R-10	2.1E-07	6.6E-08	3.1

ENTER K VALUES FOR EACH LITHO FOR CALCULATIONS.

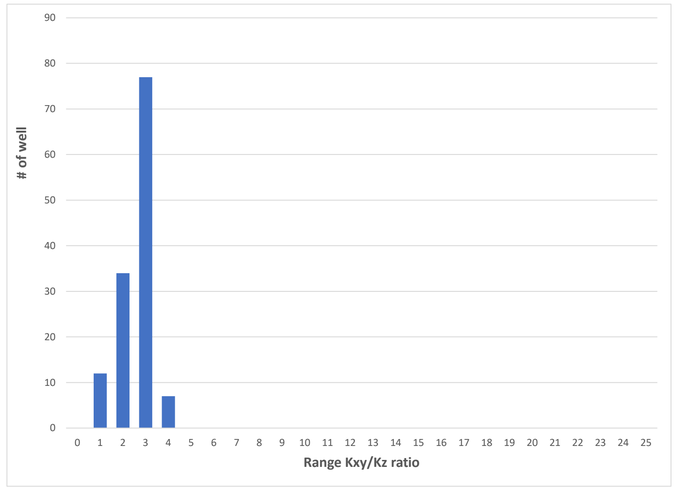
(if Kn set to 0, interval n is excluded)

List	K assumptions
COAL	5.0E-07
SDST	3.0E-07
SLTS	3.00E-08
MDST	3.0E-08

Option1	coal arythm mean	1.00E-06
	sst arythm mean	2.00E-06
	SLTS harm mean	2.00E-08
	SST harm mean	2.00E-08
Option2	coal geomean	5.00E-07
	sst geomean	3.00E-07
	SLTS geomean	3.00E-08
	SST geomean	3.00E-08

Stats	Kxy	Kz	Kxy/Kv
Count	221	221	221
min	3.0E-08	3.0E-08	1.00
max	3.6E-07	2.3E-07	4.67
average	1.5E-07	4.9E-08	3.02
median	1.4E-07	4.3E-08	3.15
harmean	1.1E-07	4.4E-08	2.73
geomean	1.3E-07	4.6E-08	2.90

Bin	Kxy/Kv
0	0
1	12
2	34
3	77
4	7
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	0
25	0



Kyxz per well

Hole ID	Kxy	Kz	Kxy/Kv
	sum(Bn*Kn)/Bt	Bt/sum(Bn/Kn)	
T95R-11	8.5E-08	3.5E-08	2.4
T95R-13	9.7E-08	3.5E-08	2.7
T95R-14	8.3E-08	3.5E-08	2.4
T95R-15C	1.1E-07	3.7E-08	2.9
T95R-17	1.3E-07	4.5E-08	2.9
T95R-19C	1.2E-07	3.7E-08	3.3
T95R-20	n/a	n/a	n/a
T95R-21	1.1E-07	3.6E-08	3.0
T95R-22C	1.2E-07	3.7E-08	3.2
T95R-24	1.2E-07	3.8E-08	3.2
T95R-25	2.3E-07	8.0E-08	2.9
T95R-26	3.0E-08	3.0E-08	1.0
T95R-28C	7.7E-08	3.3E-08	2.3
T95R-30	n/a	n/a	n/a
T95R-31	1.8E-07	5.4E-08	3.3
T95R-32	9.2E-08	3.7E-08	2.5
T95R-34	9.7E-08	3.6E-08	2.7
T95R-35C	1.7E-07	5.4E-08	3.1
T95R-36	1.7E-07	5.4E-08	3.1
T95R-38C	1.7E-07	4.5E-08	3.7
T95R-39C	9.1E-08	3.5E-08	2.6
T95R-40	1.8E-07	4.3E-08	4.3
T95R-43	2.7E-07	1.3E-07	2.1
T95R-44	n/a	n/a	n/a
T95R-45	n/a	n/a	n/a
T95R-46	1.6E-07	4.6E-08	3.4
T95R-50C	2.6E-07	9.5E-08	2.7
T95R-60	1.5E-07	4.2E-08	3.5
T95R-61	1.9E-07	5.7E-08	3.4
T95R-62	1.1E-07	3.9E-08	2.9
T95R-63	1.5E-07	4.1E-08	3.5
T95R-64	2.2E-07	7.1E-08	3.1
T95R-65	9.2E-08	3.6E-08	2.6
T95R-66	2.0E-07	6.7E-08	3.0
T95R-67	1.8E-07	5.1E-08	3.6
T95R-68	1.6E-07	4.9E-08	3.4
T95R-69	2.1E-07	6.0E-08	3.4
T95R-70	2.7E-07	1.4E-07	1.9
T95R-71	2.2E-07	6.6E-08	3.3
T95R-74	2.6E-07	9.7E-08	2.7
T95R-76	2.0E-07	5.6E-08	3.5
T95R-77	5.5E-08	3.3E-08	1.7
T95R-78	2.4E-07	9.4E-08	2.5
T95R-79	1.5E-07	4.5E-08	3.3
T95R-80	2.2E-07	6.8E-08	3.2
T95R-81	1.4E-07	4.3E-08	3.2
T96R-01	1.4E-07	4.3E-08	3.1
T96R-02	4.7E-08	3.2E-08	1.5
T96R-03	1.4E-07	4.4E-08	3.1
T96R-04C	2.0E-07	5.2E-08	3.8
T96R-05C	1.2E-07	3.7E-08	3.2
T96R-06	2.0E-07	5.9E-08	3.4
T96R-07C	1.8E-07	4.3E-08	4.2
T96R-08	1.8E-07	5.7E-08	3.2
T96R-10	2.6E-07	9.1E-08	2.9
T96R-105	2.9E-07	2.3E-07	1.3
T96R-11	2.0E-07	6.3E-08	3.2
T96R-110	1.2E-07	3.7E-08	3.4
T96R-119	1.7E-07	5.5E-08	3.1
T96R-120	1.4E-07	4.4E-08	3.2
T96R-121	2.1E-07	6.2E-08	3.3
T96R-124	1.4E-07	4.0E-08	3.5
T96R-125	2.7E-07	8.3E-08	3.2
T96R-126	1.6E-07	4.5E-08	3.5
T96R-127	2.2E-07	6.3E-08	3.6
T96R-128	4.1E-08	3.1E-08	1.3
T96R-129	1.2E-07	3.6E-08	3.2
T96R-12C	1.9E-07	4.4E-08	4.3
T96R-130	1.3E-07	4.2E-08	3.0
T96R-131	1.2E-07	3.9E-08	3.2
T96R-137	9.1E-08	3.4E-08	2.7

Kyxz per well

Hole ID	Kxy	Kz	Kxy/Kv
	sum(Bn*Kn)/Bt	Bt/sum(Bn/Kn)	
T96R-13C	1.7E-07	4.2E-08	4.1
T96R-14	1.4E-07	4.3E-08	3.2
T96R-15	1.9E-07	5.6E-08	3.4
T96R-16	2.1E-07	6.3E-08	3.3
T96R-17C	2.1E-07	4.6E-08	4.5
T96R-18C	2.4E-07	5.2E-08	4.6
T96R-19	1.9E-07	5.6E-08	3.4
T96R-20C	1.8E-07	4.3E-08	4.2
T96R-21	1.9E-07	5.6E-08	3.4
T96R-22	1.6E-07	4.6E-08	3.4
T96R-23C	6.6E-08	3.3E-08	2.0
T96R-24	1.7E-07	4.9E-08	3.6
T96R-25	1.1E-07	3.5E-08	3.0
T96R-26	1.4E-07	4.4E-08	3.2
T96R-27	1.7E-07	4.9E-08	3.4
T96R-28C	8.3E-08	3.4E-08	2.5
T96R-29	1.7E-07	5.0E-08	3.5
T96R-30	1.7E-07	5.0E-08	3.5
T96R-31	2.2E-07	6.3E-08	3.5
T96R-32	2.0E-07	5.7E-08	3.5
T96R-33	1.5E-07	4.4E-08	3.5
T96R-34	1.8E-07	5.3E-08	3.4
T96R-35	1.0E-07	3.8E-08	2.7
T96R-37	1.6E-07	4.5E-08	3.6
T96R-38	1.6E-07	5.2E-08	3.2
T96R-39	1.8E-07	5.8E-08	3.1
T96R-41	1.9E-07	6.0E-08	3.2
T96R-42C	5.6E-08	3.2E-08	1.7
T96R-43	1.3E-07	3.7E-08	3.4
T96R-45	5.0E-08	3.2E-08	1.5
T96R-46	1.7E-07	5.3E-08	3.2
T96R-47	1.6E-07	4.9E-08	3.3
T96R-49	1.1E-07	4.0E-08	2.7
T96R-50	2.6E-07	7.4E-08	3.5
T96R-51	1.2E-07	4.2E-08	2.9
T96R-52	1.8E-07	5.2E-08	3.5
T96R-56C	9.4E-08	3.5E-08	2.7
T96R-58	1.3E-07	4.0E-08	3.2
T96R-59	2.2E-07	7.6E-08	2.9
T96R-60	2.0E-07	5.5E-08	3.6
T96R-61	1.3E-07	4.1E-08	3.2
T96R-63	1.6E-07	4.8E-08	3.4
T96R-64	2.5E-07	9.0E-08	2.8
T96R-65C	1.0E-07	3.5E-08	2.9
T96R-67	2.0E-07	6.4E-08	3.2
T96R-69	9.5E-08	3.7E-08	2.6
T96R-70	2.2E-07	6.9E-08	3.2
T96R-72	1.2E-07	4.3E-08	2.8
T96R-73	2.5E-07	9.3E-08	2.7
T96R-75	2.3E-07	6.3E-08	3.6
T96R-76	1.8E-07	4.3E-08	4.2
T96R-77	2.1E-07	7.2E-08	2.9
T96R-78	1.2E-07	3.9E-08	3.0
T96R-79	2.3E-07	8.7E-08	2.7
T96R-82	1.2E-07	3.9E-08	3.2
T96R-83	n/a	n/a	n/a
T96R-84	2.0E-07	6.5E-08	3.1
T96R-86	1.8E-07	4.7E-08	3.8
T96R-87	2.0E-07	6.0E-08	3.3
T96R-91	2.1E-07	7.1E-08	2.9
T96R-92	2.0E-07	5.5E-08	3.6
T96R-99	2.3E-07	7.0E-08	3.2
T97R-100C	1.1E-07	3.7E-08	3.0
T97R-101	1.3E-07	4.2E-08	3.1
T97R-102	1.3E-07	4.1E-08	3.2
T97R-103	5.9E-08	3.2E-08	1.9
T97R-104	1.1E-07	3.5E-08	3.0
T97R-105	2.0E-07	5.2E-08	3.9
T97R-106	6.3E-08	3.3E-08	1.9
T97R-107	1.1E-07	3.8E-08	2.9
T97R-108C	1.2E-07	3.7E-08	3.3
T97R-109	1.1E-07	3.9E-08	2.9
T97R-110	1.3E-07	3.8E-08	3.5
T97R-111	7.7E-08	3.3E-08	2.3
T97R-112	8.2E-08	3.6E-08	2.3
T97R-113	1.0E-07	3.7E-08	2.8
T97R-114	7.2E-08	3.4E-08	2.1
T97R-115	1.2E-07	3.8E-08	3.1
T97R-116	3.1E-08	3.0E-08	1.0

Kyxz per well

Hole ID	Kxy	Kz	Kxy/Kv
	sum(Bn*Kn)/Bt	Bt/sum(Bn/Kn)	
T97R-117	5.9E-08	3.3E-08	1.8
T97R-118	1.4E-07	4.4E-08	3.2
T97R-119	8.8E-08	3.5E-08	2.5
T97R-120	1.1E-07	3.5E-08	3.0
T97R-121	1.0E-07	3.7E-08	2.8
T97R-65	2.5E-07	9.3E-08	2.7
T97R-66	1.0E-07	3.5E-08	3.0
T97R-67	1.8E-07	5.1E-08	3.6
T97R-69	1.0E-07	3.6E-08	2.8
T97R-70	1.6E-07	4.0E-08	3.9
T97R-71	1.5E-07	4.2E-08	3.5
T97R-75	1.0E-07	3.7E-08	2.8
T97R-78	1.3E-07	3.9E-08	3.2
T97R-80	9.7E-08	3.5E-08	2.7
T97R-84	1.3E-07	4.0E-08	3.4
T97R-87	7.9E-08	3.3E-08	2.4
T97R-88	6.2E-08	3.2E-08	1.9
T97R-90	1.6E-07	4.3E-08	3.6
T97R-91	1.5E-07	4.2E-08	3.6
T97R-94	2.3E-07	5.7E-08	4.0
T97R-95C	1.4E-07	4.0E-08	3.5
T97R-96	7.0E-08	3.4E-08	2.1
T97R-97	2.3E-07	4.9E-08	4.6
T97R-99	9.2E-08	3.4E-08	2.7
T98R-03C	2.8E-07	6.0E-08	4.7
T98R-07C	3.4E-07	8.3E-08	4.1
T98R-09C	1.0E-07	3.5E-08	2.9
T98R-13C	2.9E-07	6.3E-08	4.6
T98R-14	3.0E-08	3.0E-08	1.0
T98R-16	2.0E-07	5.1E-08	4.0
T98R-18	1.7E-07	4.2E-08	4.1
T98R-20	1.2E-07	3.7E-08	3.3
T98R-21C	3.6E-07	8.7E-08	4.1
T98R-23	9.4E-08	3.4E-08	2.7
T98R-24	1.8E-07	4.3E-08	4.3
T98R-25	2.2E-07	4.8E-08	4.5
T98R-31C	3.1E-07	6.7E-08	4.6
TOB96-01-05	3.0E-08	3.0E-08	1.0
TOB96-02-06	3.0E-08	3.0E-08	1.0
TOB96-04	n/a	n/a	n/a
TOB96-11-04	n/a	n/a	n/a
TOB96-12-04	n/a	n/a	n/a
TOB96-13	n/a	n/a	n/a
TOB96-18	3.0E-08	3.0E-08	1.0
TOB97-07-24	n/a	n/a	n/a
W01	n/a	n/a	n/a
W02	n/a	n/a	n/a
W03	n/a	n/a	n/a

Appendix C – Groundwater Levels Measurements

of observations per events (including dry/artesian obs)

Event	OVB					BDR				
	Tenas	Goathorn	North	Access Road	Rail Loadout	Tenas	Goathorn	North	Access Rd	Rail Loadout
Nov-1989	0	0	0	0	0	0	0	5	0	0
Aug/Sep 1993	0	0	1	0	0	0	0	9	0	0
Aug-1994	0	0	0	0	0	1	0	0	0	0
Oct-1995	0	0	0	0	0	3	0	0	0	0
Sep/Oct 1996	6	0	0	0	0	7	5	0	0	0
Aug/Sep 1997	8	6	1	0	0	10	23	8	0	0
Jul-2017	6	0	0	0	0	6	0	0	0	0
Aug-2017	0	0	0	0	0	3	0	0	0	0
Sep-2017	5	0	0	0	0	6	0	0	0	0
Jan-2018	6	0	0	0	0	6	0	0	0	0
Mar/Apr 2018	13	0	0	0	0	10	0	0	0	0
Jun-2018	12	0	0	0	0	9	0	0	0	0
Sep-2018	14	0	0	0	0	9	0	0	0	0
Nov-2018	0	0	0	2	0	0	0	0	0	0
Dec-2018	0	0	0	2	0	0	0	0	0	0
Jan-2019	17	0	0	2	0	10	0	0	0	0
Feb-2019	17	0	0	2	0	9	0	0	0	0
Mar/Apr 2019	24	0	0	4	4	26	0	0	0	0
May/Jun 2019	18	0	0	2	2	13	0	0	0	0
Aug-2019	18	0	0	2	0	13	0	0	0	0
Sep-2019	0	0	0	2	0	0	0	0	0	0
Nov-2019	4	0	0	1	0	4	0	0	0	0
TOTAL	**168**	**6**	**2**	**19**	**6**	**145**	**28**	**22**	**0**	**0**

of observations per events (excluding dry/artesian obs "no-depth value")

Event	OVB					BDR				
	Tenas	Goathorn	North	Access Road	Rail Loadout	Tenas	Goathorn	North	Access Rd	Rail Loadout
Nov-1989	0	0	0	0	0	0	0	5	0	0
Aug/Sep 1993	0	0	0	0	0	0	0	9	0	0
Aug-1994	0	0	0	0	0	0	0	0	0	0
Oct-1995	0	0	0	0	0	2	0	0	0	0
Sep/Oct 1996	4	0	0	0	0	3	5	0	0	0
Aug/Sep 1997	5	6	0	0	0	10	21	8	0	0
Jul-2017	3	0	0	0	0	6	0	0	0	0
Aug-2017	0	0	0	0	0	3	0	0	0	0
Sep-2017	3	0	0	0	0	6	0	0	0	0
Jan-2018	3	0	0	0	0	4	0	0	0	0
Mar/Apr 2018	8	0	0	0	0	10	0	0	0	0
Jun-2018	7	0	0	0	0	9	0	0	0	0
Sep-2018	7	0	0	0	0	8	0	0	0	0
Nov-2018	0	0	0	2	0	0	0	0	0	0
Dec-2018	0	0	0	2	0	0	0	0	0	0
Jan-2019	9	0	0	2	0	7	0	0	0	0
Feb-2019	15	0	0	2	0	9	0	0	0	0
Mar/Apr 2019	13	0	0	4	4	25	0	0	0	0
May/Jun 2019	9	0	0	2	2	11	0	0	0	0
Aug-2019	9	0	0	2	0	12	0	0	0	0
Sep-2019	0	0	0	2	0	0	0	0	0	0
Nov-2019	3	0	0	1	0	4	0	0	0	0
TOTAL	**98**	**6**	**0**	**19**	**6**	**129**	**26**	**22**	**0**	**0**

Groundwater Level Statistics

Area	Lithologies	Hole ID	Period	Comment	# Obs	# Value [(1)]	min	avg	max	stdev
Tenas	Overburden	T18-02S (GEO11)	Mar-Aug19	dry or almost dry	7	2	821.24	821.25	821.26	0.01
		T18-04S (W1S)	Apr-Aug19	-	7	6	939.45	940.15	940.95	0.58
		T18-06D (W2)	Apr-Aug19	-	7	7	800.79	801.25	801.60	0.31
		T18-08S (W3S)	Apr-Aug19	-	9	9	769.99	770.08	770.23	0.08
		T18-11S (GEO22)	Apr-Aug19	dry	7	0	-	-	-	-
		T18-13S (GEO13)	Apr-Aug19	dry	7	0	-	-	-	-
		TOB96-01-05	96 to Aug19	-	12	12	918.50	920.57	922.27	1.51
		TOB96-02-06	96 to Aug19	-	15	14	849.72	850.92	852.27	0.83
		TOB96-02-20	96 to Aug19	dry or almost dry	11	3	833.44	834.42	835.56	1.07
		TOB96-11-04	96 to Aug19	-	12	11	824.13	824.84	825.75	0.56
		TOB96-11-19	96 to Aug19	dry	12	0	-	-	-	-
		TOB96-12-04	96-97	-	2	2	924.01	924.06	924.10	0.06
		TOB97-06-21	97 to Aug19	dry	9	0	-	-	-	-
		TOB97-07-24	97 to Aug19	dry	9	0	-	-	-	-
		T19-18S	Jan-Nov19	-	10	5	786.74	787.04	787.60	0.33
		T19-19S	Jan19-Aug19	dry	6	0	-	-	-	-
		T19-20S	Jan-Nov19	dry	7	1	845.51	845.51	845.51	-
		T19-26S	Feb-Nov19	-	13	5	772.60	772.77	772.88	0.11
		T19-27S	Feb-Nov19	-	7	7	768.16	770.05	780.90	4.79
	Bedrock	T18-01D (ARD02)	Mar18-Aug19	-	9	9	944.46	946.03	946.90	1.13
		T18-04D (W1D)	Apr18-Aug9	artesian	7	6	939.58	943.18	947.22	3.18
		T18-08D (W3D)	Apr18-Aug19	-	7	7	762.13	763.01	765.04	1.05
		T95R-15C	96 to Aug19	occasionally artesian	15	10	879.96	880.92	881.21	0.38
		T95R-39C	94-95	artesian, flowing	2	0	-	-	-	-
		T95R-40	95 to Aug19	-	13	13	892.23	892.45	893.12	0.23
		T95R-64	95 to Aug19	-	16	16	933.87	934.54	934.77	0.21
		T96R-16-19	95 to Aug19	-	12	12	1010.24	1010.68	1011.05	0.23
		T96R-16-28	95 to Aug19	-	12	12	1010.67	1011.10	1011.48	0.23
		T96R-34-67	96-97	artesian	2	1	934.33	934.33	934.33	-
		T96R-34-87	96 to Sep18	artesian	13	9	934.09	934.16	934.26	0.05
		T96R-56C-83	96-97	occasionally artesian	2	1	944.00	944.00	944.00	-
		T96TP-01-10	96	-	1	1	994.86	994.86	994.86	-
		T96TP-02-07	97	-	1	1	999.17	999.17	999.17	-
		T97R-108C-70	97	-	1	1	816.94	816.94	816.94	-
		T19-21S	Jan-Nov19	-	9	6	806.79	806.90	806.98	0.07
		T19-22S	Feb-Nov19	-	10	7	800.50	802.42	803.13	0.92
		T19-34S	Feb-Nov19	-	8	6	808.96	809.03	809.10	0.06
		T19-35S	Mar-Nov19	-	7	6	805.66	805.87	806.15	0.21
Access Road	Overburden	T18-14S	Nov18 to Nov19	-	10	10	677.08	677.39	677.60	0.19
		T18-15S	Nov18 to Nov19	-	10	10	704.06	704.14	704.29	0.08
		T19-28S	2019 (dates not available)	-	2	2	702.90	703.40	703.90	0.71
		T18-30S	2019 (dates not available)	-	2	2	693.10	694.20	695.30	1.56
		T19-31S	2019 (dates not available)	dry	1	0	-	-	-	-
Rail Loadout	Ovrburden	T19-36	Mar-May19	-	3	3	512.31	512.72	512.97	0.36
		T19-37	Mar-May19	-	3	3	512.92	513.13	513.28	0.19
Goathorn	Overburden	TOB97-05-06	97	-	1	1	756.82	756.82	756.82	n/a
		TOB97-04-07	97	-	1	1	678.95	678.95	678.95	n/a
		T97RP-03-08	97	-	1	1	759.96	759.96	759.96	n/a
		T97RP-02-12	97	-	1	1	753.07	753.07	753.07	n/a
		T97RP-01-13	97	-	1	1	743.63	743.63	743.63	n/a
		T97RP-01-04	97	-	1	1	744.29	744.29	744.29	n/a
	Bedrock	T96R-113-43	96-97	-	2	2	764.19	764.46	764.73	0.38
		T96R-113-79	96-97	-	2	2	757.59	758.87	760.15	1.81
		T96R-40-117	96-97	-	2	2	795.16	795.99	796.82	1.17
		T96R-40-87	96-97	-	2	2	814.13	815.06	815.99	1.32
		T96R-44-54	96-97	-	2	2	751.08	751.10	751.12	0.03
		T974-21-87	97	-	1	1	658.22	658.22	658.22	n/a
		T97R-12-75	97	-	1	1	786.42	786.42	786.42	n/a
		T97R-15-29	97	artesian	1	0	n/a	n/a	n/a	n/a
		T97R-15-52	97	-	1	1	739.93	739.93	739.93	n/a
		T97R-17-104	97	-	1	1	824.19	824.19	824.19	n/a
		T97R-17-79	97	-	1	1	824.14	824.14	824.14	n/a
		T97R-20-131	97	-	1	1	706.91	706.91	706.91	n/a
		T97R-20-40	97	-	1	1	707.91	707.91	707.91	n/a
		T97R-20-83	97	-	1	1	709.14	709.14	709.14	n/a
		T97R-21-41	97	-	1	1	689.91	689.91	689.91	n/a
		T97R-23-69	97	-	1	1	640.88	640.88	640.88	n/a
		T97R-33-20	97	artesian	1	0	n/a	n/a	n/a	n/a
		T97R-33-55	97	-	1	1	753.50	753.50	753.50	n/a
		T97R-33-78	97	-	1	1	753.75	753.75	753.75	n/a
		T97R-36-140	97	-	1	1	684.74	684.74	684.74	n/a
		T97R-36W	97	-	1	1	706.72	706.72	706.72	n/a
		T97R-49-63	97	-	2	2	675.19	680.13	685.06	6.98
North	Overburden	T93R-29A	93-97	dry	2	0	n/a	n/a	n/a	n/a
	Bedrock	T93R-28A	93-97	-	2	2	765.20	771.57	777.94	9.01
		T93R-28B	93-97	-	2	2	766.06	770.89	775.72	6.83
		T93R-29B	93-97	-	2	2	750.39	762.12	773.84	16.58
		T93R-30	93-97	-	2	2	843.76	843.93	844.10	0.24
		TW604A	89-97	-	3	3	787.39	788.59	789.87	1.24
		TW905A	89-93	-	2	2	787.69	787.99	788.28	0.42

Note:
Historical measurements in TW905B (North area) were inconsistent therfore removed from the dataset.

Vertical Gradient	Comment	Holde ID1 (shallow well)	Area	Screen mid	Type	Unit	Details	Date	GW Elev	Holde ID2 (deep well)	Area	Screen mid	Type	Unit	Details	Date	GW Elev
-		-	-	*masl*	-	-	-	*dd-mm-yy*	*masl*	-	-	*masl*	-	-	-	*dd-mm-yy*	*masl*
-0.003	upward	T18-04S (W1S)	Tenas	926.58	OVB	na	Gravelly Fat Clay (Till?) and Volc.	28-Apr-18	939.45	T18-04D (W1D)	Tenas	880.14	BDR	na	Till	27-Apr-18	939.58
-0.017	0.003 to 0.1							19-Jun-18	939.65							28-Jun-18	940.46
-0.029	avg 0.06							6-Sep-18	939.91							13-Sep-18	941.27
n/a								7-Jan-19	> 938.18							7-Jan-19	> 938.09
-0.121								2-Apr-19	940.51							2-Apr-19	946.14
-0.085								31-May-19	940.45							8-Jun-19	944.40
-0.135								29-Aug-19	940.95							29-Aug-19	947.22
1.589	Downward / Perched	T18-08S (W3S)	Tenas	761.97	OVB	na	Sand lense in Till	28-Apr-18	770.14	T18-08D (W3D)	Tenas	757.27	BDR	na	Volcanics	23-Apr-18	762.67
1.581	Disconnected							18-Jun-18	770.02							18-Jun-18	762.59
1.694								8-Sep-18	770.13							8-Sep-18	762.17
1.609								4-Jan-19	770.23							4-Jan-19	762.67
1.672								30-Mar-19	769.99							30-Mar-19	762.13
1.331								31-May-19	770.08							31-May-19	763.83
1.072								27-Aug-19	770.08							27-Aug-19	765.04
-0.043	Upward	T96R-16-19	Tenas	996.43	BDR	Ut l	Coal (#1)	18-Sep-96	1010.82	T96R-16-28	Tenas	986.9	BDR	na	Un-named lower coal	18-Sep-96	1011.23
-0.040	0.04 to 0.046							22-Sep-97	1010.78							22-Aug-97	1011.16
-0.046	avg 0.04							25-Jul-17	1010.59							25-Jul-17	1011.03
-0.044								27-Sep-17	1010.55							27-Sep-17	1010.96
-0.045								16-Jan-18	1010.85							16-Jan-18	1011.28
-0.043								30-Mar-18	1010.81							30-Mar-18	1011.22
-0.046								27-Jun-18	1010.94							27-Jun-18	1011.38
-0.045								6-Sep-18	1010.24							6-Sep-18	1010.67
-0.044								5-Jan-19	1010.50							5-Jan-19	1010.92
-0.043								3-Apr-19	1010.58							3-Apr-19	1010.99
-0.046								1-Jun-19	1011.05							1-Jun-19	1011.48
-0.045								31-Aug-19	1010.50							31-Aug-19	1010.92
n/a	Slightly upward	T96R-34-67	Tenas	867.17	BDR	na	Coal (upper)	18-Sep-96	> 934.02	T96R-34-87	Tenas	850.42	BDR	Ut l	Coal (#1), 1/1U?	18-Sep-96	> 934.02
0.004								22-Aug-97	934.33							22-Aug-97	934.26
1.175	Downward / Perched	TOB96-02-06	Tenas	848.96	OVB	na	Till	20-Sep-96	852.01	TOB96-02-20	Tenas	834.96	OVB	na	Sand and gravel	20-Sep-96	835.56
n/a	Disconnected							28-Sep-17	850.23							28-Sep-17	< 833.46
n/a								16-Jan-18	851.22							16-Jan-18	< 833.46
n/a								26-Mar-18	851.11							26-Mar-18	< 833.46
1.314								20-Jun-18	851.83							20-Jun-18	833.44
n/a								10-Sep-18	850.44							10-Sep-18	< 833.46
n/a	Downward / Perched	TOB96-11-04	Tenas	824.36	OVB	na	Clay	20-Sep-96	< 822.86	TOB96-11-19	Tenas	807.91	OVB	na	Fine sand	20-Sep-96	< 807.16
n/a	Disconnected							23-Aug-97	825.31							22-Aug-97	< 807.16
n/a								26-Jul-17	825.75							26-Jul-17	< 807.16
n/a								27-Sep-17	825.69							27-Sep-17	< 807.16
n/a								15-Jan-18	825.03							15-Jan-18	< 807.16
n/a								26-Mar-18	824.36							26-Mar-18	< 807.16
n/a								21-Jun-18	824.88							21-Jun-18	< 807.16
n/a								6-Sep-18	824.48							6-Sep-18	< 807.16
n/a								8-Jan-19	824.34							8-Jan-19	< 807.16
n/a								30-Mar-19	824.13							30-Mar-19	< 807.16
n/a								30-May-19	824.43							28-May-19	< 807.16
n/a								28-Aug-19	824.80							28-Aug-19	< 807.16
0.191	Downward	T96R-113-43	Goathorn	732.24	BDR	Ut lll	Coal (#4-5)	19-Sep-96	764.19	T96R-113-79	Goathorn	697.74	BDR	Ut lll	Coal (#2)	19-Sep-96	757.59
0.133	avg 0.14							20-Aug-97	764.73							20-Aug-97	760.15
0.662	Downward / Perched?	T96R-40-87	Goathorn	749.55	BDR	Ut lll	Coal (#4), 5?	19-Sep-96	815.99	T96R-40-117	Goathorn	720.6	BDR	Ut lll	Coal (#2)	19-Sep-96	796.82
0.655	avg 0.74							20-Aug-97	814.13							20-Aug-97	795.16
n/a	-	T97R-15-29	Goathorn	712.31	BDR	Ut lll	Coal (#4-5)	20-Aug-97	> 739.81	T97R-15-52	Goathorn	690.51	BDR	Ut lll	Coal (#3)	20-Aug-97	739.93
-0.002	Slightly upward	T97R-17-79	Goathorn	772.1	BDR	Ut lll	Coal (#4-5)	20-Aug-97	824.14	T97R-17-104	Goathorn	745.05	BDR	Ut lll	Coal (#2)	20-Aug-97	824.19
-0.029	Upward	T97R-20-40	Goathorn	676.16	BDR	Ut lll	Coal (#8)	21-Aug-97	707.91	T97R-20-83	Goathorn	633.11	BDR	Ut lll	Coal (#4-5)	21-Aug-97	709.14
0.328	Downward	T97R-36W	Goathorn	638.71	BDR	na	Various	21-Aug-97	706.72	T97R-36-140	Goathorn	571.78	BDR	na	Lower Mdstn	21-Aug-97	684.74
0.069	Downward	T97RP-01-04	Goathorn	741.59	OVB	na	Silty clay till fill	25-Sep-97	744.29	T97RP-01-13	Goathorn	732.04	OVB	na	Silty clay till fill	25-Sep-97	743.63
0.551	Two regimes?	T93R-28A	North	736.59	BDR	na	Coal (#6)	23-Aug-93	777.94	T93R-28B	North	715.02	BDR	Ut lll	Coal (#2)	28-Sep-93	766.06
-0.488	Or typo error?							28-Sep-97	765.20							23-Aug-97	775.72
n/a	-	T93R-29A	North	819.69	OVB	na	Till	28-Sep-93	< 816.19	T93R-29B	North	737.99	BDR	Ut l	Coal (#1)	28-Sep-93	750.39
n/a								23-Aug-97	< 816.19							23-Aug-97	773.84

ID	Northing	Easting	G.Surf Elev.	Stick-up	Screen Top	Screen Btm	Screen Mid	Date	GW Depth	GW Elev	Area	Type	Unit	Details
-	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*m*	*mgbs*	*mbgs*	*masl*	*dd-mm-yy*	*mb toc*	*masl*	-	-	-	-
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	24-Mar-18	11.00	946.49	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	21-Jun-18	10.61	946.88	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	6-Sep-18	10.76	946.73	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	8-Jan-19	10.67	946.82	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	7-Feb-19	10.64	946.85	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	10-Feb-19	10.60	946.90	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	30-Mar-19	13.01	944.48	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	1-Jun-19	12.85	944.64	Tenas	BDR	na	Sandstone
T18-01D (ARD02)	6050689	617841	956.50	0.99	69.80	72.90	885.15	31-Aug-19	13.04	944.46	Tenas	BDR	na	Sandstone
T18-02S (GEO11)	6051995	618921	835.22	0.50	11.00	14.00	822.72	26-Mar-18	14.46	821.26	Tenas	OVB	na	Till? Silty SAND with trace clay and trace cobbles
T18-02S (GEO11)	6051995	618921	835.22	0.50	11.00	14.00	822.72	27-Jun-18	14.48	821.24	Tenas	OVB	na	Till? Silty SAND with trace clay and trace cobbles
T18-02S (GEO11)	6051995	618921	835.22	0.50	11.00	14.00	822.72	8-Sep-18	dry	< 821.22	Tenas	OVB	na	Till? Silty SAND with trace clay and trace cobbles
T18-02S (GEO11)	6051995	618921	835.22	0.50	11.00	14.00	822.72	10-Jan-19	dry	< 821.22	Tenas	OVB	na	Till? Silty SAND with trace clay and trace cobbles
T18-02S (GEO11)	6051995	618921	835.22	0.50	11.00	14.00	822.72	2-Apr-19	dry	< 821.22	Tenas	OVB	na	Till? Silty SAND with trace clay and trace cobbles
T18-02S (GEO11)	6051995	618921	835.22	0.50	11.00	14.00	822.72	6-Jun-19	dry	< 821.22	Tenas	OVB	na	Till? Silty SAND with trace clay and trace cobbles
T18-02S (GEO11)	6051995	618921	835.22	0.50	11.00	14.00	822.72	30-Aug-19	dry	< 821.22	Tenas	OVB	na	Till? Silty SAND with trace clay and trace cobbles
T18-04S (W1S)	6051115	615955	938.18	1.47	10.10	13.10	926.58	28-Apr-18	0.20	939.45	Tenas	OVB	na	Gravelly Fat Clay (Till?) and Volc.
T18-04S (W1S)	6051115	615955	938.18	1.54	10.10	13.10	926.58	19-Jun-18	0.07	939.65	Tenas	OVB	na	Gravelly Fat Clay (Till?) and Volc.
T18-04S (W1S)	6051115	615955	938.18	1.91	10.10	13.10	926.58	6-Sep-18	0.18	939.91	Tenas	OVB	na	Gravelly Fat Clay (Till?) and Volc.
T18-04S (W1S)	6051115	615955	938.18	2.28	10.10	13.10	926.58	7-Jan-19	artesian	> 938.18	Tenas	OVB	na	Gravelly Fat Clay (Till?) and Volc.
T18-04S (W1S)	6051115	615955	938.18	2.65	10.10	13.10	926.58	2-Apr-19	0.32	940.51	Tenas	OVB	na	Gravelly Fat Clay (Till?) and Volc.
T18-04S (W1S)	6051115	615955	938.18	3.02	10.10	13.10	926.58	31-May-19	0.75	940.45	Tenas	OVB	na	Gravelly Fat Clay (Till?) and Volc.
T18-04S (W1S)	6051115	615955	938.18	3.39	10.10	13.10	926.58	29-Aug-19	0.62	940.95	Tenas	OVB	na	Gravelly Fat Clay (Till?) and Volc.
T18-04D (W1D)	6051115	615955	938.09	1.73	56.40	59.50	880.14	27-Apr-18	0.24	939.58	Tenas	BDR	na	Volcanics
T18-04D (W1D)	6051115	615955	938.09	2.46	56.40	59.50	880.14	28-Jun-18	0.09	940.46	Tenas	BDR	na	Volcanics
T18-04D (W1D)	6051115	615955	938.09	2.46	56.40	59.50	880.14	13-Sep-18	-0.72	941.27	Tenas	BDR	na	Volcanics
T18-04D (W1D)	6051115	615955	938.09	2.95	56.40	59.50	880.14	7-Jan-19	artesian	> 938.09	Tenas	BDR	na	Volcanics
T18-04D (W1D)	6051115	615955	938.09	3.31	56.40	59.50	880.14	2-Apr-19	-4.74	946.14	Tenas	BDR	na	Volcanics
T18-04D (W1D)	6051115	615955	938.09	3.68	56.40	59.50	880.14	8-Jun-19	-2.63	944.40	Tenas	BDR	na	Volcanics
T18-04D (W1D)	6051115	615955	938.09	4.04	56.40	59.50	880.14	29-Aug-19	-5.09	947.22	Tenas	BDR	na	Volcanics
T18-06D (W2)	6052647	616245	851.60	0.80	114.80	117.80	735.30	24-Apr-18	51.30	801.10	Tenas	OVB	na	Cobbles?
T18-06D (W2)	6052647	616245	851.60	0.80	114.80	117.80	735.30	10-Sep-18	50.80	801.60	Tenas	OVB	na	Cobbles?
T18-06D (W2)	6052647	616245	851.60	0.80	114.80	117.80	735.30	10-Sep-18	50.80	801.60	Tenas	OVB	na	Cobbles?
T18-06D (W2)	6052647	616245	851.60	0.80	114.80	117.80	735.30	5-Jan-19	51.23	801.18	Tenas	OVB	na	Cobbles?
T18-06D (W2)	6052647	616245	851.60	0.80	114.80	117.80	735.30	1-Apr-19	51.61	800.79	Tenas	OVB	na	Cobbles?
T18-06D (W2)	6052647	616245	851.60	0.80	114.80	117.80	735.30	1-Jun-19	51.36	801.04	Tenas	OVB	na	Cobbles?
T18-06D (W2)	6052647	616245	851.60	0.80	114.80	117.80	735.30	28-Aug-19	50.94	801.46	Tenas	OVB	na	Cobbles?
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	28-Apr-18	34.38	770.14	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	18-Jun-18	34.50	770.02	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	8-Sep-18	34.39	770.13	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	4-Jan-19	34.29	770.23	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	7-Feb-19	34.51	770.01	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	10-Feb-19	34.48	770.04	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	30-Mar-19	34.53	769.99	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	31-May-19	34.44	770.08	Tenas	OVB	na	Sand lense in Till
T18-08S (W3S)	6053379	618515	803.52	1.00	40.00	43.10	761.97	27-Aug-19	34.44	770.08	Tenas	OVB	na	Sand lense in Till
T18-08D (W3D)	6053379	618515	803.52	1.00	44.70	47.80	757.27	23-Apr-18	41.85	762.67	Tenas	BDR	na	Volcanics
T18-08D (W3D)	6053379	618515	803.52	1.00	44.70	47.80	757.27	18-Jun-18	41.93	762.59	Tenas	BDR	na	Volcanics
T18-08D (W3D)	6053379	618515	803.52	1.00	44.70	47.80	757.27	8-Sep-18	42.35	762.17	Tenas	BDR	na	Volcanics
T18-08D (W3D)	6053379	618515	803.52	1.00	44.70	47.80	757.27	4-Jan-19	41.85	762.67	Tenas	BDR	na	Volcanics
T18-08D (W3D)	6053379	618515	803.52	1.00	44.70	47.80	757.27	30-Mar-19	42.39	762.13	Tenas	BDR	na	Volcanics
T18-08D (W3D)	6053379	618515	803.52	1.00	44.70	47.80	757.27	31-May-19	40.70	763.83	Tenas	BDR	na	Volcanics
T18-08D (W3D)	6053379	618515	803.52	1.00	44.70	47.80	757.27	27-Aug-19	39.48	765.04	Tenas	BDR	na	Volcanics
T18-11S (GEO22)	6054253	617697	790.23	0.75	7.50	10.50	781.23	3-Apr-18	dry	< 779.73	Tenas	OVB	na	Till? Sandy CLAY with Trace Cobbles
T18-11S (GEO22)	6054253	617697	790.23	0.75	7.50	10.50	781.23	25-Jun-18	dry	< 779.73	Tenas	OVB	na	Till? Sandy CLAY with Trace Cobbles
T18-11S (GEO22)	6054253	617697	790.23	0.75	7.50	10.50	781.23	8-Sep-18	dry	< 779.73	Tenas	OVB	na	Till? Sandy CLAY with Trace Cobbles
T18-11S (GEO22)	6054253	617697	790.23	0.75	7.50	10.50	781.23	4-Jan-19	dry	< 779.73	Tenas	OVB	na	Till? Sandy CLAY with Trace Cobbles
T18-11S (GEO22)	6054253	617697	790.23	0.75	7.50	10.50	781.23	1-Apr-19	dry	< 779.73	Tenas	OVB	na	Till? Sandy CLAY with Trace Cobbles
T18-11S (GEO22)	6054253	617697	790.23	0.75	7.50	10.50	781.23	31-May-19	dry	< 779.73	Tenas	OVB	na	Till? Sandy CLAY with Trace Cobbles
T18-11S (GEO22)	6054253	617697	790.23	0.75	7.50	10.50	781.23	31-Aug-19	dry	< 779.73	Tenas	OVB	na	Till? Sandy CLAY with Trace Cobbles
T18-13S (GEO13)	6053408	617809	814.36	0.87	14.90	17.90	797.96	2-Apr-18	dry	< 796.46	Tenas	OVB	na	Till? Gravely CLAY with Some Cobbles
T18-13S (GEO13)	6053408	617809	814.36	0.87	14.90	17.90	797.96	25-Jun-18	dry	< 796.46	Tenas	OVB	na	Till? Gravely CLAY with Some Cobbles
T18-13S (GEO13)	6053408	617809	814.36	0.87	14.90	17.90	797.96	8-Sep-18	dry	< 796.46	Tenas	OVB	na	Till? Gravely CLAY with Some Cobbles
T18-13S (GEO13)	6053408	617809	814.36	0.87	14.90	17.90	797.96	4-Jan-19	dry	< 796.46	Tenas	OVB	na	Till? Gravely CLAY with Some Cobbles
T18-13S (GEO13)	6053408	617809	814.36	0.87	14.90	17.90	797.96	1-Apr-19	dry	< 796.46	Tenas	OVB	na	Till? Gravely CLAY with Some Cobbles
T18-13S (GEO13)	6053408	617809	814.36	0.87	14.90	17.90	797.96	30-May-19	dry	< 796.46	Tenas	OVB	na	Till? Gravely CLAY with Some Cobbles
T18-13S (GEO13)	6053408	617809	814.36	0.87	14.90	17.90	797.96	28-Aug-19	dry	< 796.46	Tenas	OVB	na	Till? Gravely CLAY with Some Cobbles

ID	Northing	Easting	G.Surf Elev.	Stick-up	Screen Top	Screen Btm	Screen Mid	Date	GW Depth	GW Elev	Area	Type	Unit	Details
-	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*m*	*mgbs*	*mbgs*	*masl*	*dd-mm-yy*	*mb toc*	*masl*	-	-	-	-
T93R-28A	6059121	617859	789.74	0.95	51.00	55.30	736.59	23-Aug-93	12.75	777.94	North	BDR	na	Coal (#6)
T93R-28A	6059121	617859	789.74	0.95	51.00	55.30	736.59	28-Sep-97	25.49	765.20	North	BDR	na	Coal (#6)
T93R-28B	6059121	617859	790.32	0.52	72.50	78.10	715.02	28-Sep-93	24.78	766.06	North	BDR	Ut III	Coal (#2)
T93R-28B	6059121	617859	790.32	0.52	72.50	78.10	715.02	23-Aug-97	15.12	775.72	North	BDR	Ut III	Coal (#2)
T93R-29A	6059169	617057	849.69	0.76	26.50	33.50	819.69	28-Sep-93	dry	< 816.19	North	OVB	na	Till
T93R-29A	6059169	617057	849.69	0.76	26.50	33.50	819.69	23-Aug-97	dry	< 816.19	North	OVB	na	Till
T93R-29B	6059169	617057	849.69	0.70	109.10	114.30	737.99	28-Sep-93	100.00	750.39	North	BDR	Ut I	Coal (#1)
T93R-29B	6059169	617057	849.69	0.70	109.10	114.30	737.99	23-Aug-97	76.55	773.84	North	BDR	Ut I	Coal (#1)
T93R-30	6059770	616666	902.16	0.48	100.60	106.70	798.51	28-Sep-93	58.88	843.76	North	BDR	Ut I	Coal (#1)
T93R-30	6059770	616666	902.16	0.48	100.60	106.70	798.51	23-Aug-97	58.54	844.10	North	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.08	48.00	63.00	824.70	26-Oct-96	artesian	> 880.2	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.08	48.00	63.00	824.70	23-Aug-97	1.32	879.96	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.08	48.00	63.00	824.70	26-Jul-17	0.45	880.83	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.08	48.00	63.00	824.70	26-Sep-17	0.24	881.04	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.08	48.00	63.00	824.70	15-Jan-18	frozen	n/a	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.08	48.00	63.00	824.70	28-Mar-18	0.24	881.04	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	20-Apr-18	1.23	880.61	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	19-Jun-18	0.71	881.13	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	11-Sep-18	frozen	n/a	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	4-Oct-18	frozen	n/a	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	16-Oct-18	0.65	881.19	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	9-Jan-19	artesian	> 880.2	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	5-Apr-19	0.63	881.21	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	7-Jun-19	0.66	881.18	Tenas	BDR	Ut I	Coal (#1)
T95R-15C	6051998	617062	880.20	1.64	48.00	63.00	824.70	31-Aug-19	0.82	881.02	Tenas	BDR	Ut I	Coal (#1)
T95R-39C	6050869	617336	981.03	0.80	51.20	58.40	926.23	22-Aug-94	artesian	> 981.03	Tenas	BDR	Ut I	Coal (#1)
T95R-39C	6050869	617336	981.03	0.80	51.20	58.40	926.23	27-Oct-95	artesian	> 981.03	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.35	42.00	53.00	852.68	27-Oct-95	7.88	892.65	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.35	42.00	53.00	852.68	23-Aug-97	7.41	893.12	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	25-Jul-17	7.95	892.50	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	17-Aug-17	8.16	892.29	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	29-Sep-17	8.03	892.41	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	18-Jan-18	7.95	892.49	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	3-Apr-18	7.91	892.53	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	27-Jun-18	8.11	892.33	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	15-Sep-18	8.17	892.27	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	10-Jan-19	8.02	892.42	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	2-Apr-19	8.08	892.36	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	4-Jun-19	8.13	892.32	Tenas	BDR	Ut I	Coal (#1)
T95R-40	6051461	618188	900.18	0.26	42.00	53.00	852.68	30-Aug-19	8.21	892.23	Tenas	BDR	Ut I	Coal (#1)
T95R-64	6050597	618278	940.74	1.20	85.00	94.00	851.24	26-Oct-95	8.07	933.87	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.20	85.00	94.00	851.24	22-Aug-97	7.56	934.38	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	25-Jul-17	7.54	934.44	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	17-Aug-17	7.53	934.45	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	26-Sep-17	7.35	934.63	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	15-Jan-18	7.28	934.70	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	31-Mar-18	7.20	934.77	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	21-Jun-18	7.43	934.54	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	13-Sep-18	7.51	934.46	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	11-Jan-19	7.35	934.62	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	7-Feb-19	7.36	934.62	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	10-Feb-19	7.32	934.65	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	4-Mar-19	7.37	934.60	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	6-Apr-19	7.32	934.65	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	8-Jun-19	7.37	934.60	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T95R-64	6050597	618278	940.74	1.23	85.00	94.00	851.24	31-Aug-19	7.36	934.62	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-113-43	6054134	621254	771.74	0.35	36.50	42.50	732.24	19-Sep-96	7.90	764.19	Goathorn	BDR	Ut III	Coal (#4-5)
T96R-113-43	6054134	621254	771.74	0.35	36.50	42.50	732.24	20-Aug-97	7.36	764.73	Goathorn	BDR	Ut III	Coal (#4-5)
T96R-113-79	6054134	621254	771.74	0.35	75.50	78.50	694.74	19-Sep-96	14.50	757.59	Goathorn	BDR	Ut III	Coal (#2)
T96R-113-79	6054134	621254	771.74	0.35	75.50	78.50	694.74	20-Aug-97	11.94	760.15	Goathorn	BDR	Ut III	Coal (#2)
T96R-16-19	6050613	616954	1012.53	0.65	13.10	19.10	996.43	18-Sep-96	2.36	1010.82	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.65	13.10	19.10	996.43	22-Sep-97	2.40	1010.78	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	25-Jul-17	2.69	1010.59	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	27-Sep-17	2.74	1010.55	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	16-Jan-18	2.43	1010.85	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	30-Mar-18	2.47	1010.81	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	27-Jun-18	2.34	1010.94	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	6-Sep-18	3.04	1010.24	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	5-Jan-19	2.79	1010.50	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	3-Apr-19	2.70	1010.58	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	1-Jun-19	2.24	1011.05	Tenas	BDR	Ut I	Coal (#1)
T96R-16-19	6050613	616954	1012.53	0.75	13.10	19.10	996.43	31-Aug-19	2.79	1010.50	Tenas	BDR	Ut I	Coal (#1)
T96R-16-28	6050613	616954	1012.90	0.74	24.50	27.50	986.90	18-Sep-96	2.41	1011.23	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.74	24.50	27.50	986.90	22-Aug-97	2.48	1011.16	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	25-Jul-17	2.69	1011.03	Tenas	BDR	na	Un-named lower coal

ID	Northing	Easting	G.Surf Elev.	Stick-up	Screen Top	Screen Btm	Screen Mid	Date	GW Depth	GW Elev	Area	Type	Unit	Details
-	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*m*	*mgbs*	*mbgs*	*masl*	*dd-mm-yy*	*mb toc*	*masl*	-	-	-	-
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	27-Sep-17	2.76	1010.96	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	16-Jan-18	2.45	1011.28	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	30-Mar-18	2.50	1011.22	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	27-Jun-18	2.34	1011.38	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	6-Sep-18	3.05	1010.67	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	5-Jan-19	2.81	1010.92	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	3-Apr-19	2.73	1010.99	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	1-Jun-19	2.24	1011.48	Tenas	BDR	na	Un-named lower coal
T96R-16-28	6050613	616954	1012.90	0.82	24.50	27.50	986.90	31-Aug-19	2.80	1010.92	Tenas	BDR	na	Un-named lower coal
T96R-34-67	6051180	617691	934.02	0.94	66.20	67.50	867.17	18-Sep-96	artesian	> 934.02	Tenas	BDR	na	Coal (upper)
T96R-34-67	6051180	617691	934.02	0.94	66.20	67.50	867.17	22-Aug-97	0.63	934.33	Tenas	BDR	na	Coal (upper)
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	18-Sep-96	artesian	> 934.02	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	22-Aug-97	0.73	934.26	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	25-Jul-17	0.85	934.15	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	16-Aug-17	0.88	934.11	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	27-Sep-17	0.83	934.17	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	17-Jan-18	frozen	n/a	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	28-Mar-18	0.86	934.13	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	20-Jun-18	0.78	934.21	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	12-Sep-18	0.81	934.18	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	9-Jan-19	artesian	> 934.02	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	4-Apr-19	0.90	934.09	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	5-Jun-19	n/a	n/a	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-34-87	6051180	617691	934.02	0.97	80.60	86.60	850.42	30-Aug-19	0.87	934.13	Tenas	BDR	Ut I	Coal (#1), 1/1U?
T96R-40-117	6053367	621435	833.50	0.78	108.40	117.40	720.60	19-Sep-96	37.46	796.82	Goathorn	BDR	Ut III	Coal (#2)
T96R-40-117	6053367	621435	833.50	0.78	108.40	117.40	720.60	20-Aug-97	39.12	795.16	Goathorn	BDR	Ut III	Coal (#2)
T96R-40-87	6053367	621435	833.55	0.80	81.00	87.00	749.55	19-Sep-96	18.36	815.99	Goathorn	BDR	Ut III	Coal (#4), 5?
T96R-40-87	6053367	621435	833.55	0.80	81.00	87.00	749.55	20-Aug-97	20.22	814.13	Goathorn	BDR	Ut III	Coal (#4), 5?
T96R-44-54	6054247	620908	764.94	0.62	50.50	53.50	712.94	19-Sep-96	14.44	751.12	Goathorn	BDR	Ut III	Coal (#2)
T96R-44-54	6054247	620908	764.94	0.62	50.50	53.50	712.94	20-Aug-97	14.48	751.08	Goathorn	BDR	Ut III	Coal (#2)
T96R-56C-83	6050370	618588	944.08	1.18	74.90	82.60	865.33	18-Sep-96	artesian	> 944.08	Tenas	BDR	Ut I	Coal (#1)
T96R-56C-83	6050370	618588	944.08	1.18	74.90	82.60	865.33	22-Aug-97	1.26	944.00	Tenas	BDR	Ut I	Coal (#1)
T96TP-01-10	6050718	617276	995.70	0.80	8.50	10.00	986.45	19-Sep-96	1.64	994.86	Tenas	BDR	na	Coal (C)
T96TP-02-07	6050655	617201	1001.60	0.80	2.00	7.00	997.10	20-Aug-97	3.23	999.17	Tenas	BDR	Ut I	Coal (#1)
T974-21-87	6055299	620884	690.64	0.97	81.70	87.70	605.94	21-Aug-97	33.39	658.22	Goathorn	BDR	Ut I	Coal (#1)
T97R-108C-70	6052532	617380	834.48	0.62	61.00	70.00	768.98	26-Sep-97	18.16	816.94	Tenas	BDR	Ut I	Coal (#1)
T97R-12-75	6053796	621298	792.54	0.65	68.00	74.80	721.14	20-Aug-97	6.77	786.42	Goathorn	BDR	Ut III	Coal (#2)
T97R-15-29	6054655	621062	739.81	2.15	26.00	29.00	712.31	20-Aug-97	artesian	> 739.81	Goathorn	BDR	Ut III	Coal (#4-5)
T97R-15-52	6054655	621062	739.81	0.60	47.00	51.60	690.51	20-Aug-97	0.48	739.93	Goathorn	BDR	Ut III	Coal (#3)
T97R-17-104	6052878	621462	846.30	0.55	98.50	104.00	745.05	20-Aug-97	22.66	824.19	Goathorn	BDR	Ut III	Coal (#2)
T97R-17-79	6052878	621462	846.30	0.52	69.70	78.70	772.10	20-Aug-97	22.68	824.14	Goathorn	BDR	Ut III	Coal (#4-5)
T97R-20-131	6055114	621360	713.61	0.89	127.00	131.00	584.61	21-Aug-97	7.59	706.91	Goathorn	BDR	Ut III	Coal (#2)
T97R-20-40	6055114	621360	713.61	0.82	35.20	39.70	676.16	21-Aug-97	6.52	707.91	Goathorn	BDR	Ut III	Coal (#8)
T97R-20-83	6055114	621360	713.46	0.97	77.20	83.50	633.11	21-Aug-97	5.29	709.14	Goathorn	BDR	Ut III	Coal (#4-5)
T97R-21-41	6055299	620884	690.64	0.87	37.70	49.70	646.94	21-Aug-97	1.60	689.91	Goathorn	BDR	Ut I	Coal (#?)
T97R-23-69	6055588	620717	679.72	0.60	61.50	68.50	614.72	21-Aug-97	39.44	640.88	Goathorn	BDR	Ut I	Coal (#1)
T97R-33-20	6054236	621053	767.66	0.60	12.50	15.50	753.66	21-Aug-97	artesian	> 767.66	Goathorn	BDR	Ut III	Upper Sndstn
T97R-33-55	6054236	621053	767.66	0.80	50.70	53.70	715.46	21-Aug-97	14.96	753.50	Goathorn	BDR	Ut III	Sndstn #3
T97R-33-78	6054236	621053	767.66	0.92	75.10	78.10	691.06	21-Aug-97	14.83	753.75	Goathorn	BDR	Ut III	Lower Mdstn
T97R-36-140	6055272	621430	710.28	0.86	137.00	140.00	571.78	21-Aug-97	26.40	684.74	Goathorn	BDR	na	Lower Mdstn
T97R-36W	6055272	621430	710.71	0.45	11.50	132.50	638.71	21-Aug-97	4.44	706.72	Goathorn	BDR	na	Various
T97R-49-63	6055515	621377	701.94	0.60	60.00	63.00	640.44	21-Aug-97	27.35	675.19	Goathorn	BDR	Ut III	Sndstn #3
T97R-49-63	6055515	621377	701.94	0.60	60.00	63.00	640.44	27-Aug-97	17.48	685.06	Goathorn	BDR	Ut III	Sndstn #3
T97RP-01-04	6054364	620705	744.49	0.66	1.30	4.50	741.59	25-Sep-97	0.86	744.29	Goathorn	OVB	na	Silty clay till fill
T97RP-01-13	6054364	620705	744.49	0.66	11.50	13.00	732.24	25-Sep-97	1.52	743.63	Goathorn	OVB	na	Silty clay till fill
T97RP-02-12	6054362	620887	758.56	0.60	10.80	12.30	747.01	25-Sep-97	6.09	753.07	Goathorn	OVB	na	Silty clay till fill
T97RP-03-08	6054325	621236	764.04	0.70	5.50	8.50	757.04	25-Sep-97	4.78	759.96	Goathorn	OVB	na	Silty clay till fill
TOB96-01-05	6050602	619014	922.87	0.52	1.60	4.60	919.77	20-Sep-96	1.45	921.94	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.52	1.60	4.60	919.77	22-Aug-97	1.12	922.27	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	25-Jul-17	2.70	920.92	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	28-Sep-17	3.68	919.95	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	18-Jan-18	1.92	921.70	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	29-Mar-18	1.37	922.25	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	21-Jun-18	1.96	921.66	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	13-Sep-18	4.88	918.74	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	11-Jan-19	5.12	918.50	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	3-Apr-19	4.70	918.92	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	6-Jun-19	2.36	921.26	Tenas	OVB	na	Till
TOB96-01-05	6050602	619014	922.87	0.75	1.60	4.60	919.77	31-Aug-19	4.93	918.69	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.57	3.00	6.00	848.96	20-Sep-96	2.02	852.01	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.57	3.00	6.00	848.96	23-Aug-97	1.76	852.27	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	26-Jul-17	2.93	850.91	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	28-Sep-17	3.61	850.23	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	16-Jan-18	2.63	851.22	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	26-Mar-18	2.73	851.11	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	29-Mar-18	2.81	851.03	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	20-Jun-18	2.01	851.83	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	22-Jun-10	2.06	851.78	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	10-Sep-18	3.40	850.44	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	8-Jan-19	3.96	849.88	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	29-Mar-19	2.81	n/a	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	5-Apr-19	4.12	849.72	Tenas	OVB	na	Till
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	6-Jun-19	3.62	850.22	Tenas	OVB	na	Till

ID	Northing	Easting	G.Surf Elev.	Stick-up	Screen Top	Screen Btm	Screen Mid	Date	GW Depth	GW Elev	Area	Type	Unit	Details
-	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*m*	*mgbs*	*mbgs*	*masl*	*dd-mm-yy*	*mb toc*	*masl*	-	-	-	-
TOB96-02-06	6051947	618466	853.46	0.38	3.00	6.00	848.96	30-Aug-19	3.62	850.22	Tenas	OVB	na	Till
TOB96-02-20	6051947	618466	853.46	0.52	17.00	20.00	834.96	20-Sep-96	18.42	835.56	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.52	17.00	20.00	834.96	23-Sep-97	19.71	834.27	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	28-Sep-17	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	16-Jan-18	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	26-Mar-18	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	20-Jun-18	20.36	833.44	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	10-Sep-18	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	8-Jan-19	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	5-Apr-19	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	6-Jun-19	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-02-20	6051947	618466	853.46	0.34	17.00	20.00	834.96	30-Aug-19	dry	< 833.46	Tenas	OVB	na	Sand and gravel
TOB96-11-04	6052818	617724	827.36	0.72	1.50	4.50	824.36	20-Sep-96	dry	< 822.86	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.72	1.50	4.50	824.36	23-Aug-97	2.77	825.31	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	26-Jul-17	2.48	825.75	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	27-Sep-17	2.54	825.69	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	15-Jan-18	3.20	825.03	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	26-Mar-18	3.87	824.36	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	21-Jun-18	3.35	824.88	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	6-Sep-18	3.75	824.48	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	8-Jan-19	3.89	824.34	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	30-Mar-19	4.10	824.13	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	30-May-19	3.80	824.43	Tenas	OVB	na	Clay
TOB96-11-04	6052818	617724	827.36	0.87	1.50	4.50	824.36	28-Aug-19	3.44	824.80	Tenas	OVB	na	Clay
TOB96-11-19	6052818	617724	827.36	0.68	18.70	20.20	807.91	20-Sep-96	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.68	18.70	20.20	807.91	22-Aug-97	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	26-Jul-17	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	27-Sep-17	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	15-Jan-18	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	26-Mar-18	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	21-Jun-18	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	6-Sep-18	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	8-Jan-19	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	30-Mar-19	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	28-May-19	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-11-19	6052818	617724	827.36	0.31	18.70	20.20	807.91	28-Aug-19	dry	< 807.16	Tenas	OVB	na	Fine sand
TOB96-12-04	6051377	616082	926.02	0.70	1.00	4.00	923.52	30-Sep-96	2.71	924.01	Tenas	OVB	na	Till
TOB96-12-04	6051377	616082	926.02	0.70	1.00	4.00	923.52	22-Aug-97	2.62	924.10	Tenas	OVB	na	Till
TOB97-04-07	6055616	622328	684.25	0.54	4.50	7.50	678.25	26-Sep-97	5.84	678.95	Goathorn	OVB	na	Silt till
TOB97-05-06	6054474	621931	759.37	0.83	2.80	5.90	755.02	26-Sep-97	3.38	756.82	Goathorn	OVB	na	Till
TOB97-06-21	6052496	616652	854.58	0.70	18.00	21.00	835.08	22-Aug-97	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	26-Jul-17	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	19-Jan-18	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	22-Jun-18	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	10-Sep-18	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	5-Jan-19	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	1-Apr-19	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	1-Jun-19	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-06-21	6052496	616652	854.58	0.74	18.00	21.00	835.08	28-Aug-19	dry	< 833.58	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.60	21.00	24.00	788.55	22-Aug-97	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	26-Jul-17	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	26-Mar-18	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	25-Jun-18	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	8-Sep-18	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	4-Jan-19	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	1-Apr-19	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	30-May-19	dry	< 787.05	Tenas	OVB	na	Sand
TOB97-07-24	6053579	617887	811.05	0.90	21.00	24.00	788.55	28-Aug-19	dry	< 787.05	Tenas	OVB	na	Sand
TW604A	6060134	618624	812.64	0.68	24.80	32.60	783.94	12-Nov-89	23.45	789.87	North	BDR	na	Coal (#6 mid), Mdstn
TW604A	6060134	618624	812.64	0.68	24.80	32.60	783.94	29-Sep-93	25.93	787.39	North	BDR	na	Coal (#6 mid), Mdstn
TW604A	6060134	618624	812.64	0.68	24.80	32.60	783.94	23-Aug-97	24.81	788.51	North	BDR	na	Coal (#6 mid), Mdstn
TW905A	6059904	618544	812.64	0.68	17.80	26.00	790.74	12-Nov-89	25.63	787.69	North	BDR	na	Coal (#6 mid), Mdstn
TW905A	6059904	618544	812.64	0.68	17.80	26.00	790.74	29-Sep-93	25.04	788.28	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	12-Nov-89	24.40	788.92	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	12-Nov-89	26.53	786.79	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	12-Nov-89	14.24	799.08	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	28-Sep-93	13.94	799.38	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	29-Sep-93	24.06	789.26	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	29-Sep-93	25.93	787.39	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	23-Aug-97	23.42	789.90	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	23-Aug-97	24.32	789.00	North	BDR	na	Coal (#6 mid), Mdstn
TW905B	6059901	618547	812.64	0.68	48.90	58.30	759.04	23-Aug-97	14.12	799.20	North	BDR	na	Coal (#6 mid), Mdstn
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	17-Jan-19	15.70	n/a	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	18-Jan-19	15.06	n/a	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	10-Feb-19	25.47	n/a	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	13-Feb-19	25.92	n/a	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	24-Feb-19	27.35	n/a	Tenas	OVB		Clayey Sand

ID	Northing	Easting	G.Surf Elev.	Stick-up	Screen Top	Screen Btm	Screen Mid	Date	GW Depth	GW Elev	Area	Type	Unit	Details
-	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*m*	*mgbs*	*mbgs*	*masl*	*dd-mm-yy*	*mb toc*	*masl*	-	-	-	-
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	11-Mar-19	30.43	786.87	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	3-Apr-19	29.69	787.60	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	28-May-19	30.25	787.04	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	31-Aug-19	30.56	786.74	Tenas	OVB		Clayey Sand
T19-18S	6052454	619237	816.44	0.85	34.10	35.60	781.59	28-Nov-19	30.32	786.97	Tenas	OVB		Clayey Sand
T19-19S	6052171	618775	840.44	0.90	43.50	45.00	796.19	22-Jan-19	44.40	n/a	Tenas	OVB		Clayey Sand (and Siltstone?)
T19-19S	6052171	618775	840.44	0.90	43.50	45.00	796.19	10-Feb-19	dry	< 795.44	Tenas	OVB		Clayey Sand (and Siltstone?)
T19-19S	6052171	618775	840.44	0.90	43.50	45.00	796.19	10-Mar-19	dry	< 795.44	Tenas	OVB		Clayey Sand (and Siltstone?)
T19-19S	6052171	618775	840.44	0.90	43.50	45.00	796.19	6-Apr-19	dry	< 795.44	Tenas	OVB		Clayey Sand (and Siltstone?)
T19-19S	6052171	618775	840.44	0.90	43.50	45.00	796.19	27-May-19	dry	< 795.44	Tenas	OVB		Clayey Sand (and Siltstone?)
T19-19S	6052171	618775	840.44	0.90	43.50	45.00	796.19	31-Aug-19	dry	< 795.44	Tenas	OVB		Clayey Sand (and Siltstone?)
T19-20S	6052440	616824	859.49	0.81	28.70	30.20	830.04	22-Jan-19	14.79	845.51	Tenas	OVB		Lean Clay with Sand
T19-20S	6052440	616824	859.49	0.81	28.70	30.20	830.04	10-Feb-19	dry	< 829.29	Tenas	OVB		Lean Clay with Sand
T19-20S	6052440	616824	859.49	0.81	28.70	30.20	830.04	9-Mar-19	dry	< 829.29	Tenas	OVB		Lean Clay with Sand
T19-20S	6052440	616824	859.49	0.81	28.70	30.20	830.04	4-Apr-19	dry	< 829.29	Tenas	OVB		Lean Clay with Sand
T19-20S	6052440	616824	859.49	0.81	28.70	30.20	830.04	27-May-19	dry	< 829.29	Tenas	OVB		Lean Clay with Sand
T19-20S	6052440	616824	859.49	0.81	28.70	30.20	830.04	31-Aug-19	dry	< 829.29	Tenas	OVB		Lean Clay with Sand
T19-20S	6052440	616824	859.49	0.81	28.70	30.20	830.04	22-Nov-19	dry	< 829.29	Tenas	OVB		Lean Clay with Sand
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	29-Jan-19	6.44	n/a	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	10-Feb-19	19.85	n/a	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	24-Feb-19	24.94	n/a	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	9-Mar-19	28.35	806.94	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	12-Mar-19	28.32	806.98	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	3-Apr-19	28.34	806.96	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	25-May-19	28.40	806.89	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	31-Aug-19	28.50	806.79	Tenas	BDR		Weathered Siltstone
T19-21S	6052746	616976	834.33	0.96	56.70	58.20	776.88	22-Nov-19	28.43	806.86	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	10-Feb-19	12.64	n/a	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	24-Feb-19	16.69	n/a	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	8-Mar-19	26.59	800.50	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	11-Mar-19	24.89	802.20	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	12-Mar-19	24.83	802.26	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	30-Mar-19	24.22	802.87	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	1-Apr-19	24.20	802.89	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	23-May-19	2.06	n/a	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	28-Aug-19	24.03	803.07	Tenas	BDR		Weathered Siltstone
T19-22S	6052847	617705	826.20	0.89	27.80	29.30	797.65	28-Nov-19	23.96	803.13	Tenas	BDR		Weathered Siltstone
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	7-Feb-19	14.13	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	7-Feb-19	14.65	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	10-Feb-19	28.28	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	11-Feb-19	30.18	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	12-Feb-19	31.06	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	13-Feb-19	31.94	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	15-Feb-19	33.05	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	24-Feb-19	35.35	n/a	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	11-Mar-19	35.52	772.83	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	2-Apr-19	35.46	772.88	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	24-May-19	35.55	772.79	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	28-Aug-19	35.74	772.60	Tenas	OVB		Clayey Sand
T19-26S	6053665	617469	807.43	0.91	50.80	52.30	755.88	23-Nov-19	35.61	772.73	Tenas	OVB		Clayey Sand
T19-27S	6053726	617883	808.26	0.91	43.00	44.50	764.51	15-Feb-19	28.27	780.90	Tenas	OVB		Silty Sand with Gravel
T19-27S	6053726	617883	808.26	0.91	43.00	44.50	764.51	24-Feb-19	40.99	768.18	Tenas	OVB		Silty Sand with Gravel
T19-27S	6053726	617883	808.26	0.91	43.00	44.50	764.51	10-Mar-19	40.89	768.28	Tenas	OVB		Silty Sand with Gravel
T19-27S	6053726	617883	808.26	0.91	43.00	44.50	764.51	1-Apr-19	41.01	768.16	Tenas	OVB		Silty Sand with Gravel
T19-27S	6053726	617883	808.26	0.91	43.00	44.50	764.51	24-May-19	40.96	768.21	Tenas	OVB		Silty Sand with Gravel
T19-27S	6053726	617883	808.26	0.91	43.00	44.50	764.51	28-Aug-19	40.94	768.23	Tenas	OVB		Silty Sand with Gravel
T19-27S	6053726	617883	808.26	0.91	43.00	44.50	764.51	23-Nov-19	40.78	768.39	Tenas	OVB		Silty Sand with Gravel
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	28-Feb-19	10.70	n/a	Tenas	BDR		Weathered Siltstone
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	1-Mar-19	14.07	n/a	Tenas	BDR		Weathered Siltstone
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	9-Mar-19	28.86	809.04	Tenas	BDR		Weathered Siltstone
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	11-Mar-19	28.80	809.10	Tenas	BDR		Weathered Siltstone
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	6-Apr-19	28.84	809.06	Tenas	BDR		Weathered Siltstone
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	28-May-19	28.94	808.96	Tenas	BDR		Weathered Siltstone
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	27-Aug-19	28.94	808.96	Tenas	BDR		Weathered Siltstone
T19-34S	6052399	618256	837.04	0.86	35.10	36.60	801.19	28-Nov-19	28.84	809.06	Tenas	BDR		Weathered Siltstone
T19-35S	6052834	618228	828.72	0.90	28.30	29.80	799.67	1-Mar-19	20.26	n/a	Tenas	BDR		Weathered Siltstone
T19-35S	6052834	618228	828.72	0.90	28.30	29.80	799.67	8-Mar-19	23.47	806.15	Tenas	BDR		Weathered Siltstone
T19-35S	6052834	618228	828.72	0.90	28.30	29.80	799.67	12-Mar-19	23.56	806.06	Tenas	BDR		Weathered Siltstone
T19-35S	6052834	618228	828.72	0.90	28.30	29.80	799.67	5-Apr-19	23.72	805.90	Tenas	BDR		Weathered Siltstone
T19-35S	6052834	618228	828.72	0.90	28.30	29.80	799.67	23-May-19	23.87	805.75	Tenas	BDR		Weathered Siltstone
T19-35S	6052834	618228	828.72	0.90	28.30	29.80	799.67	27-Aug-19	23.95	805.67	Tenas	BDR		Weathered Siltstone

ID	Northing	Easting	G.Surf Elev.	Stick-up	Screen Top	Screen Btm	Screen Mid	Date	GW Depth	GW Elev	Area	Type	Unit	Details
-	*UTM NAD83 9N*	*UTM NAD83 9N*	*masl*	*m*	*mgbs*	*mbgs*	*masl*	*dd-mm-yy*	*mb toc*	*masl*	-	-	-	-
T19-35S	6052834	618228	828.72	0.90	28.30	29.80	799.67	28-Nov-19	23.96	805.66	Tenas	BDR		Weathered Siltstone
T19-36	6058365	629737	515.35	0.88	3.70	5.20	510.90	12-Mar-19	3.93	512.31	Rail Loadout	OVB		Sand and Gravel
T19-36	6058365	629737	515.35	0.88	3.70	5.20	510.90	15-Apr-19	3.36	512.88	Rail Loadout	OVB		Sand and Gravel
T19-36	6058365	629737	515.35	0.88	3.70	5.20	510.90	21-May-19	3.27	512.97	Rail Loadout	OVB		Sand and Gravel
T19-37	6058215	629955	516.39	0.87	3.40	5.00	512.19	12-Mar-19	4.34	512.92	Rail Loadout	OVB		Sand and Gravel
T19-37	6058215	629955	516.39	0.87	3.40	5.00	512.19	15-Apr-19	4.07	513.19	Rail Loadout	OVB		Sand and Gravel
T19-37	6058215	629955	516.39	0.87	3.40	5.00	512.19	21-May-19	3.99	513.28	Rail Loadout	OVB		Sand and Gravel
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	13-Nov-18	6.21	677.54	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	12-Dec-18	6.23	677.52	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	16-Jan-19	6.28	677.47	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	22-Feb-19	6.32	677.43	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	22-Mar-19	6.36	677.39	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	18-Apr-19	6.15	677.60	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	29-May-19	6.18	677.57	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	23-Aug-19	6.52	677.23	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	26-Sep-19	6.67	677.08	Access Road	OVB		Silty Sand with Gravel/Till
T18-14S	6055570	620514	682.97	0.78	6.70	8.20	675.52	13-Nov-19	6.66	677.09	Access Road	OVB		Silty Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	13-Nov-18	13.44	704.11	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	12-Dec-18	13.46	704.09	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	16-Jan-19	13.48	704.07	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	22-Feb-19	13.49	704.06	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	22-Mar-19	13.49	704.06	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	18-Apr-19	13.28	704.27	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	29-May-19	13.26	704.29	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	23-Aug-19	13.41	704.14	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	26-Sep-19	13.44	704.11	Access Road	OVB		Sand with Gravel/Till
T18-15S	6054948	620563	716.75	0.80	11.30	14.30	703.95	13-Nov-19	13.37	704.18	Access Road	OVB		Sand with Gravel/Till
T19-28S	6054651	620005	710.20					n/a	6.50	703.90	Access Road	OVB		Till
T19-28S	6054651	620005	710.20					n/a	7.50	702.90	Access Road	OVB		Till
T18-30S	6054456	620050	706.70					n/a	11.40	695.30	Access Road	OVB		Clayey Silt (Fill)
T18-30S	6054456	620050	706.70					n/a	13.60	693.10	Access Road	OVB		Clayey Silt (Fill)
T19-31S	6054334	620048	704.90					n/a	dry	< 697.3	Access Road	OVB		Gravelly Silt (Fill)

Appendix D – Groundwater Quality

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64
					Sample ID	-	-	-	T95R-64-0817	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64	T95R-64
					Geol	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR
					Date Sampled	27-Oct-1995[4]	28-Oct-1996	22-Aug-1997	17-Aug-2017	26-Sep-2017	15-Jan-2018	31-Mar-2018	21-Jun-2018	13-Sep-2018	11-Jan-2019	6-Apr-2019	6-Jun-2019
					ALS Sample ID (2017-2018)	-	-	-	L1977808-4	L2000339-2	L2047836-7	L2078247-7	L2117455-5	L2164994-3	L2220048-2	L2255482-3	L2288655-1
					Maxxam Sample ID (2016)	-	-	-	-	-	-	-	-	-	-	-	-
					Chemex Lab Sample ID (1995-1997)	95-04060-3	96-04300-3	97-04136-25	-	-	-	-	-	-	-	-	-
Physical Tests					**Physical Tests**												
Colour	CU	5	n.g.	n.g.	Colour	-	-	-	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	1450.00	1305.00	1342.00	1330.00	1220.00	1270.00	1280.00	1200.00	1330.00	1250.00	1290.00	1250.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	1640.00	1304.00	1176.00	1303.00	1322.00	1279.00	1293.00	1312.00	1277.00	1285.00	1332.00	1282.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	63.10	56.40	61.80	56.80	57.20	53.50	56.60	58.10	52.80	52.00	55.60	53.90
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	7.56	7.48	7.49	8.19	8.17	8.09	8.59	8.75	8.40	7.89	8.23	8.56
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	7.03	7.70	7.56	7.35	7.50	7.12	7.68	7.39	7.51	7.63	7.77	7.41
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	84.00	1.00	8.00	5.00	3.00	3.00	3.00	7.30	3.00	3.00	3.00	3.00
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	879.00	782.00	827.00	845.00	823.00	838.00	818.00	779.00	830.00	820.00	794.00	812.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	-	-	-	4.82	4.22	1.79	0.83	3.48	2.96	1.55	0.55	3.18
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**												
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	-	-	-	2.90	3.10	-	1.00	1.00	1.00	5.60	1.0	1.0
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	975.00	920.00	973.00	739.00	716.00	756.00	697.00	653.00	741.00	729.00	750.00	675.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	0.50	0.50	0.50	39.40	44.60	1.00	61.20	48.80	29.40	1.00	1.00	64.40
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	-	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	0.10	0.10	0.10	22.30	-	-	-	-	-	-	-	-
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	800.00	755.00	798.00	778.00	761.00	756.00	759.00	702.00	770.00	729.00	750.00	739.00
Anions and Nitrogen					**Anions and Nitrogen**												
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.31	0.32	0.24	0.35	0.34	0.37	0.36	0.34	0.35	0.36	0.34	0.38
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	-	-	-	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	3.00	1.10	0.60	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	1.34	-	-	1.49	1.48	1.58	1.46	1.52	1.47	1.53	1.53	1.66
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	-	-	-	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	-	-	-	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	0.15	0.01	-	0.37	0.37	0.37	0.35	0.43	0.39	0.38	0.38	0.38
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.0010
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.05	0.01	0.02	0.00	0.00	-	0.00	0.00	0.01	0.01	0.01	0.01
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.07	0.02	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	12.40	0.40	0.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**												
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	-	-	-	0.50	0.50	0.50	0.50	0.87	0.50	0.50	0.90	0.50
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	-	-	-	0.50	0.50	0.50	0.50	0.79	0.58	0.50	0.54	0.50
Total Metals			n.g.	n.g.	**Total Metals**												
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	1.86	0.23	0.18	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.01	0.01
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	0.00	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	0.24	0.40	-	0.45	0.41	0.43	0.37	0.40	0.42	0.40	0.48	0.40
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.14	0.23	0.38	0.15	0.13	0.15	0.12	0.13	0.14	0.13	0.14	0.14
Cadmium (Cd)-Total	mg/L	0.000010	n.g.	n.g.	Cadmium (Cd)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	21.60	21.00	0.11	20.70	19.50	20.60	18.10	17.90	18.80	18.90	19.60	18.30
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.00	0.00	21.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	2.43	0.73	0.00	0.65	0.47	0.42	0.36	0.47	0.39	0.37	0.39	0.36
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.02	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	-	0.06	1.01	0.06	0.06	0.07	0.05	0.06	0.06	0.06	0.06	0.06
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	3.10	2.11	0.01	1.98	1.85	1.94	1.72	1.83	1.79	1.89	1.87	1.78
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	0.24	0.10	0.06	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	2.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.01	0.00	0.05	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	3.80	1.59	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	356.00	317.00	338.00	327.00	325.00	302.00	267.00	294.00	294.00	299.00	322.00	289.00
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	-	0.01	0.01	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.03	0.02	0.08	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Dissolved Metals			n.g.	n.g.	**Dissolved Metals**												
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.04	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	0.40	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.001	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	0.20	0.37	0.44	0.43	0.44	0.43	0.40	0.44	0.45	0.43	0.50	0.47
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.12	0.08	0.03	0.13	0.14	0.14	0.13	0.13	0.13	0.12	0.14	0.14
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.003	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	20.800	19.500	21.200	19.600	19.800	18.300	19.600	20.000	18.100	17.900	19.200	18.500
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.002	0.001	0.006	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.003	0.002	0.004	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.001	0.000	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.11	0.01	0.01	0.56	0.41	0.39	0.38	0.17	0.36	0.34	0.34	0.36
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	-	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.06	0.06	0.06
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	2.70	1.86	2.14	1.92	1.91	1.89	1.89	1.98	1.83	1.78	1.83	1.88
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.19	0.07	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0001	0.0001	0.0500	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.003	0.000	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.005	0.001	0.017	0.005	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	2.900	1.410	1.520	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0002	0.0002	0.0002	0.0010	0.0010	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	0.00	4.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	349.00	298.00	314.00	367.00	334.00	303.00	310.00	330.00	310.00	296.00	326.00	307.00
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	-	0.00	0.00	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**												
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	-	-	-	-	-	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	-	-	-	-	-	-	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	-	-	-	-	-	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	-	-	-	-	-	-	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T96R-34-87	T96R-34-87	T96R-34-87
					Sample ID	-	-	-	T95R-40-0817	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	T95R-40	-	-	96R-34-87-081
					Geol	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR
					Date Sampled	27-Oct-1995	28-Oct-1996	23-Aug-1997	17-Aug-2017	29-Sep-2017	18-Jan-2018	3-Apr-2018	27-Jun-2018	15-Sep-2018	10-Jan-2019	2-Apr-2019	4-Jun-2019	18-Sep-1996	22-Aug-1997	16-Aug-2017
					ALS Sample ID (2017-2018)	-	-	-	L1977808-3	L2000339-9	L2047836-2	L2078247-4	L2122028-3	L2166287-3	L2220047-4	L2254339-6	L2287158-2	-	-	L1977808-2
					Maxxam Sample ID (2016)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Chemex Lab Sample ID (1995-1997)	95-04060-4	96-04300-4	97-04136-37	-	-	-	-	-	-	-	-	-	96-03529-6	97-04136-35	-
Physical Tests					**Physical Tests**															
Colour	CU	5	n.g.	n.g.	Colour	-	-	-	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	-	-	5.00
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	2800.00	2836.00	2883.00	2790.00	2600.00	2680.00	2640.00	2780.00	2630.00	2600.00	2580.00	2650.00	1310.00	1400.00	1320.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	3385.00	2770.00	2470.00	2840.00	2560.00	2687.00	2726.00	2831.00	2650.00	2710.00	2921.00	2712.00	1290.00	1278.00	1312.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	131.00	110.00	116.00	113.00	102.00	103.00	103.00	92.60	95.60	99.50	108.00	97.30	46.30	43.60	44.00
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	7.48	7.37	7.48	8.08	7.81	7.67	8.44	8.36	8.42	7.58	7.98	8.46	7.55	7.39	8.15
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	6.99	7.20	7.29	7.18	7.30	7.11	7.67	7.33	7.22	7.42	7.60	7.16	7.46	7.50	7.33
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	57.00	7.00	7.00	11.60	5.30	688.00	3.00	51.30	28.40	92.70	71.80	13.00	31.00	3.00	10.40
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	1850.00	1769.00	1910.00	1750.00	1680.00	1810.00	1800.00	1790.00	1760.00	1800.00	1890.00	1750.00	818.00	838.00	834.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	-	-	-	4.21	3.81	489.00	3.38	47.30	8.68	23.30	22.70	5.31	-	-	1.55
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**															
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	-	-	-	11.30	21.50	-	1.00	1.00	17.20	22.00	17.20	1.0	-	-	3.70
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	2140.00	2103.00	2155.00	1660.00	1630.00	1690.00	1610.00	1640.00	1580.00	1570.00	1610.00	1470.00	928.00	995.00	753.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	0.50	0.50	0.50	1.00	67.40	1.00	78.20	1.00	42.80	1.00	1.00	162.00	0.50	0.50	1.00
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	-	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	1.00
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	0.10	0.10	0.10	33.70	-	-	-	-	-	-	-	-	0.10	0.10	-
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	1760.00	1725.00	1768.00	1660.00	1700.00	1690.00	1690.00	1640.00	1630.00	1570.00	1610.00	1630.00	761.00	816.00	753.00
Anions and Nitrogen					**Anions and Nitrogen**															
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.64	0.68	0.50	0.67	0.64	0.70	0.68	0.63	0.66	0.70	0.70	0.71	0.41	0.32	0.37
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	-	-	-	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	-	-	0.25
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	9.80	9.20	9.40	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	2.10	0.50	2.50
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	0.68	-	-	0.43	0.49	0.59	0.51	0.55	0.52	0.59	0.51	0.55	-	-	1.53
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	-	-	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	-	-	0.03
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	-	-	-	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	-	-	0.01
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	0.01	0.01	-	0.80	0.76	1.04	0.71	1.15	0.72	0.70	0.75	0.72	-	-	0.38
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.03	0.03	0.03	0.01	0.00	-	0.00	0.03	0.02	0.05	0.01	0.01	0.02	0.01	0.00
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.07	0.04	0.04	0.04	0.03	0.20	0.03	0.11	0.03	0.02	0.04	0.03	0.06	0.02	0.01
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	7.90	0.10	0.10	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.80	0.10	1.50
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**															
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	-	-	-	0.50	0.50	1.11	0.56	2.51	0.54	0.50	0.50	0.81	-	-	0.50
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	-	-	-	1.06	0.50	64.80	1.10	8.48	1.10	0.81	1.49	0.75	-	-	0.50
Total Metals			n.g.	n.g.	**Total Metals**															
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	0.97	0.19	0.08	0.06	0.03	9.42	0.02	0.33	0.79	5.96	4.11	0.22	0.79	0.07	0.09
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	0.00	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	2.05	3.57	3.77	4.19	3.17	5.01	3.15	3.92	3.52	3.46	4.53	3.15	0.82	0.89	0.96
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.39	0.37	0.34	0.34	0.32	0.38	0.30	0.35	0.29	0.32	0.33	0.31	0.45	0.17	0.18
Cadmium (Cd)-Total	mg/L	0.000010	n.g.	n.g.	Cadmium (Cd)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	40.90	35.00	35.20	35.60	31.30	40.70	30.70	33.10	27.70	32.70	35.80	29.00	15.90	14.00	19.60
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.00
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.00	0.00	0.01	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	1.31	0.26	1.00	0.76	0.41	8.39	0.46	1.32	0.85	2.19	2.97	0.60	1.28	0.66	0.53
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.02	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	-	0.11	0.11	0.11	0.10	0.12	0.09	0.11	0.10	0.11	0.11	0.10	0.05	0.05	0.05
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	7.60	6.84	6.69	6.70	5.96	9.75	6.07	6.93	6.19	7.54	7.47	5.51	2.45	2.08	2.15
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	0.29	0.15	0.06	0.04	0.03	0.15	0.03	0.06	0.03	0.04	0.07	0.03	0.06	0.01	0.02
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.01	0.00	0.02	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.01
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	5.50	3.70	3.39	3.40	2.90	4.00	3.00	3.90	2.80	3.20	3.60	2.90	1.98	1.68	2.00
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	733.00	701.00	778.00	776.00	746.00	698.00	615.00	771.00	663.00	738.00	754.00	649.00	326.00	342.00	331.00
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	-	0.02	0.01	0.05	0.05	0.04	0.01	0.01	0.01	0.04	0.02	0.02	0.01	0.01	0.05
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.00	0.00	0.00	0.03	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.02	0.04	0.05	0.01	0.01	0.04	0.01	0.03	0.01	0.02	0.02	0.01	0.03	0.06	0.01
Dissolved Metals					**Dissolved Metals**															
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.06	0.02	0.00	0.01	0.01	0.01	0.01	0.01	0.06	0.32	0.01	0.01	0.00	0.00	0.01
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	0.60	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.003	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.010	0.006	0.001
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	2.02	3.50	3.63	4.06	3.02	3.69	3.18	3.32	3.19	3.50	3.71	3.62	0.80	0.88	0.91
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.36	0.24	0.32	0.31	0.33	0.36	0.34	0.33	0.29	0.32	0.33	0.29	0.36	0.06	0.16
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.003	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	40.000	32.900	35.200	35.100	30.900	30.800	31.400	27.500	28.300	29.900	31.600	29.600	15.000	14.000	14.200
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.003	0.002	0.001	0.001	0.001	0.000	0.000	0.001	0.000	0.001	0.001	0.000	0.000	0.001	0.001
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.001	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.01	0.01	0.01	0.68	0.32	0.03	0.40	0.26	0.50	0.56	0.55	0.43	0.13	0.30	0.46
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	-	0.10	0.11	0.11	0.10	0.10	0.10	0.09	0.09	0.10	0.11	0.09	0.05	0.04	0.05
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	7.50	6.75	6.69	6.29	5.99	6.33	6.05	5.79	6.04	6.06	6.97	5.69	2.15	2.08	2.09
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.27	0.08	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.04	0.00	0.01
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0001	0.0001	0.0500	0.0002	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0500	0.0002
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.006	0.000	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.001
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.005	0.001	0.001	0.005	0.005	0.001	0.001	0.003	0.001	0.003	0.005	0.001	0.001	0.001	0.005
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	4.900	3.700	3.390	3.200	3.100	3.300	3.100	3.100	2.800	2.900	3.500	3.100	1.960	1.630	2.000
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0020	0.0002	0.0002	0.0010	0.0010	0.0001	0.0001	0.0003	0.0001	0.0003	0.0003	0.0001	0.0002	0.0002	0.0010
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	708.00	665.00	778.00	795.00	731.00	703.00	709.00	691.00	657.00	684.00	769.00	668.00	326.00	323.00	371.00
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	-	0.00	0.00	0.05	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.05
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**															
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	-	-	-	-	-	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	-	-
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	-	-	-	-	-	-	0.000010	0.000040	0.000010	0.000010	0.000010	0.000010	-	-	-
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	-	-	-	-	-	-	0.000015	0.000041	0.000015	0.000015	0.000015	0.000015	-	-	-
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000016	0.000010	-	-	-
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	-	-	-	-	-	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	-	-
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	-	-	-	-	-	-	0.000020	0.000020	0.000020	0.000020	0.000021	0.000020	-	-	-
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	-	-	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	-	-	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	T95R-15C	T95R-15C	T95R-15C	T95R-15C	T95R-15C	T95R-15C	T95R-15C
					Sample ID	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	T96R-34-87	-	-	-		T95R-15C	T95R-15C	T95R-15C
					Geol	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR
					Date Sampled	27-Sep-2017	2-Apr-2018	20-Jun-2018	12-Sep-2018	9-Jan-2019	4-Apr-2019	5-Jun-2019	26-Oct-1995	28-Oct-1996	23-Aug-1997	9-Nov-2016	26-Sep-2017	20-Apr-2018	20-Jun-2018
					ALS Sample ID (2017-2018)	L2000339-3	L2078247-8	L2117455-3	L2164994-2	L2220048-3	L2254339-2	L2287159-3	-	-	-	-	L2000339-1	L2085540-1	L2117455-2
					Maxxam Sample ID (2016)	-	-	-	-	-	-	-	-	-	-	QA4704	-	-	-
					Chemex Lab Sample ID (1995-1997)	-	-	-	-	-	-	-	95-04060-1	96-04300-2	97-04136-41	-	-	-	-
Physical Tests					**Physical Tests**														
Colour	CU	5	n.g.	n.g.	Colour	5.00	5.00	5.00	5.00	5.0	49.90	6.30	-	-	-	5.00	5.00	5.00	5.00
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	1280.00	1340.00	1310.00	1470.00	1830.00	1600.00	1690.00	1440.00	1375.00	1414.00	1340.00	1260.00	1300.00	1250.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	1414.00	1379.00	1453.00	1415.00	1896.00	1697.00	1744.00	1665.00	1355.00	987.00		1370.00	1602.00	1370.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	42.00	41.70	41.50	35.70	43.10	39.80	39.30	23.70	20.60	21.20	22.80	18.30	17.80	17.40
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	7.98	8.58	8.65	8.46	7.90	8.09	8.61	8.13	8.14	8.12	8.60	8.48	8.82	8.79
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	7.50	7.68	7.47	7.50	7.64	7.75	7.42	7.34	8.20	8.25	-	8.20	8.40	8.31
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	4.70	3.00	13.50	13.40	44.60	48.00	9.90	604.00	0.40	2.00	120.00	5.30	3.00	3.00
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	862.00	871.00	838.00	869.00	1220.00	1100.00	1090.00	853.00	821.00	858.00	820.00	867.00	837.00	803.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	2.45	0.98	2.94	11.90	12.90	75.10	10.60	-	-	-	120.00	3.11	0.50	1.80
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**														
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	8.80	1.00	1.00	1.00	7.00	6.60	1.00	-	-	-	0.50	1.00	-	1.00
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	759.00	740.00	762.00	803.00	1100.00	883.00	969.00	989.00	954.00	1009.00	872.00	698.00	609.00	698.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	44.80	72.40	43.40	37.40	1.00	7.20	75.80	0.50	0.50	0.50	26.60	63.80	60.40	58.00
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	1.00	1.00	1.00
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	22.40	-	-	-	-	-	-	0.10	0.10	0.10	22.20	31.90	-	-
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	804.00	813.00	805.00	840.00	1100.00	890.00	1050.00	811.00	783.00	828.00	759.00	762.00	670.00	756.00
Anions and Nitrogen					**Anions and Nitrogen**														
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.37	0.40	0.40	0.40	0.49	0.42	0.47	0.26	0.28	0.22	0.33	0.25	0.25	0.28
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	0.25	0.25	0.25	0.25	0.50	0.50	0.25	-	-	-	-	0.25	0.25	0.25
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	2.50	2.50	2.50	2.50	5.00	5.00	2.50	1.90	2.20	2.20	3.00	2.50	2.50	2.70
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	1.51	1.46	1.49	1.43	1.49	1.04	1.36	2.16	-	-	2.20	2.24	2.14	2.30
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	0.03	0.03	0.03	0.03	0.05	0.05	0.03	-	-	-	0.02	0.03	0.03	0.03
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-	-	-	0.01	0.01	0.01	0.01
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	0.42	0.40	0.46	0.49	0.52	0.70	0.48	0.00	0.01	-	0.45	0.28	0.27	0.77
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	-	0.00	0.00	0.00	0.00	0.01	0.00	-	-	-	-	-	-	0.00
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.04	0.04	0.04	-	0.03	-	0.01
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.02	0.01	0.02	0.03	0.04	0.08	0.03	0.30	0.04	0.05	0.13	0.04	0.04	0.05
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	1.50	1.50	1.50	1.50	8.40	3.00	1.50	2.40	0.30	0.40	1.01	1.50	1.50	1.50
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**														
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	0.50	0.50	0.53	1.37	0.65	7.55	1.57	-	-	-	0.84	0.50	0.62	1.71
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	0.50	0.50	0.67	1.16	1.11	10.40	2.10	-	-	-	0.50	0.80	0.54	2.71
Total Metals			n.g.	n.g.	**Total Metals**														
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	0.02	0.01	0.05	0.27	0.29	2.26	0.33	9.48	0.05	0.05	1.57	0.11	0.02	0.05
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00	0.00	0.00	0.00
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	0.85	0.78	0.94	0.95	1.04	0.95	1.00	0.53	0.33	0.30	0.38	0.29	0.29	0.30
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.17	0.16	0.16	0.18	0.17	0.17	0.17	0.19	0.24	0.16	0.14	0.15	0.12	0.12
Cadmium (Cd)-Total	mg/L	0.000010	n.g.	n.g.	Cadmium (Cd)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	14.50	13.20	21.00	13.80	15.70	13.10	12.60	-	6.99	6.54	6.63	5.59	5.12	5.10
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	0.59	0.45	0.81	1.43	0.77	3.69	0.85	24.70	0.05	0.09	3.01	0.17	0.07	0.15
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.02	0.00	0.00	0.00
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	0.05	0.04	0.04	0.05	0.05	0.05	0.05	-	0.05	0.05	0.05	0.05	0.04	0.04
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	2.05	1.72	1.92	2.10	2.73	2.75	2.22	-	1.20	1.18	1.53	1.07	0.97	0.90
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	0.01	0.01	0.02	0.02	0.03	0.17	0.04	0.79	0.00	0.00	0.08	0.01	0.00	0.00
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	2.00	2.00	2.00	2.00	2.00	2.00	2.00	-	1.26	1.29	1.20	2.00	2.00	2.00
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	353.00	284.00	311.00	345.00	467.00	427.00	425.00	-	361.00	372.00	356.00	372.00	305.00	287.00
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	0.01		0.00	0.00
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	0.05	0.01	0.01	0.01	0.03	0.01	0.01	-	0.01	0.02	0.01	0.05	0.01	0.01
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.03	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.01	0.03	0.00	0.00
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.01	0.01	0.01	0.01	0.01	0.04	0.01	0.11	0.02	0.02	0.01	0.01	0.01	0.01
Dissolved Metals					**Dissolved Metals**														
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.09	0.11	0.70	0.03	0.00	0.01	0.01	0.01	0.01
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	-	-	0.00	0.00	0.00	0.00
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	0.89	0.83	0.90	0.93	1.08	0.82	1.03	0.23	0.33	0.31	0.29	0.30	0.30	0.31
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.17	0.17	0.15	0.14	0.17	0.16	0.16	0.13	0.15	0.03	0.14	0.14	0.13	0.12
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	13.400	13.400	13.200	11.100	13.300	12.000	12.200	-	6.410	6.540	5.430	5.620	5.550	5.340
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.000	0.001	0.001	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.001	0.001	0.000	0.000
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.024	0.001	0.001	0.001	0.001	0.003	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.002
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.42	0.38	0.37	0.39	0.50	0.71	0.61	1.03	0.01	0.01	0.08	0.06	0.07	0.06
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	0.05	0.04	0.05	0.04	0.05	0.05	0.04	-	0.05	0.05	0.05	0.05	0.05	0.04
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	2.07	2.03	2.05	1.94	2.37	2.41	2.16	-	1.12	1.18	1.05	1.04	0.96	0.98
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.01	0.01	0.01	0.02	0.02	0.13	0.04	0.11	0.00	0.00	1.00	0.01	0.00	0.00
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0500	0.0000	0.0002	0.0000	0.0000
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.003	0.000	0.000	0.000	0.001	0.001	0.001
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.005	0.001	0.001	0.001	0.001	0.003	0.001	0.005	0.001	0.001	0.000	0.005	0.001	0.001
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	2.000	2.000	2.000	2.000	2.000	2.000	2.000	-	1.190	1.150	1.020	2.000	2.000	2.000
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0010	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0001	0.0010	0.0001	0.0001
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	358.00	337.00	346.00	336.00	442.00	448.00	417.00	-	332.00	342.00	333.00	357.00	321.00	313.00
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	-	0.00	0.00	0.00	0.00	0.00	0.00	-			0.01		0.00	0.00
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	0.05	0.01	0.01	0.01	0.01	0.01	0.01	-	0.00	0.00	0.01	0.05	0.01	0.01
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**														
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	-	-	-	-	0.000005	0.000005
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	-	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	-	-	-	-	-	0.000015	0.000015
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	-	-	-	-	0.000005	0.000005
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-	-	-	0.000050	0.000050
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-	-	-	0.000050	0.000050
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-	-	-	0.000050	0.000050
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	-	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	-	-	-	-	-	0.000020	0.000020
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-	-	-	-	0.000010	0.000010
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-	-	-	-	0.000050	0.000050

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	T95R-15C	T95R-15C	T95R-15C	T95R-15C	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W1 Shallow	W1 Shallow	W1 Shallow
					Sample ID	T95R-15C	T95R-15C	T95R-15C	T95R-15C	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W3 Deep	W1 Shallow	W1 Shallow	W1 Shallow
					Geol	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	OVB	OVB	OVB
					Date Sampled	11-Sep-2018	9-Jan-2019	5-Apr-2019	7-Jun-2019	25-Apr-2018	25-Jun-2018	15-Sep-2018	14-Jan-2019	5-Apr-2019	7-Jun-2019	30-Aug-2019	23-Nov-2019	27-Apr-2018	28-Jun-2018	11-Sep-2018
					ALS Sample ID (2017-2018)	L2163047-1	L2220048-4	L2255482-7	L2288653-1	L2085540-2	L2120097-2	L2166287-4	L2222626-1	L2255482-8	L2288653-2	L2340452-2	L2387383-6	L2087343-1	L2122028-2	L2163047-3
					Maxxam Sample ID (2016)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Chemex Lab Sample ID (1995-1997)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physical Tests					**Physical Tests**															
Colour	CU	5	n.g.	n.g.	Colour	5.00	5.00	5.00	5.00	9.50	13.30	9.90	11.10	7.70	8.30	6.30	7.80	9.30	6.60	6.20
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	1330.00	1280.00	1320.00	1300.00	752.00	627.00	682.00	645.00	580.00	567.00	580.00	682.00	764.00	760.00	748.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	1326.00	1310.00	1366.00	1323.00	722.00	546.00	754.00	701.00	584.00	557.00	618.00	661.00	789.00	752.00	751.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	15.00	16.50	16.60	17.30	138.00	112.00	129.00	127.00	83.40	79.80	66.00	106.00	11.40	10.80	9.72
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	8.69	8.42	8.60	8.60	8.38	7.83	8.16	8.45	8.23	8.27	8.53	8.14	8.74	8.86	8.80
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	8.18	8.41	8.59	8.27	8.20	7.65	8.26	7.74	8.17	7.79	8.03	7.78	9.10	8.85	8.99
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	3.00	34.40	12.20	4.20	70.50	9.90	8.00	14.00	46.20	7.20	196.00	55.50	41.30	3.00	17.10
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	793.00	848.00	801.00	850.00	595.00	504.00	500.00	420.00	365.00	409.00	373.00	460.00	494.00	459.00	466.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	0.23	53.50	9.90	4.42	8.02	5.54	2.32	5.23	29.00	3.04	22.60	31.00	173.00	4.13	6.29
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**															
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	1.00	1.00	1.00	1.00	-	8.60	1.90	1.90	1.20	1.00	1.00	3.10	-	1.00	1.00
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	739.00	718.00	734.00	692.00	238.00	247.00	283.00	265.00	257.00	248.00	240.00	295.00	318.00	310.00	321.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	51.00	18.40	36.60	83.00	8.20	1.00	13.40	16.20	1.00	17.60	14.20	13.60	26.60	25.80	30.60
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	790.00	736.00	770.00	775.00	246.00	247.00	296.00	281.00	257.00	266.00	254.00	309.00	344.00	336.00	351.00
Anions and Nitrogen					**Anions and Nitrogen**															
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.01	0.26	0.23	0.25	0.47	0.40	0.36	0.30	0.12	0.04	0.08	0.09	0.06	0.05	0.06
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	0.25	0.25	0.25	0.25	0.30	0.07	0.25	0.05	0.05	0.05	0.05	0.07	0.25	0.05	0.25
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	2.50	2.50	2.50	2.50	15.10	7.63	7.30	4.27	3.42	3.05	2.70	5.62	2.50	0.50	2.50
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	2.47	2.33	2.23	2.40	0.41	0.41	0.42	0.48	0.32	0.34	0.34	0.43	0.80	0.87	0.98
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	0.03	0.03	0.03	0.03	0.03	0.01	0.03	0.03	0.53	0.89	0.59	0.05	0.03	0.01	0.03
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	0.28	0.28	0.28	0.27	12.10	7.12	2.23	1.60	1.99	3.40	0.93	0.83	0.48	0.11	0.58
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	0.03	0.03	0.03	0.03	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.01	0.01
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.04	0.04	0.04	0.04	-	0.01	0.00	0.00	0.01	0.01	0.01	0.01	-	0.02	0.06
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.04	0.05	0.05	0.04	0.02	0.07	0.00	0.03	0.03	0.01	0.02	0.02	0.10	0.02	0.10
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	1.50	1.50	1.50	1.50	141.00	76.90	84.70	59.20	51.30	53.70	51.30	75.80	62.30	62.60	66.00
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**															
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	1.10	0.75	0.84	0.57	38.70	27.70	23.90	11.70	7.14	10.60	12.40	18.30	2.91	2.56	3.84
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	0.58	1.86	1.27	0.50	47.10	31.00	15.50	7.02	6.12	9.93	3.85	21.40	6.62	2.58	5.91
Total Metals			n.g.	n.g.	**Total Metals**															
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	0.01	1.05	0.59	0.08	0.10	0.02	0.04	0.37	0.27	0.03	0.30	0.24	5.32	0.13	0.38
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	0.31	0.33	0.36	0.29	0.05	0.02	0.03	0.03	0.05	0.03	0.07	0.07	0.10	0.03	0.03
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.12	0.13	0.15	0.14	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.19	0.23	0.22
Cadmium (Cd)-Total	mg/L	0.000010	n.g.	n.g.	Cadmium (Cd)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	4.79	5.95	5.80	5.56	42.00	28.90	32.90	25.60	29.50	19.90	18.80	32.00	4.49	3.16	3.28
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.00	0.00	0.00	0.00	0.01	0.03	0.02	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	0.06	1.18	0.40	0.14	0.17	0.09	0.12	0.54	0.37	0.08	0.22	0.27	4.36	0.11	0.34
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	0.04	0.04	0.05	0.05	0.02	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.02	0.02	0.02
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	0.85	1.29	1.11	1.01	9.61	7.21	9.18	7.59	6.86	6.73	6.12	9.30	2.45	0.63	0.70
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	0.00	0.03	0.01	0.00	0.28	0.21	0.22	0.21	0.13	0.09	0.09	0.19	0.16	0.02	0.04
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	2.00	2.00	2.00	2.00	3.30	2.90	2.50	2.10	2.00	2.00	2.00	2.40	2.20	2.00	2.00
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	294.00	325.00	340.00	325.00	115.00	112.00	132.00	117.00	118.00	101.00	107.00	113.00	177.00	194.00	187.00
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.01
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.01	0.01	0.01	0.01	0.04	0.01	0.01	0.03	0.03	0.01	0.02	0.02	0.02	0.01	0.01
Dissolved Metals					**Dissolved Metals**															
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.01	0.02	0.01	0.02
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	0.32	0.31	0.35	0.31	0.04	0.02	0.03	0.03	0.03	0.03	0.03	0.04	0.02	0.03	0.02
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.11	0.12	0.13	0.14	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.19	0.21	0.20
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	4.590	5.110	5.080	5.370	40.600	31.400	36.100	33.800	22.300	20.600	16.500	28.100	3.490	3.320	3.020
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.001	0.001	0.001	0.001	0.004	0.015	0.014	0.003	0.002	0.001	0.003	0.003	0.001	0.002	0.002
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.06	0.07	0.06	0.07	0.04	0.05	0.06	0.16	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	0.04	0.04	0.05	0.05	0.02	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.02	0.02	0.02
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	0.86	0.91	0.94	0.94	8.82	8.13	9.40	10.40	6.71	6.89	6.04	8.82	0.64	0.61	0.53
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.00	0.00	0.00	0.00	0.27	0.24	0.22	0.34	0.11	0.07	0.06	0.15	0.02	0.01	0.01
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.001	0.001	0.001	0.001	0.009	0.007	0.006	0.007	0.011	0.010	0.012	0.007	0.009	0.008	0.008
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.001	0.001	0.001	0.001	0.005	0.003	0.003	0.003	0.002	0.001	0.001	0.002	0.001	0.001	0.001
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	2.000	2.000	2.000	2.000	3.600	3.000	2.600	2.600	2.000	2.000	2.000	2.200	2.000	2.000	2.000
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0001	0.0001	0.0001	0.0001	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	314.00	298.00	327.00	316.00	113.00	116.00	126.00	138.00	118.00	104.00	107.00	109.00	183.00	194.00	181.00
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.01	0.01	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**															
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	0.000054	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	0.000060	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	0.000065	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	0.000094	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	-
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	0.000048	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	0.000029	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	0.000085	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	0.000008	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	0.000184	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	0.000048	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	0.000020	0.000022	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	-
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	0.000237	0.000010	0.000010	0.000010	0.000010	0.000030	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	0.000050	0.000050	0.000050	0.000050	0.000080	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	W1 Shallow	W1 Shallow	W1 Shallow	W1 Shallow	W1 Shallow	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	T0B96-02-06	T0B96-02-06
					Sample ID	W1 Shallow	W1 Shallow	W1 Shallow	W1 Shallow	W1 Shallow	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	W1 Deep	-	T0B96-02-06
					Geol	OVB	OVB	OVB	OVB	OVB	BDR	BDR	BDR	BDR	BDR	BDR	BDR	BDR	OVB	OVB
					Date Sampled	10-Jan-2019	6-Apr-2019	4-Jun-2019	29-Aug-2019	21-Nov-2019	28-Apr-2018	28-Jun-2018	11-Sep-2018	10-Jan-2019	6-Apr-2019	4-Jun-2019	29-Aug-2019	24-Nov-2019	20-Sep-1996	23-Aug-1997
					ALS Sample ID (2017-2018)	L2220047-3	L2255482-4	L2287158-1	L2339588-1	L2387383-4	L2087343-2	L2122028-1	L2163047-2	L2220047-1	L2255482-5	L2287159-2	L2340452-1	L2387383-2	-	-
					Maxxam Sample ID (2016)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Chemex Lab Sample ID (1995-1997)	-	-	-	-	-	-	-	-	-	-	-	-	-	96-03529-14	97-04136-38
Physical Tests					**Physical Tests**															
Colour	CU	5	n.g.	n.g.	Colour	14.70	7.30	6.90	5.00	15.10	8.50	5.50	5.00	23.10	7.20	8.20	6.90	5.00	-	-
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	738.00	758.00	752.00	775.00	767.00	1040.00	1070.00	1050.00	933.00	1060.00	1040.00	1080.00	1070.00	630.00	568.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	770.00	787.00	756.00	798.00	745.00	1212.00	1057.00	1045.00	966.00	1096.00	1053.00	1111.00	1061.00	570.00	560.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	12.20	11.00	10.10	10.90	11.40	6.38	4.68	3.88	4.29	4.20	4.03	3.87	3.97	338.00	289.00
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	8.80	8.77	8.80	8.85	8.74	8.92	8.96	9.01	9.15	8.95	8.97	9.01	9.04	7.87	7.12
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	8.33	9.60	8.96	9.08	8.87	9.30	9.10	9.25	8.97	9.64	9.16	9.17	9.18	7.58	7.36
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	32.70	111.00	59.40	49.60	33.10	266.00	34.70	20.50	17.50	73.80	53.40	253.00	182.00	63.00	37.00
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	574.00	462.00	529.00	545.00	491.00	901.00	697.00	651.00	621.00	628.00	673.00	834.00	711.00	340.00	311.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	164.00	62.50	160.00	166.00	88.70	730.00	56.20	30.90	26.20	106.00	77.30	858.00	254.00	-	-
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**															
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	1.00	1.00	1.00	1.00	2.00	-	1.00	1.00	1.00	1.00	1.00	1.00	2.00	-	-
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	300.00	306.00	325.00	329.00	318.00	468.00	465.00	456.00	377.00	471.00	473.00	465.00	461.00	386.00	380.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	26.20	24.20	27.00	29.20	26.20	56.40	58.80	66.80	70.40	57.80	49.80	65.60	63.00	0.50	0.50
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	0.10
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	326.00	331.00	352.00	358.00	344.00	524.00	524.00	522.00	447.00	529.00	523.00	530.00	524.00	317.00	312.00
Anions and Nitrogen					**Anions and Nitrogen**															
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.06	0.06	0.07	0.05	0.05	0.10	0.10	0.11	0.07	0.10	0.11	0.13	0.12	0.05	0.01
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	-	-
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	0.50
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	0.90	0.91	0.85	0.85	0.89	5.06	5.12	5.55	3.85	5.40	4.72	5.12	5.32	-	-
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	-	-
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	-	-
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	0.18	0.34	0.24	0.11	0.18	0.19	0.16	0.15	0.25	0.23	0.44	0.35	0.20	-	-
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	0.02	0.02	0.01	0.01	0.02	-	0.02	0.03	0.10	0.04	0.06	0.03	0.06	-	-
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.03	0.03	0.02	0.02	0.02	-	0.04	0.04	0.12	0.07	0.06	-	0.07	0.01	0.00
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.09	0.06	0.09	0.09	0.06	0.10	0.05	0.04	0.11	0.07	0.09	0.10	0.08	0.06	0.04
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	70.20	62.00	56.00	58.80	73.50	47.40	54.30	52.60	48.20	46.90	46.90	46.70	48.70	13.40	9.10
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**															
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	2.85	3.45	3.84	5.06	3.10	2.99	3.86	2.99	4.05	5.68	4.44	4.23	4.39	-	-
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	3.70	4.91	4.06	7.03	3.35	3.58	3.88	3.00	4.17	5.77	6.19	4.93	4.10	-	-
Total Metals			n.g.	n.g.	**Total Metals**															
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	4.22	0.58	4.19	3.98	2.32	9.96	1.21	0.58	0.57	1.55	1.36	6.33	3.59	1.30	0.18
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	0.07	41.30	1.30	1.72	0.13	0.15	0.03	0.03	0.02	0.04	0.07	0.12	0.08	0.16	0.14
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.20	0.22	0.24	0.22	0.20	0.30	0.35	0.33	0.30	0.35	0.30	0.27	0.33	0.09	0.01
Cadmium (Cd)-Total	mg/L	0.000010	n.g.	n.g.	Cadmium (Cd)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	4.77	4.08	4.26	4.39	4.55	3.13	1.61	1.34	1.55	1.52	1.61	2.06	1.60	90.60	86.00
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	3.81	0.75	3.94	3.55	2.19	3.21	0.38	0.19	0.25	0.52	0.94	2.13	1.17	1.77	0.27
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	0.02	0.02	0.02	0.02	0.02	0.09	0.09	0.09	0.07	0.09	0.08	0.09	0.09	0.00	0.00
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	2.33	0.88	2.07	2.14	1.59	2.92	0.50	0.33	0.35	0.56	0.53	1.93	1.06	27.20	23.90
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	0.14	0.05	0.14	0.13	0.08	0.13	0.02	0.02	0.02	0.03	0.04	0.10	0.05	0.12	0.05
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.00	0.00
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	2.00	2.00	2.00	2.00	2.00	2.70	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.03	0.75
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	190.00	205.00	190.00	191.00	181.00	259.00	279.00	255.00	246.00	256.00	247.00	234.00	240.00	11.40	8.11
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	0.04	0.02	0.07	0.05	0.03	0.02	0.01	0.01	0.01	0.02	0.01	0.02	0.02	0.03	0.01
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02	0.00
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04
Dissolved Metals					**Dissolved Metals**															
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.03	0.01	0.01	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.28	0.01	0.00	0.00
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.000	0.000
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	0.02	0.15	0.02	0.05	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.03	0.03	0.14	0.14
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.19	0.23	0.19	0.23	0.20	0.29	0.32	0.30	0.30	0.33	0.30	0.27	0.31	0.04	0.01
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	3.780	3.360	3.120	3.310	3.480	2.040	1.490	1.240	1.400	1.320	1.280	1.180	1.240	90.600	79.200
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.019	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.005
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.003
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.03	0.03	0.03	0.04	0.03	0.03	0.05	0.03	0.03	0.03	0.03	0.09	0.03	0.01	0.01
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	0.02	0.02	0.02	0.02	0.01	0.09	0.09	0.08	0.07	0.10	0.07	0.08	0.09	0.00	0.00
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	0.66	0.63	0.57	0.65	0.65	0.31	0.23	0.19	0.19	0.22	0.20	0.22	0.21	27.20	22.10
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	0.00
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.010	0.009	0.007	0.008	0.011	0.016	0.016	0.017	0.008	0.015	0.013	0.013	0.014	0.000	0.000
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.027
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	0.860	0.650
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0010	0.0004	0.0001	0.0004	0.0001	0.0002	0.0002
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	174.00	198.00	183.00	199.00	174.00	268.00	271.00	250.00	234.00	260.00	238.00	229.00	233.00	11.40	7.80
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.00
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**															
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	-
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	-	-
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	-
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	-	-
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	-
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	-

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-20	T0B96-02-20	T0B96-02-20
					Sample ID	-	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-06	T0B96-02-20	T0B96-02-20	T0B96-02-20
					Geol	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB
					Date Sampled	10-Nov-2016	28-Sep-2017	16-Jan-2018	29-Mar-2018	22-Jun-2018	12-Sep-2018	8-Jan-2019	5-Apr-2019	6-Jun-2019	20-Sep-1996	23-Aug-1997	22-Jun-2018
					ALS Sample ID (2017-2018)	-	L2000339-4	L2047836-5	L2078247-6	L2120097-4	L2164994-1	L2218463-4	L2255482-6	L2288655-2	-	-	L2120097-3
					Maxxam Sample ID (2016)	QA4706	-	-	-	-	-	-	-	-	-	-	-
					Chemex Lab Sample ID (1995-1997)	-	-	-	-	-	-	-	-	-	96-03529-16	97-04136-39	-
Physical Tests					**Physical Tests**												
Colour	CU	5	n.g.	n.g.	Colour	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	-	-	5.00
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	484.00	535.00	553.00	510.00	573.00	600.00	569.00	558.00	570.00	621.00	532.00	439.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	-	557.00	555.00	559.00	587.00	587.00	565.00	595.00	586.00	560.00	500.00	395.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	389.00	314.00	297.00	311.00	308.00	312.00	328.00	325.00	321.00	246.00	271.00	200.00
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	8.05	7.79	8.04	8.22	7.99	7.72	7.78	8.10	8.08	8.14	7.67	7.97
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	-	7.50	7.20	7.73	7.42	7.72	7.66	7.74	7.31	7.90	7.93	7.53
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	2670.00	35.50	6.10	3.00	3.70	3.00	6.00	14.60	15.10	26640.00	8060.00	378.00
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	314.00	329.00	327.00	318.00	334.00	335.00	324.00	306.00	336.00	357.00	290.00	248.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	1950.00	19.90	4.83	2.00	0.74	0.57	2.42	6.07	8.33			229.00
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**												
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	0.99	10.20	-	1.00	7.10	1.00	18.50	4.20	4.50	-	-	5.80
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	320.00	301.00	321.00	267.00	317.00	338.00	321.00	304.00	277.00	395.00	351.00	234.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	1.00
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	1.00
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	0.50	2.00	-	-	-	-	-	-	1.0	0.10	0.10	-
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	263.00	301.00	321.00	267.00	317.00	338.00	321.00	304.00	277.00	324.00	288.00	234.00
Anions and Nitrogen			n.g.	n.g.	**Anions and Nitrogen**												
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.19	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.33	0.04	0.03
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	-	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	-	-	0.05
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	1.10	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.60	0.50	0.77
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	0.14	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.12	-	-	0.10
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	0.02	0.01	0.01	0.02	0.01	0.02	0.01	0.02	0.02	-	-	0.07
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	0.48	0.04	0.03	0.23	0.16	0.28	0.03	0.06	0.07	-	-	0.76
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	-	-	-	0.00	0.00	0.00	0.00	0.0010	0.0010	-	-	0.00
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	-	0.00	-	0.00	0.00	0.01	0.0020	0.0020	0.00	0.01	0.01	0.00
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.85	0.02	0.00	0.01	0.01	0.02	0.00	0.01	0.01	13.70	6.42	1.21
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	10.80	9.77	10.40	9.28	9.61	9.15	11.10	9.86	11.60	19.50	9.90	9.98
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**												
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	1.95	1.88	1.36	3.78	2.29	2.72	1.30	3.89	1.48	-	-	4.21
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	1.92	1.25	1.18	2.21	1.85	1.43	1.05	1.42	1.32	-	-	24.60
Total Metals			n.g.	n.g.	**Total Metals**												
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	16.70	1.19	0.19	0.06	0.05	0.05	0.14	0.40	0.83	116.00	65.40	7.95
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.03	0.01
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	1.01	0.14	0.13	0.10	0.11	0.14	0.13	0.15	0.14	4.94	1.37	0.30
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.13	0.10
Cadmium (Cd)-Total	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Total	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	106.00	85.40	92.70	77.70	80.80	87.40	80.70	88.60	81.30	343.00	154.00	93.40
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.08	0.01
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.13	0.01
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.21	0.03
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	20.00	0.85	0.14	0.06	0.07	0.07	0.08	0.28	0.61	521.00	143.00	17.00
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.11	0.02
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	0.02	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.05	0.01
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	30.40	24.90	25.30	21.50	24.00	24.40	24.90	26.80	23.90	145.00	54.60	25.10
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	4.46	0.48	0.11	0.03	0.01	0.02	0.03	0.11	0.15	8.36	3.94	0.75
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.02
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	3.96	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	22.80	8.60	2.50
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	13.60	7.90	7.80	6.60	7.70	7.50	8.10	8.30	7.30	63.50	11.50	8.60
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	0.01	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	0.04	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.20	0.51	0.05
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.16	0.02
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.11	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.11	0.49	0.07
Dissolved Metals					**Dissolved Metals**												
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.00	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	1.00	0.01
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.004	0.001
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	0.11	0.12	0.12	0.11	0.12	0.13	0.13	0.14	0.14	0.17	1.07	0.09
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.05	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.01	0.01	0.10
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	78.200	84.900	80.900	85.100	82.700	84.900	90.000	85.300	86.100	62.200	69.700	49.800
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.007	0.001	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.006	0.000
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.009	0.001
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.01	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.03
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	0.01	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	22.40	24.80	23.20	23.90	24.70	24.40	25.20	27.20	25.80	21.90	23.50	18.50
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.18	0.00
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0000	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0000
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.001
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.001	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.019	0.001
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	0.794	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.160	0.690	2.000
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0004	0.0010	0.0005	0.0006	0.0008	0.0010	0.0004	0.0005	0.0010	0.0002	0.0002	0.0008
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	12.10	7.70	8.20	8.00	8.00	7.90	7.30	8.10	7.30	53.70	9.46	7.90
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	0.01	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.00
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.01	0.01
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.24	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**												
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	-	-	-	0.000005	-	-	-	-	0.000005	-	-	-
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	-	-	-	0.000015	-	-	-	-	0.000015	-	-	-
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	-	-	-	0.000005	-	-	-	-	0.000005	-	-	-
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	-	-	-	0.000050	-	-	-	-	0.000050	-	-	-
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	-	-	-	0.000050	-	-	-	-	0.000050	-	-	-
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	-	-	-	0.000050	-	-	-	-	0.000050	-	-	-
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	-	-	-	0.000020	-	-	-	-	0.000020	-	-	-
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	-	-	-	0.000010	-	-	-	-	0.000010	-	-	-
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	-	-	-	0.000050	-	-	-	-	0.000050	-	-	-

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-01-05	T0B96-01-05	T0B96-01-05	T0B96-01-05	T0B96-01-05	T0B96-01-05
					Sample ID	-	-	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	T0B96-11-04	-	-	T0B96-01-05	T0B96-01-05	T0B96-01-05	T0B96-01-05
					Geol	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB
					Date Sampled	23-Aug-1997	10-Nov-2016	27-Sep-2017	18-Jan-2018	5-Apr-2018	25-Jun-2018	10-Sep-2018	11-Jan-2019	1-Apr-2019	5-Jun-2019	20-Sep-1996	22-Aug-1997	19-Jan-2018	31-Mar-2018	21-Jun-2018	21-Jun-2018
					ALS Sample ID (2017-2018)	-	-	L2000339-5	L2047836-6	L2078247-3	L2120097-5	L2163047-4	L2220048-1	L2254339-3	L2287159-4	-	-	L2047836-8	L2078247-5	L2117455-4	L2117455-4
					Maxxam Sample ID (2016)	-	QA4705	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Chemex Lab Sample ID (1995-1997)	97-04136-40	-	-	-	-	-	-	-	-	-	96-03529-13	97-04136-32	-	-	-	-
Physical Tests					**Physical Tests**																
Colour	CU	5	n.g.	n.g.	Colour	-	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	-	-	6.20	13.70	6.60	6.60
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	760.00	729.00	695.00	650.00	647.00	697.00	668.00	666.00	639.00	587.00	373.00	403.00	392.00	225.00	365.00	365.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	670.00	-	781.00	709.00	638.00	737.00	672.00	661.00	665.00	645.00	430.00	413.00	472.00	518.00	430.00	430.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	381.00	423.00	405.00	339.00	354.00	363.00	364.00	382.00	375.00	356.00	181.00	189.00	154.00	74.20	175.00	175.00
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	7.57	8.16	7.85	8.18	8.35	8.14	8.37	8.26	8.36	8.36	7.18	6.70	7.66	7.87	8.46	8.46
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	7.58	-	7.70	7.68	7.88	7.70	8.20	7.37	8.47	7.91	7.08	7.23	7.20	7.02	7.00	7.00
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	27.00	385.00	21.90	14.10	25.80	21.70	44.10	69.00	32.20	3.50	170.00	418.00	43.50	3.00	10.90	10.90
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	427.00	420.00	390.00	367.00	345.00	373.00	389.00	384.00	387.00	344.00	199.00	220.00	261.00	167.00	251.00	251.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	-	288.00	20.20	7.74	19.80	10.00	22.80	48.50	22.10	6.31			47.10	21.00	10.20	10.20
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**																
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	-	7.87	10.80	-	1.00	4.80	1.00	1.00	1.00	1.00	-	-	-	2.60	1.00	1.0
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	492.00	492.00	407.00	380.00	340.00	369.00	372.00	377.00	347.00	314.00	232.00	263.00	220.00	127.00	208.00	208.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	0.50	0.50	1.00	1.00	9.40	8.80	11.80	1.00	7.20	2.60	0.50	0.50	1.00	1.00	8.60	8.60
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.50	0.50	1.00	1.00	1.00	1.00
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	0.10	0.50	2.00	-	-	-	-	-	-	-	0.10	-	-	-	-	-
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	404.00	403.00	407.00	380.00	350.00	378.00	384.00	377.00	354.00	317.00	190.00	216.00	220.00	127.00	217.00	217.00
Anions and Nitrogen			n.g.	n.g.	**Anions and Nitrogen**																
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.02	0.09	0.02	0.01	0.01	0.01	-	0.01	0.01	0.01	0.03	0.01	0.02	0.02	0.01	0.01
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	-	-	0.25	0.05	0.05	0.05	0.05	0.05	0.25	-	-	-	0.05	0.05	0.05	0.05
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	0.50	1.10	2.50	0.50	0.54	0.50	0.50	0.50	2.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	-	0.10	0.10	0.11	0.10	0.11	0.11	0.11	0.10	0.11	-	-	0.14	0.09	0.13	0.13
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	-	0.02	0.13	0.15	0.17	0.13	0.20	0.18	0.14	0.14	-	-	0.01	0.01	0.01	0.01
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	-	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-	-	0.00	0.00	0.00	0.00
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	-	0.28	0.74	0.32	0.57	0.50	-	0.32	0.42	0.28	-	-	0.68	0.37	0.26	0.26
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	-	-	-	-	0.00	0.00	-	-	0.00	-	-	-	-	0.00	0.00	0.00
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.02	-	0.00	-	0.01	0.02	-	0.01	0.01	0.00	0.01	0.01	-	0.01	0.00	0.00
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.06	0.22	0.06	0.06	0.05	0.20	-	0.05	0.03	0.02	0.09	0.40	0.11	0.03	0.02	0.02
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	36.80	21.70	20.80	22.40	24.10	23.10	26.50	28.20	25.90	24.80	5.80	9.30	4.27	1.37	2.20	2.20
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**																
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	-	2.42	3.25	1.71	2.47	1.92	-	-	-	-	-	-	10.40	7.42	7.91	7.91
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	-	2.16	4.63	2.87	3.51	3.93	-	-	-	1.88	-	-	11.60	8.91	7.38	7.38
Total Metals			n.g.	n.g.	**Total Metals**																
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	0.64	5.27	2.81	1.31	1.27	0.75	-	0.46	0.43	0.41	3.82	4.41	0.84	1.05	0.96	0.96
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.00	0.00	0.00	0.00
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	0.15	0.19	0.14	0.10	0.09	0.08	-	0.10	0.25	0.08	0.34	0.50	0.26	0.07	0.24	0.24
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.00	0.00	0.01	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.01	0.05	0.10	0.10	0.10	0.10	-	0.10	0.10	0.10	0.09	0.01	0.10	0.10	0.10	0.10
Cadmium (Cd)-Total	mg/L	0.000010	n.g.	n.g.	Cadmium (Cd)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	75.00	75.10	69.80	66.50	55.30	59.00	-	59.40	64.70	53.70	52.50	60.50	45.30	18.00	42.30	42.30
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.01	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.01	0.02	0.01	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	1.18	5.89	2.39	1.00	1.13	0.80	-	0.42	0.39	0.32	5.05	19.10	0.62	1.03	0.50	0.50
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.00	0.01	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	0.01	0.01	0.05	0.01	0.00	0.00	-	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	60.60	57.30	55.50	49.70	46.10	49.50	-	56.90	51.90	46.30	14.70	19.00	11.10	4.48	11.50	11.50
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	0.13	0.24	0.07	0.04	0.06	0.05	-	0.02	0.03	0.02	0.35	0.24	1.07	0.09	0.86	0.86
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.05	0.01	0.01	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	1.91	2.04	2.80	2.00	2.00	2.00	-	2.00	2.00	2.00	0.97	1.98	2.00	2.00	2.00	2.00
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	25.20	19.80	19.40	16.60	16.20	17.50	-	20.90	19.50	17.30	18.30	14.00	32.70	19.20	30.80	30.80
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	-	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.00	0.00	0.00	0.00
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	-	0.01	-	0.00	0.00	0.00	-	0.01	0.00	0.00	-	-	0.00	0.00	0.00	0.00
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	0.02	0.07	0.06	0.02	0.03	0.02	-	0.02	0.01	0.01	0.07	0.04	0.01	0.01	0.02	0.02
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.00	0.01	0.03	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.04	0.03	0.02	0.01	0.01	0.01	-	0.01	0.01	0.01	0.02	0.03	0.01	0.01	0.01	0.01
Dissolved Metals			n.g.	n.g.	**Dissolved Metals**																
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.00	0.00	0.01	0.01	0.01	0.01	-	-	-	0.01	0.00	0.01	0.02	0.02	0.01	0.01
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	-	0.00	0.00	0.00	0.00	0.00	-	-	-	0.00	-	-	0.00	0.00	0.00	0.00
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.000	0.000	0.001	0.001	0.001	0.001	-	-	-	0.001	0.000	0.000	0.001	0.001	0.001	0.001
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	0.12	0.09	0.10	0.08	0.07	0.08	-	-	-	0.07	0.28	0.20	0.25	0.07	0.25	0.25
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.00	0.00	0.01	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.01	0.05	0.10	0.10	0.10	0.10	-	-	-	0.10	0.01	0.01	0.10	0.10	0.10	0.10
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.000	0.000	0.000	0.000	0.000	0.000	-	-	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	74.500	69.400	69.800	58.800	62.500	60.600	61.700	-	-	58.800	50.500	52.400	43.500	21.000	47.900	47.900
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	-	-	-	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.004	0.001	0.001	0.000	0.000	0.000	-	-	-	0.000	0.004	0.003	0.001	0.000	0.000	0.000
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.003	0.000	0.001	0.001	0.001	0.006	-	-	-	0.001	0.000	0.002	0.002	0.003	0.002	0.002
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.01	0.02	0.03	0.03	0.03	0.03	-	-	-	0.03	0.01	0.01	0.03	0.04	0.03	0.03
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	0.00	0.01	0.05	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.01	0.01	0.00	0.00
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	47.40	54.70	56.10	46.70	48.00	51.30	50.90	-	-	50.80	13.20	14.00	11.00	5.26	13.60	13.60
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.02	0.12	0.01	0.00	0.00	0.00	-	-	-	0.00	0.21	0.04	0.92	0.09	0.57	0.57
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0001	0.0000	0.0002	0.0000	0.0000	0.0000	-	-	-	0.0000	0.0001	0.0500	0.0000	0.0000	0.0000	0.0000
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.000	0.002	0.001	0.004	0.002	0.002	-	-	-	0.002	0.000	0.000	0.001	0.001	0.001	0.001
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.022	0.001	0.005	0.001	0.001	0.001	-	-	-	0.001	0.001	0.001	0.002	0.001	0.001	0.001
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	1.740	1.030	2.000	2.000	2.000	2.000	-	-	-	2.000	0.370	0.270	2.000	2.000	2.000	2.000
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0002	0.0001	0.0010	0.0004	0.0007	0.0005	-	-	-	0.0008	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	17.00	19.40	19.20	17.10	19.20	18.80	-	-	-	18.10	12.50	12.40	33.90	25.20	31.90	31.90
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	-	0.00	0.00	0.00	0.00	0.00	-	-	-	0.00	-	-	0.00	0.00	0.00	0.00
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	-	0.01	-	0.00	0.00	0.00	-	-	-	0.00	-	-	0.00	0.00	0.00	0.00
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	0.00	0.01	0.05	0.01	0.01	0.01	-	-	-	0.01	0.02	0.00	0.01	0.01	0.01	0.01
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.00	0.01	0.03	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	-	-	-	0.01	0.00	0.03	0.01	0.01	0.01	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**																
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	-	-	-	-	-	-	-	-	-	-	-	-	0.000005	-	-	
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	0.000015	-	-	
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	-	-	-	-	-	-	-	-	-	-	-	-	0.000005	-	-	
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	0.000050	-	-	
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	-	-	-	-	-	-	-	-	-	-	-	-	0.000050	-	-	
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	-	-	-	-	-	-	-	-	-	-	-	-	0.000050	-	-	
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	-	-	-	-	-	-	-	-	-	-	-	-	0.000020	-	-	
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	-	-	-	-	-	-	-	-	-	-	-	-	0.000010	-	-	
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	-	-	-	-	-	-	-	-	-	-	-	-	0.000050	-	-	

Concentration above BC WQG DWS

Parameter	Units	Detection Limits[1]	BC WQG DWS screening parameter	BC WQG DWS Value	Well ID	T0B96-01-05	T0B96-01-05	W3 Shallow	W3 Shallow	W3 Shallow	W3 Shallow	W3 Shallow	W3 Shallow	W3 Shallow	W3 Shallow	W2	W2	W2	W2	W2	W2
					Sample ID	T0B96-01-05	T0B96-01-05	W3-S	W3 SHALLOW	W3 SHALLOW	W3 SHALLOW	W3 SHALLOW	W3 SHALLOW	W3 SHALLOW	W3 SHALLOW	W2	W2	W2	W2	W2	W2
					Geol	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB	OVB
					Date Sampled	4-Apr-2019	7-Jun-2019	6-Apr-2018	18-Jun-2018	8-Sep-2018	4-Jan-2019	30-Mar-2019	31-May-2019	27-Aug-2019	20-Nov-2019	5-Apr-2018	22-Jun-2018	10-Sep-2018	5-Jan-2019	1-Apr-2019	1-Jun-2019
					ALS Sample ID (2017-2018)	L2254339-1	L2288655-3	L2078247-1	L2117455-1	L2163047-6	L2218463-5	L2254339-9	L2284065-2	L2339589-2	L2387383-5	L2078247-2	L2120097-6	L2163047-5	L2218463-2	L2254339-4	L2284065-1
					Maxxam Sample ID (2016)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
					Chemex Lab Sample ID (1995-1997)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Physical Tests					**Physical Tests**																
Colour	CU	5	n.g.	n.g.	Colour	18.40	9.00	7.50	5.00	5.00	5.00	5.00	5.00	5.00	5.00	41.30	44.70	42.30	41.40	42.50	36.10
Conductivity (lab)	uS/cm	2.0	n.g.	n.g.	Conductivity (lab)	300.00	363.00	495.00	495.00	510.00	509.00	498.00	525.00	519.00	520.00	494.00	548.00	534.00	537.00	531.00	552.00
Specific Conductivity (field)	uS/cm	1.0	n.g.	n.g.	Specific Conductivity (field)	375.00	367.00	535.00	535.00	516.00	506.00	516.00	518.00	521.00	512.00	523.00	535.00	535.00	533.00	563.00	540.00
Hardness (as $CaCO_3$)- total	mg/L	0.5	n.g.	n.g.	Hardness (as $CaCO_3$)- total	108.00	155.00	108.00	113.00	110.00	115.00	117.00	121.00	111.00	102.00	57.90	59.90	69.20	73.40	73.60	71.60
pH (lab)	pH	0.10	n.g.	n.g.	pH (lab)	7.78	8.34	8.50	8.52	8.50	8.39	8.42	8.53	8.56	8.46	8.43	8.49	8.60	8.46	8.48	8.54
pH (field)	pH	0.10	n.g.	n.g.	pH (field)	7.59	7.07	8.71	8.45	8.34	7.75	9.15	8.36	8.33	8.33	8.78	8.39	8.51	7.91	8.99	8.46
Total Suspended Solids	mg/L	3.0	n.g.	n.g.	Total Suspended Solids	36.20	9.10	3.00	5.30	78.10	3.00	3.00	3.00	3.00	3.00	80.60	28.70	14.30	11.40	5.80	680.00
Total Dissolved Solids[2]	mg/L	10.0	n.g.	n.g.	Total Dissolved Solids[2]	275.00	243.00	356.00	388.00	402.00	356.00	408.00	332.00	336.00	330.00	381.00	366.00	365.00	343.00	358.00	361.00
Turbidity (lab)	NTU	0.10	raw with	50	Turbidity (lab)	76.30	6.53	2.02	2.00	19.10	0.93	1.49	0.20	0.30	0.32	76.30	22.80	5.74	5.19	0.60	415.00
Alkalinity and Acidity			n.g.	n.g.	**Alkalinity and Acidity**																
Acidity (as CaCO3)	mg/L	1.0	n.g.	n.g.	Acidity (as CaCO3)	4.00	5.10	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
Alkalinity, Bicarbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Bicarbonate (as	156.00	215.00	220.00	226.00	231.00	234.00	225.00	278.00	237.00	255.00	227.00	266.00	282.00	283.00	283.00	289.00
Alkalinity, Carbonate (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Carbonate (as	1.00	6.80	15.40	12.80	14.00	9.40	5.80	14.80	13.60	15.80	9.80	13.40	19.60	10.60	8.80	11.40
Alkalinity, Hydroxide (as	mg/L	1.0	n.g.	n.g.	Alkalinity, Hydroxide (as	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Alkalinity, Phenolphthalein (as	mg/L	2.0	n.g.	n.g.	Alkalinity, Phenolphthalein	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as $CaCO_3$)	mg/L	1.0	n.g.	n.g.	Alkalinity, Total (as $CaCO_3$)	156.00	221.00	235.00	239.00	245.00	243.00	230.00	293.00	250.00	271.00	237.00	280.00	301.00	294.00	292.00	300.00
Anions and Nitrogen					**Anions and Nitrogen**																
Ammonia, Total (as N)	mg/L	0.0050	n.g.	n.g.	Ammonia, Total (as N)	0.01	0.01	0.21	0.19	0.17	0.17	0.16	0.18	0.17	0.26	0.01	0.45	0.59	0.65	0.62	0.63
Bromide (Br)	mg/L	0.050	n.g.	n.g.	Bromide (Br)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.08	0.05	0.05	0.05	0.05	0.05
Chloride (Cl)	mg/L	0.50	AO, Cl	250	Chloride (Cl)	0.50	0.50	4.38	3.35	2.95	2.49	2.14	2.15	2.00	2.40	7.28	3.24	3.18	2.95	2.76	2.69
Fluoride (F)	mg/L	0.020	MAC, F	1.5	Fluoride (F)	0.09	0.15	0.20	0.19	0.21	0.19	0.17	0.20	0.16	0.20	0.32	0.38	0.37	0.34	0.32	0.33
Nitrate (as N)	mg/L	0.0050	MAC, nitrate-N	10	Nitrate (as N)	0.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nitrite (as N)	mg/L	0.0010	MAC, nitrite-N	1.0	Nitrite (as N)	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Nitrogen	mg/L	0.050	n.g.	n.g.	Total Nitrogen	0.31	0.40	9.19	2.68	2.49	6.99	5.29	3.05	1.00	1.71	5.80	1.45	0.92	0.87	0.96	0.95
Orthophosphate-Dissolved (as P	mg/L	0.001	n.g.	n.g.	Orthophosphate-Dissolved (as	0.00	0.0010	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.42	0.78	0.86	0.83	0.87	0.80
Phosphorus (P)-Total Dissolved	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.01	0.00	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.72	0.76	0.93	0.91	0.88	0.79
Phosphorus (P)-Total	mg/L	0.0020	n.g.	n.g.	Phosphorus (P)-Total	0.04	0.02	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.02	0.79	0.71	0.94	0.91	0.92	0.94
Sulfate (SO_4)	mg/L	0.50	AO, SO4	500	Sulfate (SO_4)	8.19	6.02	45.40	41.80	43.70	41.80	38.50	40.40	38.50	41.70	41.90	13.30	9.56	9.16	6.50	12.30
Inorganic/Organic Carbon			n.g.	n.g.	**Inorganic/Organic Carbon**																
Dissolved Organic Carbon	mg/L	0.5	n.g.	n.g.	Dissolved Organic Carbon	9.06	8.30	15.40	9.43	22.80	20.30	5.07	6.71	2.33	5.15	20.80	14.20	9.31	8.83	9.21	8.60
Total Organic Carbon	mg/L	0.50	n.g.	n.g.	Total Organic Carbon	9.68	8.01	26.70	10.90	9.86	23.40	4.54	9.14	11.40	13.60	17.80	11.80	8.58	8.27	8.35	11.40
Total Metals			n.g.	n.g.	**Total Metals**																
Aluminum (Al)-Total	mg/L	0.0050	n.g.	n.g.	Aluminum (Al)-Total	7.80	1.19	0.04	0.06	0.29	0.02	0.03	0.01	0.01	0.01	2.41	30.00	0.11	0.10	0.03	11.70
Antimony (Sb)-Total	mg/L	0.00050	n.g.	n.g.	Antimony (Sb)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic (As)-Total	mg/L	0.00050	n.g.	n.g.	Arsenic (As)-Total	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01
Barium (Ba)-Total	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Total	0.36	0.21	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.32	0.04	0.04	0.07	0.20
Beryllium (Be)-Total	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Total	mg/L	0.10	n.g.	n.g.	Boron (B)-Total	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cadmium (Cd)-Total	mg/L	0.000010	n.g.	n.g.	Cadmium (Cd)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Calcium (Ca)-Total	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Total	44.10	42.40	24.90	26.00	26.90	25.80	26.50	25.50	25.70	25.90	19.30	139.00	20.20	19.90	21.00	30.50
Chromium (Cr)-Total	mg/L	0.0010	n.g.	n.g.	Chromium (Cr)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Cobalt (Co)-Total	mg/L	0.00030	n.g.	n.g.	Cobalt (Co)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Copper (Cu)-Total	mg/L	0.0010	n.g.	n.g.	Copper (Cu)-Total	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.01
Iron (Fe)-Total	mg/L	0.030	n.g.	n.g.	Iron (Fe)-Total	6.31	0.52	0.09	0.11	0.19	0.06	0.08	0.05	0.05	0.06	1.44	18.20	0.18	0.18	0.12	4.24
Lead (Pb)-Total	mg/L	0.00050	n.g.	n.g.	Lead (Pb)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Lithium (Li)-Total	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Magnesium (Mg)-Total	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Total	14.10	11.00	9.08	10.70	11.30	11.30	11.10	11.50	11.80	10.90	3.38	11.30	4.37	4.45	4.38	10.80
Manganese (Mn)-Total	mg/L	0.00030	n.g.	n.g.	Manganese (Mn)-Total	0.17	1.38	0.08	0.07	0.08	0.06	0.05	0.05	0.05	0.06	0.13	2.70	0.16	0.17	0.18	0.30
Mercury (Hg)-Total	mg/L	0.000010	n.g.	n.g.	Mercury (Hg)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Molybdenum (Mo)-Total	mg/L	0.0010	n.g.	n.g.	Molybdenum (Mo)-Total	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Nickel (Ni)-Total	mg/L	0.0010	n.g.	n.g.	Nickel (Ni)-Total	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Potassium (K)-Total	mg/L	2.0	n.g.	n.g.	Potassium (K)-Total	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.40	2.00	2.00	2.00	2.90
Selenium (Se)-Total	mg/L	0.00010	n.g.	n.g.	Selenium (Se)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silver (Ag)-Total	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Total	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Total	30.00	19.20	70.60	82.30	83.10	85.10	83.10	83.30	85.50	80.20	86.80	112.00	105.00	111.00	111.00	116.00
Thallium (Tl)-Total	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tin (Sn)-Total	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Titanium (Ti)-Total	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Total	0.05	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.14	0.01	0.01	0.01	0.01
Uranium (U)-Total	mg/L	0.00020	n.g.	n.g.	Uranium (U)-Total	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Total	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Total	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.05	0.00	0.00	0.00	0.01
Zinc (Zn)-Total	mg/L	0.0050	n.g.	n.g.	Zinc (Zn)-Total	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.11	0.01	0.01	0.01	0.08
Dissolved Metals					**Dissolved Metals**																
Aluminum (Al)-Dissolved	mg/L	0.0050	MAC Al-tot	9.5	Aluminum (Al)-Dissolved	0.10	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01	0.01	0.03
Antimony (Sb)-Dissolved	mg/L	0.00050	MAC Sb-tot	0.006	Antimony (Sb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arsenic (As)-Dissolved	mg/L	0.00050	MAC, As-tot	0.01	Arsenic (As)-Dissolved	0.001	0.001	0.005	0.007	0.006	0.007	0.008	0.007	0.007	0.006	0.008	0.008	0.010	0.010	0.012	0.010
Barium (Ba)-Dissolved	mg/L	0.020	n.g.	n.g.	Barium (Ba)-Dissolved	0.14	0.21	0.04	0.05	0.04	0.05	0.05	0.05	0.05	0.04	0.02	0.04	0.04	0.04	0.04	0.04
Beryllium (Be)-Dissolved	mg/L	0.0010	n.g.	n.g.	Beryllium (Be)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boron (B)-Dissolved	mg/L	0.10	MAC, B-tot	5.0	Boron (B)-Dissolved	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Cadmium (Cd)-Dissolved	mg/L	0.000010	MAC, Cd-tot	0.005	Cadmium (Cd)-Dissolved	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Calcium (Ca)-Dissolved	mg/L	0.10	n.g.	n.g.	Calcium (Ca)-Dissolved	29.300	42.800	26.400	27.200	26.100	27.100	27.200	28.500	25.400	24.000	18.100	18.200	20.600	22.000	22.000	20.800
Chromium (Cr)-Dissolved	mg/L	0.0010	MAC, Cr-tot	0.05	Chromium (Cr)-Dissolved	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cobalt (Co)-Dissolved	mg/L	0.00030	MAC, Co-tot	0.001	Cobalt (Co)-Dissolved	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Copper (Cu)-Dissolved	mg/L	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	Copper (Cu)-Dissolved	0.003	0.005	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Iron (Fe)-Dissolved	mg/L	0.030	AO, Fe-tot	0.30	Iron (Fe)-Dissolved	0.23	0.03	0.03	0.05	0.04	0.05	0.05	0.05	0.05	0.05	0.03	0.06	0.09	0.10	0.10	0.05
Lead (Pb)-Dissolved	mg/L	0.00050	MAC, Pb-tot	0.005	Lead (Pb)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lithium (Li)-Dissolved	mg/L	0.0050	n.g.	n.g.	Lithium (Li)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Magnesium (Mg)-Dissolved	mg/L	0.10	n.g.	n.g.	Magnesium (Mg)-Dissolved	8.52	11.70	10.10	10.90	10.80	11.40	11.90	12.00	11.60	10.30	3.08	3.53	4.31	4.45	4.54	4.78
Manganese (Mn)-Dissolved	mg/L	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	Manganese (Mn)-Dissolved	0.01	1.37	0.08	0.07	0.06	0.06	0.05	0.05	0.05	0.05	0.09	0.14	0.16	0.17	0.17	0.14
Mercury (Hg)-Dissolved	mg/L	0.000010	MAC, Hg-tot	0.001	Mercury (Hg)-Dissolved	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Molybdenum (Mo)-Dissolved	mg/L	0.0010	MAC, Mo-tot	0.088	Molybdenum (Mo)-Dissolved	0.001	0.001	0.010	0.012	0.011	0.011	0.011	0.011	0.011	0.011	0.012	0.017	0.012	0.014	0.014	0.020
Nickel (Ni)-Dissolved	mg/L	0.0010	MAC, Ni-tot	0.08	Nickel (Ni)-Dissolved	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Potassium (K)-Dissolved	mg/L	2.0	n.g.	n.g.	Potassium (K)-Dissolved	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000
Selenium (Se)-Dissolved	mg/L	0.00010	MAC, Se-tot	0.01	Selenium (Se)-Dissolved	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0004	0.0005	0.0002
Silver (Ag)-Dissolved	mg/L	0.000020	n.g.	n.g.	Silver (Ag)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sodium (Na)-Dissolved	mg/L	2.0	n.g.	n.g.	Sodium (Na)-Dissolved	27.00	19.90	87.20	84.90	83.60	77.60	85.90	102.00	85.40	77.30	111.00	111.00	112.00	102.00	113.00	132.00
Thallium (Tl)-Dissolved	mg/L	0.00020	n.g.	n.g.	Thallium (Tl)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tin (Sn)-Dissolved	mg/L	0.00050	n.g.	n.g.	Tin (Sn)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Titanium (Ti)-Dissolved	mg/L	0.010	n.g.	n.g.	Titanium (Ti)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Uranium (U)-Dissolved	mg/L	0.00020	MAC, U-tot	0.02	Uranium (U)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vanadium (V)-Dissolved	mg/L	0.0010	n.g.	n.g.	Vanadium (V)-Dissolved	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Zinc (Zn)-Dissolved	mg/L	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	Zinc (Zn)-Dissolved	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Polycyclic Aromatic			n.g.	n.g.	**Polycyclic Aromatic**																
Acenaphthene	mg/L	0.000010	n.g.	n.g.	Acenaphthene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Acenaphthylene	mg/L	0.000010	n.g.	n.g.	Acenaphthylene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Acridene	mg/L	0.000010	n.g.	n.g.	Acridene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Anthracene	mg/L	0.000010	n.g.	n.g.	Anthracene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Benz(a)anthracene	mg/L	0.000010	n.g.	n.g.	Benz(a)anthracene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Benzo(a)pyrene	mg/L	0.000005	n.g.	n.g.	Benzo(a)pyrene	-	0.000005	0.000005	-	-	-	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	0.000005	0.000005
Benzo(b&j)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(b&j)fluoranthene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Benzo(b+j+k)fluoranthene	mg/L	0.000015	n.g.	n.g.	Benzo(b+j+k)fluoranthene	-	0.000015	0.000015	-	-	-	-	0.000015	0.000015	0.000015	0.000015	0.000015	0.000015	-	0.000015	0.000015
Benzo(g,h,i)perylene	mg/L	0.000010	n.g.	n.g.	Benzo(g,h,i)perylene	-	0.000011	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Benzo(k)fluoranthene	mg/L	0.000010	n.g.	n.g.	Benzo(k)fluoranthene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Chrysene	mg/L	0.000010	n.g.	n.g.	Chrysene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Dibenz(a,h)anthracene	mg/L	0.000005	n.g.	n.g.	Dibenz(a,h)anthracene	-	0.000005	0.000005	-	-	-	-	0.000005	0.000005	0.000005	0.000005	0.000005	0.000005	-	0.000005	0.000005
Fluoranthene	mg/L	0.000010	n.g.	n.g.	Fluoranthene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Fluorene	mg/L	0.000010	n.g.	n.g.	Fluorene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Indeno(1,2,3-c,d)pyrene	mg/L	0.000010	n.g.	n.g.	Indeno(1,2,3-c,d)pyrene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
1-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	1-Methylnaphthalene	-	0.000050	0.000050	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	0.000050	0.000050
2-Methylnaphthalene	mg/L	0.000050	n.g.	n.g.	2-Methylnaphthalene	-	0.000050	0.000050	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	0.000050	0.000050
Naphthalene	mg/L	0.000050	n.g.	n.g.	Naphthalene	-	0.000050	0.000050	-	-	-	-	0.000050	0.000050	0.000050	0.000053	0.000050	0.000050	-	0.000050	0.000050
Phenanthrene	mg/L	0.000020	n.g.	n.g.	Phenanthrene	-	0.000020	0.000020	-	-	-	-	0.000020	0.000020	0.000020	0.000020	0.000020	0.000020	-	0.000020	0.000020
Pyrene	mg/L	0.000010	n.g.	n.g.	Pyrene	-	0.000010	0.000010	-	-	-	-	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	-	0.000010	0.000010
Quinoline	mg/L	0.000050	n.g.	n.g.	Quinoline	-	0.000050	0.000050	-	-	-	-	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	-	0.000050	0.000050

Appendix E - Liner Seepage Assessment and Preliminary Cost Estimate for Tenas Management Ponds

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FINAL

Technical Memo

March 3, 2022

To	Dan Farmer, P.Eng., Allegiance Coal Limited
From	Kyle Scale, P.Eng., Ph.D.; Calvin Boese, P.Eng., M.Sc.
Subject	Liner Design and Construction Methodology for Tenas Management Ponds
Client	Telkwa Coal Ltd.
Project	2CT025.008.0300

1 Introduction

Telkwa Coal Ltd. (TCL) has retained SRK Consulting (Canada) Inc. (SRK) to design and provide a preliminary construction methodology for a liner system that will reduce seepage rates from the Tenas Management Ponds to below allowable thresholds defined in SRK's site water balance (SRK, 2020a). This liner assessment was initially conducted on four liner alternatives in the preliminary seepage assessment (Section 4.4.1); however, based on the performance and estimated costs, one of these liner alternatives was advanced to a focused seepage assessment (Section 4.4.2). The construction methodology for the selected liner alternative is detailed in Section 0 at an early design stage level.

This technical memo is divided into sections describing the Liner Design, Seepage Modeling, Construction Methodology, and Recommendations. The *Liner Design* section provides background on the seepage design criteria from SRK's site water balance, geometry of the PAG management ponds, and details the liner materials and liner system configurations. The *Seepage Modeling* section details the cross sections that serve as a basis for the seepage models, the assumptions and calibration of these models, and presents the results of the seepage assessment and presents a recommended liner option. The *Construction Methodology* section outlines the assumptions, material characteristics, execution of the liner system at an early design stage level, and quality control. The technical memo concludes with the *Recommendations* section, presenting SRK's recommendations for field and laboratory testing, construction methodology, and quality control of the recommended liner system.

2 Background

The Tenas Project is in central British Columbia, approximately 15 km south of Smithers and 2 km southwest of Telkwa. The Project site is located south of the Tenas River and the boundaries of the Project encompass the lower reaches of the Telkwa River, Goathorn Creek, and Pine Creek. The Tenas Project's total mine life is anticipated to be 22 years, including one year of pre-stripping and construction followed by 21 years of production. The mine plan was designed and scheduled in a manner that allows potentially-acid generating (PAG) rock to be deposited into management ponds (MP), including the East Management Pond (EMP), West Management Pond (WMP), and North Management Pond (NMP). These MP are above-ground PAG rock storage facilitates. The WMP consists of a portion that is an excavated pit (*Tenas Pit Phase 9*), referred to herein as '*In Pit*', and the remaining portion outside the pit referred to herein as '*Ex Pit*'.

Environmental containment is to be achieved with liner systems that are constructed along the bottom of the ponds and the upstream slopes of the perimeter dams.

3 Liner Design Basis

The following subsections describe the seepage design criteria, pond geometry, material properties, and liner configurations.

3.1 Seepage Design Criteria

A preliminary water balance provided design targets for the liner seepage analyses that evaluated seepage rates through the bottom of the MP and upstream slopes of the perimeter dams. The maximum allowable seepage through the MP catchments was determined to be 2,800 m^3/day from the site wide water balance (SRK, 2020a). This value represents the maximum seepage rate allowed to maintain a positive water balance over the PAG rock (e.g. maintain a minimum 1 m capping of ponded water).

This value is conservatively based on the "*10 Year Dry*" scenario. For the average year scenario, the allowable seepage rate through the management pond catchments increases to 4,260 m^3/day. For reference, the water quality target from the Definitive Feasibility Study (DFS) model was 1,700 m^3/day.

3.2 Pond Geometry and Potential Seepage Areas

Design elevations for the dam crests, freeboard, and areas pertinent to the seepage assessments are included in Table 1. Design revision 1 includes added capacity to account for the reduction in MP storage capacity due to the incorporation of a 1 m thick soil over-liner as the liner protective component (discussed in Section 4.4.2). This revision included raising the dam crests and freeboard elevations for the EMP, NMP, and WMP (Ex-Pit).

Table 1: Model Geometry for the TCL Management Ponds

Design Revision	Management Pond	Area Pond[1] (m^2)	Area Upstream Dam Slopes[1] (m^2)	Cumulative Area[1] (m^2)	Dam Crest Elev. (masl)	Freeboard Elev. (masl)
0	EMP	901,000	163,000	1,064,000	850	849
	WMP (Ex Pit)	371,600	122,000	493,600	850	849
	WMP (In Pit)	440,400	n/a	440,400	n/a	n/a
	NMP	76,900	184,500	261,400	830	829
1	EMP	961,939	180,136	1,142,075	852	851
	WMP (Ex Pit)	361,874	141,148	503,022	852	851
	WMP (In Pit)	533,548	n/a	533,548	n/a	n/a
	NMP	210,190	83,017	293,207	831	830

Notes:
(1) MP surfaces areas contributing to seepage through the liner system.
(2) Model geometry for Design Revision 1 provided by Telkwa on November 17, 2020.

3.3 Material Properties

Table 2 lists the materials that were modeled in the seepage assessment for the various liner design options. The high case for the native soils represents an increase of the base case hydraulic conductivities by a factor of 2.7 (SRK, 2020b).

Table 2: Materials Considered for the Liner Seepage Assessment

Material	Hydraulic Conductivity, k (m/s)	
	Base Case	High Case
Native soil (EMP)[1]	3.0E-6	8.1E-6
Native soil (NMP)[1]	1.9E-6	5.1E-6
Bentonite[2]	5.0E-11	-
Soil-bentonite mixture[2]	1.0E-9	-
Soil-bentonite mixture (optimized)[2]	1.0E-10	-
Skilhorn clay[3]	5.9E-9	-
Clay-bentonite mixture[2]	8.6E-10	-
Skeena Sedimentary Rock[4]	3.62E-7	-

Notes:
(1) Values for native soil derived from calibration with the site wide FEFLOW® groundwater model.
(2) Values for bentonite, soil-bentonite mixtures, and clay-bentonite mixtures assumed based on experience with previous projects.
(3) Values for Skilhorn measured in laboratory falling head hydraulic conductivity testing performed with a flexible wall permeameter.
(4) Values for Skeena sedimentary rock (bedrock) obtained from FEFLOW® groundwater model.

A hydraulic conductivity of 1.0E-9 m/s for the soil-bentonite mixture was calculated for a 5% (by volume) soil-bentonite mixture based an assumed hydraulic conductivity for bentonite of 5E-11 m/s. However, recent laboratory testing performed by Golder Associates on available bentonite are showing the hydraulic conductivity to be 3E-12 m/s. The calculated hydraulic conductivity of the soil-bentonite mixture, using the recent lab test value, equates to 6E-11 m/s. Based on the lab data and previous experience with a similar northern project, it is anticipated that a hydraulic conductivity value of 1E-10 m/s can be achieved and was therefore considered in the liner option assessment as an optimized value.

4 Seepage Model Development

Two-dimensional liner seepage analyses were carried out with GeoStudio's SEEP/W modeling software (Version 11.0.1.21429). The following subsections detail the cross-sections, model assumptions and calibration, and results of the seepage assessment.

4.1 Cross Sections

The cross sections shown in Figure 1 were developed into seepage models for the NMP, EMP, and WMP based on site topography, bedrock elevations, and perimeter dam designs. These cross sections were chosen along alignments that intersect the lowest topography in each pond as well as nearby creeks (*topographic lows*). Section 1 (1'-1') was used to develop the model for the NMP; Section 2 (2'-2') was used to develop the model for the EMP; and Sections 3 (3'-3') and 4 (4'-4') were used to develop models for the WMP.

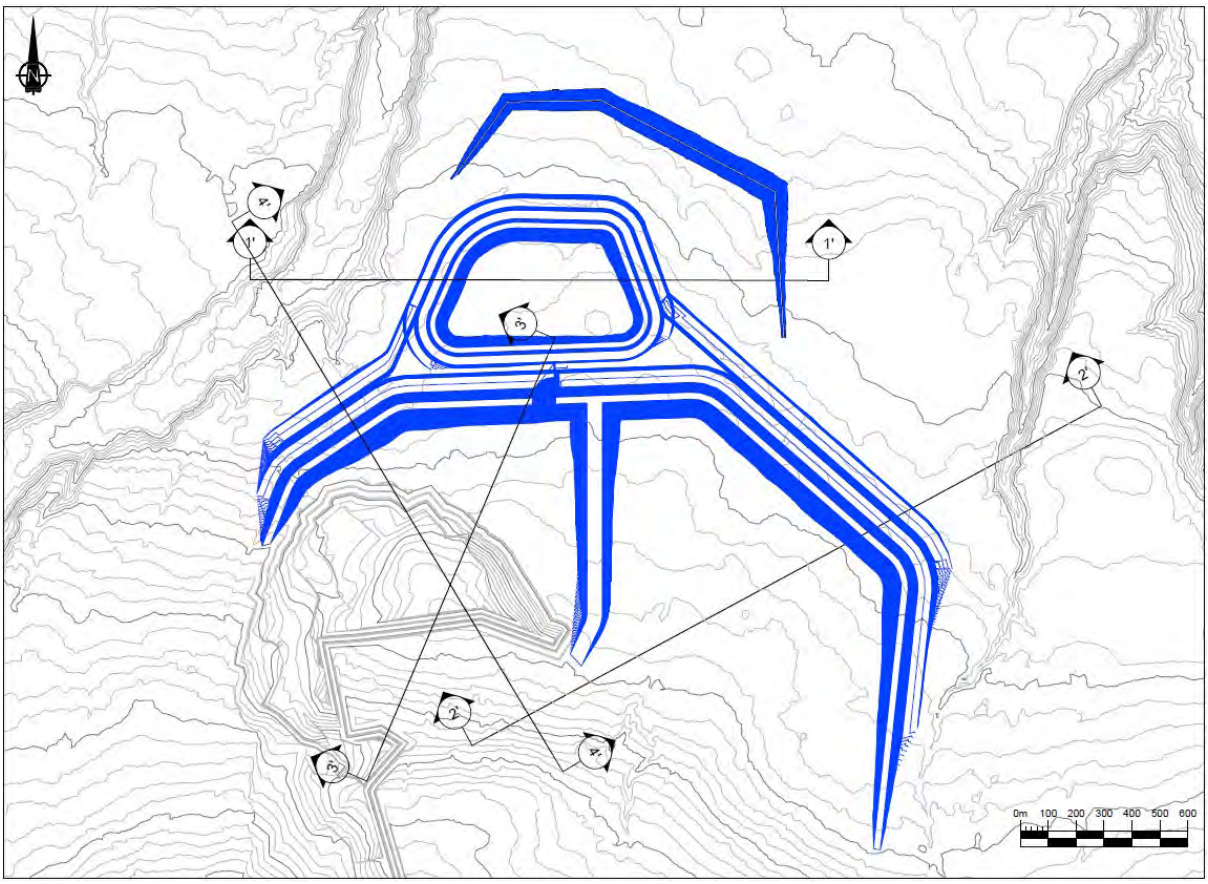


Figure 1: Cross sections of the North Management Pond (Section 1'-1'), the East Management Pond (Section 2'-2'), and the West Management Pond (Sections 3'-3' and 4'-4') that served as the basis for the seepage models

4.2 Model Assumptions

The seepage models for the EMP, WMP, and NMP were developed based on cross sections that included the site topography, bedrock elevations, and designs of the perimeter dams. For the preliminary seepage assessment only Section 1 for the NMP and Section 2 for the EMP were evaluated. At this early stage, seepage through the WMP was assumed to be equivalent to seepage through the EMP.

The seepage assessment for revision 1 included two additional sections for the WMP that spanned the *In Pit* and *Ex Pit* portions. Seepage through unlined portions of the WMP *In Pit* were determined using FEFLOW® groundwater modeling software by applying a total head of 851 masl (*the dam freeboard elevation*). The WMP *In Pit* portion is assumed to be graded at 2.5H:1V from the *Ex Pit* portion towards the south-southwest. This produces a portion of the north slope that is comprised of overburden and a portion that is a bedrock pit wall. The sub-vertical bedrock cliff at the south of the model is unlined in Model Scenarios 1 to 8 and is re-sloped to 2.5H:1V and lined in Scenarios 9 to 16. These scenarios are discussed in Section 4.4.

Seepage models developed for the preliminary and revision 1 seepage assessments consider the uppermost soil layer to be unsaturated and the underlying soil (below the estimated water table) to be saturated.

4.3 Calibration

The site wide groundwater model was developed with FEFLOW® groundwater modeling software. This model utilized data from recent and historic drilling campaigns to distribute the native ground in the vicinity of the MP into *Silty Clay* and *Sand & Gravel*, with hydraulic conductivities of 2E-7 and 3E-6 m/s, respectively. These materials were used as a basis to calibrate the two-dimensional liner seepage models.

To accomplish this calibration, the hydraulic conductivity of the materials in the unlined two-dimensional seepage models were toggled until the seepage rates matched the rates measured with FEFLOW®. For the purposes of this calibration, the resulting material at the EMP and WMP were *Sand & Gravel*, with a hydraulic conductivity of 3E-6 m/s, and the material at the NMP was 40% *Clay* and 60% *Sand & Gravel,* with a hydraulic conductivity of 1.88E-6 m/s.

4.4 Liner Configurations

Four liner configurations were modeled as part of the preliminary seepage assessment (Design Revision 0) and one of these configurations was advanced to the focused seepage assessment (Design Revision 1).

4.4.1 Preliminary Seepage Assessment (Design Revision 0)

The liner options that were modeled in the two-dimensional SEEP/W (2020) for the preliminary seepage assessment are listed below:

1. Native soil with bentonite disked into the surface at 0.15 or 0.30 m.
2. Clay from Skilhorn Quarry placed to a depth of 1 to 2 m.
3. Clay from Skilhorn Quarry placed to a depth of 1 m with bentonite disked to a depth of 0.15 or 0.30 m.
4. Bentonite placed to a thickness of 0.15 or 0.30 m and covered with a minimum 0.15 m of native soil.

4.4.2 Focused Seepage Assessment 1 (Design Revision 1)

The soil-bentonite liner system (Option 1 from Design Revision 0) was progressed to a focused liner seepage assessment in 0.15 m, 0.30 m, 0.45 m, and 0.56 m thicknesses with the optimized bentonite hydraulic conductivity of 1E-10 m/s. Table 3**Error! Reference source not found.** presents the various configurations of the soil-bentonite liner system that were assessed.

Each configuration considers the WMP *Ex Pit* portion to be lined. Configurations 1 to 8 consider the overburden pit slope of the WMP *In Pit* portion to be lined. Configurations 9 to 16 consider the subvertical bedrock cliff to be re-sloped to 2.5H:1V. These configurations were modeled with the base and high case hydraulic conductivity values listed in Table 2.

Table 3: Soil-Bentonite Liner Systems Assessed as Part of the Focused Seepage Modeling

Configuration	Case	SB Thickness (m)	NMP	EMP	WMP Liner Configurations		
					OVB Slope Liner	In-Pit Liner	BR Pit Wall Resloped
1	BC	0.15	Y	Y	Y	N	N
2	BC	0.30	Y	Y	Y	N	N
3	BC	0.45	Y	Y	Y	N	N
4	BC	0.56	Y	Y	Y	N	N
5	HC	0.15	Y	Y	Y	N	N
6	HC	0.30	Y	Y	Y	N	N
7	HC	0.45	Y	Y	Y	Y	N
8	HC	0.56	Y	Y	Y	Y	N
9	BC	0.15	Y	Y	Y	Y	N
10	BC	0.30	Y	Y	Y	Y	N
11	BC	0.45	Y	Y	Y	Y	N
12	BC	0.56	Y	Y	Y	Y	N
13	HC	0.15	Y	Y	Y	Y	Y
14	HC	0.30	Y	Y	Y	Y	Y
15	HC	0.45	Y	Y	Y	Y	Y
16	HC	0.56	Y	Y	Y	Y	Y

Notes:
(1) BC = Base Case; HC = High Case; MP = Management Pond; BR = Bedrock; OVB = Overburden; SB = Soil-Bentonite.
(2) For the High Case, the hydraulic conductivity of the underlying soils has been increased by a factor of 2.7.
(3) The Soil-Bentonite material assumes an optimized hydraulic conductivity of 1E-10 m/s.

5 Seepage Model Results

Seepage rates were quantified through the surface areas corresponding to the upstream perimeter dam slopes and MP pond bottoms. Results of the preliminary seepage modeling (Design Revision 0) are presented in Section 5.1 and results of the focused seepage modeling (Design Revision 1) are presented in Section 5.2.

5.1 Results of the Preliminary Seepage Modeling (Design Revision 0)

Preliminary seepage modeling was conducted with the geometry shown in Table 1 for *Design Revision 0.* Only Section 1 for the NMP and Section 2 for the EMP were modeled at this stage and the *In Pit* portion of the WMP was not independently assessed. Based on FEFLOW® groundwater modeling, with a scenario considering a 0.5 m thick compacted clay liner, the seepage from the *Ex Pit* portion of the WMP would be 483 m^3/day. This seepage rate was factored into the seepage results calculated for the various liner systems with SEEP/W (2020).

Results of the two-dimensional liner seepage assessment are shown in Table 4 and plotted in Figure 2. Seven liner alternatives provided a seepage rate < 2,800 m^3/day, which corresponds to the maximum allowable seepage rate for the *10 Year Dry* scenario. Four of these alternatives barely met the design criteria. However, the design criteria was easily achieved for bentonite placed to a thickness of 0.15 or 0.30 m covered with a minimum 0.15 m of native soil, and the optimized native soil with bentonite disked into the surface at 0.15 m (soil-bentonite). Each of the liner alternatives listed below provide a seepage rate ≤ 4,260 m^3/day, which corresponds to the *Average Year* scenario.

Table 4: Results from the Two-dimensional Liner Seepage Assessment for the Various Liner Configurations Modeled in SEEP/W

Model	Seepage (m^3/day)	Seepage < 2800 m^3/day (Y/N)
No Liner	6,992	N
0.15m Soil-Bentonite	3,226	N
0.15m Soil-Bentonite (Optimized)	1,606	Y
0.3m Soil-Bentonite	2,779	Y
1m Skilhorn Clay	3,201	N
2m Skilhorn Clay	2,779	Y
1m Skilhorn Clay + 0.15m Clay-Bentonite	2,788	Y
1m Skilhorn Clay + 0.30m Clay-Bentonite	2,580	Y
0.15m Bentonite	1,204	Y
0.30m Bentonite	843	Y

Notes:
(1) Seepage limit based on the 10 Year Dry scenario developed in the site water balance is 2,800 m^3/day.
(2) Seepage limit based on the Average Year scenario developed in the site water balance is 4,260 m^3/day.

Results of the two-dimensional liner seepage assessment are plotted in Figure 2.

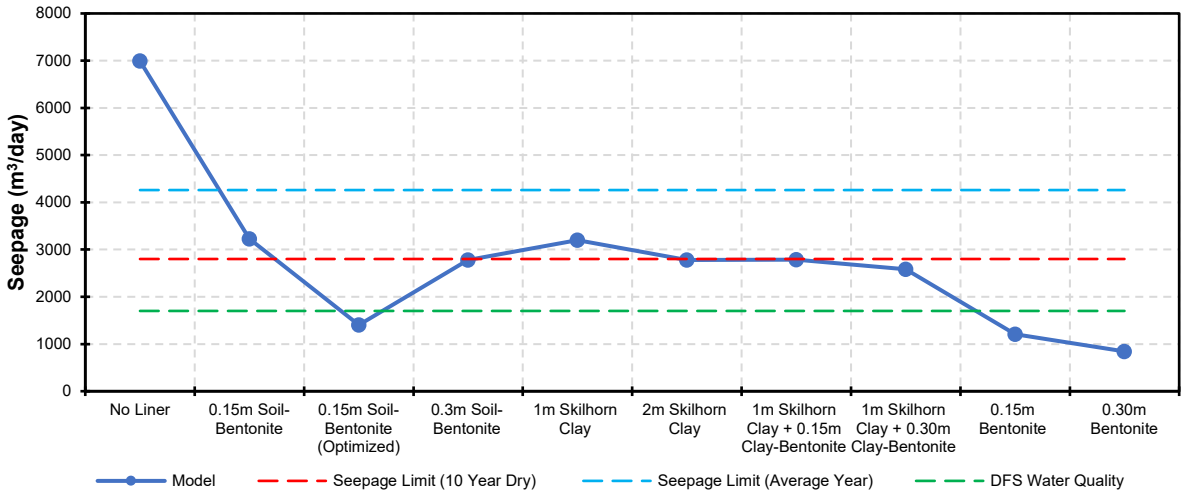


Figure 2: Results of the Preliminary Liner Seepage Assessment (Design Revision 0) for the Various Liner Configurations Modeled in SEEP/W

From these scenarios, the 0.15 m soil-bentonite liner system with the optimized bentonite hydraulic conductivity of 1E-10 m/s was advanced to the focused seepage modeling (Design Revision 1). The alternatives for the 0.15 m and 0.30 m pure bentonite were not advanced due to the costs being significantly higher compared to the other liner systems.

5.2 Results of the Focused Seepage Modeling (Design Revision 1)

The 0.15 m soil-bentonite liner system with the optimized bentonite hydraulic conductivity of 1E-10 m/s was subjected to a more detailed assessment as part of the focused seepage modeling (Design Revision 1). Additional 0.30 m, 0.45 m, and 0.56 m soil-bentonite liner systems with the optimized bentonite hydraulic conductivity of 1E-10 m/s were also incorporated into the focused seepage modeling. These seepage models were developed with the geometry shown in Table 1 for *Design Revision 1*.

5.2.1 WMP Liner Assessment

For the focused seepage modeling, two cross sections were modeled for the WMP (Section 3 and Section 4), in addition to the sections for the NMP and EMP. The new cross sections spanned the WMP *In Pit* and *Ex Pit* portions.

The results of the focused seepage assessment for all MPs with the geometry shown in Table 1 for *Design Revision 1* are listed in Table 5 and shown in Figure 3. The seepage rates for the WMP *In Pit* and *Ex Pit* portions are the average of Sections 3 and 4. As noted in Section 4.4.2, Configurations 1 to 8 consider the overburden pit slope of the WMP *In Pit* portion to be lined. Configurations 9 to 16 consider the subvertical bedrock cliff to be re-sloped to 2.5H:1V.

Table 5: Results of the Focused Liner Seepage Assessment for the NMP, EMP, and WMP *In Pit* and *Ex Pit* Conducted using the Geometry from Design Revision 1

Liner	Case	SB Thickness (m)	WMP Liner Configurations			Seepage Rates (m^3/day)				
			OVB Slope Liner	In-Pit Liner	BR Pit Wall Slope Liner	EMP	NMP	WMP (In-Pit)	WMP (Ex-Pit)	Cumulative
1	BC	0.15	Y	N	N	738	296	591	706	2331
2	BC	0.30	Y	N	N	458	161	665	384	1667
3	BC	0.45	Y	N	N	334	109	710	267	1419
4	BC	0.56	Y	N	N	277	87	720	215	1299
5	HC	0.15	Y	N	N	978	320	1346	764	3408
6	HC	0.30	Y	N	N	536	164	1395	397	2492
7	HC	0.45	Y	N	N	366	112	1429	277	2184
8	HC	0.56	Y	N	N	296	90	1436	223	2044
9	BC	0.15	Y	Y	Y	738	296	234	748	2017
10	BC	0.30	Y	Y	Y	458	161	197	392	1207
11	BC	0.45	Y	Y	Y	334	109	179	269	891
12	BC	0.56	Y	Y	Y	277	87	186	216	766
13	HC	0.15	Y	Y	Y	978	320	384	759	2441
14	HC	0.30	Y	Y	Y	536	164	273	385	1358
15	HC	0.45	Y	Y	Y	366	112	226	265	969
16	HC	0.56	Y	Y	Y	296	90	226	216	827

Notes:
(1) BC = Base Case; HC = High Case; MP = Management Pond; BR = Bedrock; OVB = Overburden; SB = Soil-Bentonite
(2) For the High Case, the hydraulic conductivity of the underlying soils has been increased by a factor of 2.7.
(3) The Soil-Bentonite material assumes an optimized hydraulic conductivity of 1E-10 m/s.

The results of the focused seepage assessment for all MPs with the geometry shown in Table 1 for *Design Revision 1* are shown in Figure 3.

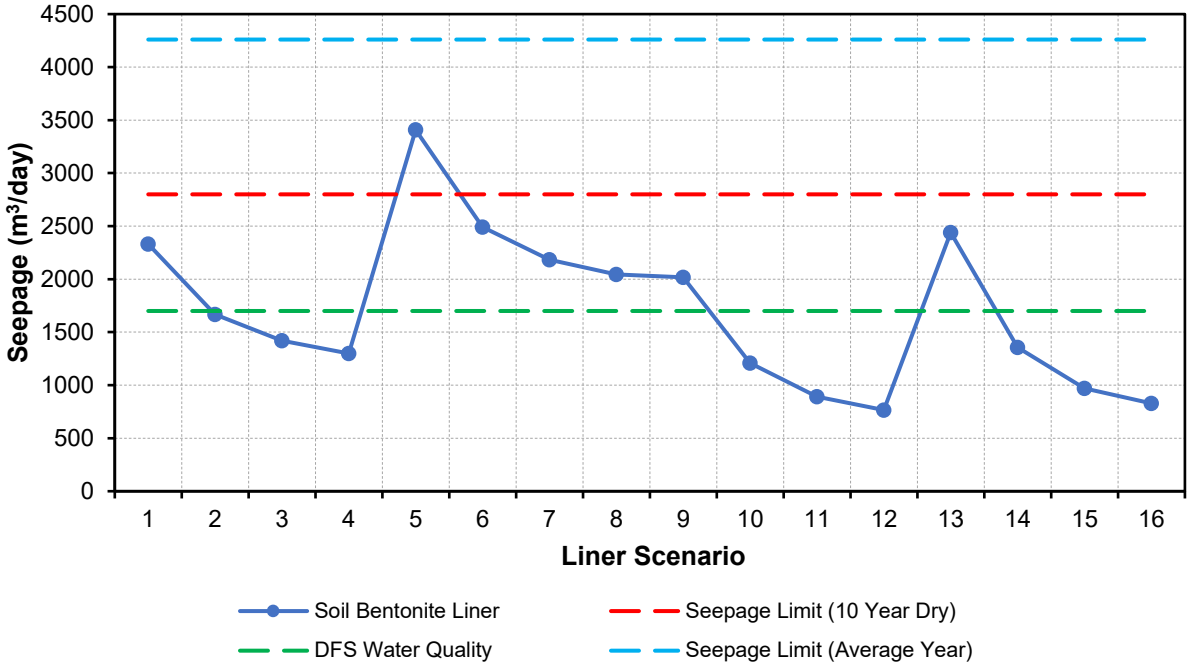


Figure 3: Results of the Focused Liner Seepage Assessment (Design Revision 1) for the Various Soil-bentonite Liner Configurations Modeled in SEEP/W

Each of the liner alternatives listed above provide a seepage rate ≤ 4,260 m^3/day, which corresponds to the *Average Year* scenario. The 0.3 m, 0.45 m, and 0.56 m soil-bentonite liner systems provide seepage rates < 2,800 m^3/day for both the base and high cases, which corresponds to the maximum allowable seepage rate for the *10 Year Dry* scenario.

5.3 Recommended Liner Design

The recommended liner design is the 0.45 m soil-bentonite liner constructed in the NMP, EMP and over the *Ex Pit* portion of and the overburden pit slope of the WMP. This liner system provides a seepage rate ≤ 2,800 m^3/day for both the base and high cases, which corresponds to the maximum allowable seepage rate for the *10 Year Dry* scenario.

6 Construction Methodology

The following section details a preliminary construction methodology for the recommended 0.45 m soil-bentonite liner system that will be constructed in three 0.15 m lifts. This construction methodology was completed at an early design stage level and will be refined in greater detail in detailed design engineering.

6.1 Assumptions

It is assumed that construction of the embankments and buttresses are to be completed to the specifications in SRK (2021).

Table 6 lists the lined areas for the various MP that were evaluated in the preliminary cost estimate.

Table 6: Lined Areas for the Various Liner Alternatives

Design Revision[1]	Management Pond	Area Pond (m^2)	Area Upstream Dam Slopes (m^2)	Cumulative Area (m^2)
1	EMP	961,939	180,136	1,142,075
	WMP[2] (Ex Pit)	361,874	141,148	503,022
	NMP	210,190	83,017	293,207

Notes:
(1) Model geometry for Design Revision 1 provided by Telkwa on November 17, 2020.
(2) Lining of the WMP *In Pit* portion is not being considered for the construction methodology

Plan view of the areas requiring soil-bentonite liner is shown in Figure 4.

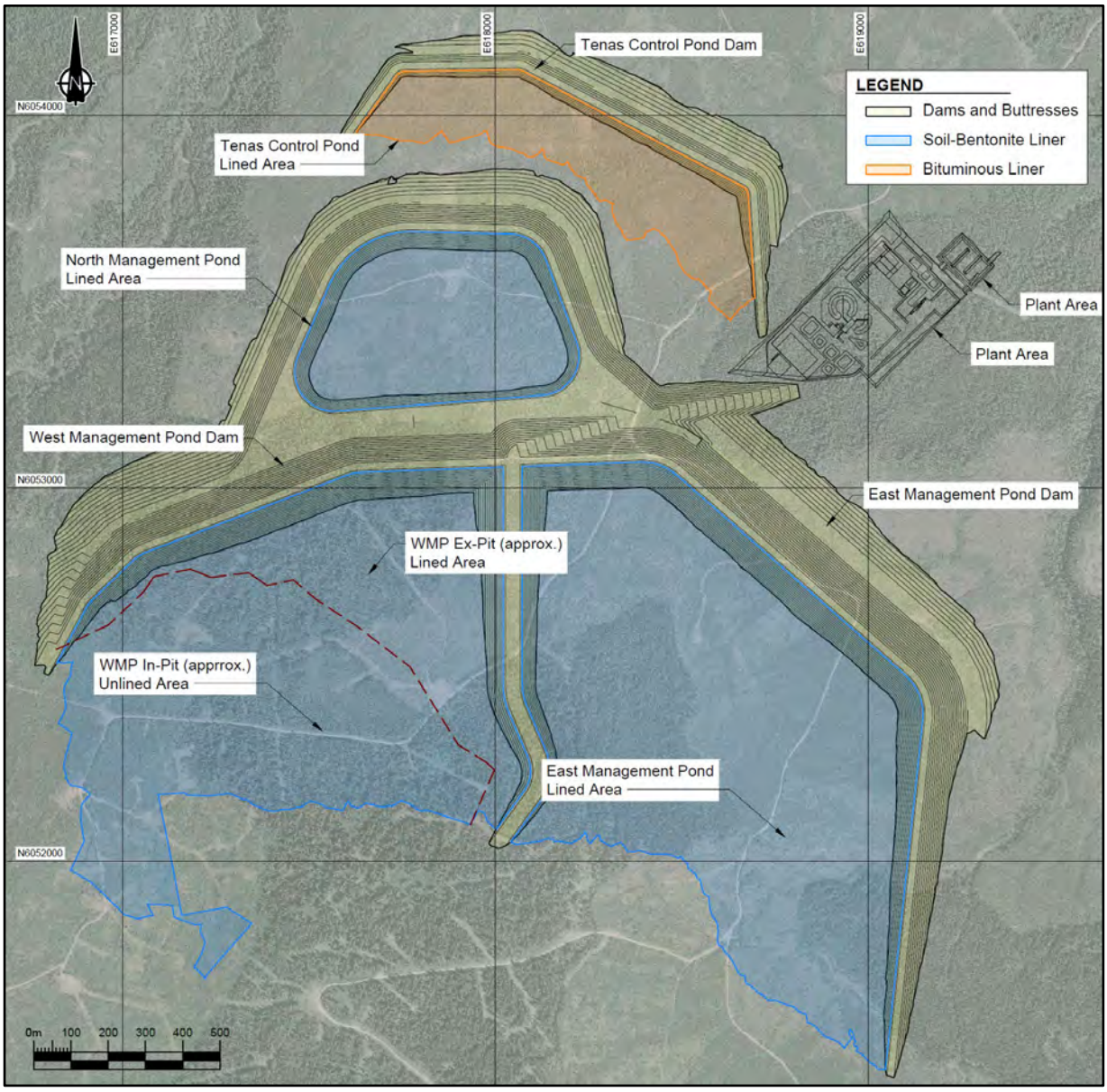


Figure 4: Plan view of the lined surface areas of the Tenas Control Pond and PAG management ponds at the Tenas Project

6.2 Material Characteristics

The blend of materials used for the soil-bentonite liner system (surface soils and bentonite) depend on the parameters adopted in the design, specifically the geotechnical parameters and hydraulic conductivity. The material characteristics and its adequacy to quality standards will need to be proven in laboratory testing and in the field.

Field obtained geotechnical parameters should be equal to or better than those adopted in the design. The *in-situ* hydraulic conductivity of the soil-bentonite liner should have a hydraulic conductivity ≤ $1x10^{-10}$ m/s; therefore, a correct characterization of the geotechnical parameters (particle-size distribution and clay/bentonite content) and parameters associated with the condition of permeability (degree of compaction, *in-situ* hydraulic conductivity) will be required. Additional characteristic parameters are recommended to be evaluated during the construction works to check compliance with minimum material requirements during construction.

6.2.1 On-Site Soil

The selected area for the MP is located at the north and north-east of the projected Tenas open pit. The overburden material is composed principally of a very stiff to hard lean clay (CL), with low to medium plasticity, with intervals of high plasticity clay (CH), clayey silty sand (SC or SM) or gravel (GC or GM) at various depths (with an overburden total thickness equal or higher than 30 m in most of the extension).

Fine-grained and coarse-grained native soil utilized for the soil-bentonite liner system will be exposed during foundation preparation (described in Section 6.3.3). Coarser-grained granular particles such as cobbles and boulders should be removed. The native soil should be subjected to field and laboratory testing to verify the proportion of bentonite required to meet the target hydraulic conductivity ≤ $1x10^{-10}$ m/s, which served as the basis of the liner design.

6.3 Execution of the Liner System

6.3.1 General

During the construction procedure (cleaning, excavation, embankment construction and operations), additional information related to foundation characteristics and slope materials can be obtained. This information can continue to inform and help to develop processes.

6.3.2 Equipment

Equipment options that can be considered for construction of the soil-bentonite liner system include haul trucks, haul trucks equipped with truck mounted spreaders or tractors pulling trailer mounted spreaders, smooth-drum and/or padfoot vibrating compactors, tractors (equipped with or) pulling trailer mounted rotovators or disc harrows, dozers, or graders. The most suitable equipment will be selected by Telkwa Coal based on the soil characteristics and construction requirements.

6.3.3 Foundation Preparation

In preparation for construction of the soil-bentonite liner system, clearing and grubbing should be completed until surface soils, trunks, roots, and topsoil materials have been removed and no appreciable content of organic matter remains:

- Clearing involves cutting of tree stumps and brush, and removal of snow and ice.
- Grubbing involves removal of tree stumps, shrubs, grasses, including their complete root system.

The terrain slope should be uniform for consistent pre-disking and subsequent application & mixing of bentonite.

6.3.4 Placement, Disking, and Compaction

In this section, preliminary placement, disking, and compaction specifications are provided. These will be further studied and updated during detailed design engineering.

Previous Studies

Placement, discing, and compaction equipment and use shall be determined from field studies in trial pads. From these studies, the optimum combination of type of equipment and operation shall be specified. The feasibility of pre-disking the upstream dam surface area shall be assessed on a trial embankment. However, it may be determined that instead of pre-disking, the upstream dam face should be scarified with a toothed excavator bucket or alternative methods.

Pre-Disking

Construction of the soil-bentonite liner system involves pre-disking the uppermost 0.15 m of soil to ensure hydraulic connectivity of the native soils and bentonite. This will take place following inspection and approval of preliminary foundation preparation (clearing and grubbing). The field engineer shall carry out visual inspection and approval of the pre-disked surface prior to advancing to bentonite placement. The number of passes required for pre-disking to is dependent on the prepared foundation conditions and selection of equipment.

Placement, Disking, and Compaction

Bentonite will be spread onto the uppermost 0.15 m of pre-disked surface soil. Spreading the bentonite may be accomplished from a haul truck mounted cement spreader or a tractor pulling a trailer mounted spreader. Equipment to consider for spreading bentonite are the Stoltz Site Spreader® mounted on a CAT® haul truck. The number of passes to dispense a sufficient quantity of bentonite is dependent on the selection of equipment. For the upstream dam faces it may be necessary to utilize an excavator to roughly dispense the bentonite from 1 m^3 bags, followed by manual smoothing/raking of the bentonite by laborers using manual tools such as rakes and shovels.

Following spreading of the bentonite, disking will be undertaken to mix the pre-disked native soil and bentonite. The maximum disking depth per pass is 0.15 m; hence, survey control will need to be achieved using either GPS, rod & level (horizontal levelling), or Total Station. The number of passes of the disking equipment to achieve adequate mixing will be based on the selection of equipment and informed by field studies on trial pads.

To achieve the 0.45 m soil-bentonite liner, 0.15 m layers of local material will need to be placed prior to the second and third additions of bentonite. Placement of the native soil can be completed by hauling native soil with a haul truck, dumping the material in local stockpiles, and then spreading the soil to the target 0.15 m lift thickness with a dozer or grader. For each 0.15 m lift of the soil-bentonite liner system, bentonite will be spread onto the 0.15 m of native soil followed by disking to mix the native soil and bentonite, and compaction.

Compaction of each 0.15 m lift of the 0.45 m soil bentonite liner system will be accomplished with a vibratory smooth drum or sheepsfoot roller. The number of passes of the compactor will be dependent on dry density targets defined in the detailed design engineering and selection of equipment.

Grab samples of the surface soil, bentonite, and soil-bentonite mixture shall be collected and subjected to the testing procedures recommended in Section 6.4.2. Testing of the compacted soil-bentonite liner system *in-situ* shall be undertaken with the testing procedures recommended in Section 6.4.

6.3.5 Protective Component

Prior to placement of PAG material, the soil-bentonite liner system will require a protective component to protect the liners from being punctured by large waste rock, which could damage the integrity and functionality of the liner system. Two options were evaluated for this protective layer:

1. Placement of a 1 m thick over-liner layer of locally stockpiled soil.
2. Deployment of a 16 oz. non-woven geotextile.

A protective layer of 16 oz. non-woven geotextile was selected to be placed on top of the liner instead of a soil over-liner. Aside from being the lower cost of the two alternatives, the non-woven geotextile does not reduce the storage capacity of the MPs.

6.4 Quality Control and Quality Assurance

The development of an adequate geotechnical campaign, technical specifications for construction and quality controls mitigate the risk of requiring a re-design during construction. The definition of ranges for acceptable parameters ensures flexibility in design tolerances and enables foreseeing actions on possible variabilities in material quality. The design of adequate construction methodologies and its correct control can help prevent contingent quality defects due to negligence and the additional associated costs.

6.4.1 Weather Considerations

Weather and runoff conditions during construction can significantly affect the water content of the surface soil material or create hydraulic conditions different from those assumed, which could in turn cause changes in the liner design. For this reason, the project must be continuously evaluated to make sure that the conditions found during construction are compatible with the final design.

6.4.2 Recommended Testing

It will be necessary to maintain density control and verify the in-situ hydraulic conductivity of the soil-bentonite liner system to ensure the liner will perform to specification. This will involve a combination of laboratory testing on grab samples collected in the field and *in-situ* (field based) testing.

Routine Tests

The following routine testing and visual-manual inspection shall be performed to establish the soil type and *in-situ* condition:

- Natural moisture content testing according to standard ASTM D2216;
- Particle size distribution curves shall be obtained according to standards ASTM D0422 (granular material) and ASTM D2487 (fine material). These shall be obtained for samples of surface soils, bentonite, and soil-bentonite liner material; and
- Permeability tests shall be performed according to standards ASTM D2434 (granular material) and ASTM D5084 (fine material).

6.4.3 Compaction

The *in-situ* soil density can be measured by two methods:

- Sand-cone method (ASTM D1556): an excavation is made, and the weight of the extracted material is determined. The excavation volume is computed by filling the hole with sand using a calibrated recipient; and
- Nuclear methods (ASTM D2922, ASTM D3017): based on the interaction between gamma radiation and existing electrons in the soil particles. The difference between energy emitted and received is measured, which is proportional to the soil density.

A systematic on-site control program of the degree of compaction must be elaborated and implemented to determine the density and moisture content of the compacted material and compare the results with the specified limits.

The degree of compaction grade shall be verified in each lift. Control of the fill material shall be carried out continuously by visual inspection of the operations (unloading, spreading, humidification, mixing and compaction).

The number of control tests shall be determined for the detailed level design. No new lift shall be spread until the degree of compaction (moisture and density) has been tested and accepted.

6.4.4 Permeability Tests

The soil permeability governs the hydraulic performance of the soil-bentonite liner system. Permeability shall be verified by the use of trial pads, either prior to or during construction, by a Double Ring Infiltrometer, Guelph infiltrometer or *in situ* tests (ASTM D5126).

Permeability results for the soil bentonite liner must be less than or equal to $1x10^{-10}$ m/s in accordance with hypotheses made during the geotechnical design of the embankment.

7 Recommendations

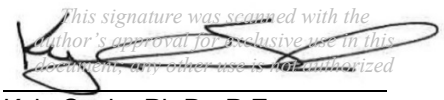
- A 0.45 m soil-bentonite liner system with a hydraulic conductivity of 1E-10 m/s would be sufficient to reduce total seepage below the 2,800 m^3/day design criteria target for both the base and high cases.
- To perform a laboratory study to determine the optimal proportion of bentonite-soil blend to produce a soil-bentonite mixture with a hydraulic conductivity ≤ 1E-10 m/s.
- To perform field trials to refine the construction methodology and equipment selection, and verify the soil-bentonite liner system performs to specification with an *in-situ* hydraulic conductivity ≤ 1E-10 m/s.
- The preliminary construction methodology for the recommended 0.45 m soil-bentonite liner system will be constructed in three 0.15 m lifts:
  - Preliminary foundation preparation (clearing & grubbing) followed by pre-disking the native soil;
  - Spreading bentonite to meet the target ≤ $1x10^{-10}$ m/s hydraulic conductivity, disking the first 0.15 m lift of soil-bentonite, and compaction;
  - Placement of 0.15 m lifts of native soil, with each lift followed by application of bentonite to meet the target ≤ $1x10^{-10}$ m/s hydraulic conductivity, disking the 0.15 m lifts of soil-bentonite, and subsequent compaction.
- Quality control and quality assurance procedures should be implemented to mitigate the risk of redesign and prevent quality defects. This includes proper oversight of weather and implementation of routine testing to establish the soil type and *in-situ* condition, as well as maintaining control of the degree of compaction and permeability of the soil-bentonite liner system.

8 Closure

This technical memo, “Liner System Seepage Assessment and Construction Methodology for Tenas Management Ponds”, was prepared by SRK Consulting (Canada) Inc. to provide recommendations for a liner system that will reduce seepage rates from the Tenas Management Ponds to below allowable thresholds defined in SRK’s site water balance (SRK, 2020a).

We trust the information included meets your present requirements. If you have any questions regarding the analyses or if you require additional information, please do not hesitate to contact the undersigned.

SRK Consulting (Canada) Inc.



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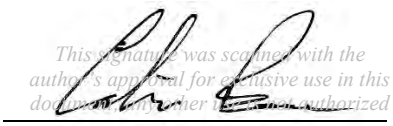

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Principal Consultant

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

References

SRK, 2020a. Tenas Project Water and Load Balance Report. Report prepared for Telkwa Coal Limited. Project no. 2CT025.008.

SRK, 2020b. 2020 EA Groundwater Technical Report. Report prepared for Telkwa Coal Limited. Project no. 2CT025.008.

SRK Consulting (Canada) Inc. 2021. Tenas Project – Management and Control Ponds Stability Assessment. Prepared for Telkwa Coal Ltd.: Telkwa, BC. Project number: 2CT025.0082CT025.008. Issued April 2021.

Appendix F – Estimation of Seepages Underneath the Bituminous Geomembrane of the Control Pond

LEAKAGE RATE A THROUGH A COMPOSITE LINER

Source:Giroud, J.P., 1997, "Equations for Calculating the Rate of Liquid Migration Through Composite Liners Due to Geomembrane Defects", Geosynthetics International, Vol. 4, Nos. 3-4, pp. 335-348.

INPUTS

A, Geomembrane area (m2)

n, Number of defects per considered geomembrane area (A)

Feature	(A) Footprint	(n) Defect density			
		Excellent	Good	Fair	poor
	m2	*1/acre*	*4/acre*	*10/acre*	*20/acre*
-	-	*1*	*4*	*10*	*20*
Control Po	386000	96	382	954	1908

C_{qo} or $C_{q\infty}$, Contact quality factor

	Good contact	Poor contact
C_{qo}	0.21	1.15
Cq ∞	0.52	1.22

C_{q0} => circular, square, rectangular

$C_{q\infty}$ => infinite length

h. hydraulic heads

h = 10 m

Note: Limitation of Giroud equation Semi-Prmb => head above geomembrane must be <=3m.

If head above the liner is >3m, the leakage rate is overpredicted (Source: Paul Hubbard, Car

ts. Thickness of the low-permeability soil component of the composite liner

ts = 7 m

CCL, compacted clay liner => typically between 0.3 to 1.5m

GCL, geosytnthetic clay liner => typicallybetween 5 and 100mm

ks, Permeability of the low-permeability soil (m/s)

ks = 7.0E-07 m/s Base Case (geomean of the mixed grain till)

ks = 1.9E-06 m/s High Case (base case ks x 2.7)

ks must be equal or less to kg (see limitations to Giroud equations)

kg 5.9E-07 => Calculation kg assumes geomembrane defect is circular

k of CCL typically between 1E-10 and 1E-9 m/s

k of GCL typically between 5-12 and 5E-11 m/s

d, Diameter of circular defect (m)

d = 3.5 mm 3.5E-03 m

(min. 0.5mm / max.25mm)

case 1: Typical for liner performance evaluation => defect area of 0.1 cm^2
(equivalent to defect diameter of 3.5 mm)

Case 2: Conservative design => defect area of 1 cm^2
(equivalent to defect diameter of 11.284 mm)

b, Width of defect (m) for an infinitely long defect

square defect with side le 3.5E-03 m

infinitely long defect with 3.5E-03 m

b and B, Width and Length (m) for a recta m

Rectangular defect with w 3.5E-03 m

Rectangular defect with le 7.0E-03

CALCULATIONS

Case 1: Circular defect with diameter (d)

$$Q = 0.976\ C_{qo}\left[1+0.1(h/t_s)^{0.95}\right] d^{0.2}\ h^{0.9}\ k_s^{0.74}$$

Q, Leakage rate through the geomembrane defects

Unit m^3/d

	Q per defect x # defect			
	Excellent	Good	Fair	poor
Base Cas	**139**	551	1377	2754
High Cas	**289**	1150	2872	5744

Case 2: Square defect with side length (b)

$$Q = C_{qo}\ [1+0.1\ (h/t_s)^{0.95}]\ b^{0.2}\ h^{0.9}\ k_s^{0.74}$$

Q, Leakage rate through the geomembrane defects

Unit m^3/d

	Q per defect x # defect			
	Excellent	Good	Fair	poor
Base Cas	142	565	1411	2822
High Cas	296	1178	2942	5885

Case 3: Infinitely long defect with width (b)

$$Q^* = C_{q\infty}\ [1+0.2\ (h/t_s)^{0.95}]\ b^{0.1}\ h^{0.45}\ k_s^{0.87}$$

Q, Leakage rate through the geomembrane defects

Unit m^3/d

	Q per defect x # defect			
	Excellent	Good	Fair	poor
Base Cas	39	155	388	777
High Cas	93	369	921	1843

Case 4: Rectangular defect with width (b) and length (B)

$$Q = C_{qo}\ [1+0.1\ (h/t_s)^{0.95}]\ b^{0.2}\ h^{0.9}\ k_s^{0.74} + C_{q\infty}\ [1+0.2\ (h/t_s)^{0.95}]\ (B-b)\ b^{0.1}\ h^{0.45}\ k_s^{0.87}$$

Q, Leakage rate through the geomembrane defects

Unit m^3/d

	Q per defect x # defect			
	Excellent	Good	Fair	poor
Base Cas	142	565	1412	2825
High Cas	296	1180	2946	5891

Limitations of Giroud (1997) equations

- If the defects is circular, the defect diameter should be no less than 0.5mm and not greate
- Do not use for very small defects (d<0.5mm because capillarity may prevent free flow;
- In the case of defects that are not circular, it is proposed to use these limitations for the defect width.
- The liquid head on top of the geomembrane should be equal or less than 3m
- The K of the low-permeability soil underlying the geomembrane shoul be equal to or less than a certain value kg
- Limitations to diameter width and groundwater head are linked to the experimental data that were used to deveop the semi-empirical equations

Conversion factors

1 m2 = 2.5E-04 acre

LEAKAGE RATE COMPOSITE LINER (BGM + S/B LINER)

CALCULATIONS

Source: Leakage Control using Geomembrane Liners J.P. Giroud. Soils and Rocks, São Paulo, 39(3): 213-235, September-December, 2016.

Case 1: Circular defect with diameter of d

$$Q = 0.21\left[1+0.1\left(\frac{h}{t}\right)^{0.95}\right]a^{0.1}h^{0.9}k^{0.74} \qquad (4)$$

$$k_G = \left\{\frac{0.3891\, d^{1.8}}{C_{qo}\left[1+0.1\left(\frac{h}{t_s}\right)^{0.95}\right]h^{0.4}}\right\}^{1/0.74}$$

C_{qo} = 0.21

INPUTS

Instructions => Enter value in yellow cell to modify calculations

Feature	A (m^2)	k (m/s)	h (m)	ts (m)	kg (m/s)	Q (m^3/d) Number of defects per acre: Excellent 1	Good 2	Fair 10	poor 20
EMP	1,127,069	4.1E-10	25	0.15	*2.1E-07*	57.4	**114.9**	573.6	1147.0
				0.30	*4.7E-07*	31.7	**63.5**	316.8	633.5
				0.45	*7.3E-07*	22.9	**45.8**	228.7	457.4
				0.56	*9.2E-07*	19.4	**38.8**	193.6	387.0
Assumption that	286,995	4.1E-10	20	0.15	*3.1E-07*	9.8	**19.7**	98.4	196.6
				0.30	*6.8E-07*	5.5	**11.0**	55.1	110.1
				0.45	*1.0E-06*	4.0	**8.0**	40.2	80.4
				0.56	*1.3E-06*	3.4	**6.9**	34.3	68.5
TCP	368,603	4.1E-10	10	0.15	*9.9E-07*	3.8	**7.6**	37.9	75.7
				0.30	*2.0E-06*	2.3	**4.5**	22.5	44.9
				0.45	*2.9E-06*	1.7	**3.4**	17.2	34.3
				0.56	*3.4E-06*	1.5	**3.0**	15.1	30.1
WMP ex-pit	491,397	4.1E-10	30	0.15	*1.5E-07*	34.8	**69.3**	346.5	692.7
				0.30	*3.5E-07*	19.0	**37.9**	189.6	379.0
				0.45	*5.5E-07*	13.6	**27.2**	135.8	271.4
				0.56	*6.9E-07*	11.5	**22.9**	114.3	228.4
WMP in-pit ovb	123,239	4.1E-10	30	0.15	*1.5E-07*	8.8	**17.4**	87.0	174.0
				0.30	*3.5E-07*	4.8	**9.5**	47.6	95.2
				0.45	*5.5E-07*	3.5	**6.8**	34.1	68.2
				0.56	*6.9E-07*	2.9	**5.7**	28.7	57.4
WMP in-pit rock	471,130	4.1E-10	30	0.15	*1.5E-07*	33.4	**66.4**	332.2	664.2
				0.30	*3.5E-07*	18.3	**36.4**	181.8	363.4
				0.45	*5.5E-07*	13.1	**26.0**	130.2	260.2
				0.56	*6.9E-07*	11.0	**21.9**	109.6	219.0

NOTES:

Q_r , Leakage rate through the geomembrane defects

n, defect density (number of defects per acre)

h, hydrauli head

A, liner footprint

ts, thickness of the low-permeability soil component of the composite liner

ks, permeabiliyy of the low-permeability soil component of the composite liner

ks must be equal or less to kg (see limitations to Giroud equations). Calculation kg assumes geomembrane defect is circular.

k of CCL typically between 1E-10 and 1E-9 m/s

k of GCL typically between 5-12 and 5E-11 m/s

Limitations of Giroud (1997) equations

- if the defects is circular, the defect diameter should be no less than 0.5mm and not greater than 25mm. Do not use for very small defects (d<0.5mm because capillarity may prevent free flow.
- The liquid head on top of the geomembrane should be equal or less than 3m. If head above the liner is >3m, the leakage rate is overpredicted (Source: Paul Hubbard, Cardiff)
- The K of the low-permeability soil underlying the geomembrane shoul be equal to or less than a certain value kg
- Limitations to diameter width and groundwater head are linked to the experimental data that were used to deveop the semi-empirical equations.

GENERAL PROPERTIES APPLIED TO ALL CASES:

Table 1 Giroud 1997: Contact quality factor Cqo or Cq ∞

	Good contact	Poor contact
C_{qo}	0.21	1.15
Cq ∞	0.52	1.22

Cq0 => circular, square, rectangular

Cq ∞ => infinite length

Cqo or Cq ∞ , Contact quality factor

Cqo	0.21
Cq ∞	0.52

r, Radius of circular defect (m)

r 5.65 mm a 100 mm^2

(diam. min. 0.5mm / max.25mm)

Giroud 2016: over the years, the practice for engineers as well as researchers has been to consider 2 holes per acre with a hole size of 100 mm^2.

Conversion factors

1 m^2 = 2.5E-04 acre

SCENARIOS

Leakage rate (m^3/d) for designs with bituminous geomembrane on top of a soil-bentonite liner

Liner design	TCP	EMP	NMP	WMP ex-pit	WMP in-pit ovb	WMP in-pit rock
B0.15	8	115	20	69	17	66
B0.30	5	63	11	38	10	36
B0.45	3	46	8	27	7	26
B0.56	3	39	7	23	6	22

Mitigation #1 and #2

Notes:
- Liner design notation: Letter B signifies that a bituminouS liner is placed on top of a soil-bentonite (s/b) liner, the value indicates the thickness in meter of the s/b liner
- nr, option not requested by TCL

Leakage rate (m^3/d) for designs with a soil-bentonite liner (i.e., no BGM) placed on top of overburden or weathered bedrock

Liner design	TCP	EMP	NMP	WMP ex-pit	WMP in-pit	WMP in-pit ovb	WMP in-pit rock
0.15	na	738	371	762	403	85	318
0.30	na	458	198	400	312	66	246
0.45	na	334	109	269	186	39	147
0.56	na	277	87	216	179	38	141

Distribution of leakages in the WMP in-pit between OVB and BDR is based on footprint's proportions (21% OVB, 79% BDR)

Notes:
- Liner design notation: Letter B signifies that a bituminoUS liner is placed on top of a soil-bentonite (s/b) liner, the value indicates the thickness in meter of the s/b liner
- na, not available

Leakage estimations (m^3/d) with variable designs

Assumption that all MPs are 100% lined (i.e., seepage controlled by the liners)

Scenarios	WMP Ex Pit Lined		WMP Inpit OVB Lined		WMP Inpit Rock Lined		Total Q (m^3/d)	
	Design	Q (m^3/d)	Design	Q (m^3/d)	Design	Q (m^3/d)		
Post EA1	0.30	400	B0.30	10	0.15	318	**728**	
Post EA2	0.30	400	0.30	66	0.15	318	**784**	
Post EA3	0.30	400	0.45	39	0.15	318	**757**	
Post EA4	0.30	400	0.56	38	0.15	318	**756**	
Post EA5	B0.30	38	B0.30	10	0.15	318	**366**	
Post EA6	B0.30	38	0.30	66	0.15	318	**422**	
Post EA7	B0.30	38	0.45	39	0.15	318	**395**	Mitigation #1
Post EA8	B0.30	38	0.56	38	0.15	318	**394**	
Post EA9	0.45	269	B0.30	10	0.15	318	**597**	
Post EA10	0.45	269	0.30	66	0.15	318	**653**	
Post EA11	0.45	269	0.45	39	0.15	318	**626**	
Post EA12	0.45	269	0.56	38	0.15	318	**625**	
Post EA13	0.56	216	B0.30	10	0.15	318	**544**	Mitigation #2
Post EA14	0.56	216	0.30	66	0.15	318	**600**	
Post EA15	0.56	216	0.45	39	0.15	318	**573**	
Post EA16	0.56	216	0.56	38	0.15	318	**572**	
Post EA17	0.30	400	B0.30	10	B0.15	66	**476**	
Post EA18	0.30	400	0.30	66	B0.15	66	**532**	
Post EA19	0.30	400	0.45	39	B0.15	66	**506**	
Post EA20	0.30	400	0.56	38	B0.15	66	**504**	
Post EA21	B0.30	38	B0.30	10	B0.15	66	**114**	
Post EA22	B0.30	38	0.30	66	B0.15	66	**170**	
Post EA23	B0.30	38	0.45	39	B0.15	66	**143**	
Post EA24	B0.30	38	0.56	38	B0.15	66	**142**	
Post EA25	0.45	269	B0.30	10	B0.15	66	**345**	
Post EA26	0.45	269	0.30	66	B0.15	66	**401**	
Post EA27	0.45	269	0.45	39	B0.15	66	**375**	
Post EA28	0.45	269	0.56	38	B0.15	66	**373**	
Post EA29	0.56	216	B0.30	10	B0.15	66	**292**	
Post EA30	0.56	216	0.30	66	B0.15	66	**348**	
Post EA31	0.56	216	0.45	39	B0.15	66	**322**	
Post EA32	0.56	216	0.56	38	B0.15	66	**320**	
Post EA33	0.30	400	B0.30	10	0.30	246	**656**	
Post EA34	0.30	400	0.30	66	0.30	246	**712**	
Post EA35	0.30	400	0.45	39	0.30	246	**686**	
Post EA36	0.30	400	0.56	38	0.30	246	**684**	
Post EA37	B0.30	38	B0.30	10	0.30	246	**294**	
Post EA38	B0.30	38	0.30	66	0.30	246	**350**	
Post EA39	B0.30	38	0.45	39	0.30	246	**323**	
Post EA40	B0.30	38	0.56	38	0.30	246	**322**	
Post EA41	0.45	269	B0.30	10	0.30	246	**525**	
Post EA42	0.45	269	0.30	66	0.30	246	**581**	
Post EA43	0.45	269	0.45	39	0.30	246	**555**	
Post EA44	0.45	269	0.56	38	0.30	246	**553**	
Post EA45	0.56	216	B0.30	10	0.30	246	**472**	
Post EA46	0.56	216	0.30	66	0.30	246	**528**	
Post EA47	0.56	216	0.45	39	0.30	246	**502**	
Post EA48	0.56	216	0.56	38	0.30	246	**500**	
Post EA49	0.30	400	B0.30	10	B0.30	36	**446**	
Post EA50	0.30	400	0.30	66	B0.30	36	**502**	
Post EA51	0.30	400	0.45	39	B0.30	36	**475**	
Post EA52	0.30	400	0.56	38	B0.30	36	**474**	
Post EA53	B0.30	38	B0.30	10	B0.30	36	**84**	
Post EA54	B0.30	38	0.30	66	B0.30	36	**140**	
Post EA55	B0.30	38	0.45	39	B0.30	36	**113**	
Post EA56	B0.30	38	0.56	38	B0.30	36	**112**	
Post EA57	0.45	269	B0.30	10	B0.30	36	**315**	
Post EA58	0.45	269	0.30	66	B0.30	36	**371**	
Post EA59	0.45	269	0.45	39	B0.30	36	**344**	
Post EA60	0.45	269	0.56	38	B0.30	36	**343**	
Post EA61	0.56	216	B0.30	10	B0.30	36	**262**	
Post EA62	0.56	216	0.30	66	B0.30	36	**318**	
Post EA63	0.56	216	0.45	39	B0.30	36	**291**	
Post EA64	0.56	216	0.56	38	B0.30	36	**290**	

Appendix G - Model Calibration

row list model	13
Model ID	06-13-lc

Hydraulic Head Data
(Measured between the 6th and 15th of September 2018)

Observed Label	Unit	Observed (m)	Calculated (m)	Diff Calc-Obs	Squared Error	Absolute Error
T95R-15C	BDR, Coal (#1)	881.14	869.17	-12.0	143.2	-12.0
T95R-64	BDR, Coal (#1), 1/1U?	934.62	937.42	2.8	7.8	2.8
T95R-40	BDR, Coal (#1)	892.33	889.92	-2.4	5.8	-2.4
T96R-16-19	BDR, Coal (#1)	1010.65	979.99	-30.7	940.3	-30.7
T96R-16-28	BDR, Un-named lower coal	1011.08	976.35	-34.7	1206.2	-34.7
T96R-34-87	BDR, Coal (#1), 1/1U?	934.11	915.06	-19.1	362.9	-19.1
T18-01D (ARD02)	BDR, Sandstone	945.1	939.41	-5.7	32.3	-5.7
T18-04D (W1D)	BDR, Volcanics	945.92	926.46	-19.5	378.7	-19.5
T18-08D (W3D)	BDR, Volcanics	763.42	793.26	29.8	890.5	29.8
T19-21S	BDR, Weathered Siltstone	806.88	802.36	-4.5	20.4	-4.5
T19-22S	BDR, Weathered Siltstone	802.98	806.94	4.0	15.7	4.0
T19-26S	OVB, Clayey Sand	772.76	776.67	3.9	15.3	3.9
T19-34S	BDR, Weathered Siltstone	808.99	826.34	17.3	300.9	17.3
T19-35S	BDR, Weathered Siltstone	805.77	809.62	3.8	14.8	3.8
TOB96-01-05	OVB, Till	919.34	932.54	13.2	174.3	13.2
TOB96-02-06	OVB, Till	850.01	845.42	-4.6	21.0	-4.6
TOB96-11-04	OVB, Clay	824.42	808.83	-15.6	243.2	-15.6
T18-04S (W1S)	OVB, Gravelly Fat Clay (Till?) and Volc.	940.64	927.21	-13.4	180.3	-13.4
T18-06D (W2)	OVB, Cobbles?	801.12	809.05	7.9	62.8	7.9
T18-08S (W3S)	OVB, Sand lense in Till	770.1	793.27	23.2	536.8	23.2
T18-14S	OVB, Silty Sand with Gravel/Till	677.42	673.53	-3.9	15.2	-3.9
T18-15S	OVB, Sand with Gravel/Till	704.14	687.73	-16.4	269.2	-16.4
T19-18S	OVB, Clayey Sand	787.13	801.32	14.2	201.2	14.2
T19-27S	OVB, Silty Sand with Gravel	768.2	780.47	12.3	150.7	12.3
T19-36	OVB, Sand and Gravel	512.64	524.25	11.6	134.8	11.6
T19-37	OVB, Sand and Gravel	513.1	526.02	12.9	166.9	12.9
TOB96-02-20	OVB, Sand and gravel	< 833.46	845.23	well not dry		
TOB97-06-21	OVB, Sand	< 833.58	814.73	dry well		
TOB97-07-24	OVB, Sand	< 787.05	784.50	dry well		
TOB96-11-19	OVB, Fine sand	< 807.16	808.94	well not dry		
T18-02S (GEO11)	OVB, Till? Silty SAND with trace clay and trace cob	< 821.22	828.58	well not dry		
T18-11S (GEO22)	OVB, Till? Sandy CLAY with Trace Cobbles	< 779.73	759.05	dry well		
T18-13S (GEO13)	OVB, Till? Gravely CLAY with Some Cobbles	< 796.46	788.98	dry well		
T19-19S	OVB, Clayey Sand (and Siltstone?)	< 795.44	823.57	well not dry		
T19-20S	OVB, Lean Clay with Sand	< 829.29	819.47	dry well		

Hydraulic Head Calibration Statistics	
ME	-1.0
Max. AE	34.7
AME	13.1
RMSE	15.80
NRMSE	3.17%
R2	1.0

Hydraulic Head Calibration Statistics
- Mean Error = -1.0 m
- Maximum Absolute Error = 34.7 m
- Absolute Mean Error = 13.1 m
- Root Mean Squared Error = 15.8 m
- Norm. Root Mean Squared Error = 3.2%
- Coeff. of Determ. (R^2) = 0.99

Baseflow Calibration Statistics	
ME	-1.6
Max. AE	13.0
AME	6.0
RMSE	7.4
NRMSE	3.59%
R2	1.0

Baseflow Calibration Statistics
- Mean Error = -1.6 L/s
- Maximum Absolute Error = 13.0 L/s
- Absolute Mean Error = 6.0 L/s
- Root Mean Squared Error = 7.4 L/s
- Norm. Root Mean Squared Error = 3.6%
- Coeff. of Determ. (R^2) = 1.00

BUDGET

Selection ID	Dirichlet + Cauchy + sink IN (m^3/d)	Dirichlet + Cauchy IN + Sink OUT (m^3/d)	Dirichlet IN (m^3/d)	Dirichlet OUT (m^3/d)	Neumann IN (m^3/d)	Neumann OUT (m^3/d)	Cauchy IN (m^3/d)	Cauchy OUT (m^3/d)	Well IN (m^3/d)	Well OUT (m^3/d)	Source/sink IN (m^3/d)	Source/sink OUT (m^3/d)	Storage Capture(-)/Release(+) IN (m^3/d)	Storage Capture(-)/Release(+) OUT (m^3/d)	Internal Transfer (Porous Medium) IN (m3/d)	Internal Transfer (Porous Medium) OUT (m3/d)	Imbalance Rate In (+) / Out (-) (m3/d)	Internal Transfer (Discrete Features) IN (m3/d)	Internal Transfer (Discrete Features) OUT (m3/d)
CabinetCk_at_GoathornCk	783.310	8432.735	0.000	8432.735	0.000	0.000	0.000	0.000	0.000	0.000	783.310	0.000	3.914	4.037	0.000	0.000	0.000	0.000	0.000
FourCk_at_GoathornCk	103.767	1488.703	0.000	1488.703	0.000	0.000	0.000	0.000	0.000	0.000	103.767	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000
GoathonCk_at_CabinetCk	664.327	6253.404	0.000	6253.404	0.000	0.000	0.000	0.000	0.000	0.000	664.327	0.000	0.814	0.705	0.000	0.000	0.000	0.000	0.000
Goathorn_Ck_at_FourCk	1567.126	17228.538	0.000	17228.538	0.000	0.000	0.000	0.000	0.000	0.000	1567.126	0.000	5.458	4.932	0.000	0.000	0.000	0.000	0.000
GoathornCk_at_TenasCk	1758.826	20119.544	51.773	20119.544	0.000	0.000	0.000	0.000	0.000	0.000	1707.053	0.000	5.458	4.933	0.000	0.000	0.000	0.000	0.000
GoathornCk_at_08EE008	1702.425	19982.790	0.000	19982.790	0.000	0.000	0.000	0.000	0.000	0.000	1702.425	0.000	5.458	4.933	0.000	0.000	0.000	0.000	0.000
GoathornCk_at_TelkwaRv	3814.225	29477.819	1086.340	29477.819	0.000	0.000	0.000	0.000	0.000	0.000	2727.885	0.000	5.683	5.289	0.000	0.000	0.000	0.000	0.000
TenasCk_at_GoathornCk	2048.955	9073.124	1034.567	9073.124	0.000	0.000	0.000	0.000	0.000	0.000	1014.388	0.000	0.224	0.356	0.000	0.000	0.000	0.000	0.000
TelkwaRv_at_BulkleyRv	4257.840	35315.657	1201.343	35315.657	0.000	0.000	0.000	0.000	0.000	0.000	3056.498	0.000	8.050	6.583	0.000	0.000	0.000	0.000	0.000
BulkleyRv_at_TelkwaRv	1072.215	10286.165	168.837	10286.165	0.000	0.000	0.000	0.000	0.000	0.000	903.377	0.000	2.952	3.669	0.000	0.000	0.000	0.000	0.000
All_Ck_Rv_nodes	5346.496	45601.822	1386.521	45601.822	0.000	0.000	0.000	0.000	0.000	0.000	3959.975	0.000	11.002	10.252	0.000	0.000	0.000	0.000	0.000
Domain	45599.632	45601.822	1386.521	45601.822	0.000	0.000	0.000	0.000	0.000	0.000	44213.111	0.000	133.894	132.024	0.000	0.000	0.000	0.000	0.000

Baseflow Data (L/s)

(NOMENCLATURE: <0 outflow / >0 Inflow to the model)

Location	Selection Label	Total watershed (km^2)	Mdl watershed (km^2)	Estim.	Calc	Stats	
				Target (L/s)	Calc. (L/s)	Squared Error	Absolute Error
Cabinet Creek	CabinetCk_at_GoathornCk	54.1	54.1	97.9	97.6	1.0E-01	-0.33%
Four Creek	FourCk_at_GoathornCk	14.1	14.1	25.6	17.2	7.0E+01	-32.72%
Tenas Creek	TenasCk_at_GoathornCk	58.6	58.6	106.0	93.0	1.7E+02	-12.27%
Goathorn Creek	GoathonCk_at_CabinetCk	50.3	40.6	73.4	72.4	1.1E+00	-1.45%
	Goathorn_Ck_at_FourCk	116.7	106.9	193.6	199.4	3.4E+01	3.02%
	GoathornCk_at_08EE008	133.5	123.7	223.9	231.3	5.5E+01	3.30%
Telkwa River	TelkwaRv_at_BulkleyRv	834.3	197.9	358.2	394.8	not applicable	not applicable
Bulkey River	BulkleyRv_at_TelkwaRv	12400.0	280.2	507.2	511.9	not applicable	not applicable

Note:
Goathorn Ck @ Telkwa River = 192.8 km2
Model represents only about 2% of the Bulkey watershed

Appendix H – Analysis of the Potential Groundwater Quality at Post-closure in the Private Wells Area

Estimation groundwater quality downgradient of the Project (WQS09), along pathways towards private wells - Base Case

Calculation concentration of the groundwater flowing into the Telkwa River Valley:

Three private domestic wells (Goalder, Mapletoft, Baker) are shown to be within the potential paths of mine affected groundwater (i.e., based on particle paths predictions for post-closure conditions). These wells are located in the Telkwa River valley, and pumping groundwater from the fluvial aquifer at a relatively shallow depth (15 to 30m deep). To evaluate the potential maximum effects from the Project to the groundwater quality of the fluvial aquifer, it is assumed:

* The mine affected groundwater reached final discharge locations (i.e., post-closure, pseudo -steady state conditions);

* The groundwater pumped by the three private domestic wells corresponds exclusively to the groundwater coming from southern side of the Telkwa River valley, and discharging upstream of WQS09. The groundwater contributions from the northern side of the Telkwa River, and from the fluvial aquifer upstream of the project influence are not accounted;

* The mass of constituents in groundwater is conserved (i.e., transport of mine affected groundwater by advection only, no diffusion or dispersion, and conservation of mass, no natural attenuation).

(1) **[Qw x Cw] = [Qb x Cb] + [Qm x Cm]**
(2) **[Qm x Cm] = [Q1 x C1] + ... + [Qi x Ci]**

For a unit volume Qw = 1, Cw can be expressed using the estimated percentage contributions relative to each sources predicted by the groundwater model (i.e., particle path analyses):

(3) **Cw = Pb x Cb + + (Pm x P1) x C1 ... + (Pm x Pi) x Ci**

Qw, groundwater flow into the Telkwa River valley.
Cw, concentration of the groundwater into the Telkwa River valley.
Qb, flow contribution from background groundwater.
Cb, concentration of background groundwater (baseline).
Pb, percentage contribution of background groundwater into the Telkwa River valley.
Qm, flow contribution from mine affected groundwater.
Cm, concentration of mine affected groundwater.
Pm, percentage contribution of mine affected groundwater into the Telkwa River valley.
Qi, flow contribution from mine feature i.
Ci,, concentration of from mine feature i (source terms).
Pi,, percentage contribution of from mine feature i to total mine affected groundwater

Model: 08-05l-lc (PostClosure) - Base Case

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP	TCP	PL 909	SWR 901
			%	%	%	%	%	%
WQS09	95.6%	4.4%	13.4%	30.9%	55.3%	na	na	0.5%
WQS09 (TCL 25y)	95.2%	4.8%	12.2%	28.2%	50.5%	8.6%	na	0.4%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

Parameter	Detection Limit [mg/L]	BC WQG DWS Guideline		Groundwater background (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)										Base Case Source Terms (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)												Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: Post-closure (25 years pulse from control pond already discharged)				Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: 1st 25 years of Post-closure period (incl. seepage from control pond)			
		Screening parameter	Value (mg/L)	Overburden Water Quality (mg/L)					Bedrock Water Quality (mg/L)					Control Pond		NMP		EMP		WMP		Pit lake 909masl		Saturated WR 901masl		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50	
				Count	Avg.	P50	P75	P95	Count	Avg.	P50	P75	P95	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter
Chloride	0.50	AO, Cl	250	48	1.52	0.52	2.50	3.31	69	4.16	2.50	5.00	10.00	0.68	0.75	0.55	0.55	0.39	0.39	1.20	1.20	0.05	0.05	0.86	0.89	0.54	0.54	2.43	2.43	0.54	0.54	2.42	2.42
Fluoride	0.020	MAC, F	1.5	41	0.171	0.132	0.196	0.345	61	1.682	1.460	2.160	5.120	0.035	0.053	0.065	0.064	0.003	0.003	0.080	0.080	0.007	0.007	0.170	0.170	0.129	0.129	1.398	1.398	0.128	0.128	1.392	1.393
Nitrate	0.0050	MAC, nitrate-N	10	41	0.0399	0.0050	0.0235	0.1650	58	0.0705	0.0250	0.0423	0.1640	2.5000	3.5000	0.6900	0.7000	0.5500	0.5500	2.4000	2.4000	0.0080	0.0079	0.0230	0.0230	0.0747	0.0748	0.0938	0.0939	0.0848	0.0890	0.1038	0.1080
Nitrite	0.0010	MAC, nitrite-N	1.0	41	0.0016	0.0010	0.0013	0.0050	58	0.0072	0.0050	0.0050	0.0200	0.0590	0.0820	0.0160	0.0170	0.0130	0.0130	0.0560	0.0570	0.0002	0.0002	0.0019	0.0019	0.0026	0.0026	0.0064	0.0064	0.0028	0.0029	0.0066	0.0068
Orthophosphate, dissolved	0.001	n.g.	n.g.	28	0.227	0.019	0.506	0.851	43	0.014	0.002	0.022	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.018	0.002	0.002	0.018	0.018	0.002	0.002
Sulfate	0.50	AO, SO4	500	48	18.38	11.35	26.05	41.87	69	23.59	6.00	51.30	74.88	20.00	21.00	10.00	10.00	13.00	13.00	33.00	33.00	1.30	1.30	4.80	4.90	11.89	11.89	6.78	6.78	11.92	11.93	6.83	6.83
Aluminum, dissolved	0.0050	MAC Al-tot	9.5	45	0.0312	0.0050	0.0064	0.0339	69	0.0334	0.0086	0.0149	0.1000	0.0710	0.0720	0.0300	0.0300	0.0500	0.0500	0.1300	0.1300	0.0035	0.0035	0.0074	0.0073	0.0088	0.0088	0.0122	0.0122	0.0091	0.0091	0.0125	0.0125
Antimony, dissolved	0.00050	MAC Sb-tot	0.006	38	0.00052	0.00050	0.00050	0.00053	61	0.02179	0.00050	0.00050	0.00097	0.00720	0.00880	0.00008	0.00008	0.00001	0.00001	0.00009	0.00009	0.00002	0.00002	0.00018	0.00019	0.00048	0.00048	0.00048	0.00048	0.00051	0.00052	0.00051	0.00052
Arsenic, dissolved	0.00050	MAC, As-tot	0.01	45	0.00337	0.00070	0.00678	0.01104	69	0.00106	0.00060	0.00107	0.00196	0.00680	0.00830	0.00370	0.00370	0.00150	0.00150	0.00760	0.00760	0.00150	0.00140	0.00740	0.00730	0.00090	0.00090	0.00080	0.00080	0.00092	0.00093	0.00083	0.00083
Barium, dissolved	0.020	n.g.	n.g.	45	0.125	0.093	0.137	0.248	69	0.850	0.330	0.893	3.626	0.037	0.043	0.030	0.030	0.012	0.012	0.046	0.046	0.010	0.010	0.059	0.060	0.090	0.090	0.317	0.317	0.090	0.090	0.316	0.316
Beryllium, dissolved	0.0010	n.g.	n.g.	45	0.0003	0.0001	0.0001	0.0002	69	0.0008	0.0001	0.0002	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Boron, dissolved	0.10	MAC, B-tot	5.0	45	0.08	0.10	0.10	0.10	69	0.19	0.16	0.29	0.34	0.28	0.35	0.16	0.16	0.06	0.06	0.33	0.33	0.06	0.06	0.32	0.32	0.11	0.11	0.16	0.16	0.11	0.11	0.16	0.16
Cadmium, dissolved	0.000010	MAC, Cd-tot	0.005	45	0.000122	0.000021	0.000090	0.000269	69	0.000216	0.000012	0.000050	0.001600	0.000260	0.000280	0.000120	0.000120	0.000100	0.000100	0.000350	0.000360	0.000057	0.000056	0.000140	0.000140	0.000031	0.000031	0.000022	0.000022	0.000032	0.000032	0.000023	0.000023
Calcium, dissolved	0.10	n.g.	n.g.	46	50.78	50.15	73.33	85.90	68	15.74	14.10	23.60	35.17	39.00	46.00	21.00	21.00	8.30	8.30	40.00	40.00	11.00	11.00	41.00	41.00	49.16	49.16	14.70	14.70	49.12	49.15	14.80	14.83
Chromium, dissolved	0.0010	MAC, Cr-tot	0.05	45	0.0015	0.0010	0.0010	0.0010	69	0.0011	0.0010	0.0010	0.0020	0.0008	0.0010	0.0005	0.0005	0.0002	0.0002	0.0011	0.0011	0.0002	0.0002	0.0009	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Cobalt, dissolved	0.00030	MAC, Co-tot	0.001	45	0.00088	0.00030	0.00050	0.00410	69	0.00057	0.00030	0.00050	0.00260	0.01200	0.01500	0.00640	0.00650	0.00260	0.00260	0.01400	0.01400	0.00250	0.00240	0.01300	0.01300	0.00070	0.00070	0.00070	0.00070	0.00075	0.00076	0.00075	0.00076
Copper, dissolved	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	45	0.0016	0.0010	0.0015	0.0050	69	0.0019	0.0010	0.0010	0.0039	0.0024	0.0028	0.0013	0.0013	0.0006	0.0006	0.0026	0.0026	0.0006	0.0006	0.0024	0.0024	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Iron, dissolved	0.030	AO, Fe-tot	0.30	45	0.043	0.030	0.050	0.099	69	0.203	0.065	0.379	0.589	0.033	0.035	0.018	0.018	0.019	0.019	0.055	0.056	0.003	0.003	0.019	0.019	0.030	0.030	0.064	0.064	0.030	0.030	0.064	0.064
Lead, dissolved	0.00050	MAC, Pb-tot	0.005	45	0.00203	0.00050	0.00050	0.00090	69	0.00137	0.00050	0.00050	0.00100	0.00039	0.00045	0.00024	0.00024	0.00013	0.00013	0.00054	0.00054	0.00008	0.00008	0.00041	0.00041	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Lithium, dissolved	0.0050	n.g.	n.g.	45	0.0048	0.0028	0.0042	0.0067	66	0.0536	0.0500	0.0770	0.1035	0.1400	0.1700	0.0760	0.0760	0.0320	0.0320	0.1600	0.1600	0.0290	0.0280	0.1500	0.1500	0.0075	0.0075	0.0526	0.0526	0.0080	0.0082	0.0530	0.0531
Magnesium, dissolved	0.10	n.g.	n.g.	46	20.75	13.80	25.10	51.20	68	2.99	1.92	6.00	8.58	69.00	85.00	37.00	37.00	14.00	14.00	77.00	77.00	15.00	15.00	75.00	75.00	15.49	15.49	4.13	4.13	15.71	15.78	4.40	4.46
Manganese, dissolved	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	45	0.13352	0.05210	0.14200	0.57100	69	0.06061	0.01680	0.03700	0.25400	0.01400	0.01600	0.00890	0.00900	0.00570	0.00570	0.02200	0.02200	0.00210	0.00210	0.01400	0.01400	0.05047	0.05047	0.01673	0.01673	0.05032	0.05033	0.01672	0.01673
Mercury, dissolved	0.000010	MAC, Hg-tot	0.001	45	0.001131	0.000005	0.000005	0.000170	69	0.002928	0.000005	0.000050	0.030080	0.000180	0.000190	0.000081	0.000082	0.000081	0.000082	0.000260	0.000260	0.000042	0.000042	0.000065	0.000064	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013	0.000013
Molybdenum, dissolved	0.0010	MAC, Mo-tot	0.088	45	0.0053	0.0010	0.0112	0.0150	69	0.0044	0.0010	0.0076	0.0148	0.0220	0.0270	0.0120	0.0120	0.0047	0.0048	0.0240	0.0240	0.0052	0.0050	0.0230	0.0230	0.0017	0.0017	0.0017	0.0017	0.0018	0.0018	0.0018	0.0018
Nickel, dissolved	0.0010	MAC, Ni-tot	0.08	45	0.0026	0.0010	0.0010	0.0163	69	0.0021	0.0010	0.0025	0.0050	0.0190	0.0240	0.0100	0.0100	0.0042	0.0042	0.0220	0.0220	0.0040	0.0039	0.0210	0.0200	0.0016	0.0016	0.0016	0.0016	0.0017	0.0017	0.0017	0.0017
Potassium, dissolved	2.0	n.g.	n.g.	45	1.8	2.0	2.0	2.0	68	2.2	2.0	2.3	3.5	12.0	15.0	6.6	6.6	2.5	2.5	14.0	14.0	2.6	2.5	13.0	13.0	2.3	2.3	2.3	2.3	2.4	2.4	2.4	2.4
Selenium, dissolved	0.00010	MAC, Se-tot	0.01	45	0.00032	0.00020	0.00050	0.00096	69	0.00026	0.00014	0.00021	0.00100	0.01600	0.01900	0.00830	0.00840	0.00340	0.00340	0.01800	0.01800	0.00330	0.00320	0.01700	0.01600	0.00073	0.00073	0.00067	0.00067	0.00079	0.00080	0.00073	0.00074
Silver, dissolved	0.000020	n.g.	n.g.	45	0.000098	0.000020	0.000020	0.000260	68	0.059061	0.000020	0.000050	0.000100	0.000150	0.000160	0.000069	0.000070	0.000075	0.000076	0.000230	0.000230	0.000037	0.000037	0.000042	0.000041	0.000026	0.000026	0.000026	0.000026	0.000027	0.000027	0.000027	0.000027
Sodium, dissolved	2.0	n.g.	n.g.	45	46.0	19.9	85.4	111.8	68	349.4	315.0	360.3	723.3	11.0	17.0	23.0	23.0	1.6	1.6	30.0	30.0	1.3	1.3	58.0	61.0	19.9	19.9	302.0	302.0	19.9	19.9	300.8	300.8
Tin, dissolved	0.00050	n.g.	n.g.	36	0.00102	0.00050	0.00050	0.00490	51	0.00061	0.00050	0.00050	0.00053	0.01100	0.01400	0.00590	0.00590	0.00250	0.00250	0.01300	0.01300	0.00230	0.00220	0.01200	0.01200	0.00087	0.00087	0.00087	0.00087	0.00091	0.00092	0.00091	0.00092
Uranium, dissolved	0.00020	MAC, U-tot	0.02	45	0.00169	0.00114	0.00228	0.00322	69	0.02268	0.00040	0.00094	0.00711	0.00380	0.00460	0.00210	0.00210	0.00083	0.00084	0.00430	0.00430	0.00080	0.00078	0.00410	0.00410	0.00122	0.00122	0.00051	0.00051	0.00123	0.00123	0.00053	0.00053
Vanadium, dissolved	0.0010	n.g.	n.g.	45	0.0027	0.0010	0.0022	0.0050	69	0.0039	0.0005	0.0010	0.0300	0.0010	0.0012	0.0006	0.0006	0.0003	0.0003	0.0012	0.0012	0.0002	0.0002	0.0011	0.0011	0.0010	0.0010	0.0005	0.0005	0.0010	0.0010	0.0005	0.0005
Zinc, dissolved	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	45	0.0110	0.0050	0.0050	0.0123	69	0.0067	0.0050	0.0050	0.0115	0.0040	0.0048	0.0025	0.0025	0.0009	0.0009	0.0047	0.0047	0.0009	0.0009	0.0050	0.0051	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049

Note
MAC, maximum allowable concentration
AO, aesthetic objective
diss, dissolved
tot. total

Estimation groundwater quality downgradient of the Project (WQS09), along pathways towards private wells - HighCase

Calculation concentration of the groundwater flowing into the Telkwa River Valley:

Three private domestic wells (Goalder, Mapletoft, Baker) are shown to be within the potential paths of mine affected groundwater (i.e., based on particle paths predictions for post-closure conditions). These wells are located in the Telkwa River valley, and pumping groundwater from the fluvial aquifer at a relatively shallow depth (15 to 30m deep). To evaluate the potential maximum effects from the Project to the groundwater quality of the fluvial aquifer, it is assumed:

* The mine affected groundwater reached final discharge locations (i.e., post-closure, pseudo -steady state conditions);

* The groundwater pumped by the three private domestic wells corresponds exclusively to the groundwater coming from southern side of the Telkwa River valley, and discharging upstream of WQS09. The groundwater contributions from the northern side of the Telkwa River, and from the fluvial aquifer upstream of the project influence are not accounted;

* The mass of constituents in groundwater is conserved (i.e., transport of mine affected groundwater by advection only, no diffusion or dispersion, and conservation of mass, no natural attenuation).

(1) **[Qw x Cw] = [Qb x Cb] + [Qm x Cm]**
(2) **[Qm x Cm] = [Q1 x C1] + ... + [Qi x Ci]**

For a unit volume Qw = 1, Cw can be expressed using the estimated percentage contributions relative to each sources predicted by the groundwater model (i.e., particle path analyses):

(3) **Cw = Pb x Cb + + (Pm x P1) x C1 ... + (Pm x Pi) x Ci**

Qw, groundwater flow into the Telkwa River valley.
Cw, concentration of the groundwater into the Telkwa River valley.
Qb, flow contribution from background groundwater.
Cb, concentration of background groundwater (baseline).
Pb, percentage contribution of background groundwater into the Telkwa River valley.
Qm, flow contribution from mine affected groundwater.
Cm, concentration of mine affected groundwater.
Pm, percentage contribution of mine affected groundwater into the Telkwa River valley.
Qi, flow contribution from mine feature i.
$C_{i,}$, concentration of from mine feature i (source terms).
$P_{i,}$, percentage contribution of from mine feature i to total mine affected groundwater

Model: 08-05l-hc (PostClosure) - High Case

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP-In	TCP	PL 909	SWR 901
			%	%	%	%	%	%
WQS09	91.9%	8.1%	7.4%	18.8%	67.3%	na	na	6.6%
WQS09 (TCL 25y)	91.1%	8.9%	6.7%	17.0%	61.1%	9.2%	na	6.0%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

Parameter	Detection Limit [mg/L]	BC WQG DWS Guideline		Groundwater background (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)										High Case Source Terms (Source: Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm)												High Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: Post-closure (25 years pulse from control pond already discharged)				Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: 1st 25 years of Post-closure period (incl. seepage from control pond)			
		Screening parameter	Value (mg/L)	Overburden Water Quality (mg/L)					Bedrock Water Quality (mg/L)					Control Pond		NMP		EMP		WMP		Pit lake 909masl		Saturated WR 901masl		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50	
				Count	Avg.	P50	P75	P95	Count	Avg.	P50	P75	P95	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter
Chloride	0.50	AO, Cl	250	48	1.52	0.52	2.50	3.31	69	4.16	2.50	5.00	10.00	29.02	28.34	11.73	11.75	6.09	6.15	37.98	38.15	6.56	6.36	30.41	30.21	2.89	2.90	4.70	4.71	3.10	3.10	4.90	4.91
Fluoride	0.020	MAC, F	1.5	41	0.171	0.132	0.196	0.345	61	1.682	1.460	2.160	5.120	0.049	0.085	0.069	0.069	0.004	0.004	0.082	0.082	0.007	0.007	0.166	0.172	0.127	0.127	1.347	1.347	0.126	0.127	1.336	1.337
Nitrate	0.0050	MAC, nitrate-N	10	41	0.0399	0.0050	0.0235	0.1650	58	0.0705	0.0250	0.0423	0.1640	1.8826	3.2811	0.1686	0.1713	0.3718	0.3755	1.2846	1.2939	0.0075	0.0074	0.0213	0.0217	0.0818	0.0824	0.1001	0.1007	0.0966	0.1086	0.1148	0.1268
Nitrite	0.0010	MAC, nitrite-N	1.0	41	0.0016	0.0010	0.0013	0.0050	58	0.0072	0.0050	0.0050	0.0200	0.0434	0.0759	0.0044	0.0045	0.0085	0.0086	0.0302	0.0304	0.0001	0.0001	0.0018	0.0019	0.0027	0.0028	0.0064	0.0064	0.0031	0.0034	0.0067	0.0070
Orthophosphate, dissolved	0.001	n.g.	n.g.	28	0.227	0.019	0.506	0.851	43	0.014	0.002	0.022	0.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.017	0.002	0.002	0.017	0.017	0.002	0.002
Sulfate	0.50	AO, SO4	500	48	18.38	11.35	26.05	41.87	69	23.59	6.00	51.30	74.88	664.31	632.36	250.86	251.42	150.16	151.68	879.71	883.88	145.05	140.81	637.48	632.73	65.86	66.09	60.94	61.17	70.77	70.74	65.90	65.86
Aluminum, dissolved	0.0050	MAC Al-tot	9.5	45	0.0312	0.0050	0.0064	0.0339	69	0.0334	0.0086	0.0149	0.1000	0.1692	0.1175	0.0211	0.0214	0.0944	0.0954	0.2852	0.2873	0.0036	0.0036	0.0073	0.0073	0.0218	0.0220	0.0251	0.0253	0.0230	0.0227	0.0263	0.0260
Antimony, dissolved	0.00050	MAC Sb-tot	0.006	38	0.00052	0.00050	0.00050	0.00053	61	0.02179	0.00050	0.00050	0.00097	0.01381	0.01307	0.00008	0.00008	0.00001	0.00001	0.00009	0.00009	0.00002	0.00002	0.00018	0.00019	0.00047	0.00047	0.00047	0.00047	0.00058	0.00057	0.00058	0.00057
Arsenic, dissolved	0.00050	MAC, As-tot	0.01	45	0.00337	0.00070	0.00678	0.01104	69	0.00106	0.00060	0.00107	0.00196	0.01319	0.01249	0.00489	0.00490	0.00300	0.00303	0.01707	0.01715	0.00298	0.00290	0.01220	0.01212	0.00172	0.00172	0.00163	0.00163	0.00181	0.00181	0.00172	0.00172
Barium, dissolved	0.020	n.g.	n.g.	45	0.125	0.093	0.137	0.248	69	0.850	0.330	0.893	3.626	0.056	0.062	0.032	0.032	0.018	0.018	0.061	0.062	0.010	0.010	0.059	0.060	0.089	0.089	0.307	0.307	0.089	0.089	0.305	0.305
Beryllium, dissolved	0.0010	n.g.	n.g.	45	0.0003	0.0001	0.0001	0.0002	69	0.0008	0.0001	0.0002	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Boron, dissolved	0.10	MAC, B-tot	5.0	45	0.08	0.10	0.10	0.10	69	0.19	0.16	0.29	0.34	0.48	0.47	0.20	0.20	0.10	0.10	0.63	0.64	0.11	0.10	0.52	0.52	0.13	0.13	0.19	0.19	0.14	0.14	0.19	0.19
Cadmium, dissolved	0.000010	MAC, Cd-tot	0.005	45	0.000122	0.000021	0.000090	0.000269	69	0.000216	0.000012	0.000050	0.001600	0.001817	0.001335	0.000285	0.000288	0.000702	0.000710	0.002498	0.002515	0.000317	0.000314	0.000262	0.000260	0.000170	0.000171	0.000162	0.000163	0.000184	0.000181	0.000175	0.000172
Calcium, dissolved	0.10	n.g.	n.g.	46	50.78	50.15	73.33	85.90	68	15.74	14.10	23.60	35.17	61.02	60.69	23.15	23.18	12.98	13.09	67.65	67.93	15.12	14.84	54.61	54.41	50.40	50.42	17.29	17.31	50.49	50.50	17.65	17.66
Chromium, dissolved	0.0010	MAC, Cr-tot	0.05	45	0.0015	0.0010	0.0010	0.0010	69	0.0011	0.0010	0.0010	0.0020	0.0042	0.0033	0.0009	0.0009	0.0015	0.0015	0.0058	0.0058	0.0008	0.0008	0.0014	0.0014	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
Cobalt, dissolved	0.00030	MAC, Co-tot	0.001	45	0.00088	0.00030	0.00050	0.00410	69	0.00057	0.00030	0.00050	0.00260	0.02194	0.02099	0.00840	0.00841	0.00476	0.00481	0.02869	0.02882	0.00496	0.00482	0.02146	0.02130	0.00209	0.00209	0.00209	0.00209	0.00225	0.00225	0.00225	0.00225
Copper, dissolved	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	45	0.0016	0.0010	0.0015	0.0050	69	0.0019	0.0010	0.0010	0.0039	0.0031	0.0030	0.0011	0.0011	0.0007	0.0007	0.0035	0.0035	0.0007	0.0007	0.0025	0.0025	0.0011	0.0011	0.0011	0.0011	0.0012	0.0012	0.0012	0.0012
Iron, dissolved	0.030	AO, Fe-tot	0.30	45	0.043	0.030	0.050	0.099	69	0.203	0.065	0.379	0.589	0.071	0.056	0.016	0.016	0.035	0.036	0.117	0.118	0.003	0.003	0.019	0.019	0.035	0.035	0.067	0.067	0.035	0.035	0.067	0.067
Lead, dissolved	0.00050	MAC, Pb-tot	0.005	45	0.00203	0.00050	0.00050	0.00090	69	0.00137	0.00050	0.00050	0.00100	0.00121	0.00094	0.00025	0.00026	0.00045	0.00046	0.00168	0.00169	0.00021	0.00021	0.00035	0.00035	0.00056	0.00056	0.00056	0.00056	0.00057	0.00057	0.00057	0.00057
Lithium, dissolved	0.0050	n.g.	n.g.	45	0.0048	0.0028	0.0042	0.0067	66	0.0536	0.0500	0.0770	0.1035	0.2405	0.2338	0.0963	0.0965	0.0512	0.0517	0.3166	0.3180	0.0538	0.0522	0.2494	0.2478	0.0226	0.0227	0.0660	0.0661	0.0244	0.0244	0.0674	0.0674
Magnesium, dissolved	0.10	n.g.	n.g.	46	20.75	13.80	25.10	51.20	68	2.99	1.92	6.00	8.58	117.84	115.75	47.36	47.44	23.18	23.41	150.18	150.83	27.84	27.03	123.84	122.95	22.21	22.24	11.29	11.33	22.99	23.01	12.17	12.19
Manganese, dissolved	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	45	0.13352	0.05210	0.14200	0.57100	69	0.06061	0.01680	0.03700	0.25400	0.06990	0.05394	0.01432	0.01444	0.02697	0.02724	0.10213	0.10281	0.01045	0.01036	0.01915	0.01931	0.05405	0.05410	0.02163	0.02167	0.05418	0.05409	0.02202	0.02194
Mercury, dissolved	0.000010	MAC, Hg-tot	0.001	45	0.001131	0.000005	0.000005	0.000170	69	0.002928	0.000005	0.000050	0.030080	0.003018	0.002150	0.000404	0.000410	0.001216	0.001229	0.004146	0.004176	0.000517	0.000515	0.000181	0.000178	0.000254	0.000256	0.000254	0.000256	0.000276	0.000271	0.000276	0.000271
Molybdenum, dissolved	0.0010	MAC, Mo-tot	0.088	45	0.0053	0.0010	0.0112	0.0150	69	0.0044	0.0010	0.0076	0.0148	0.0371	0.0365	0.0147	0.0147	0.0074	0.0075	0.0457	0.0459	0.0089	0.0086	0.0377	0.0374	0.0038	0.0038	0.0038	0.0038	0.0041	0.0041	0.0041	0.0041
Nickel, dissolved	0.0010	MAC, Ni-tot	0.08	45	0.0026	0.0010	0.0010	0.0163	69	0.0021	0.0010	0.0025	0.0050	0.0341	0.0329	0.0133	0.0133	0.0073	0.0073	0.0446	0.0448	0.0077	0.0075	0.0342	0.0339	0.0037	0.0037	0.0037	0.0037	0.0040	0.0040	0.0040	0.0040
Potassium, dissolved	2.0	n.g.	n.g.	45	1.8	2.0	2.0	2.0	68	2.2	2.0	2.3	3.5	20.4	20.1	8.4	8.4	3.9	4.0	26.2	26.4	4.8	4.6	22.1	22.0	3.5	3.5	3.5	3.5	3.6	3.6	3.6	3.6
Selenium, dissolved	0.00010	MAC, Se-tot	0.01	45	0.00032	0.00020	0.00050	0.00096	69	0.00026	0.00014	0.00021	0.00100	0.02758	0.02660	0.01076	0.01078	0.00588	0.00594	0.03594	0.03610	0.00627	0.00609	0.02775	0.02754	0.00246	0.00247	0.00240	0.00241	0.00266	0.00266	0.00260	0.00261
Silver, dissolved	0.000020	n.g.	n.g.	45	0.000098	0.000020	0.000020	0.000260	68	0.059061	0.000020	0.000050	0.000100	0.002976	0.002110	0.000388	0.000394	0.001208	0.001220	0.004091	0.004121	0.000507	0.000506	0.000138	0.000136	0.000264	0.000266	0.000264	0.000266	0.000286	0.000281	0.000286	0.000281
Sodium, dissolved	2.0	n.g.	n.g.	45	46.0	19.9	85.4	111.8	68	349.4	315.0	360.3	723.3	53.5	54.4	28.9	28.9	17.1	17.3	84.6	84.9	7.8	7.8	60.1	62.5	23.7	23.7	294.7	294.8	23.9	24.0	292.8	292.8
Tin, dissolved	0.00050	n.g.	n.g.	36	0.00102	0.00050	0.00050	0.00490	51	0.00061	0.00050	0.00050	0.00053	0.02089	0.01974	0.00775	0.00777	0.00480	0.00484	0.02748	0.02761	0.00461	0.00448	0.01953	0.01939	0.00219	0.00220	0.00219	0.00220	0.00234	0.00234	0.00234	0.00234
Uranium, dissolved	0.00020	MAC, U-tot	0.02	45	0.00169	0.00114	0.00228	0.00322	69	0.02268	0.00040	0.00094	0.00711	0.00430	0.00340	0.00095	0.00095	0.00153	0.00154	0.00585	0.00589	0.00079	0.00078	0.00148	0.00148	0.00140	0.00141	0.00073	0.00073	0.00143	0.00142	0.00075	0.00075
Vanadium, dissolved	0.0010	n.g.	n.g.	45	0.0027	0.0010	0.0022	0.0050	69	0.0039	0.0005	0.0010	0.0300	0.0081	0.0072	0.0025	0.0025	0.0023	0.0023	0.0108	0.0108	0.0017	0.0016	0.0055	0.0054	0.0016	0.0016	0.0012	0.0012	0.0016	0.0016	0.0012	0.0012
Zinc, dissolved	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	45	0.0110	0.0050	0.0050	0.0123	69	0.0067	0.0050	0.0050	0.0115	0.0233	0.0219	0.0084	0.0084	0.0057	0.0057	0.0302	0.0304	0.0051	0.0050	0.0202	0.0201	0.0065	0.0065	0.0065	0.0065	0.0066	0.0066	0.0066	0.0066

Note
MAC, maximum allowable concentration
AO, aesthetic objective
diss, dissolved
tot. total

Estimation groundwater quality downgradient of the Project and along pathways towards private wells - Base Case

Calculation concentration of the groundwater flowing into the Telkwa River Valley:

Three private domestic wells (Goalder, Mapletoft, Baker) are shown to be within the potential paths of mine affected groundwater (i.e., based on particle paths predictions for post-closure conditions). These wells are located in the Telkwa River valley, and pumping groundwater from the fluvial aquifer at a relatively shallow depth (15 to 30m deep). To evaluate the potential maximum effects from the Project to the groundwater quality of the fluvial aquifer, it is assumed:

* The mine affected groundwater reached final discharge locations (i.e., post-closure, pseudo -steady state conditions);

* The groundwater pumped by the three private domestic wells corresponds exclusively to the groundwater coming from southern side of the Telkwa River valley, and discharging upstream of WQ509. The groundwater contributions from the northern side of the Telkwa River, and from the fluvial aquifer upstream of the project influence are not accounted;

* The mass of constituents in groundwater is conserved (i.e., transport of mine affected groundwater by advection only, no diffusion or dispersion, and conservation of mass, no natural attenuation).

(1) **[Qw x Cw] = [Qb x Cb] + [Qm x Cm]**
(2) **[Qm x Cm] = [Q1 x C1] + ... + [Qi x Ci]**

For a unit volume Qw = 1, Cw can be expressed using the estimated percentage contributions relative to each sources predicted by the groundwater model (i.e., particle path analyses):

(3) **Cw = Pb x Cb + + (Pm x P1) x C1 ... + (Pm x Pi) x Ci**

Qw, groundwater flow into the Telkwa River valley.
Cw, concentration of the groundwater into the Telkwa River valley.
Qb, flow contribution from background groundwater.
Cb, concentration of background groundwater (baseline).
Pb, percentage contribution of background groundwater into the Telkwa River valley.
Qm, flow contribution from mine affected groundwater.
Cm, concentration of mine affected groundwater.
Pm, percentage contribution of mine affected groundwater into the Telkwa River valley.
Qi, flow contribution from mine feature i.
Ci,, concentration of from mine feature i (source terms).
Pi,, percentage contribution of from mine feature i to total mine affected groundwater

Model: 08-05z-lc (PostClosure) - Base Case

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP	TCP	PL 909	SWR 901
			%	%	%	%	%	%
WQS09	96.8%	3.2%	8.2%	26.0%	65.0%	na	na	0.8%
WQS09 (TCL 25y)	96.8%	3.2%	8.1%	25.8%	64.5%	0.7%	na	0.8%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

Parameter	Detection Limit [mg/L]	BC WQG DWS Guideline		Groundwater background (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)										Base Case Source Terms Sources: Control Pond = Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm NMP, EMP, WMP, Pit = Results_MPSeepage_WaterQuality_EAModel_rev07_20220209.xlsm										Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: Posz-closure (25 years pulse from control pond already discharged)				Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: 1st 25 years of Post-closure period (incl. seepage from control pond)			
		Screening parameter	Value (mg/L)	Overburden Water Quality (mg/L)					Bedrock Water Quality (mg/L)					Control Pond		NMP		EMP		WMP		Pit lake 909masl		Saturated WR 901masl		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50	
				Count	Avg.	P50	P75	P95	Count	Avg.	P50	P75	P95	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter
Chloride	0.50	AO, Cl	250	48	1.52	0.52	2.50	3.31	69	4.16	2.50	5.00	10.00	0.68	0.75	8.00	8.00	2.70	2.70	20.00	20.00	22.00	22.00	22.00	22.00	0.97	0.97	2.89	2.89	0.97	0.97	2.89	2.89
Fluoride	0.020	MAC, F	1.5	41	0.171	0.132	0.196	0.345	61	1.682	1.460	2.160	5.120	0.035	0.053	0.069	0.069	0.004	0.004	0.083	0.082	0.170	0.170	0.170	0.170	0.130	0.130	1.415	1.415	0.130	0.130	1.415	1.415
Nitrate	0.0050	MAC, nitrate-N	10	41	0.0399	0.0050	0.0235	0.1650	58	0.0705	0.0250	0.0423	0.1640	2.5000	3.5000	0.1900	0.1900	0.4200	0.4300	2.6000	2.6000	0.0210	0.0220	0.0210	0.0220	0.0631	0.0632	0.0824	0.0825	0.0637	0.0640	0.0830	0.0833
Nitrite	0.0010	MAC, nitrite-N	1.0	41	0.0016	0.0010	0.0013	0.0050	58	0.0072	0.0050	0.0050	0.0200	0.0590	0.0820	0.0049	0.0050	0.0097	0.0098	0.0600	0.0600	0.0018	0.0019	0.0018	0.0019	0.0023	0.0023	0.0062	0.0062	0.0023	0.0023	0.0062	0.0062
Orthophosphate, dissolved	0.001	n.g.	n.g.	28	0.227	0.019	0.506	0.851	43	0.014	0.002	0.022	0.060	0.000	0.000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.018	0.018	0.002	0.002	0.018	0.018	0.002	0.002
Sulfate	0.50	AO, SO4	500	48	18.38	11.35	26.05	41.87	69	23.59	6.00	51.30	74.88	20.00	21.00	180.00	190.00	76.00	77.00	520.00	520.00	510.00	500.00	510.00	500.00	23.07	23.11	17.90	17.93	23.07	23.11	17.90	17.93
Aluminum, dissolved	0.0050	MAC Al-tot	9.5	45	0.0312	0.0050	0.0064	0.0339	69	0.0334	0.0086	0.0149	0.1000	0.0710	0.0720	0.0091	0.0092	0.0270	0.0270	0.0460	0.0460	0.0069	0.0069	0.0069	0.0069	0.0060	0.0061	0.0095	0.0095	0.0061	0.0061	0.0095	0.0095
Antimony, dissolved	0.00050	MAC Sb-tot	0.006	38	0.00052	0.00050	0.00050	0.00053	61	0.02179	0.00050	0.00050	0.00097	0.00720	0.00880	0.00008	0.00008	0.00001	0.00001	0.00010	0.00010	0.00018	0.00019	0.00018	0.00019	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Arsenic, dissolved	0.00050	MAC, As-tot	0.01	45	0.00337	0.00070	0.00678	0.01104	69	0.00106	0.00060	0.00107	0.00196	0.00680	0.00830	0.00035	0.00035	0.00015	0.00016	0.00082	0.00082	0.00081	0.00082	0.00081	0.00082	0.00070	0.00070	0.00060	0.00060	0.00070	0.00070	0.00060	0.00060
Barium, dissolved	0.020	n.g.	n.g.	45	0.125	0.093	0.137	0.248	69	0.850	0.330	0.893	3.626	0.037	0.043	0.029	0.029	0.011	0.011	0.049	0.049	0.059	0.061	0.059	0.061	0.091	0.091	0.321	0.321	0.091	0.091	0.321	0.321
Beryllium, dissolved	0.0010	n.g.	n.g.	45	0.0003	0.0001	0.0001	0.0002	69	0.0008	0.0001	0.0002	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Boron, dissolved	0.10	MAC, B-tot	5.0	45	0.08	0.10	0.10	0.10	69	0.19	0.16	0.29	0.34	0.28	0.35	0.12	0.12	0.04	0.04	0.30	0.30	0.33	0.33	0.33	0.33	0.10	0.10	0.16	0.16	0.10	0.10	0.16	0.16
Cadmium, dissolved	0.000010	MAC, Cd-tot	0.005	45	0.000122	0.000021	0.000090	0.000269	69	0.000216	0.000012	0.000050	0.001600	0.000260	0.000280	0.000049	0.000049	0.000055	0.000056	0.000240	0.000240	0.000100	0.000100	0.000100	0.000100	0.000026	0.000026	0.000017	0.000017	0.000026	0.000026	0.000017	0.000017
Calcium, dissolved	0.10	n.g.	n.g.	46	50.78	50.15	73.33	85.90	68	15.74	14.10	23.60	35.17	39.00	46.00	7.80	7.80	3.40	3.50	13.00	13.00	16.00	16.00	16.00	16.00	48.86	48.87	13.97	13.97	48.86	48.86	13.98	13.98
Chromium, dissolved	0.0010	MAC, Cr-tot	0.05	45	0.0015	0.0010	0.0010	0.0010	69	0.0011	0.0010	0.0010	0.0020	0.0008	0.0010	0.0012	0.0012	0.0004	0.0004	0.0029	0.0029	0.0032	0.0032	0.0032	0.0032	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Cobalt, dissolved	0.00030	MAC, Co-tot	0.001	45	0.00088	0.00030	0.00050	0.00410	69	0.00057	0.00030	0.00050	0.00260	0.01200	0.01500	0.00040	0.00040	0.00024	0.00025	0.00140	0.00140	0.00094	0.00094	0.00094	0.00094	0.00032	0.00032	0.00032	0.00032	0.00033	0.00033	0.00033	0.00033
Copper, dissolved	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	45	0.0016	0.0010	0.0015	0.0050	69	0.0019	0.0010	0.0010	0.0039	0.0024	0.0028	0.0015	0.0015	0.0006	0.0006	0.0038	0.0038	0.0040	0.0040	0.0040	0.0040	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Iron, dissolved	0.030	AO, Fe-tot	0.30	45	0.043	0.030	0.050	0.099	69	0.203	0.065	0.379	0.589	0.033	0.035	0.011	0.011	0.013	0.013	0.039	0.040	0.019	0.019	0.019	0.019	0.030	0.030	0.064	0.064	0.030	0.030	0.064	0.064
Lead, dissolved	0.00050	MAC, Pb-tot	0.005	45	0.00203	0.00050	0.00050	0.00090	69	0.00137	0.00050	0.00050	0.00100	0.00039	0.00045	0.00018	0.00018	0.00008	0.00008	0.00049	0.00049	0.00046	0.00046	0.00046	0.00046	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Lithium, dissolved	0.0050	n.g.	n.g.	45	0.0048	0.0028	0.0042	0.0067	66	0.0536	0.0500	0.0770	0.1035	0.1400	0.1700	0.0750	0.0750	0.0270	0.0270	0.1900	0.1900	0.2100	0.2100	0.2100	0.2100	0.0072	0.0072	0.0528	0.0528	0.0072	0.0072	0.0529	0.0529
Magnesium, dissolved	0.10	n.g.	n.g.	46	20.75	13.80	25.10	51.20	68	2.99	1.92	6.00	8.58	69.00	85.00	5.90	5.90	2.30	2.30	14.00	14.00	15.00	15.00	15.00	15.00	13.69	13.69	2.18	2.18	13.70	13.70	2.20	2.20
Manganese, dissolved	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	45	0.13352	0.05210	0.14200	0.57100	69	0.06061	0.01680	0.03700	0.25400	0.01400	0.01600	0.01800	0.01800	0.01100	0.01200	0.07500	0.07500	0.04500	0.04500	0.04500	0.04500	0.05214	0.05215	0.01798	0.01798	0.05213	0.05214	0.01798	0.01798
Mercury, dissolved	0.000010	MAC, Hg-tot	0.001	45	0.001131	0.000005	0.000005	0.000170	69	0.002928	0.000005	0.000050	0.030080	0.000180	0.000190	0.000032	0.000033	0.000043	0.000044	0.000170	0.000180	0.000061	0.000061	0.000061	0.000061	0.000009	0.000009	0.000009	0.000009	0.000009	0.000009	0.000009	0.000009
Molybdenum, dissolved	0.0010	MAC, Mo-tot	0.088	45	0.0053	0.0010	0.0112	0.0150	69	0.0044	0.0010	0.0076	0.0148	0.0220	0.0270	0.0023	0.0023	0.0011	0.0011	0.0052	0.0052	0.0056	0.0055	0.0056	0.0055	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Nickel, dissolved	0.0010	MAC, Ni-tot	0.08	45	0.0026	0.0010	0.0010	0.0163	69	0.0021	0.0010	0.0025	0.0050	0.0190	0.0240	0.0016	0.0016	0.0008	0.0008	0.0053	0.0053	0.0042	0.0041	0.0042	0.0041	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Potassium, dissolved	2.0	n.g.	n.g.	45	1.8	2.0	2.0	2.0	68	2.2	2.0	2.3	3.5	12.0	15.0	8.4	8.5	2.8	2.8	21.0	21.0	24.0	23.0	24.0	23.0	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Selenium, dissolved	0.00010	MAC, Se-tot	0.01	45	0.00032	0.00020	0.00050	0.00096	69	0.00026	0.00014	0.00021	0.00100	0.01600	0.01900	0.00340	0.00340	0.00120	0.00130	0.00880	0.00880	0.00930	0.00920	0.00930	0.00920	0.00040	0.00040	0.00034	0.00034	0.00040	0.00040	0.00034	0.00034
Silver, dissolved	0.000020	n.g.	n.g.	45	0.000098	0.000020	0.000020	0.000260	68	0.059061	0.000020	0.000050	0.000100	0.000150	0.000160	0.000024	0.000024	0.000040	0.000040	0.000150	0.000150	0.000037	0.000037	0.000037	0.000037	0.000023	0.000023	0.000023	0.000023	0.000023	0.000023	0.000023	0.000023
Sodium, dissolved	2.0	n.g.	n.g.	45	46.0	19.9	85.4	111.8	68	349.4	315.0	360.3	723.3	11.0	17.0	220.0	220.0	67.0	68.0	540.0	540.0	620.0	620.0	620.0	620.0	31.8	31.8	317.5	317.5	31.8	31.8	317.4	317.4
Tin, dissolved	0.00050	n.g.	n.g.	36	0.00102	0.00050	0.00050	0.00490	51	0.00061	0.00050	0.00050	0.00053	0.01100	0.01400	0.00430	0.00430	0.00170	0.00170	0.01200	0.01200	0.01200	0.01200	0.01200	0.01200	0.00076	0.00076	0.00076	0.00076	0.00077	0.00077	0.00077	0.00077
Uranium, dissolved	0.00020	MAC, U-tot	0.02	45	0.00169	0.00114	0.00228	0.00322	69	0.02268	0.00040	0.00094	0.00711	0.00380	0.00460	0.00130	0.00130	0.00046	0.00047	0.00330	0.00330	0.00350	0.00350	0.00350	0.00350	0.00118	0.00118	0.00046	0.00046	0.00118	0.00118	0.00046	0.00047
Vanadium, dissolved	0.0010	n.g.	n.g.	45	0.0027	0.0010	0.0022	0.0050	69	0.0039	0.0005	0.0010	0.0300	0.0010	0.0012	0.0034	0.0034	0.0012	0.0012	0.0087	0.0087	0.0094	0.0094	0.0094	0.0094	0.0012	0.0012	0.0007	0.0007	0.0012	0.0012	0.0007	0.0007
Zinc, dissolved	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	45	0.0110	0.0050	0.0050	0.0123	69	0.0067	0.0050	0.0050	0.0115	0.0040	0.0048	0.0031	0.0031	0.0013	0.0014	0.0084	0.0085	0.0079	0.0079	0.0079	0.0079	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050

Note
MAC, maximum allowable concentration
AO, aesthetic objective
diss, dissolved
tot. total

Estimation groundwater quality downgradient of the Project and along pathways towards private wells - High Case

Calculation concentration of the groundwater flowing into the Telkwa River Valley:

Three private domestic wells (Goalder, Mapletoft, Baker) are shown to be within the potential paths of mine affected groundwater (i.e., based on particle paths predictions for post-closure conditions). These wells are located in the Telkwa River valley, and pumping groundwater from the fluvial aquifer at a relatively shallow depth (15 to 30m deep). To evaluate the potential maximum effects from the Project to the groundwater quality of the fluvial aquifer, it is assumed:

* The mine affected groundwater reached final discharge locations (i.e., post-closure, pseudo -steady state conditions);

* The groundwater pumped by the three private domestic wells corresponds exclusively to the groundwater coming from southern side of the Telkwa River valley, and discharging upstream of WQS09. The groundwater contributions from the northern side of the Telkwa River, and from the fluvial aquifer upstream of the project influence are not accounted;

* The mass of constituents in groundwater is conserved (i.e., transport of mine affected groundwater by advection only, no diffusion or dispersion, and conservation of mass, no natural attenuation).

(1) **[Qw x Cw] = [Qb x Cb] + [Qm x Cm]**
(2) [Qm x Cm] = [Q1 x C1] + ... + [Qi x Ci]

For a unit volume Qw = 1, Cw can be expressed using the estimated percentage contributions relative to each sources predicted by the groundwater model (i.e., particle path analyses):

(3) **Cw = Pb x Cb + + (Pm x P1) x C1 ... + (Pm x Pi) x Ci**

Qw, groundwater flow into the Telkwa River valley.
Cw, concentration of the groundwater into the Telkwa River valley.
Qb, flow contribution from background groundwater.
Cb, concentration of background groundwater (baseline).
Pb, percentage contribution of background groundwater into the Telkwa River valley.
Qm, flow contribution from mine affected groundwater.
Cm, concentration of mine affected groundwater.
Pm, percentage contribution of mine affected groundwater into the Telkwa River valley.
Qi, flow contribution from mine feature i.
C_i,, concentration of from mine feature i (source terms).
P_i,, percentage contribution of from mine feature i to total mine affected groundwater

Model: 08-05z-hc (PostClosure) - High Case

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP	TCP	PL 909	SWR 901
			%	%	%	%	%	%
WQS09	96.1%	3.9%	6.7%	22.2%	54.8%	na	5.0%	11.2%
WQS09 (TCL 25y)	96.1%	3.9%	6.7%	22.0%	54.5%	0.6%	5.0%	11.2%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

Parameter	Detection Limit [mg/L]	BC WQG DWS Guideline		Groundwater background (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)										High Case Source Terms Sources: Control Pond = Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm NMP, EMP, WMP, Pit = Results_MPSeepage_WaterQuality_EAModel_rev07_20220209.xlsm										High Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: Posz-closure (25 years pulse from control pond already discharged)				Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: 1st 25 years of Post-closure period (incl. seepage from control pond)			
		Screening parameter	Value (mg/L)	Overburden Water Quality (mg/L)					Bedrock Water Quality (mg/L)					Control Pond		NMP		EMP		WMP		Pit lake 909masl		Saturated WR 901masl		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50	
				Count	Avg.	P50	P75	P95	Count	Avg.	P50	P75	P95	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter
Chloride	0.50	AO, Cl	250	48	1.52	0.52	2.50	3.31	69	4.16	2.50	5.00	10.00	29.02	28.34	16.00	16.00	6.10	6.20	42.00	42.00	43.00	42.00	43.00	42.00	1.77	1.76	3.67	3.66	1.69	1.69	3.59	3.59
Fluoride	0.020	MAC, F	1.5	41	0.171	0.132	0.196	0.345	61	1.682	1.460	2.160	5.120	0.049	0.085	0.069	0.069	0.004	0.004	0.083	0.082	0.170	0.170	0.170	0.170	0.130	0.130	1.406	1.406	0.130	0.130	1.405	1.405
Nitrate	0.0050	MAC, nitrate-N	10	41	0.0399	0.0050	0.0235	0.1650	58	0.0705	0.0250	0.0423	0.1640	1.8826	3.2811	0.1900	0.1900	0.4200	0.4300	2.6000	2.6000	0.0210	0.0220	0.0210	0.0220	0.0648	0.0649	0.0840	0.0841	0.0652	0.0656	0.0844	0.0848
Nitrite	0.0010	MAC, nitrite-N	1.0	41	0.0016	0.0010	0.0013	0.0050	58	0.0072	0.0050	0.0050	0.0200	0.0434	0.0759	0.0049	0.0050	0.0097	0.0098	0.0600	0.0600	0.0018	0.0019	0.0018	0.0019	0.0024	0.0024	0.0062	0.0062	0.0024	0.0024	0.0062	0.0062
Orthophosphate, dissolved	0.001	n.g.	n.g.	28	0.227	0.019	0.506	0.851	43	0.014	0.002	0.022	0.060	0.000	0.000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.018	0.018	0.002	0.002	0.018	0.018	0.002	0.002
Sulfate	0.50	AO, SO4	500	48	18.38	11.35	26.05	41.87	69	23.59	6.00	51.30	74.88	664.31	632.36	380.00	380.00	200.00	200.00	1200.00	1200.00	1000.00	990.00	1000.00	990.00	45.71	45.64	40.57	40.50	43.89	43.84	38.75	38.70
Aluminum, dissolved	0.0050	MAC Al-tot	9.5	45	0.0312	0.0050	0.0064	0.0339	69	0.0334	0.0086	0.0149	0.1000	0.1692	0.1175	0.0150	0.0150	0.0510	0.0520	0.0860	0.0870	0.0073	0.0073	0.0073	0.0073	0.0072	0.0072	0.0106	0.0107	0.0072	0.0072	0.0107	0.0107
Antimony, dissolved	0.00050	MAC Sb-tot	0.006	38	0.00052	0.00050	0.00050	0.00053	61	0.02179	0.00050	0.00050	0.00097	0.01381	0.01307	0.00008	0.00008	0.00001	0.00001	0.00010	0.00010	0.00018	0.00019	0.00018	0.00019	0.00048	0.00048	0.00048	0.00048	0.00049	0.00049	0.00049	0.00049
Arsenic, dissolved	0.00050	MAC, As-tot	0.01	45	0.00337	0.00070	0.00678	0.01104	69	0.00106	0.00060	0.00107	0.00196	0.01319	0.01249	0.00071	0.00071	0.00083	0.00084	0.00330	0.00330	0.00130	0.00130	0.00130	0.00130	0.00076	0.00076	0.00066	0.00066	0.00076	0.00076	0.00066	0.00066
Barium, dissolved	0.020	n.g.	n.g.	45	0.125	0.093	0.137	0.248	69	0.850	0.330	0.893	3.626	0.056	0.062	0.031	0.031	0.015	0.015	0.061	0.061	0.059	0.060	0.059	0.060	0.091	0.091	0.319	0.319	0.091	0.091	0.319	0.319
Beryllium, dissolved	0.0010	n.g.	n.g.	45	0.0003	0.0001	0.0001	0.0002	69	0.0008	0.0001	0.0002	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Boron, dissolved	0.10	MAC, B-tot	5.0	45	0.08	0.10	0.10	0.10	69	0.19	0.16	0.29	0.34	0.48	0.47	0.23	0.23	0.10	0.10	0.64	0.64	0.62	0.61	0.62	0.61	0.12	0.12	0.17	0.17	0.11	0.11	0.17	0.17
Cadmium, dissolved	0.000010	MAC, Cd-tot	0.005	45	0.000122	0.000021	0.000090	0.000269	69	0.000216	0.000012	0.000050	0.001600	0.001817	0.001335	0.000250	0.000250	0.000660	0.000660	0.002300	0.002300	0.000190	0.000190	0.000190	0.000190	0.000077	0.000077	0.000068	0.000068	0.000077	0.000077	0.000068	0.000068
Calcium, dissolved	0.10	n.g.	n.g.	46	50.78	50.15	73.33	85.90	68	15.74	14.10	23.60	35.17	61.02	60.69	7.80	7.80	4.40	4.40	16.00	16.00	15.00	15.00	15.00	15.00	48.69	48.69	14.05	14.05	48.66	48.66	14.03	14.03
Chromium, dissolved	0.0010	MAC, Cr-tot	0.05	45	0.0015	0.0010	0.0010	0.0010	69	0.0011	0.0010	0.0010	0.0020	0.0042	0.0033	0.0023	0.0024	0.0014	0.0014	0.0077	0.0077	0.0059	0.0059	0.0059	0.0059	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012
Cobalt, dissolved	0.00030	MAC, Co-tot	0.001	45	0.00088	0.00030	0.00050	0.00410	69	0.00057	0.00030	0.00050	0.00260	0.02194	0.02099	0.00097	0.00098	0.00130	0.00130	0.00540	0.00540	0.00170	0.00170	0.00170	0.00170	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043	0.00043
Copper, dissolved	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	45	0.0016	0.0010	0.0015	0.0050	69	0.0019	0.0010	0.0010	0.0039	0.0031	0.0030	0.0029	0.0029	0.0018	0.0019	0.0095	0.0095	0.0073	0.0072	0.0073	0.0072	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012
Iron, dissolved	0.030	AO, Fe-tot	0.30	45	0.043	0.030	0.050	0.099	69	0.203	0.065	0.379	0.589	0.071	0.056	0.014	0.014	0.024	0.025	0.067	0.068	0.019	0.019	0.019	0.019	0.031	0.031	0.064	0.064	0.031	0.031	0.064	0.064
Lead, dissolved	0.00050	MAC, Pb-tot	0.005	45	0.00203	0.00050	0.00050	0.00090	69	0.00137	0.00050	0.00050	0.00100	0.00121	0.00094	0.00037	0.00038	0.00042	0.00043	0.00180	0.00180	0.00074	0.00075	0.00074	0.00075	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
Lithium, dissolved	0.0050	n.g.	n.g.	45	0.0048	0.0028	0.0042	0.0067	66	0.0536	0.0500	0.0770	0.1035	0.2405	0.2338	0.1500	0.1500	0.0640	0.0640	0.4200	0.4200	0.4000	0.4000	0.4000	0.4000	0.0152	0.0152	0.0605	0.0605	0.0144	0.0144	0.0598	0.0598
Magnesium, dissolved	0.10	n.g.	n.g.	46	20.75	13.80	25.10	51.20	68	2.99	1.92	6.00	8.58	117.84	115.75	12.00	12.00	9.40	9.50	44.00	44.00	27.00	27.00	27.00	27.00	14.49	14.49	3.07	3.07	14.46	14.46	3.04	3.04
Manganese, dissolved	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	45	0.13352	0.05210	0.14200	0.57100	69	0.06061	0.01680	0.03700	0.25400	0.06990	0.05394	0.03700	0.03700	0.04100	0.04100	0.20000	0.21000	0.08100	0.08100	0.08100	0.08100	0.05532	0.05553	0.02140	0.02161	0.05516	0.05537	0.02125	0.02146
Mercury, dissolved	0.000010	MAC, Hg-tot	0.001	45	0.001131	0.000005	0.000005	0.000170	69	0.002928	0.000005	0.000050	0.030080	0.003018	0.002150	0.000210	0.000210	0.000600	0.000610	0.002100	0.002100	0.000120	0.000120	0.000120	0.000120	0.000056	0.000056	0.000056	0.000056	0.000057	0.000057	0.000057	0.000057
Molybdenum, dissolved	0.0010	MAC, Mo-tot	0.088	45	0.0053	0.0010	0.0112	0.0150	69	0.0044	0.0010	0.0076	0.0148	0.0371	0.0365	0.0040	0.0041	0.0023	0.0023	0.0110	0.0110	0.0097	0.0096	0.0097	0.0096	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
Nickel, dissolved	0.0010	MAC, Ni-tot	0.08	45	0.0026	0.0010	0.0010	0.0163	69	0.0021	0.0010	0.0025	0.0050	0.0341	0.0329	0.0034	0.0034	0.0030	0.0030	0.0150	0.0150	0.0078	0.0078	0.0078	0.0078	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Potassium, dissolved	2.0	n.g.	n.g.	45	1.8	2.0	2.0	2.0	68	2.2	2.0	2.3	3.5	20.4	20.1	17.0	17.0	6.6	6.6	45.0	46.0	46.0	46.0	46.0	46.0	3.3	3.3	3.3	3.3	3.2	3.2	3.2	3.2
Selenium, dissolved	0.00010	MAC, Se-tot	0.01	45	0.00032	0.00020	0.00050	0.00096	69	0.00026	0.00014	0.00021	0.00100	0.02758	0.02660	0.00690	0.00690	0.00340	0.00350	0.02100	0.02100	0.01800	0.01800	0.01800	0.01800	0.00080	0.00081	0.00074	0.00074	0.00078	0.00078	0.00071	0.00071
Silver, dissolved	0.000020	n.g.	n.g.	45	0.000098	0.000020	0.000020	0.000260	68	0.059061	0.000020	0.000050	0.000100	0.002976	0.002110	0.000190	0.000200	0.000600	0.000600	0.002000	0.002000	0.000066	0.000066	0.000066	0.000066	0.000068	0.000068	0.000068	0.000068	0.000069	0.000069	0.000069	0.000069
Sodium, dissolved	2.0	n.g.	n.g.	45	46.0	19.9	85.4	111.8	68	349.4	315.0	360.3	723.3	53.5	54.4	420.0	420.0	150.0	150.0	1100.0	1100.0	1200.0	1200.0	1200.0	1200.0	52.7	52.7	336.3	336.3	50.4	50.4	333.9	333.9
Tin, dissolved	0.00050	n.g.	n.g.	36	0.00102	0.00050	0.00050	0.00490	51	0.00061	0.00050	0.00050	0.00053	0.02089	0.01974	0.00880	0.00880	0.00460	0.00460	0.02700	0.02700	0.02300	0.02300	0.02300	0.02300	0.00127	0.00127	0.00127	0.00127	0.00123	0.00123	0.00123	0.00123
Uranium, dissolved	0.00020	MAC, U-tot	0.02	45	0.00169	0.00114	0.00228	0.00322	69	0.02268	0.00040	0.00094	0.00711	0.00430	0.00340	0.00260	0.00260	0.00150	0.00160	0.00850	0.00860	0.00680	0.00670	0.00680	0.00670	0.00134	0.00134	0.00063	0.00063	0.00133	0.00133	0.00062	0.00062
Vanadium, dissolved	0.0010	n.g.	n.g.	45	0.0027	0.0010	0.0022	0.0050	69	0.0039	0.0005	0.0010	0.0300	0.0081	0.0072	0.0068	0.0068	0.0032	0.0032	0.0200	0.0200	0.0180	0.0180	0.0180	0.0180	0.0015	0.0015	0.0011	0.0011	0.0015	0.0015	0.0011	0.0011
Zinc, dissolved	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	45	0.0110	0.0050	0.0050	0.0123	69	0.0067	0.0050	0.0050	0.0115	0.0233	0.0219	0.0059	0.0059	0.0045	0.0045	0.0220	0.0220	0.0140	0.0140	0.0140	0.0140	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054

Note
MAC, maximum allowable concentration
AO, aesthetic objective
diss, dissolved
tot. total

Estimation groundwater quality downgradient of the Project and along pathways towards private wells - Base Case

Calculation concentration of the groundwater flowing into the Telkwa River Valley:

Three private domestic wells (Goalder, Mapletoft, Baker) are shown to be within the potential paths of mine affected groundwater (i.e., based on particle paths predictions for post-closure conditions). These wells are located in the Telkwa River valley, and pumping groundwater from the fluvial aquifer at a relatively shallow depth (15 to 30m deep). To evaluate the potential maximum effects from the Project to the groundwater quality of the fluvial aquifer, it is assumed:

* The mine affected groundwater reached final discharge locations (i.e., post-closure, pseudo -steady state conditions);

* The groundwater pumped by the three private domestic wells corresponds exclusively to the groundwater coming from southern side of the Telkwa River valley, and discharging upstream of WQ509. The groundwater contributions from the northern side of the Telkwa River, and from the fluvial aquifer upstream of the project influence are not accounted;

* The mass of constituents in groundwater is conserved (i.e., transport of mine affected groundwater by advection only, no diffusion or dispersion, and conservation of mass, no natural attenuation).

(1) **[Qw x Cw] = [Qb x Cb] + [Qm x Cm]**
(2) **[Qm x Cm] = [Q1 x C1] + ... + [Qi x Ci]**

For a unit volume Qw = 1, Cw can be expressed using the estimated percentage contributions relative to each sources predicted by the groundwater model (i.e., particle path analyses):

(3) **Cw = Pb x Cb + + (Pm x P1) x C1 ... + (Pm x Pi) x Ci**

Qw, groundwater flow into the Telkwa River valley.
Cw, concentration of the groundwater into the Telkwa River valley.
Qb, flow contribution from background groundwater.
Cb, concentration of background groundwater (baseline).
Pb, percentage contribution of background groundwater into the Telkwa River valley.
Qm, flow contribution from mine affected groundwater.
Cm, concentration of mine affected groundwater.
Pm, percentage contribution of mine affected groundwater into the Telkwa River valley.
Qi, flow contribution from mine feature i.
Ci,, concentration of from mine feature i (source terms).
Pi,, percentage contribution of from mine feature i to total mine affected groundwater

Model: 08-05zb-lc (PostClosure) - Base Case

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP	TCP	PL 909	SWR 901
			%	%	%	%	%	%
WQS09	97.4%	2.6%	10.0%	7.2%	81.5%	na	na	1.3%
WQS09 (TCL 25y)	97.3%	2.7%	9.9%	7.2%	80.8%	0.9%	na	1.3%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

Parameter	Detection Limit [mg/L]	BC WQG DWS Guideline		Groundwater background (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)										Base Case Source Terms Sources: Control Pond = Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm NMP, EMP, WMP, PIt = Results_MPSeepage_WaterQuality_EAModel_rev07_20220209.xlsm										Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: Posz-closure (25 years pulse from control pond already discharged)				Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: 1st 25 years of Post-closure period (incl. seepage from control pond)			
		Screening parameter	Value (mg/L)	Overburden Water Quality (mg/L)					Bedrock Water Quality (mg/L)					Control Pond		NMP		EMP		WMP		Pit lake 909masl		Saturated WR 901masl		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50	
				Count	Avg.	P50	P75	P95	Count	Avg.	P50	P75	P95	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter
Chloride	0.50	AO, Cl	250	48	1.52	0.52	2.50	3.31	69	4.16	2.50	5.00	10.00	0.68	0.75	8.00	8.00	2.70	2.70	20.00	20.00	22.00	22.00	22.00	22.00	0.97	0.97	2.90	2.90	0.97	0.97	2.90	2.90
Fluoride	0.020	MAC, F	1.5	41	0.171	0.132	0.196	0.345	61	1.682	1.460	2.160	5.120	0.035	0.053	0.069	0.069	0.004	0.004	0.083	0.082	0.170	0.170	0.170	0.170	0.131	0.131	1.424	1.424	0.131	0.131	1.423	1.423
Nitrate	0.0050	MAC, nitrate-N	10	41	0.0399	0.0050	0.0235	0.1650	58	0.0705	0.0250	0.0423	0.1640	2.5000	3.5000	0.1900	0.1900	0.4200	0.4300	2.6000	2.6000	0.0210	0.0220	0.0210	0.0220	0.0621	0.0621	0.0815	0.0816	0.0627	0.0629	0.0821	0.0824
Nitrite	0.0010	MAC, nitrite-N	1.0	41	0.0016	0.0010	0.0013	0.0050	58	0.0072	0.0050	0.0050	0.0200	0.0590	0.0820	0.0049	0.0050	0.0097	0.0098	0.0600	0.0600	0.0018	0.0019	0.0018	0.0019	0.0023	0.0023	0.0062	0.0062	0.0023	0.0023	0.0062	0.0062
Orthophosphate, dissolved	0.001	n.g.	n.g.	28	0.227	0.019	0.506	0.851	43	0.014	0.002	0.022	0.060	0.000	0.000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.018	0.018	0.002	0.002	0.018	0.018	0.002	0.002
Sulfate	0.50	AO, SO4	500	48	18.38	11.35	26.05	41.87	69	23.59	6.00	51.30	74.88	20.00	21.00	180.00	190.00	76.00	77.00	520.00	520.00	510.00	500.00	510.00	500.00	23.02	23.04	17.81	17.83	23.02	23.04	17.81	17.84
Aluminum, dissolved	0.0050	MAC Al-tot	9.5	45	0.0312	0.0050	0.0064	0.0339	69	0.0334	0.0086	0.0149	0.1000	0.0710	0.0720	0.0091	0.0092	0.0270	0.0270	0.0460	0.0460	0.0069	0.0069	0.0069	0.0069	0.0059	0.0059	0.0094	0.0094	0.0060	0.0060	0.0095	0.0095
Antimony, dissolved	0.00050	MAC Sb-tot	0.006	38	0.00052	0.00050	0.00050	0.00053	61	0.02179	0.00050	0.00050	0.00097	0.00720	0.00880	0.00008	0.00008	0.00001	0.00001	0.00010	0.00010	0.00018	0.00019	0.00018	0.00019	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Arsenic, dissolved	0.00050	MAC, As-tot	0.01	45	0.00337	0.00070	0.00678	0.01104	69	0.00106	0.00060	0.00107	0.00196	0.00680	0.00830	0.00035	0.00035	0.00015	0.00016	0.00082	0.00082	0.00081	0.00082	0.00081	0.00082	0.00070	0.00070	0.00060	0.00060	0.00070	0.00070	0.00060	0.00061
Barium, dissolved	0.020	n.g.	n.g.	45	0.125	0.093	0.137	0.248	69	0.850	0.330	0.893	3.626	0.037	0.043	0.029	0.029	0.011	0.011	0.049	0.049	0.059	0.061	0.059	0.061	0.091	0.091	0.322	0.322	0.091	0.091	0.322	0.322
Beryllium, dissolved	0.0010	n.g.	n.g.	45	0.0003	0.0001	0.0001	0.0002	69	0.0008	0.0001	0.0002	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Boron, dissolved	0.10	MAC, B-tot	5.0	45	0.08	0.10	0.10	0.10	69	0.19	0.16	0.29	0.34	0.28	0.35	0.12	0.12	0.04	0.04	0.30	0.30	0.33	0.33	0.33	0.33	0.10	0.10	0.16	0.16	0.10	0.10	0.16	0.16
Cadmium, dissolved	0.000010	MAC, Cd-tot	0.005	45	0.000122	0.000021	0.000090	0.000269	69	0.000216	0.000012	0.000050	0.001600	0.000260	0.000280	0.000049	0.000049	0.000055	0.000056	0.000240	0.000240	0.000100	0.000100	0.000100	0.000100	0.000026	0.000026	0.000017	0.000017	0.000026	0.000026	0.000017	0.000017
Calcium, dissolved	0.10	n.g.	n.g.	46	50.78	50.15	73.33	85.90	68	15.74	14.10	23.60	35.17	39.00	46.00	7.80	7.80	3.40	3.50	13.00	13.00	16.00	16.00	16.00	16.00	49.14	49.14	14.04	14.04	49.14	49.14	14.05	14.05
Chromium, dissolved	0.0010	MAC, Cr-tot	0.05	45	0.0015	0.0010	0.0010	0.0010	69	0.0011	0.0010	0.0010	0.0020	0.0008	0.0010	0.0012	0.0012	0.0004	0.0004	0.0029	0.0029	0.0032	0.0032	0.0032	0.0032	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010	0.0010
Cobalt, dissolved	0.00030	MAC, Co-tot	0.001	45	0.00088	0.00030	0.00050	0.00410	69	0.00057	0.00030	0.00050	0.00260	0.01200	0.01500	0.00040	0.00040	0.00024	0.00025	0.00140	0.00140	0.00094	0.00094	0.00094	0.00094	0.00032	0.00032	0.00032	0.00032	0.00033	0.00033	0.00033	0.00033
Copper, dissolved	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	45	0.0016	0.0010	0.0015	0.0050	69	0.0019	0.0010	0.0010	0.0039	0.0024	0.0028	0.0015	0.0015	0.0006	0.0006	0.0038	0.0038	0.0040	0.0040	0.0040	0.0040	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Iron, dissolved	0.030	AO, Fe-tot	0.30	45	0.043	0.030	0.050	0.099	69	0.203	0.065	0.379	0.589	0.033	0.035	0.011	0.011	0.013	0.013	0.039	0.040	0.019	0.019	0.019	0.019	0.030	0.030	0.064	0.064	0.030	0.030	0.064	0.064
Lead, dissolved	0.00050	MAC, Pb-tot	0.005	45	0.00203	0.00050	0.00050	0.00090	69	0.00137	0.00050	0.00050	0.00100	0.00039	0.00045	0.00018	0.00018	0.00008	0.00008	0.00049	0.00049	0.00046	0.00046	0.00046	0.00046	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Lithium, dissolved	0.0050	n.g.	n.g.	45	0.0048	0.0028	0.0042	0.0067	66	0.0536	0.0500	0.0770	0.1035	0.1400	0.1700	0.0750	0.0750	0.0270	0.0270	0.1900	0.1900	0.2100	0.2100	0.2100	0.2100	0.0071	0.0071	0.0531	0.0531	0.0072	0.0072	0.0531	0.0531
Magnesium, dissolved	0.10	n.g.	n.g.	46	20.75	13.80	25.10	51.20	68	2.99	1.92	6.00	8.58	69.00	85.00	5.90	5.90	2.30	2.30	14.00	14.00	15.00	15.00	15.00	15.00	13.76	13.76	2.19	2.19	13.78	13.78	2.21	2.21
Manganese, dissolved	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	45	0.13352	0.05210	0.14200	0.57100	69	0.06061	0.01680	0.03700	0.25400	0.01400	0.01600	0.01800	0.01800	0.01100	0.01200	0.07500	0.07500	0.04500	0.04500	0.04500	0.04500	0.05242	0.05242	0.01805	0.01805	0.05241	0.05241	0.01805	0.01805
Mercury, dissolved	0.000010	MAC, Hg-tot	0.001	45	0.001131	0.000005	0.000005	0.000170	69	0.002928	0.000005	0.000050	0.030080	0.000180	0.000190	0.000032	0.000033	0.000043	0.000044	0.000170	0.000180	0.000061	0.000061	0.000061	0.000061	0.000009	0.000009	0.000009	0.000009	0.000009	0.000009	0.000009	0.000009
Molybdenum, dissolved	0.0010	MAC, Mo-tot	0.088	45	0.0053	0.0010	0.0112	0.0150	69	0.0044	0.0010	0.0076	0.0148	0.0220	0.0270	0.0023	0.0023	0.0011	0.0011	0.0052	0.0052	0.0056	0.0055	0.0056	0.0055	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Nickel, dissolved	0.0010	MAC, Ni-tot	0.08	45	0.0026	0.0010	0.0010	0.0163	69	0.0021	0.0010	0.0025	0.0050	0.0190	0.0240	0.0016	0.0016	0.0008	0.0008	0.0053	0.0053	0.0042	0.0041	0.0042	0.0041	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
Potassium, dissolved	2.0	n.g.	n.g.	45	1.8	2.0	2.0	2.0	68	2.2	2.0	2.3	3.5	12.0	15.0	8.4	8.5	2.8	2.8	21.0	21.0	24.0	23.0	24.0	23.0	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Selenium, dissolved	0.00010	MAC, Se-tot	0.01	45	0.00032	0.00020	0.00050	0.00096	69	0.00026	0.00014	0.00021	0.00100	0.01600	0.01900	0.00340	0.00340	0.00120	0.00130	0.00880	0.00880	0.00930	0.00920	0.00930	0.00920	0.00040	0.00040	0.00034	0.00034	0.00040	0.00040	0.00034	0.00034
Silver, dissolved	0.000020	n.g.	n.g.	45	0.000098	0.000020	0.000020	0.000260	68	0.059061	0.000020	0.000050	0.000100	0.000150	0.000160	0.000024	0.000024	0.000040	0.000040	0.000150	0.000150	0.000037	0.000037	0.000037	0.000037	0.000023	0.000023	0.000023	0.000023	0.000023	0.000023	0.000023	0.000023
Sodium, dissolved	2.0	n.g.	n.g.	45	46.0	19.9	85.4	111.8	68	349.4	315.0	360.3	723.3	11.0	17.0	220.0	220.0	67.0	68.0	540.0	540.0	620.0	620.0	620.0	620.0	31.9	31.9	319.2	319.2	31.9	31.9	319.1	319.1
Tin, dissolved	0.00050	n.g.	n.g.	36	0.00102	0.00050	0.00050	0.00490	51	0.00061	0.00050	0.00050	0.00053	0.01100	0.01400	0.00430	0.00430	0.00170	0.00170	0.01200	0.01200	0.01200	0.01200	0.01200	0.01200	0.00076	0.00076	0.00076	0.00076	0.00077	0.00077	0.00077	0.00077
Uranium, dissolved	0.00020	MAC, U-tot	0.02	45	0.00169	0.00114	0.00228	0.00322	69	0.02268	0.00040	0.00094	0.00711	0.00380	0.00460	0.00130	0.00130	0.00046	0.00047	0.00330	0.00330	0.00350	0.00350	0.00350	0.00350	0.00119	0.00119	0.00047	0.00047	0.00119	0.00119	0.00047	0.00047
Vanadium, dissolved	0.0010	n.g.	n.g.	45	0.0027	0.0010	0.0022	0.0050	69	0.0039	0.0005	0.0010	0.0300	0.0010	0.0012	0.0034	0.0034	0.0012	0.0012	0.0087	0.0087	0.0094	0.0094	0.0094	0.0094	0.0012	0.0012	0.0007	0.0007	0.0012	0.0012	0.0007	0.0007
Zinc, dissolved	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	45	0.0110	0.0050	0.0050	0.0123	69	0.0067	0.0050	0.0050	0.0115	0.0040	0.0048	0.0031	0.0031	0.0013	0.0014	0.0084	0.0085	0.0079	0.0079	0.0079	0.0079	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051

Note
MAC, maximum allowable concentration
AO, aesthetic objective
diss, dissolved
tot. total

Estimation groundwater quality downgradient of the Project and along pathways towards private wells - High Case

Calculation concentration of the groundwater flowing into the Telkwa River Valley:

Three private domestic wells (Goalder, Mapletoft, Baker) are shown to be within the potential paths of mine affected groundwater (i.e., based on particle paths predictions for post-closure conditions). These wells are located in the Telkwa River valley, and pumping groundwater from the fluvial aquifer at a relatively shallow depth (15 to 30m deep). To evaluate the potential maximum effects from the Project to the groundwater quality of the fluvial aquifer, it is assumed:

* The mine affected groundwater reached final discharge locations (i.e., post-closure, pseudo -steady state conditions);

* The groundwater pumped by the three private domestic wells corresponds exclusively to the groundwater coming from southern side of the Telkwa River valley, and discharging upstream of WQS09. The groundwater contributions from the northern side of the Telkwa River, and from the fluvial aquifer upstream of the project influence are not accounted;

* The mass of constituents in groundwater is conserved (i.e., transport of mine affected groundwater by advection only, no diffusion or dispersion, and conservation of mass, no natural attenuation).

(1) **[Qw x Cw] = [Qb x Cb] + [Qm x Cm]**
(2) **[Qm x Cm] = [Q1 x C1] + ... + [Qi x Ci]**

For a unit volume Qw = 1, Cw can be expressed using the estimated percentage contributions relative to each sources predicted by the groundwater model (i.e., particle path analyses):

(3) **Cw = Pb x Cb + + (Pm x P1) x C1 ... + (Pm x Pi) x Ci**

Qw, groundwater flow into the Telkwa River valley.
Cw, concentration of the groundwater into the Telkwa River valley.
Qb, flow contribution from background groundwater.
Cb, concentration of background groundwater (baseline).
Pb, percentage contribution of background groundwater into the Telkwa River valley.
Qm, flow contribution from mine affected groundwater.
Cm, concentration of mine affected groundwater.
Pm, percentage contribution of mine affected groundwater into the Telkwa River valley.
Qi, flow contribution from mine feature i.
C_i,, concentration of from mine feature i (source terms).
P_i,, percentage contribution of from mine feature i to total mine affected groundwater

Model: 08-05zb-hc (PostClosure) - High Case

ID	% Baseflow Bckgrnd	% Baseflow Mine	Detailed distribution of mine affected baseflow					
			NMP	EMP	WMP	TCP	PL 909	SWR 901
			%	%	%	%	%	%
WQS09	96.8%	3.2%	8.2%	5.8%	67.4%	na	5.1%	13.5%
WQS09 (TCL 25y)	96.7%	3.3%	8.2%	5.7%	66.9%	0.7%	5.1%	13.4%

Note: Modelled WQS09 GW'shed corresponds only to the southern contribution from the valley.

Parameter	Detection Limit [mg/L]	BC WQG DWS Guideline		Groundwater background (Source: GWQuality_Summary_Stats_rev08_smh.xlsx)										High Case Source Terms Sources: Control Pond = Results_MPSeepage_WaterQuality_EAModel_rev06_07072021.xlsm NMP, EMP, WMP, Pit = Results_MPSeepage_WaterQuality_EAModel_rev07_20220209.xlsm										High Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: Posz-closure (25 years pulse from control pond already discharged)				Base Case Long-term groundwater concentrations downgradient of Project, along groundwater pathways to private wells: 1st 25 years of Post-closure period (incl. seepage from control pond)			
		Screening parameter	Value (mg/L)	Overburden Water Quality (mg/L)					Bedrock Water Quality (mg/L)					Control Pond		NMP		EMP		WMP		Pit lake 909masl		Saturated WR 901masl		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50		Backgroun GWQ: overburden P50		Backgroun GWQ: bedrock P50	
				Count	Avg.	P50	P75	P95	Count	Avg.	P50	P75	P95	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter	Average Summer	Average Winter
Chloride	0.50	AO, Cl	250	48	1.52	0.52	2.50	3.31	69	4.16	2.50	5.00	10.00	29.02	28.34	16.00	16.00	6.10	6.20	42.00	42.00	43.00	42.00	43.00	42.00	1.73	1.72	3.65	3.64	1.67	1.66	3.58	3.58
Fluoride	0.020	MAC, F	1.5	41	0.171	0.132	0.196	0.345	61	1.682	1.460	2.160	5.120	0.049	0.085	0.069	0.069	0.004	0.004	0.083	0.082	0.170	0.170	0.170	0.170	0.131	0.131	1.416	1.416	0.130	0.130	1.415	1.415
Nitrate	0.0050	MAC, nitrate-N	10	41	0.0399	0.0050	0.0235	0.1650	58	0.0705	0.0250	0.0423	0.1640	1.8826	3.2811	0.1900	0.1900	0.4200	0.4300	2.6000	2.6000	0.0210	0.0220	0.0210	0.0220	0.0628	0.0628	0.0822	0.0822	0.0632	0.0636	0.0826	0.0829
Nitrite	0.0010	MAC, nitrite-N	1.0	41	0.0016	0.0010	0.0013	0.0050	58	0.0072	0.0050	0.0050	0.0200	0.0434	0.0759	0.0049	0.0050	0.0097	0.0098	0.0600	0.0600	0.0018	0.0019	0.0018	0.0019	0.0023	0.0023	0.0062	0.0062	0.0023	0.0023	0.0062	0.0062
Orthophosphate, dissolved	0.001	n.g.	n.g.	28	0.227	0.019	0.506	0.851	43	0.014	0.002	0.022	0.060	0.000	0.000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.018	0.018	0.002	0.002	0.018	0.018	0.002	0.002
Sulfate	0.50	AO, SO4	500	48	18.38	11.35	26.05	41.87	69	23.59	6.00	51.30	74.88	664.31	632.36	380.00	380.00	200.00	200.00	1200.00	1200.00	1000.00	990.00	1000.00	990.00	44.48	44.42	39.31	39.25	42.99	42.94	37.81	37.76
Aluminum, dissolved	0.0050	MAC Al-tot	9.5	45	0.0312	0.0050	0.0064	0.0339	69	0.0334	0.0086	0.0149	0.1000	0.1692	0.1175	0.0150	0.0150	0.0510	0.0520	0.0860	0.0870	0.0073	0.0073	0.0073	0.0073	0.0069	0.0069	0.0104	0.0104	0.0069	0.0069	0.0104	0.0104
Antimony, dissolved	0.00050	MAC Sb-tot	0.006	38	0.00052	0.00050	0.00050	0.00053	61	0.02179	0.00050	0.00050	0.00097	0.01381	0.01307	0.00008	0.00008	0.00001	0.00001	0.00010	0.00010	0.00018	0.00019	0.00018	0.00019	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049	0.00049
Arsenic, dissolved	0.00050	MAC, As-tot	0.01	45	0.00337	0.00070	0.00678	0.01104	69	0.00106	0.00060	0.00107	0.00196	0.01319	0.01249	0.00071	0.00071	0.00083	0.00084	0.00330	0.00330	0.00130	0.00130	0.00130	0.00130	0.00076	0.00076	0.00066	0.00066	0.00076	0.00076	0.00066	0.00066
Barium, dissolved	0.020	n.g.	n.g.	45	0.125	0.093	0.137	0.248	69	0.850	0.330	0.893	3.626	0.056	0.062	0.031	0.031	0.015	0.015	0.061	0.061	0.059	0.060	0.059	0.060	0.091	0.091	0.321	0.321	0.091	0.091	0.321	0.321
Beryllium, dissolved	0.0010	n.g.	n.g.	45	0.0003	0.0001	0.0001	0.0002	69	0.0008	0.0001	0.0002	0.0050	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Boron, dissolved	0.10	MAC, B-tot	5.0	45	0.08	0.10	0.10	0.10	69	0.19	0.16	0.29	0.34	0.48	0.47	0.23	0.23	0.10	0.10	0.64	0.64	0.62	0.61	0.62	0.61	0.12	0.12	0.17	0.17	0.11	0.11	0.17	0.17
Cadmium, dissolved	0.000010	MAC, Cd-tot	0.005	45	0.000122	0.000021	0.000090	0.000269	69	0.000216	0.000012	0.000050	0.001600	0.001817	0.001335	0.000250	0.000250	0.000660	0.000660	0.002300	0.002300	0.000190	0.000190	0.000190	0.000190	0.000074	0.000074	0.000065	0.000065	0.000074	0.000074	0.000065	0.000065
Calcium, dissolved	0.10	n.g.	n.g.	46	50.78	50.15	73.33	85.90	68	15.74	14.10	23.60	35.17	61.02	60.69	7.80	7.80	4.40	4.40	16.00	16.00	15.00	15.00	15.00	15.00	49.00	49.00	14.11	14.11	48.98	48.98	14.10	14.10
Chromium, dissolved	0.0010	MAC, Cr-tot	0.05	45	0.0015	0.0010	0.0010	0.0010	69	0.0011	0.0010	0.0010	0.0020	0.0042	0.0033	0.0023	0.0024	0.0014	0.0014	0.0077	0.0077	0.0059	0.0059	0.0059	0.0059	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012
Cobalt, dissolved	0.00030	MAC, Co-tot	0.001	45	0.00088	0.00030	0.00050	0.00410	69	0.00057	0.00030	0.00050	0.00260	0.02194	0.02099	0.00097	0.00098	0.00130	0.00130	0.00540	0.00540	0.00170	0.00170	0.00170	0.00170	0.00042	0.00042	0.00042	0.00042	0.00043	0.00043	0.00043	0.00043
Copper, dissolved	0.0010	MAC/AO, Cu-tot	2.0 / 1.0	45	0.0016	0.0010	0.0015	0.0050	69	0.0019	0.0010	0.0010	0.0039	0.0031	0.0030	0.0029	0.0029	0.0018	0.0019	0.0095	0.0095	0.0073	0.0072	0.0073	0.0072	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012
Iron, dissolved	0.030	AO, Fe-tot	0.30	45	0.043	0.030	0.050	0.099	69	0.203	0.065	0.379	0.589	0.071	0.056	0.014	0.014	0.024	0.025	0.067	0.068	0.019	0.019	0.019	0.019	0.031	0.031	0.065	0.065	0.031	0.031	0.065	0.065
Lead, dissolved	0.00050	MAC, Pb-tot	0.005	45	0.00203	0.00050	0.00050	0.00090	69	0.00137	0.00050	0.00050	0.00100	0.00121	0.00094	0.00037	0.00038	0.00042	0.00043	0.00180	0.00180	0.00074	0.00075	0.00074	0.00075	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053	0.00053
Lithium, dissolved	0.0050	n.g.	n.g.	45	0.0048	0.0028	0.0042	0.0067	66	0.0536	0.0500	0.0770	0.1035	0.2405	0.2338	0.1500	0.1500	0.0640	0.0640	0.4200	0.4200	0.4000	0.4000	0.4000	0.4000	0.0148	0.0148	0.0604	0.0604	0.0142	0.0142	0.0598	0.0598
Magnesium, dissolved	0.10	n.g.	n.g.	46	20.75	13.80	25.10	51.20	68	2.99	1.92	6.00	8.58	117.84	115.75	12.00	12.00	9.40	9.50	44.00	44.00	27.00	27.00	27.00	27.00	14.52	14.52	3.02	3.02	14.50	14.50	3.00	3.00
Manganese, dissolved	0.00030	MAC/AO, Mn-tot	0.12 / 0.02	45	0.13352	0.05210	0.14200	0.57100	69	0.06061	0.01680	0.03700	0.25400	0.06990	0.05394	0.03700	0.03700	0.04100	0.04100	0.20000	0.21000	0.08100	0.08100	0.08100	0.08100	0.05543	0.05565	0.02127	0.02149	0.05530	0.05552	0.02115	0.02136
Mercury, dissolved	0.000010	MAC, Hg-tot	0.001	45	0.001131	0.000005	0.000005	0.000170	69	0.002928	0.000005	0.000050	0.030080	0.003018	0.002150	0.000210	0.000210	0.000600	0.000610	0.002100	0.002100	0.000120	0.000120	0.000120	0.000120	0.000053	0.000053	0.000053	0.000053	0.000053	0.000053	0.000053	0.000053
Molybdenum, dissolved	0.0010	MAC, Mo-tot	0.088	45	0.0053	0.0010	0.0112	0.0150	69	0.0044	0.0010	0.0076	0.0148	0.0371	0.0365	0.0040	0.0041	0.0023	0.0023	0.0110	0.0110	0.0097	0.0096	0.0097	0.0096	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
Nickel, dissolved	0.0010	MAC, Ni-tot	0.08	45	0.0026	0.0010	0.0010	0.0163	69	0.0021	0.0010	0.0025	0.0050	0.0341	0.0329	0.0034	0.0034	0.0030	0.0030	0.0150	0.0150	0.0078	0.0078	0.0078	0.0078	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
Potassium, dissolved	2.0	n.g.	n.g.	45	1.8	2.0	2.0	2.0	68	2.2	2.0	2.3	3.5	20.4	20.1	17.0	17.0	6.6	6.6	45.0	46.0	46.0	46.0	46.0	46.0	3.2	3.3	3.2	3.3	3.2	3.2	3.2	3.2
Selenium, dissolved	0.00010	MAC, Se-tot	0.01	45	0.00032	0.00020	0.00050	0.00096	69	0.00026	0.00014	0.00021	0.00100	0.02758	0.02660	0.00690	0.00690	0.00340	0.00350	0.02100	0.02100	0.01800	0.01800	0.01800	0.01800	0.00078	0.00078	0.00072	0.00072	0.00076	0.00076	0.00070	0.00070
Silver, dissolved	0.000020	n.g.	n.g.	45	0.000098	0.000020	0.000020	0.000260	68	0.059061	0.000020	0.000050	0.000100	0.002976	0.002110	0.000190	0.000200	0.000600	0.000600	0.002000	0.002000	0.000066	0.000066	0.000066	0.000066	0.000065	0.000065	0.000065	0.000065	0.000065	0.000065	0.000065	0.000065
Sodium, dissolved	2.0	n.g.	n.g.	45	46.0	19.9	85.4	111.8	68	349.4	315.0	360.3	723.3	53.5	54.4	420.0	420.0	150.0	150.0	1100.0	1100.0	1200.0	1200.0	1200.0	1200.0	51.8	51.8	337.4	337.4	49.8	49.8	335.3	335.3
Tin, dissolved	0.00050	n.g.	n.g.	36	0.00102	0.00050	0.00050	0.00490	51	0.00061	0.00050	0.00050	0.00053	0.02089	0.01974	0.00880	0.00880	0.00460	0.00460	0.02700	0.02700	0.02300	0.02300	0.02300	0.02300	0.00124	0.00124	0.00124	0.00124	0.00121	0.00121	0.00121	0.00121
Uranium, dissolved	0.00020	MAC, U-tot	0.02	45	0.00169	0.00114	0.00228	0.00322	69	0.02268	0.00040	0.00094	0.00711	0.00430	0.00340	0.00260	0.00260	0.00150	0.00160	0.00850	0.00860	0.00680	0.00670	0.00680	0.00670	0.00134	0.00134	0.00062	0.00062	0.00133	0.00133	0.00061	0.00061
Vanadium, dissolved	0.0010	n.g.	n.g.	45	0.0027	0.0010	0.0022	0.0050	69	0.0039	0.0005	0.0010	0.0300	0.0081	0.0072	0.0068	0.0068	0.0032	0.0032	0.0200	0.0200	0.0180	0.0180	0.0180	0.0180	0.0015	0.0015	0.0011	0.0011	0.0015	0.0015	0.0011	0.0011
Zinc, dissolved	0.0050	MAC/AO, Zn-tot	3.0 / 5.0	45	0.0110	0.0050	0.0050	0.0123	69	0.0067	0.0050	0.0050	0.0115	0.0233	0.0219	0.0059	0.0059	0.0045	0.0045	0.0220	0.0220	0.0140	0.0140	0.0140	0.0140	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054	0.0054

Note
MAC, maximum allowable concentration
AO, aesthetic objective
diss, dissolved
tot. total

Appendix E Parameters of Concern for the Updated EAC Project Case (2024)

Table A-3.1 Model Results and WQG Exceedances for Four Creek

Receiving Environment		Four Creek (WQS03_DS)				
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**Max Normal ST**	**P50 Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0092	0.99	0.078	0.0061
Chloride	mg/L	0.25	0.50	150	0.47	0.31
Fluoride	mg/L	0.059	0.068	1.4	0.10	0.068
Nitrate	mg-N/L	0.013	0.058	3.0	0.61	0.028
Nitrite	mg-N/L	0.00050	0.0010	0.020	0.015	0.0017
Sulfate	mg/L	1.9	28	310	33	3.3
Aluminum, total	mg/L	0.099	1.2	0.69	0.26	0.12
Antimony, total	mg/L	0.000050	0.00012	0.074	0.000087	0.000060
Arsenic, total	mg/L	0.00074	0.0011	0.0050	0.0013	0.00083
Barium, total	mg/L	0.071	0.13	1.0	0.16	0.090
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.000086	0.000056
Boron, total	mg/L	0.012	0.020	1.2	0.019	0.013
Cadmium, dissolved	mg/L	0.0000052	0.000012	0.00023	0.000013	0.0000066
Chromium (Cr(VI)), total	mg/L	0.00026	0.0016	0.0010	0.00052	0.00027
Cobalt, total	mg/L	0.000050	0.00047	0.0040	0.00068	0.00014
Copper, dissolved	mg/L	0.0014	0.0034	0.0047	0.0024	0.0015
Iron, total	mg/L	0.095	1.1	1.0	0.24	0.10
Iron, dissolved	mg/L	0.015	0.41	0.35	0.052	0.029
Lead, total	mg/L	0.000025	0.00028	0.0069	0.000065	0.000038
Manganese, total	mg/L	0.0025	0.024	1.1	0.013	0.0032
Mercury, total	mg/L	0.0000025	0.000013	0.000020	0.0000052	0.0000034
Molybdenum, total	mg/L	0.00023	0.00038	0.034	0.0012	0.00028
Nickel, dissolved	mg/L	0.00025	0.0011	0.0047	0.0011	0.00040
Selenium, total	mg/L	0.000025	0.000095	0.0020	0.00081	0.000059
Silver, total	mg/L	0.0000050	0.000022	0.0015	0.0000087	0.0000058
Strontium, dissolved	mg/L	0.16	0.24	2.5	0.32	0.18
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.000020	0.000013
Uranium, total	mg/L	0.000078	0.00025	0.0085	0.00019	0.000099
Zinc, dissolved	mg/L	0.0015	0.0025	0.014	0.0026	0.0012

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20250206_noblast_formitigationmemo.xlsx]COCs selection

Table A-3.2 Model Results and WQG Exceedances for Goathorn Creek

Receiving Environment		Goathorn Creek (WQSEA1)				
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**Max Normal ST**	**P50 Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0070	1.6	0.030	0.0049
Chloride	mg/L	0.25	0.50	150	0.86	0.30
Fluoride	mg/L	0.032	0.041	1.2	0.050	0.035
Nitrate	mg-N/L	0.041	0.076	3.0	0.25	0.052
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.0058	0.0013
Sulfate	mg/L	24	37	220	62	27
Aluminum, total	mg/L	0.092	0.75	0.27	0.19	0.11
Antimony, total	mg/L	0.000073	0.00014	0.074	0.00013	0.000089
Arsenic, total	mg/L	0.00023	0.00068	0.0050	0.00044	0.00031
Barium, total	mg/L	0.058	0.072	1.0	0.076	0.061
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.000060	0.000051
Boron, total	mg/L	0.0050	0.050	1.2	0.029	0.0064
Cadmium, dissolved	mg/L	0.0000081	0.000036	0.00016	0.000016	0.0000099
Chromium (Cr(VI)), total	mg/L	0.00020	0.00091	0.0010	0.00053	0.00024
Cobalt, total	mg/L	0.000050	0.00055	0.0040	0.00039	0.00014
Copper, dissolved	mg/L	0.0014	0.0039	0.0013	0.0021	0.0016
Iron, total	mg/L	0.085	0.78	1.0	0.43	0.13
Iron, dissolved	mg/L	0.015	0.13	0.35	0.025	0.021
Lead, total	mg/L	0.000025	0.00023	0.0053	0.00021	0.000056
Manganese, total	mg/L	0.0059	0.033	0.91	0.012	0.0071
Mercury, total	mg/L	0.0000025	0.0000064	0.000020	0.0000040	0.0000031
Molybdenum, total	mg/L	0.00047	0.00062	0.034	0.0022	0.00067
Nickel, dissolved	mg/L	0.00025	0.00060	0.0022	0.00065	0.00035
Selenium, total	mg/L	0.000086	0.00020	0.0020	0.0015	0.00024
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000012	0.000010
Strontium, dissolved	mg/L	0.077	0.12	2.5	0.14	0.11
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.000014	0.000011
Uranium, total	mg/L	0.000054	0.00014	0.0085	0.00049	0.000087
Zinc, dissolved	mg/L	0.0015	0.0021	0.0074	0.0021	0.0016

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20250206_noblast_formitigationmemo.xlsx]COCs selection

Table A-3.3 Model Results and WQG Exceedances for Tenas Creek

Receiving Environment		Tenas Creek (WQS04)				
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**Max Normal ST**	**P50 Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0074	1.3	0.048	0.0041
Chloride	mg/L	0.25	0.50	150	0.52	0.29
Fluoride	mg/L	0.031	0.045	1.2	0.055	0.035
Nitrate	mg-N/L	0.0050	0.060	3.0	0.37	0.025
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.0090	0.0013
Sulfate	mg/L	2.6	7.4	220	24	3.2
Aluminum, total	mg/L	0.056	1.8	0.35	0.11	0.069
Antimony, total	mg/L	0.00013	0.00024	0.074	0.00022	0.00015
Arsenic, total	mg/L	0.00048	0.00090	0.0050	0.00068	0.00052
Barium, total	mg/L	0.034	0.047	1.0	0.054	0.035
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.000068	0.000052
Boron, total	mg/L	0.015	0.050	1.2	0.028	0.014
Cadmium, dissolved	mg/L	0.0000025	0.0000058	0.00017	0.0000069	0.0000034
Chromium (Cr(VI)), total	mg/L	0.00032	0.0018	0.0010	0.00054	0.00035
Cobalt, total	mg/L	0.000050	0.00099	0.0040	0.00034	0.00012
Copper, dissolved	mg/L	0.0011	0.0030	0.0026	0.0015	0.0011
Iron, total	mg/L	0.048	1.2	1.0	0.068	0.052
Iron, dissolved	mg/L	0.015	0.14	0.35	0.028	0.021
Lead, total	mg/L	0.000025	0.00039	0.0055	0.000070	0.000035
Manganese, total	mg/L	0.0050	0.058	0.94	0.0084	0.0052
Mercury, total	mg/L	0.0000025	0.0000089	0.000020	0.0000041	0.0000031
Molybdenum, total	mg/L	0.00012	0.00019	0.034	0.00084	0.00013
Nickel, dissolved	mg/L	0.00025	0.00054	0.0025	0.00068	0.00035
Selenium, total	mg/L	0.000051	0.00020	0.0020	0.00078	0.000064
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000014	0.000010
Strontium, dissolved	mg/L	0.10	0.14	2.5	0.14	0.11
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.000016	0.000011
Uranium, total	mg/L	0.00011	0.00025	0.0085	0.00034	0.00011
Zinc, dissolved	mg/L	0.0015	0.0015	0.0071	0.0019	0.0016

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20250206_noblast_formitigationmemo.xlsx]COCs selection

Table A-3.4 Model Results and WQG Exceedances for Telkwa River

Receiving Environment		Telkwa River (WQS09)				
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**Max Normal ST**	**P50 Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0095	1.7	0.0064	0.0040
Chloride	mg/L	0.25	0.50	150	0.28	0.26
Fluoride	mg/L	0.029	0.038	0.99	0.034	0.025
Nitrate	mg-N/L	0.013	0.076	3.0	0.052	0.029
Nitrite	mg-N/L	0.00050	0.0050	0.020	0.0014	0.0011
Sulfate	mg/L	5.6	9.0	220	9.5	6.6
Aluminum, total	mg/L	0.17	1.7	0.19	0.39	0.20
Antimony, total	mg/L	0.000050	0.000050	0.074	0.000063	0.000055
Arsenic, total	mg/L	0.00024	0.00055	0.0050	0.00033	0.00027
Barium, total	mg/L	0.040	0.049	1.0	0.045	0.041
Beryllium, total	mg/L	0.000050	0.000050	0.00013	0.000054	0.000050
Boron, total	mg/L	0.0050	0.050	1.2	0.0067	0.0054
Cadmium, dissolved	mg/L	0.0000063	0.0000099	0.00011	0.0000081	0.0000065
Chromium (Cr(VI)), total	mg/L	0.00020	0.0010	0.0010	0.00032	0.00026
Cobalt, total	mg/L	0.000050	0.00088	0.0040	0.00022	0.00015
Copper, dissolved	mg/L	0.00067	0.0017	0.00080	0.00088	0.00074
Iron, total	mg/L	0.31	1.5	1.0	0.42	0.29
Iron, dissolved	mg/L	0.076	0.27	0.35	0.11	0.070
Lead, total	mg/L	0.00014	0.0014	0.0044	0.00041	0.00020
Manganese, total	mg/L	0.020	0.078	0.79	0.025	0.020
Mercury, total	mg/L	0.0000025	0.0000070	0.000020	0.0000033	0.0000030
Molybdenum, total	mg/L	0.00053	0.00073	0.034	0.00069	0.00056
Nickel, dissolved	mg/L	0.00025	0.00025	0.0013	0.00034	0.00031
Selenium, total	mg/L	0.000080	0.00020	0.0020	0.00015	0.000091
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000011	0.000010
Strontium, dissolved	mg/L	0.056	0.091	2.5	0.11	0.051
Thallium, total	mg/L	0.0000050	0.0000050	0.00080	0.000011	0.000010
Uranium, total	mg/L	0.000056	0.000092	0.0085	0.000082	0.000058
Zinc, dissolved	mg/L	0.0015	0.0015	0.0042	0.0016	0.0015

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Table A-3.5 Model Results and WQG Exceedances for the Bulkley River (WQS11)

Receiving Environment		Bulkley River (WQS11)				
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**Max Normal ST**	**P50 Normal ST**
Ammonia, total	mg-N/L	0.0050	0.017	1.6	0.0052	0.0040
Chloride	mg/L	0.25	0.86	150	0.26	0.25
Fluoride	mg/L	0.023	0.035	0.84	0.031	0.024
Nitrate	mg-N/L	0.013	0.041	3.0	0.014	0.013
Nitrite	mg-N/L	0.0020	0.0050	0.020	0.0052	0.0029
Sulfate	mg/L	4.0	5.0	130	4.8	4.2
Aluminum, total	mg/L	0.13	1.3	0.18	0.15	0.14
Antimony, total	mg/L	0.000050	0.00011	0.074	0.000052	0.000050
Arsenic, total	mg/L	0.00024	0.00070	0.0050	0.00031	0.00025
Barium, total	mg/L	0.026	0.038	1.0	0.031	0.030
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.000052	0.000050
Boron, total	mg/L	0.0050	0.010	1.2	0.0052	0.0050
Cadmium, dissolved	mg/L	0.0000025	0.0000065	0.000085	0.0000031	0.0000030
Chromium (Cr(VI)), total	mg/L	0.00025	0.0012	0.0010	0.00031	0.00030
Cobalt, total	mg/L	0.000050	0.00068	0.0040	0.00010	0.00010
Copper, dissolved	mg/L	0.00067	0.0020	0.0011	0.00073	0.00070
Iron, total	mg/L	0.18	1.3	1.0	0.19	0.18
Iron, dissolved	mg/L	0.024	0.16	0.35	0.052	0.034
Lead, total	mg/L	0.000095	0.00051	0.0040	0.00016	0.00011
Manganese, total	mg/L	0.016	0.059	0.73	0.018	0.015
Mercury, total	mg/L	0.0000025	0.0000055	0.000020	0.0000031	0.0000030
Molybdenum, total	mg/L	0.00037	0.00055	0.034	0.00042	0.00040
Nickel, dissolved	mg/L	0.00025	0.0013	0.0013	0.00031	0.00030
Selenium, total	mg/L	0.000025	0.00020	0.0020	0.000031	0.000030
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000010	0.000010
Strontium, dissolved	mg/L	0.040	0.055	2.5	0.0000023	<DL
Thallium, total	mg/L	0.0000050	0.000014	0.00080	0.000010	0.000010
Uranium, total	mg/L	0.000036	0.000094	0.0085	0.000042	0.000040
Zinc, dissolved	mg/L	0.0013	0.0045	0.0039	0.0016	0.0012

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Table A-3.6 Model Results and WQG Exceedances for the Bulkley River (WQS12)

Receiving Environment		Bulkley River (WQS12)				
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**Max Normal ST**	**P50 Normal ST**
Ammonia, total	mg-N/L	0.0050	0.017	1.6	0.0052	0.0040
Chloride	mg/L	0.25	0.86	150	0.28	0.25
Fluoride	mg/L	0.023	0.035	0.84	0.034	0.024
Nitrate	mg-N/L	0.013	0.041	3.0	0.020	0.014
Nitrite	mg-N/L	0.0020	0.0050	0.020	0.0049	0.0026
Sulfate	mg/L	4.0	5.0	130	5.7	4.5
Aluminum, total	mg/L	0.13	1.3	0.18	0.21	0.15
Antimony, total	mg/L	0.000050	0.00011	0.074	0.000057	0.000051
Arsenic, total	mg/L	0.00024	0.00070	0.0050	0.00032	0.00025
Barium, total	mg/L	0.026	0.038	1.0	0.035	0.032
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.000056	0.000050
Boron, total	mg/L	0.0050	0.010	1.2	0.0057	0.0051
Cadmium, dissolved	mg/L	0.0000025	0.0000065	0.000085	0.0000043	0.0000036
Chromium (Cr(VI)), total	mg/L	0.00025	0.0012	0.0010	0.00033	0.00030
Cobalt, total	mg/L	0.000050	0.00068	0.0040	0.00013	0.00011
Copper, dissolved	mg/L	0.00067	0.0020	0.0011	0.00078	0.00071
Iron, total	mg/L	0.18	1.3	1.0	0.25	0.20
Iron, dissolved	mg/L	0.024	0.16	0.35	0.064	0.040
Lead, total	mg/L	0.000095	0.00051	0.0040	0.00022	0.00012
Manganese, total	mg/L	0.016	0.059	0.73	0.020	0.016
Mercury, total	mg/L	0.0000025	0.0000055	0.000020	0.0000034	0.0000030
Molybdenum, total	mg/L	0.00037	0.00055	0.034	0.00048	0.00043
Nickel, dissolved	mg/L	0.00025	0.0013	0.0013	0.00034	0.00030
Selenium, total	mg/L	0.000025	0.00020	0.0020	0.000051	0.000040
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000011	0.000010
Strontium, dissolved	mg/L	0.040	0.055	2.5	0.017	<DL
Thallium, total	mg/L	0.0000050	0.000014	0.00080	0.000011	0.000010
Uranium, total	mg/L	0.000036	0.000094	0.0085	0.000049	0.000043
Zinc, dissolved	mg/L	0.0013	0.0045	0.0039	0.0016	0.0013

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Table A-2.1 TCP surface discharge (operations), NMP surface discharge (closure) - POCs

		TCP surface discharge (operations), NMP surface discharge (closure) - POCs						
		Goathorn creek (WQSEA1)				POCs selection		
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**80% WQG**	**Max TCP discharge - Normal ST**	**Max NMP discharge -Normal ST**	**Exceeds at EA1? - Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0070	1.6	1.3	1.7	0.14	0.030
Chloride	mg/L	0.25	0.50	150	120	6.6	3.1	0.86
Fluoride	mg/L	0.032	0.041	1.2	0.96	0.15	0.031	0.050
Nitrate	mg-N/L	0.041	0.076	3.0	2.4	13	1.0	0.25
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.016	0.30	0.024	0.0058
Sulphate	mg/L	24	37	220	180	420	230	62
Aluminum, total	mg/L	0.092	0.75	0.27	0.22	0.39	0.39	0.19
Antimony, total	mg/L	0.000073	0.00014	0.074	0.059	0.00079	0.00043	0.00013
Arsenic, total	mg/L	0.00023	0.00068	0.0050	0.0040	0.0018	0.00090	0.00044
Barium, total	mg/L	0.058	0.072	1.0	0.80	0.080	0.025	0.076
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0.000061	0.000015	0.000060
Boron, total	mg/L	0.0050	0.050	1.2	0.96	0.13	0.14	0.029
Cadmium, dissolved	mg/L	0.0000081	0.000036	0.00016	0.00013	0.000032	0.0000054	0.000016
Chromium (Cr(VI)), total	mg/L	0.00020	0.00091	0.0010	0.00080	0.0020	0.0013	0.00053
Cobalt, total	mg/L	0.000050	0.00055	0.0040	0.0032	0.0035	0.0013	0.00039
Copper, dissolved	mg/L	0.0014	0.0039	0.0013	0.0010	0.0017	0.0022	0.0021
Iron, total	mg/L	0.085	0.78	1.0	0.80	1.5	1.5	0.43
Iron, dissolved	mg/L	0.015	0.13	0.35	0.28	0.036	0.0080	0.025
Lead, total	mg/L	0.000025	0.00023	0.0053	0.0042	0.0016	0.0010	0.00021
Manganese, total	mg/L	0.0059	0.033	0.91	0.73	0.061	0.030	0.012
Mercury, total	mg/L	0.0000025	0.0000064	0.000020	0.000016	0.0000085	0.0000046	0.0000040
Molybdenum, total	mg/L	0.00047	0.00062	0.034	0.027	0.035	0.0077	0.0022
Nickel, dissolved	mg/L	0.00025	0.0011	0.0022	0.0018	0.0060	0.0023	0.00065
Selenium, total	mg/L	0.000086	0.00020	0.0020	0.0016	0.024	0.0082	0.0015
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000040	0.000027	0.0000084	0.000012
Strontium, dissolved	mg/L	0.076	0.11	2.5	2.0	0.28	0.25	0.14
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.000076	0.000017	0.000014
Uranium, total	mg/L	0.000054	0.00014	0.0085	0.0068	0.0047	0.0025	0.00049
Zinc, dissolved	mg/L	0.0015	0.0021	0.0074	0.0059	0.0098	0.0019	0.0021

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Table A-2.2 MP seepage - POCs

		MP seepage - POCs					
		Four creek (WQS03_DS)				POCs selection	
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**80% WQG**	**Max EMP - Normal ST**	**Exceeds at WQS03_DS? - Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0092	0.99	0.79	0.44	0.078
Chloride	mg/L	0.25	0.50	150	120	1.6	0.47
Fluoride	mg/L	0.059	0.068	1.4	1.1	0.027	0.10
Nitrate	mg-N/L	0.013	0.058	3.0	2.4	3.4	0.61
Nitrite	mg-N/L	0.00050	0.0010	0.020	0.016	0.079	0.015
Sulphate	mg/L	1.9	28	310	250	200	33
Aluminum, total	mg/L	0.099	1.2	0.69	0.55	0.018	0.26
Antimony, total	mg/L	0.000050	0.00012	0.074	0.059	0.00018	0.000087
Arsenic, total	mg/L	0.00074	0.0011	0.0050	0.0040	0.00037	0.0013
Barium, total	mg/L	0.071	0.13	1.0	0.80	0.032	0.16
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0.000027	0.000086
Boron, total	mg/L	0.012	0.020	1.2	0.96	0.032	0.019
Cadmium, dissolved	mg/L	0.0000052	0.000012	0.00023	0.00018	0.000059	0.000013
Chromium (Cr(VI)), total	mg/L	0.00026	0.0016	0.0010	0.00080	0.00023	0.00052
Cobalt, total	mg/L	0.000050	0.00047	0.0040	0.0032	0.0035	0.00068
Copper, dissolved	mg/L	0.0014	0.0034	0.0047	0.0038	0.00098	0.0024
Iron, total	mg/L	0.095	1.1	1.0	0.80	0.080	0.24
Iron, dissolved	mg/L	0.015	0.41	0.35	0.28	0.080	0.052
Lead, total	mg/L	0.000025	0.00028	0.0069	0.0055	0.00027	0.000065
Manganese, total	mg/L	0.0025	0.024	1.1	0.88	0.064	0.013
Mercury, total	mg/L	0.0000025	0.000013	0.000020	0.000016	0.0000030	0.0000052
Molybdenum, total	mg/L	0.00023	0.00038	0.034	0.027	0.0075	0.0012
Nickel, dissolved	mg/L	0.00025	0.0018	0.0047	0.0038	0.0053	0.0011
Selenium, total	mg/L	0.000025	0.000095	0.0020	0.0016	0.0051	0.00081
Silver, total	mg/L	0.0000050	0.000022	0.0015	0.0012	0.000010	0.0000087
Strontium, dissolved	mg/L	0.17	0.24	2.5	2.0	0.17	0.32
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.000074	0.000020
Uranium, total	mg/L	0.000078	0.00025	0.0085	0.0068	0.00096	0.00019
Zinc, dissolved	mg/L	0.0015	0.0025	0.014	0.011	0.0073	0.0026

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Table A-2.3 MP seepage - POCs

		MP seepage - POCs							
		Tenas Creek (WQS04)				POCs selection			
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**80% WQG**	**Max NMP - Normal ST**	**Max WMP - Normal ST**	**Max TCP - Normal ST**	**Exceeds at WQS04? Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0074	1.3	1.0	0.30	0.59	1.7	0.048
Chloride	mg/L	0.25	0.50	150	120	2.3	3.2	6.6	0.52
Fluoride	mg/L	0.031	0.045	1.2	0.96	0.043	0.033	0.15	0.055
Nitrate	mg-N/L	0.0050	0.060	3.0	2.4	2.3	4.6	13	0.37
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.016	0.054	0.11	0.30	0.0090
Sulphate	mg/L	2.6	7.4	220	180	240	250	420	24
Aluminum, total	mg/L	0.056	1.8	0.35	0.28	0.022	0.021	0.018	0.11
Antimony, total	mg/L	0.00013	0.00024	0.074	0.059	0.00033	0.00046	0.00079	0.00022
Arsenic, total	mg/L	0.00048	0.00090	0.0050	0.0040	0.00065	0.00042	0.0013	0.00068
Barium, total	mg/L	0.034	0.047	1.0	0.80	0.059	0.024	0.074	0.054
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0.000058	0.000018	0.000061	0.000068
Boron, total	mg/L	0.015	0.050	1.2	0.96	0.10	0.14	0.13	0.028
Cadmium, dissolved	mg/L	0.0000025	0.0000058	0.00017	0.00014	0.000082	0.000055	0.000032	0.0000069
Chromium (Cr(VI)), total	mg/L	0.00032	0.0018	0.0010	0.00080	0.00035	0.00020	0.00077	0.00054
Cobalt, total	mg/L	0.000050	0.00099	0.0040	0.0032	0.0040	0.0042	0.0028	0.00034
Copper, dissolved	mg/L	0.0011	0.0030	0.0026	0.0021	0.0017	0.0023	0.0017	0.0015
Iron, total	mg/L	0.048	1.2	1.0	0.80	0.11	0.063	0.036	0.068
Iron, dissolved	mg/L	0.015	0.14	0.35	0.28	0.11	0.063	0.036	0.028
Lead, total	mg/L	0.000025	0.00039	0.0055	0.0044	0.00045	0.00060	0.0012	0.000070
Manganese, total	mg/L	0.0050	0.058	0.94	0.75	0.079	0.074	0.036	0.0084
Mercury, total	mg/L	0.0000025	0.0000089	0.000020	0.000016	0.0000046	0.0000023	0.0000054	0.0000041
Molybdenum, total	mg/L	0.00012	0.00019	0.034	0.027	0.0100	0.0084	0.035	0.00084
Nickel, dissolved	mg/L	0.00025	0.0017	0.0025	0.0020	0.0065	0.0056	0.0060	0.00068
Selenium, total	mg/L	0.000051	0.00020	0.0020	0.0016	0.0069	0.0082	0.024	0.00078
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000040	0.000017	0.0000094	0.000027	0.000014
Strontium, dissolved	mg/L	0.11	0.13	2.5	2.0	0.24	0.27	0.28	0.14
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.00010	0.000067	0.000076	0.000016
Uranium, total	mg/L	0.00011	0.00025	0.0085	0.0068	0.0019	0.0026	0.0047	0.00034
Zinc, dissolved	mg/L	0.0015	0.0015	0.0071	0.0057	0.0092	0.0071	0.0098	0.0019

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Table A-2.4 Rail Load Out - POCs

		Rail Load Out - POCs					
		Bulkley River (WQS11)				POCs selection	
Parameter	Units	Baseline P50	Baseline P95	WQG	80% WQG	Max RLO discharge - Normal ST	Exceeds at WQS11? - Normal ST
Ammonia, total	mg-N/L	0.0025	0.0074	1.6	1.3	0	0.0052
Chloride	mg/L	0.25	0.50	150	120	0.080	0.26
Fluoride	mg/L	0.031	0.045	0.84	0.67	0	0.031
Nitrate	mg-N/L	0.0050	0.060	3.0	2.4	0	0.014
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.016	0	0.0052
Sulphate	mg/L	2.6	7.4	130	100	68	4.8
Aluminum, total	mg/L	0.056	1.8	0.18	0.14	0.37	0.15
Antimony, total	mg/L	0.00013	0.00024	0.074	0.059	0.0000054	0.000052
Arsenic, total	mg/L	0.00048	0.00090	0.0050	0.0040	0.00051	0.00031
Barium, total	mg/L	0.034	0.047	1.0	0.80	0.012	0.031
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0	0.000052
Boron, total	mg/L	0.015	0.050	1.2	0.96	0.0083	0.0052
Cadmium, dissolved	mg/L	0.0000025	0.0000058	0.000085	0.000068	0.000091	0.0000031
Chromium (Cr(VI)), total	mg/L	0.00032	0.0018	0.0010	0.00080	0.0012	0.00031
Cobalt, total	mg/L	0.000050	0.00099	0.0040	0.0032	0.0014	0.00010
Copper, dissolved	mg/L	0.0011	0.0030	0.0011	0.00088	0.00023	0.00073
Iron, total	mg/L	0.048	1.2	1.0	0.80	1.5	0.19
Iron, dissolved	mg/L	0.015	0.14	0.35	0.28	0.076	0.052
Lead, total	mg/L	0.000025	0.00039	0.0040	0.0032	0.00044	0.00016
Manganese, total	mg/L	0.0050	0.058	0.73	0.58	0.071	0.018
Mercury, total	mg/L	0.0000025	0.0000089	0.000020	0.000016	0.0000047	0.0000031
Molybdenum, total	mg/L	0.00012	0.00019	0.034	0.027	0.00018	0.00042
Nickel, dissolved	mg/L	0.00025	0.0017	0.0013	0.0010	0.0023	0.00031
Selenium, total	mg/L	0.000051	0.00020	0.0020	0.0016	0.00035	0.000031
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000040	0	0.000010
Strontium, dissolved	mg/L	0.11	0.13	2.5	2.0	0.068	0.0000023
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.00010	0.000010
Uranium, total	mg/L	0.00011	0.00025	0.0085	0.0068	0.000031	0.000042
Zinc, dissolved	mg/L	0.0015	0.0015	0.0039	0.00312	0.0034	0.0016

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Appendix F Stream Water Quality Exceedances for Mitigation Controls

Appendix 6-A

Four Creek water quality exceedances

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Figure 6A-1: Nitrite modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

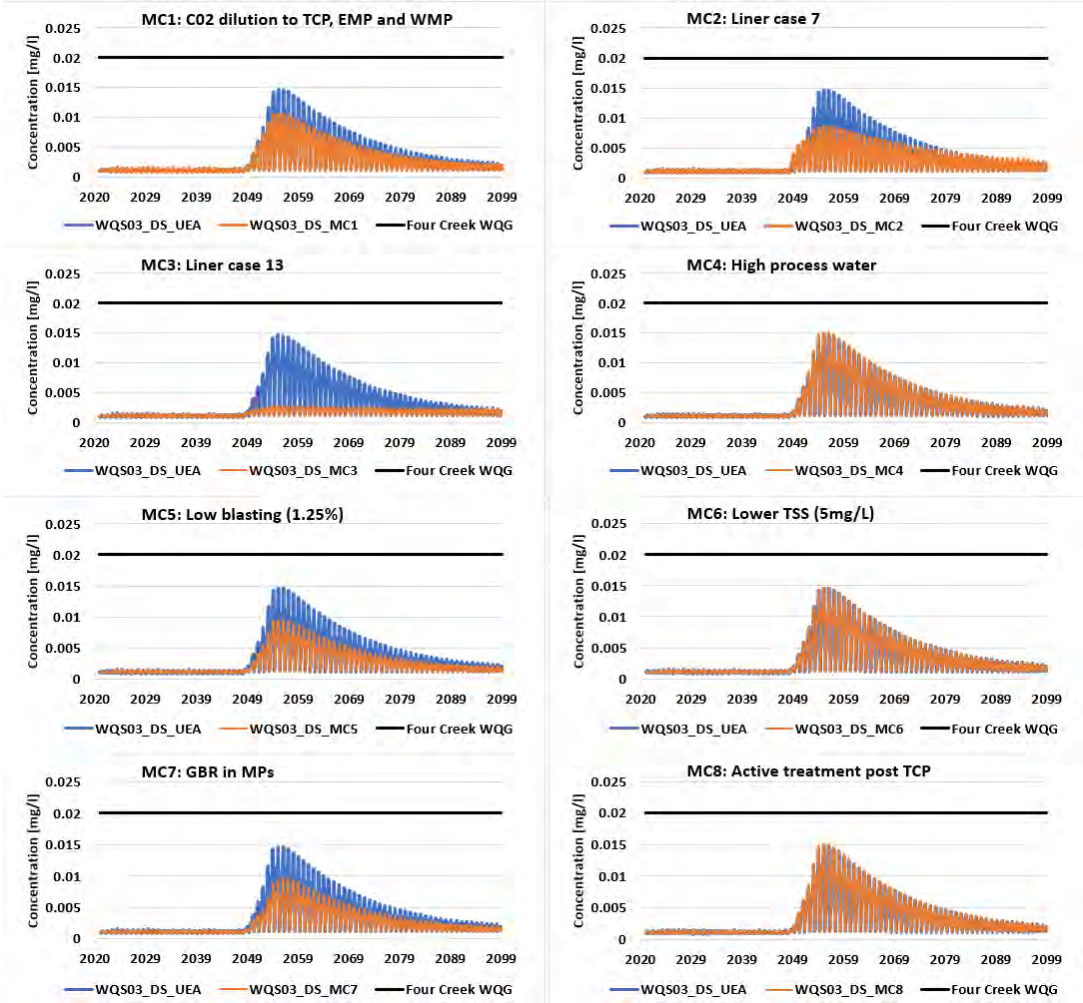

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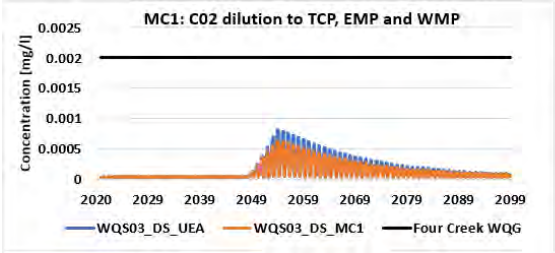
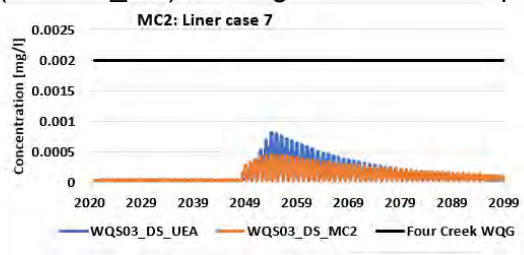
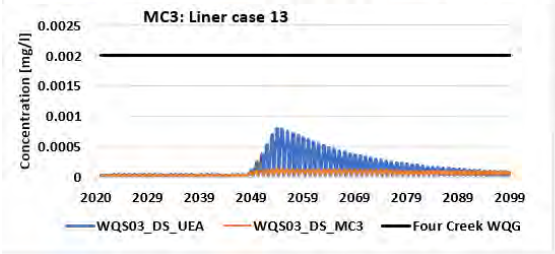
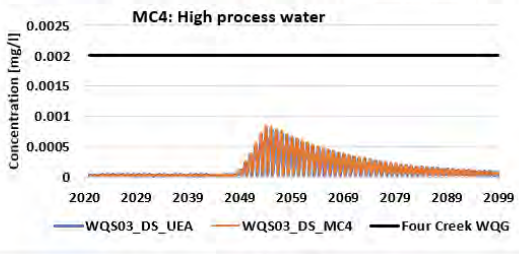
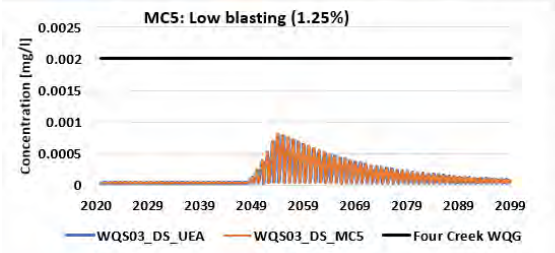
Figure 6A-2: Total Selenium modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

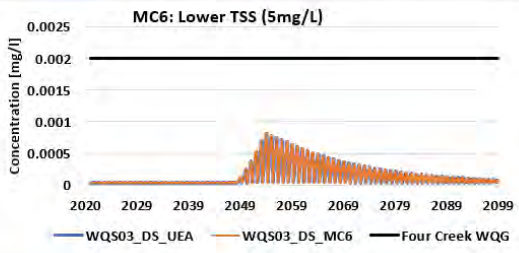


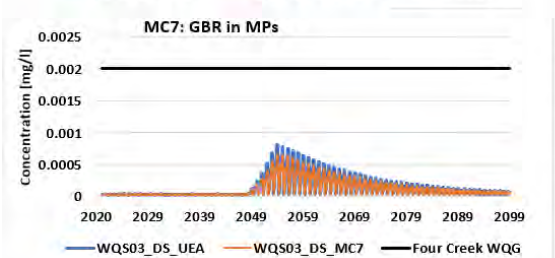












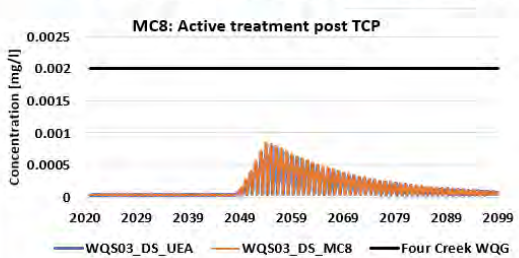


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Figure 6A-3: Sulphate modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

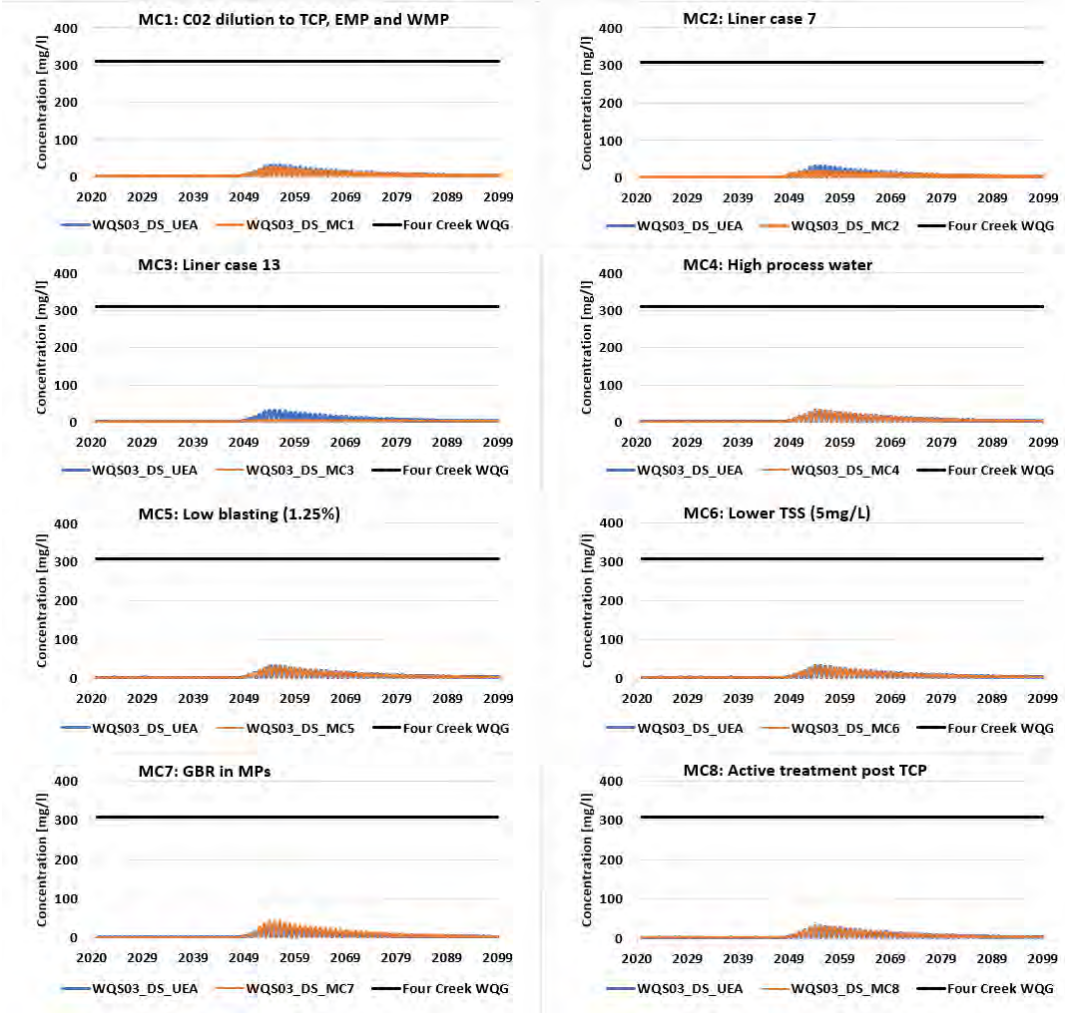

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Figure 6A-4: Total Aluminium modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

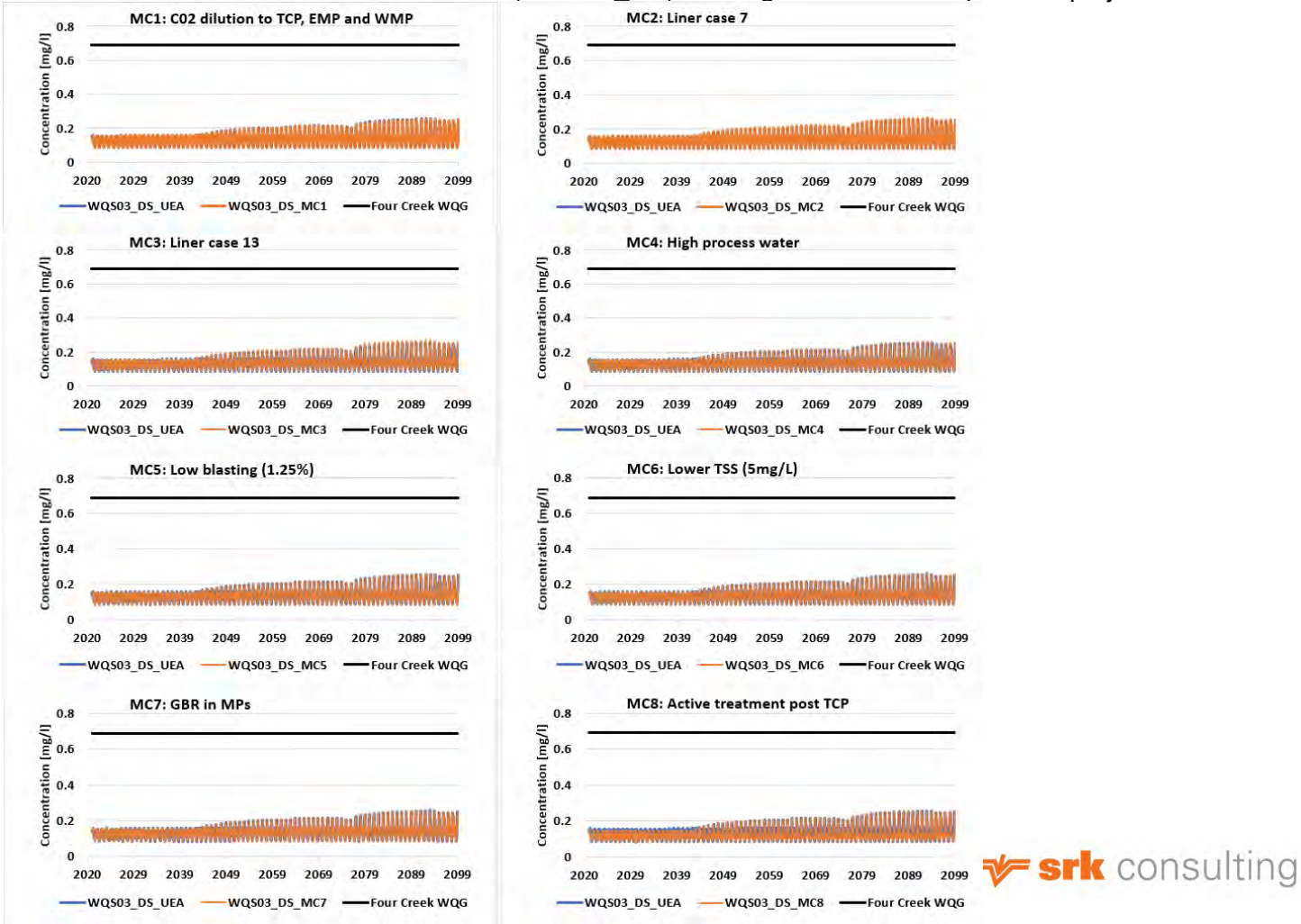

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Figure 6A-5: Nitrate modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

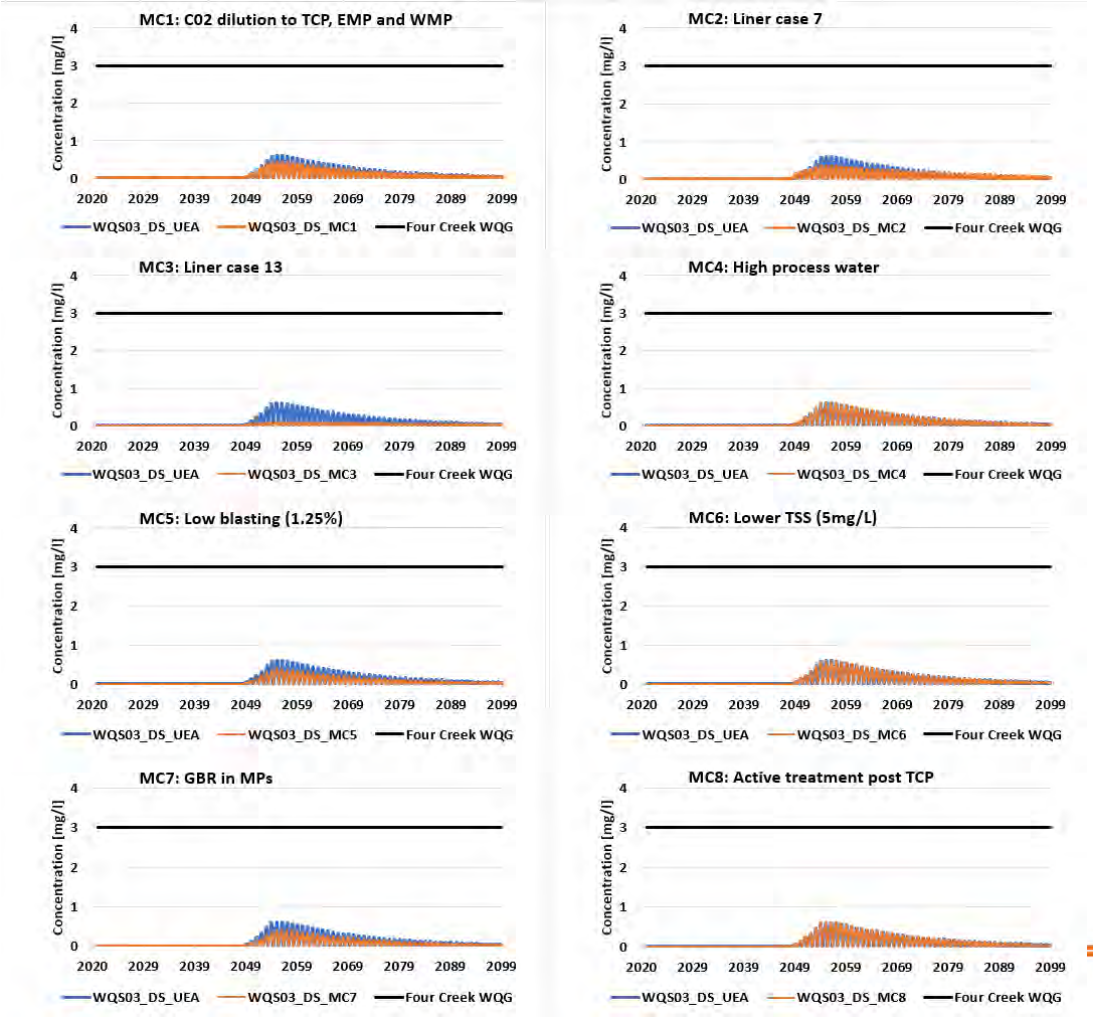

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Figure 6A-6: Dissolved Zinc modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

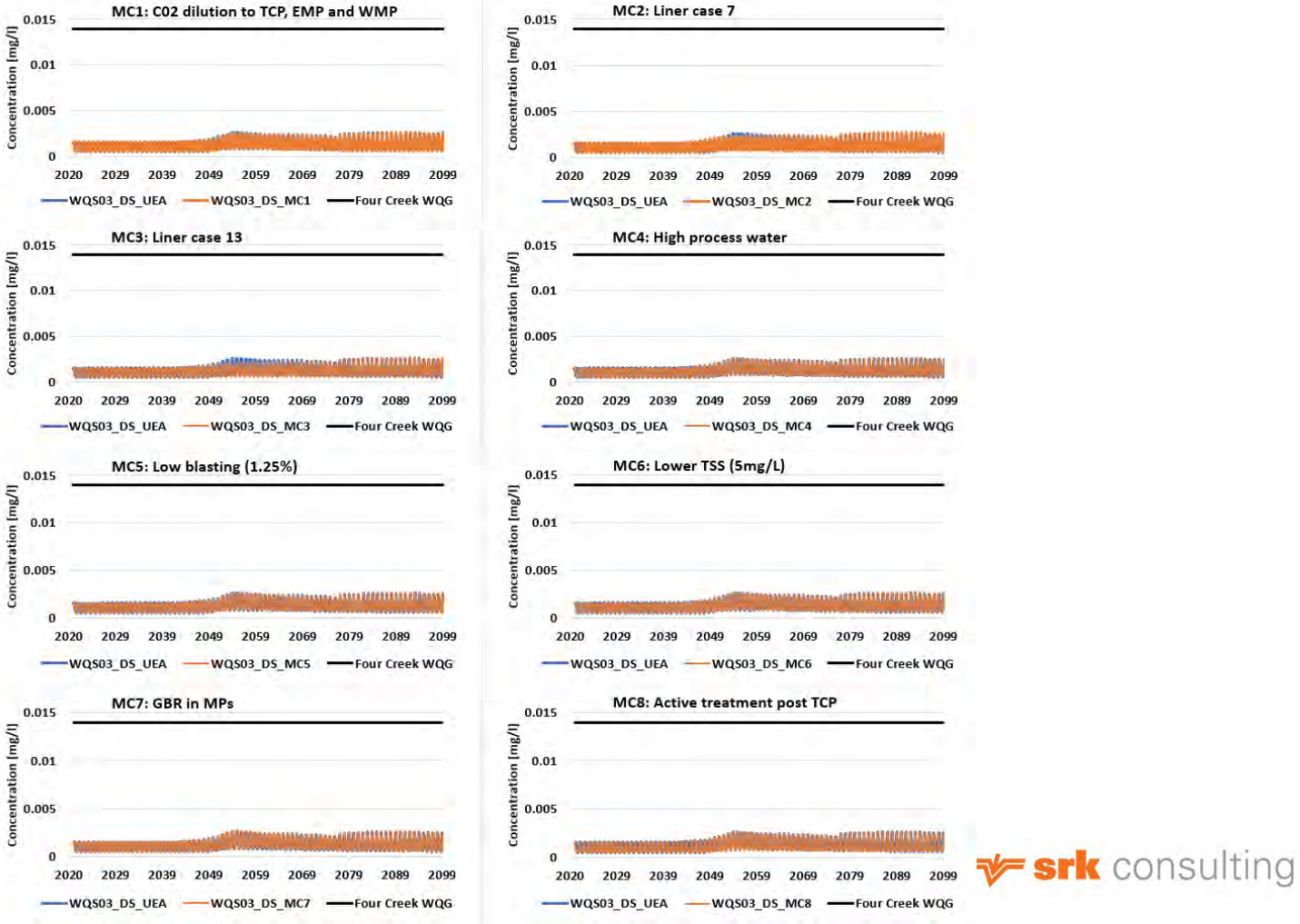

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Figure 6A-7: Dissolved Copper modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

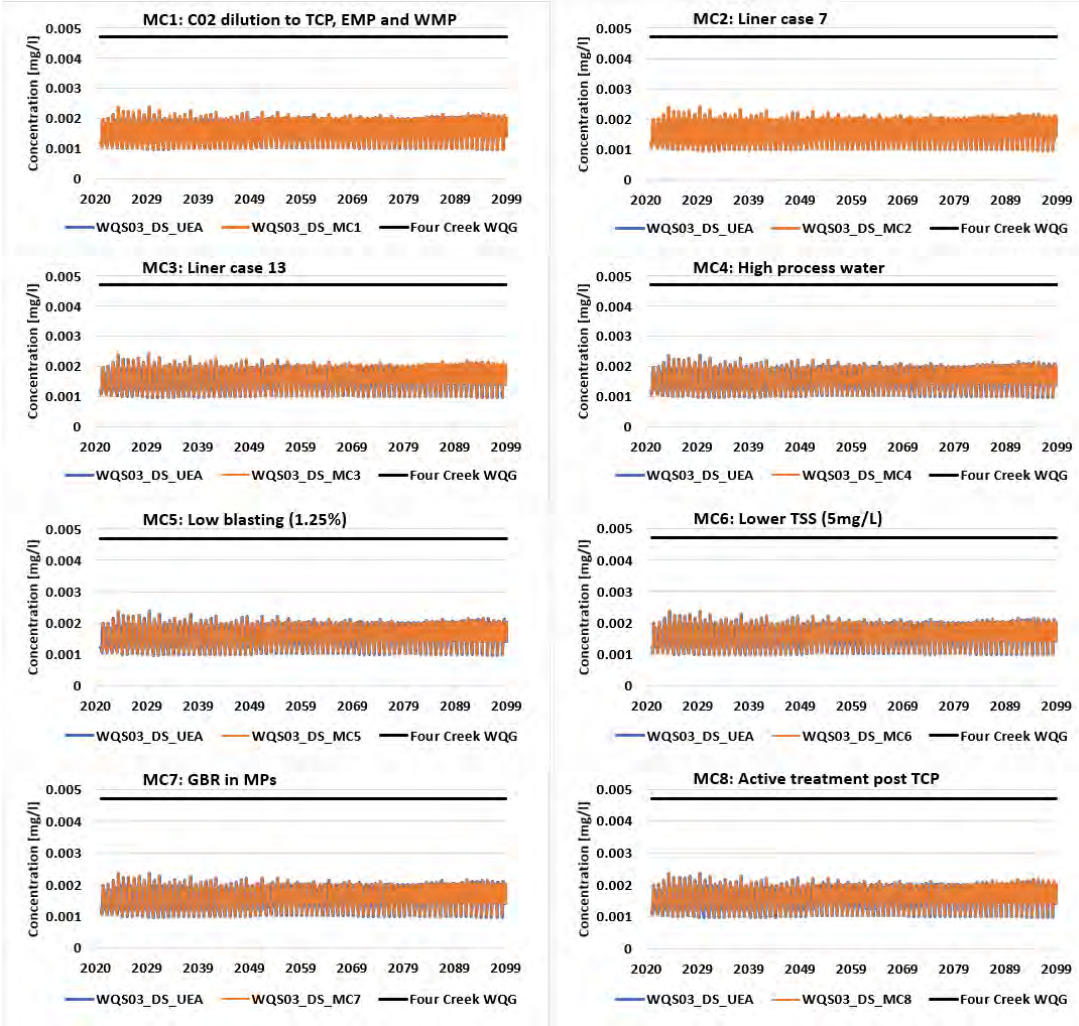

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Figure 6A-8: Dissolved Nickel modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

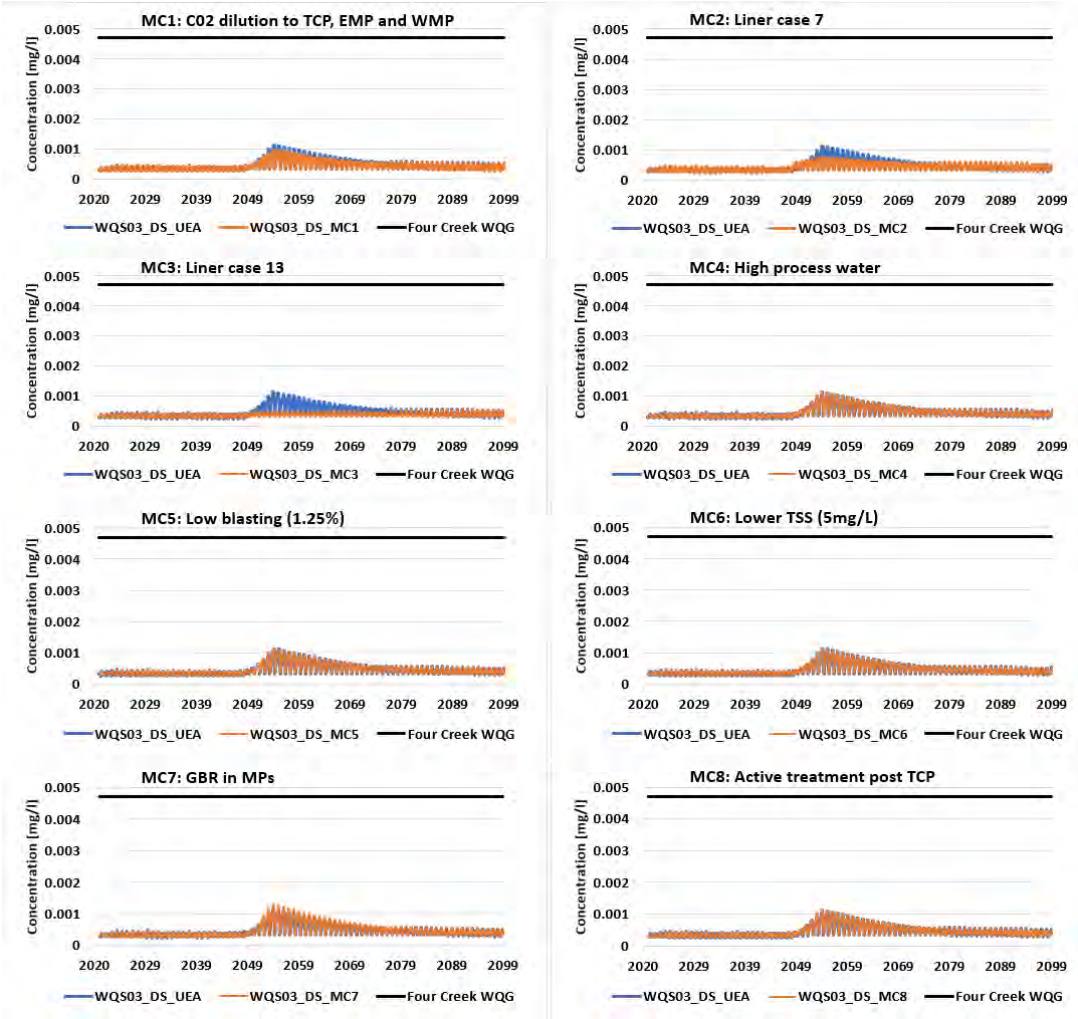

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Figure 6A-9: Total Molybdenum modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

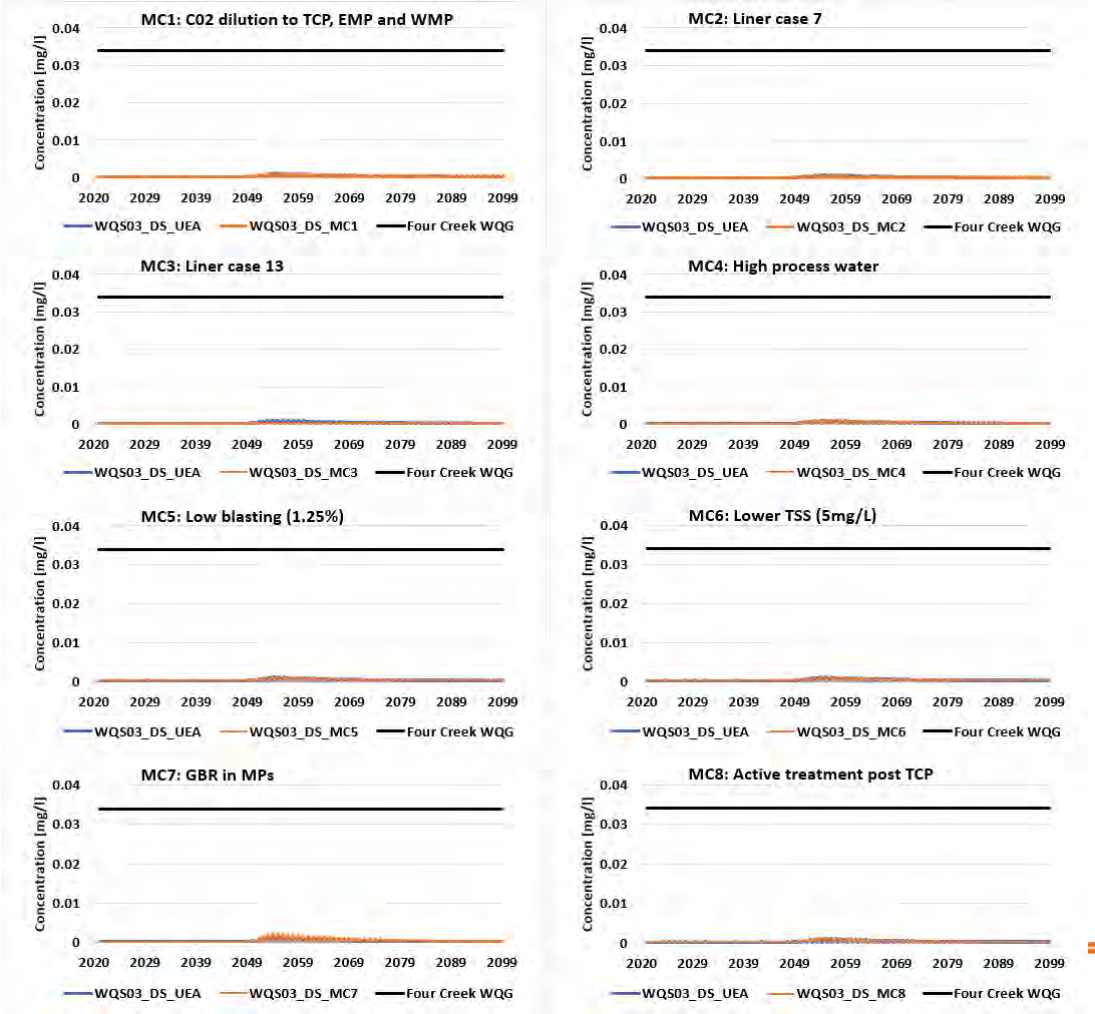

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Figure 6A-10: Total Iron modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

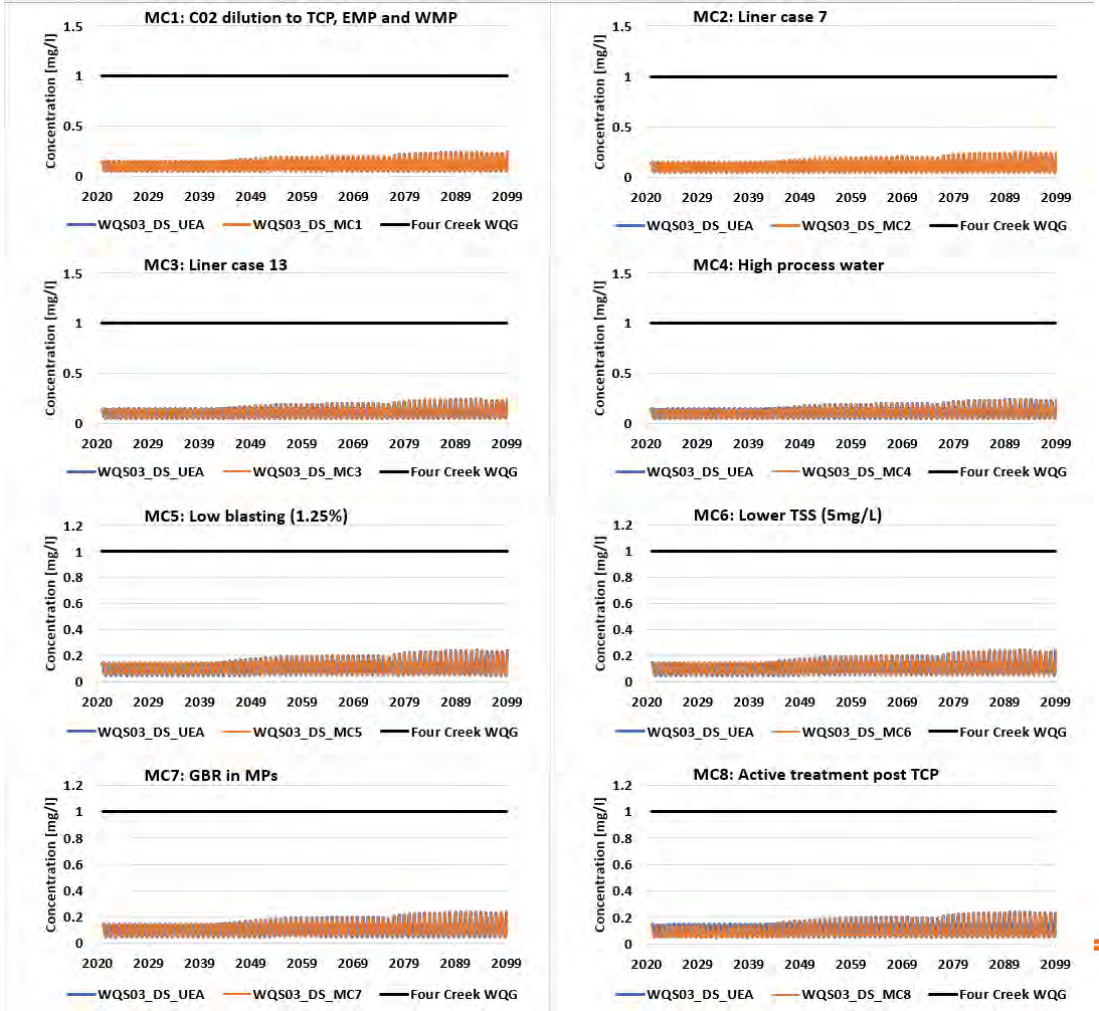

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Figure 6A-11: Total Chromium modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case

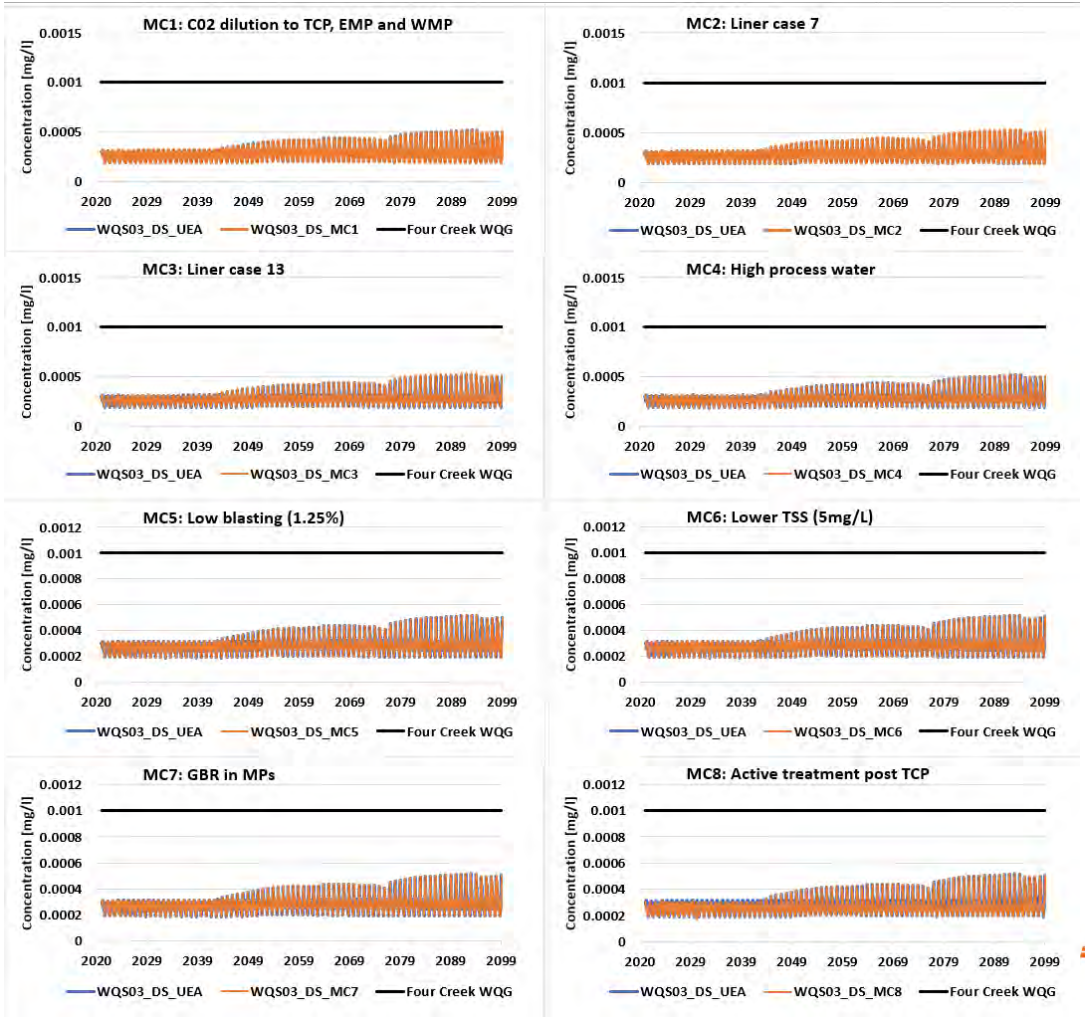
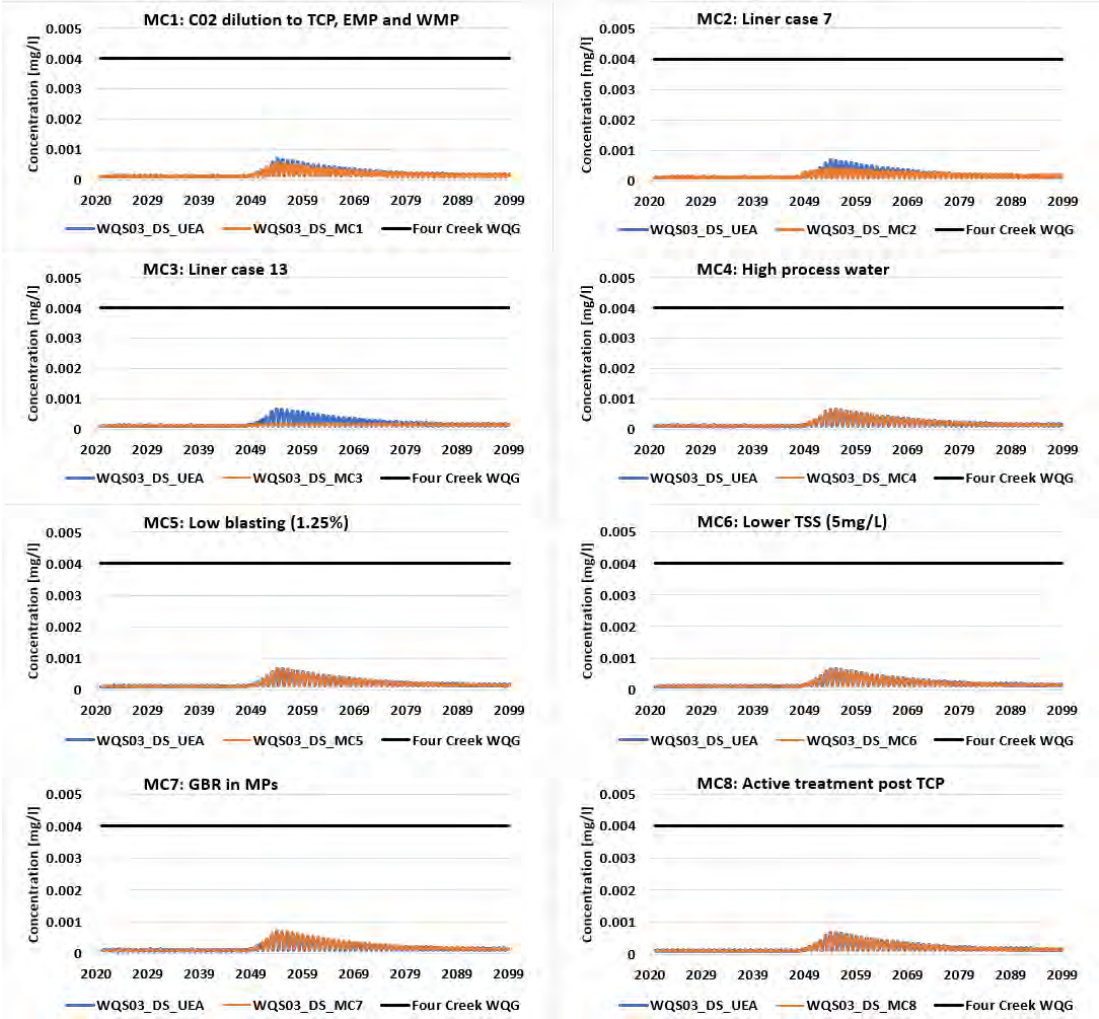


Figure 6A-12: Total Cobalt modelled concentrations in Four Creek (WQS03_DS) for mitigation cases compared to project case



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Appendix 6-B

Tenas Creek water quality exceedances

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Figure 6B-1: Nitrite modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

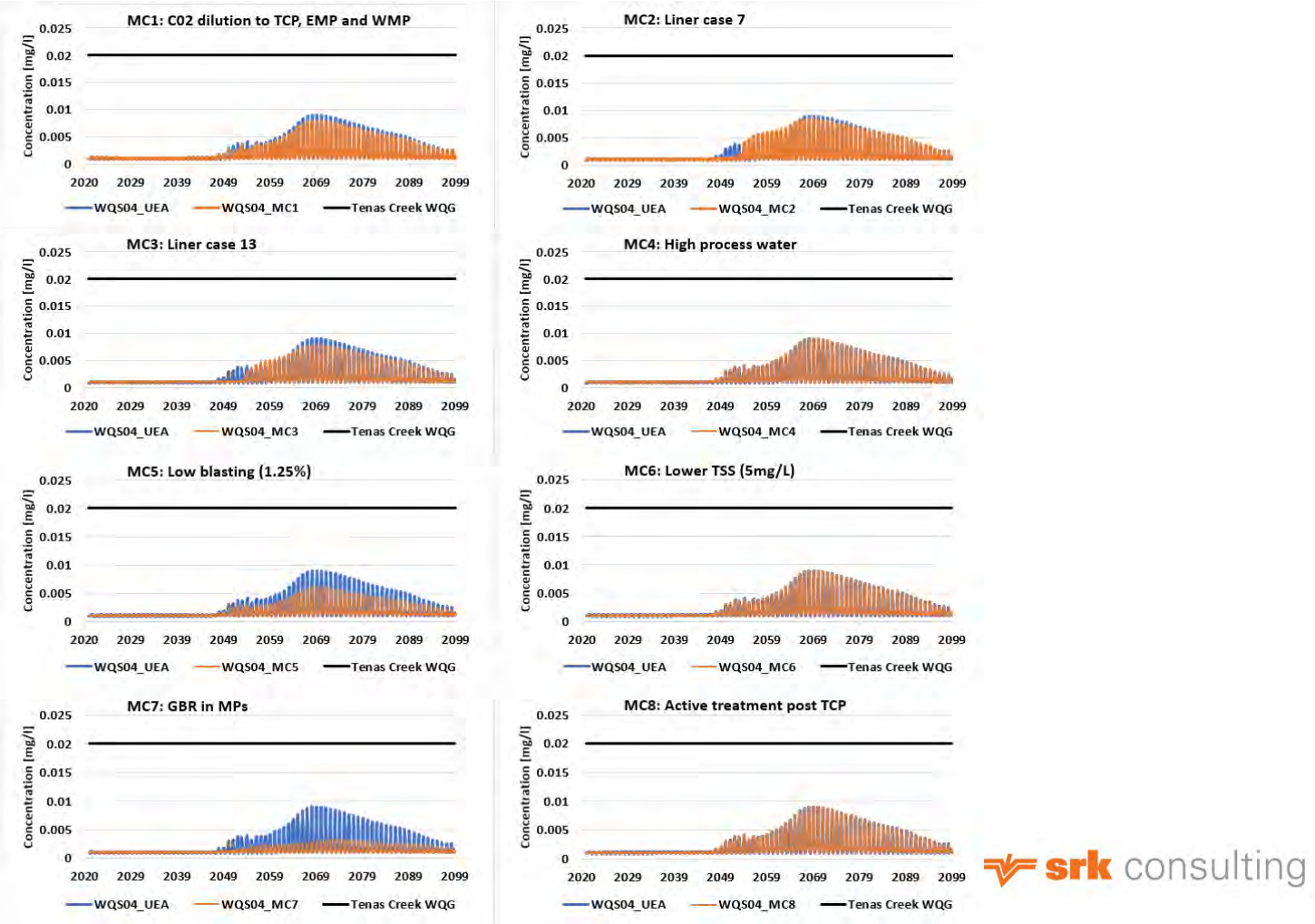

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Figure 6B-2: Total Selenium modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

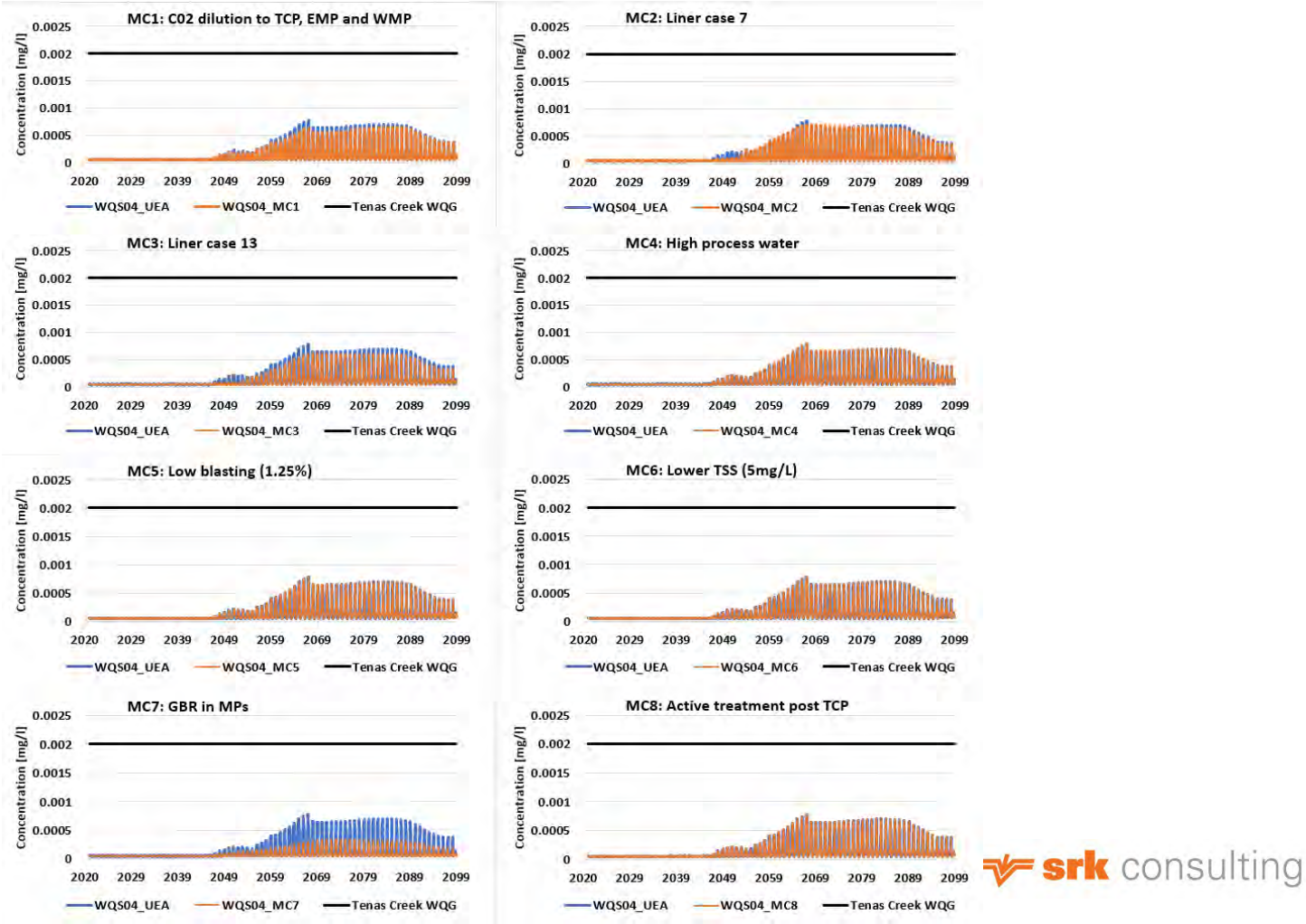

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Figure 6B-3: Sulphate modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

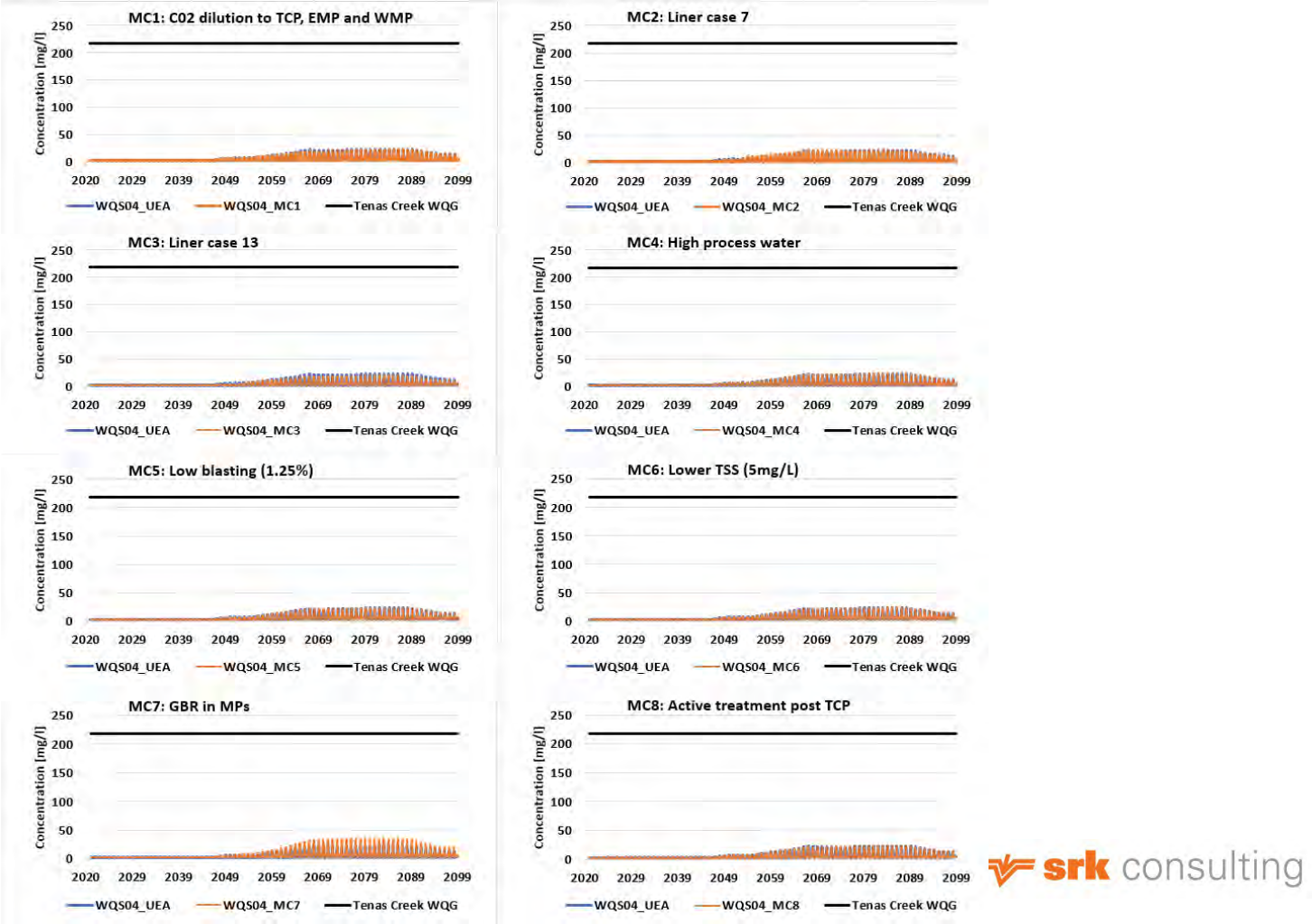

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Figure 6B-4: Total Aluminium modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

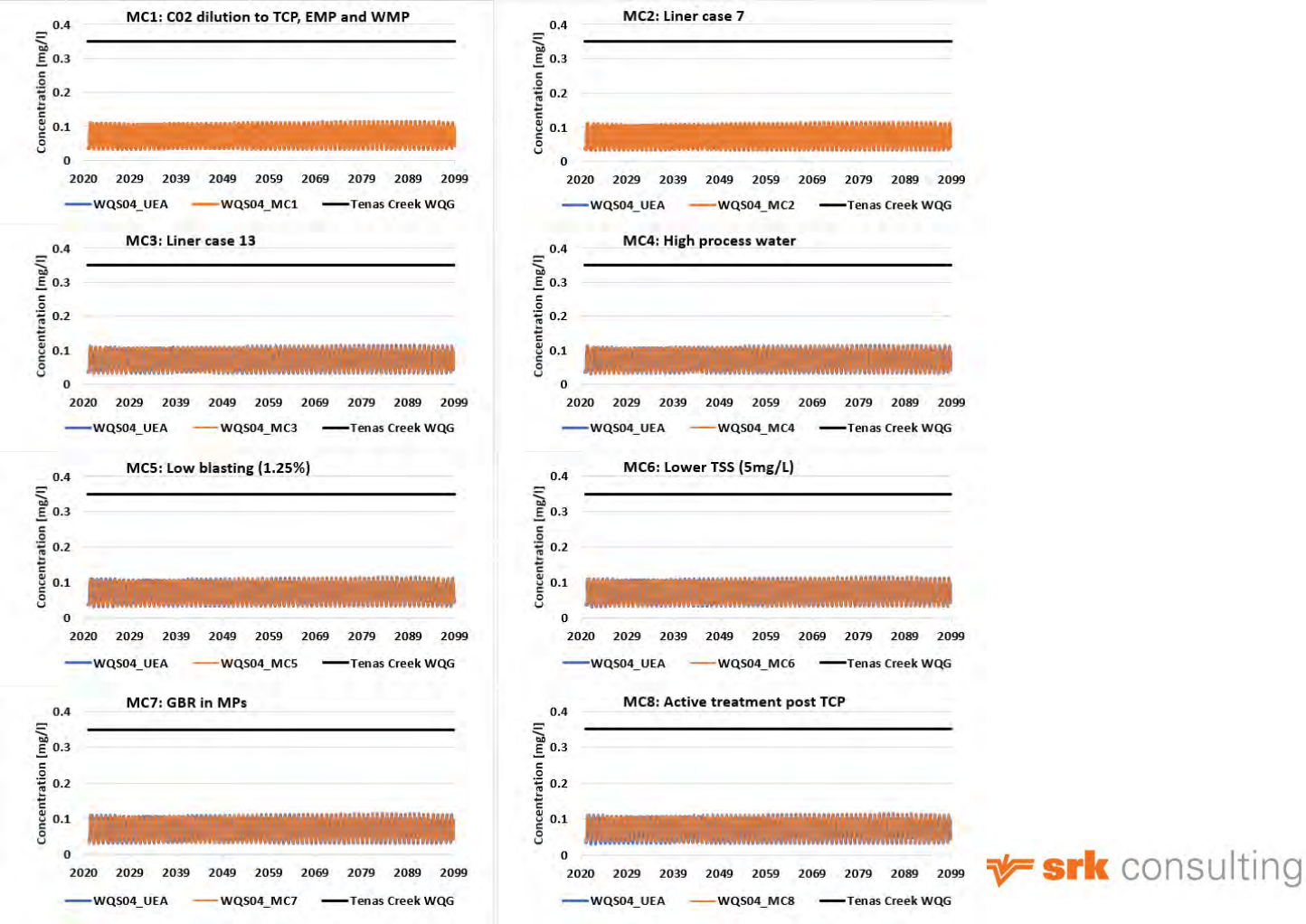

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Figure 6B-5: Nitrate modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

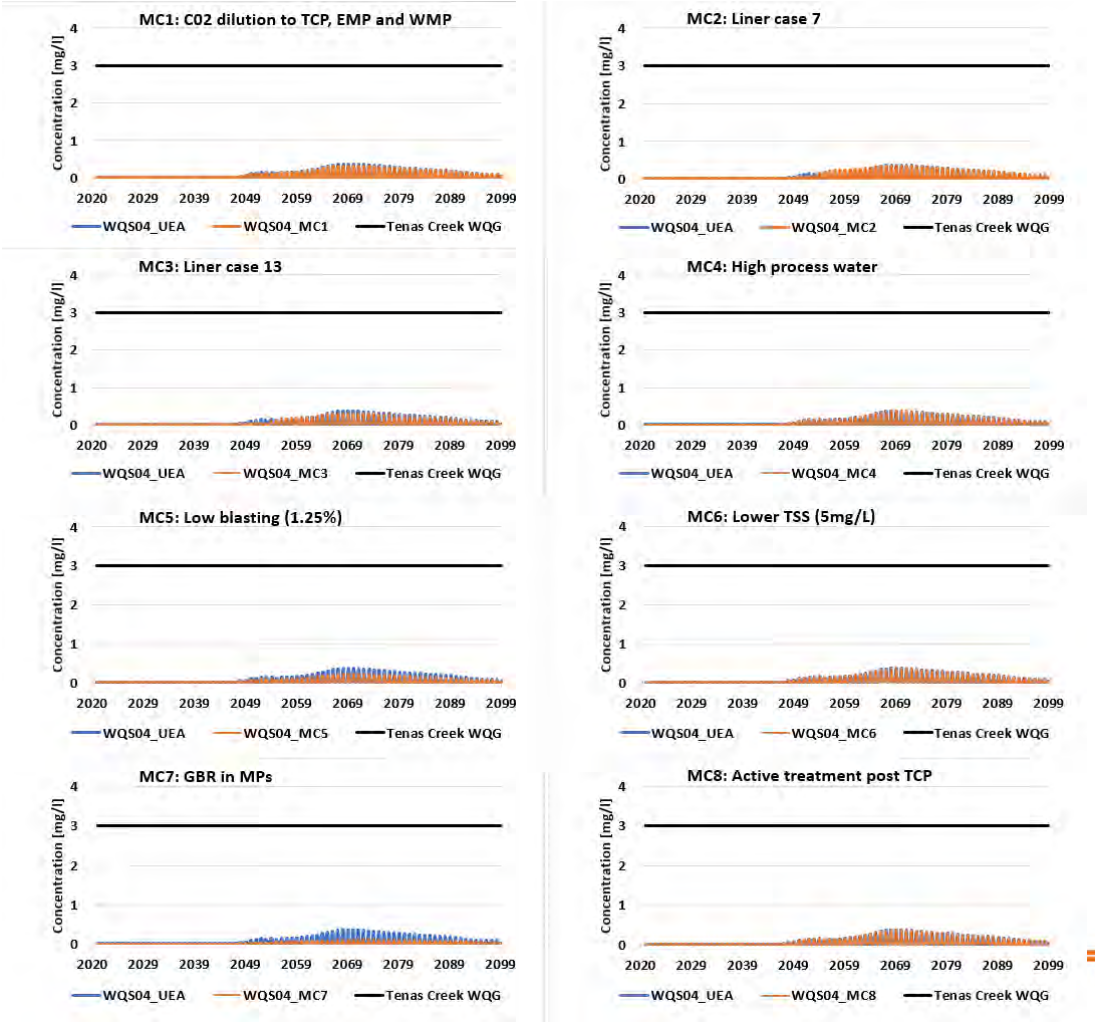

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Figure 6B-6: Dissolved Zinc modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

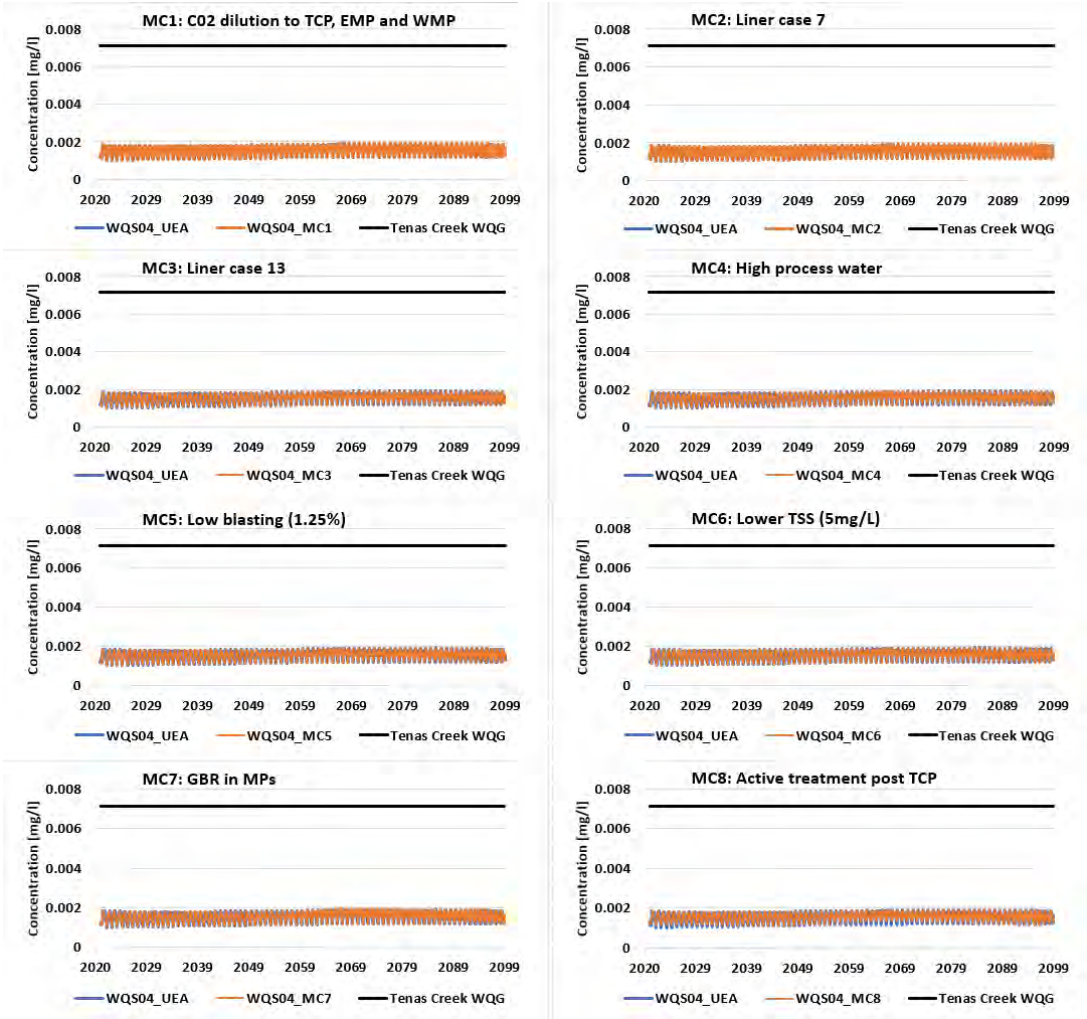

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Figure 6B-7: Dissolved Copper modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

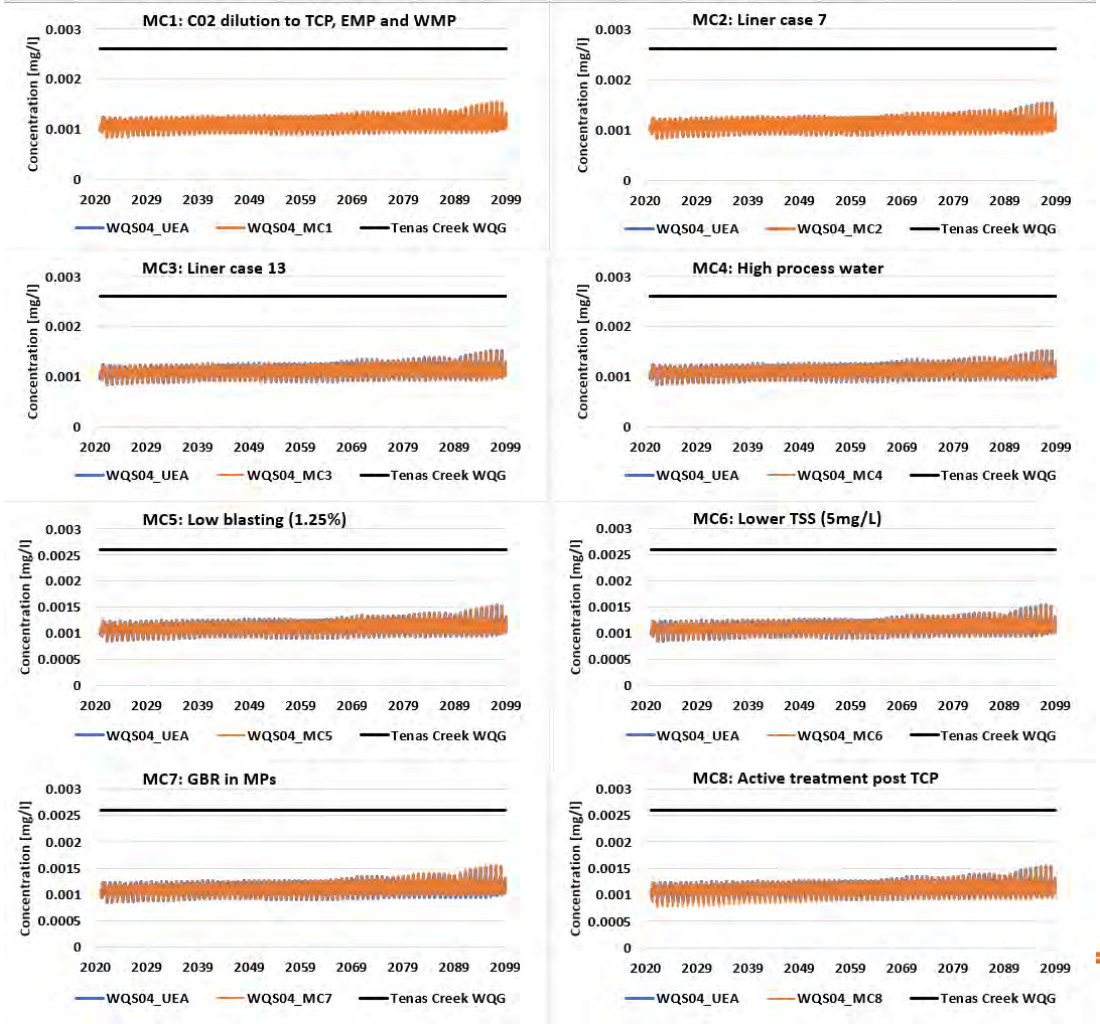

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Figure 6B-8: Dissolved Nickel modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

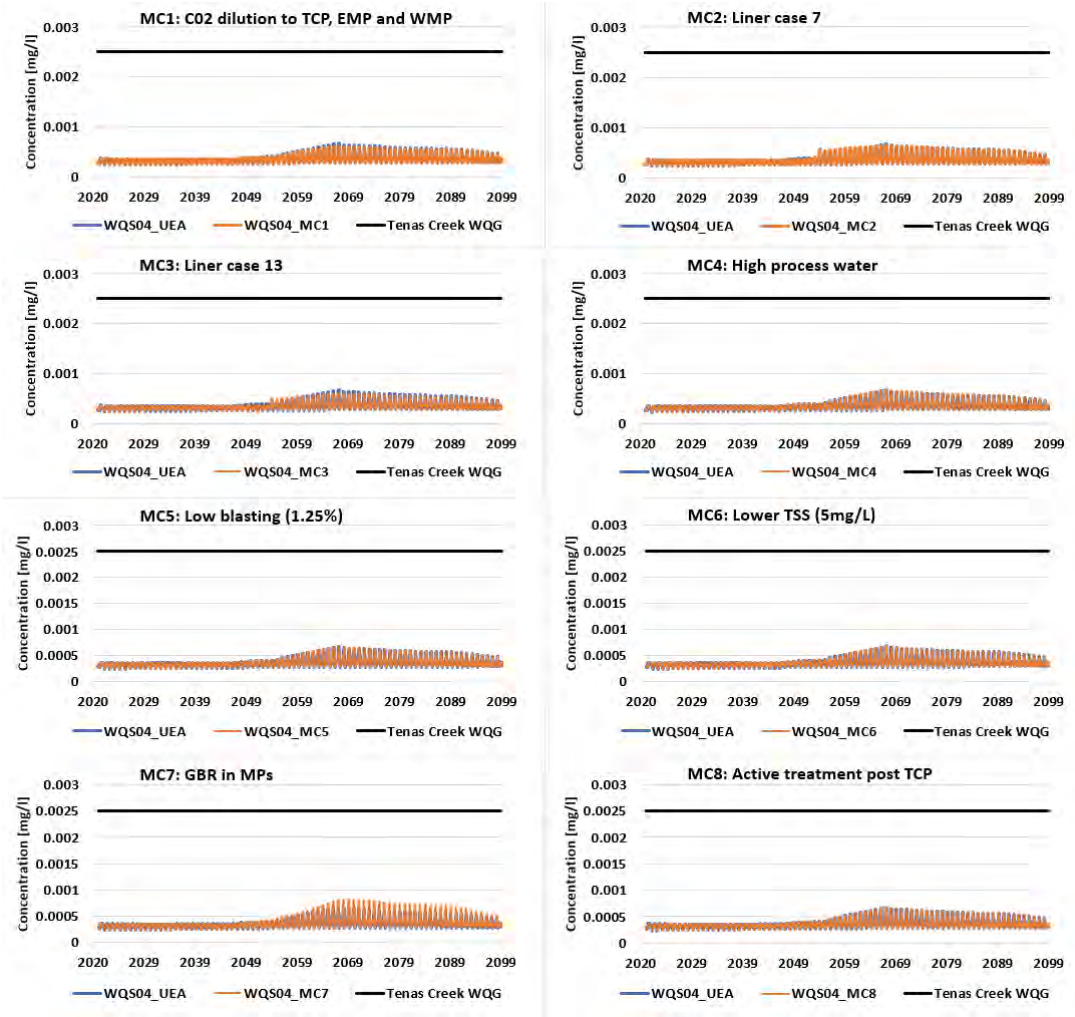

Figure 6B-9: Total Molybdenum modelled concentrations in Tenas Creek (WQS04) mitigation cases compared to project case

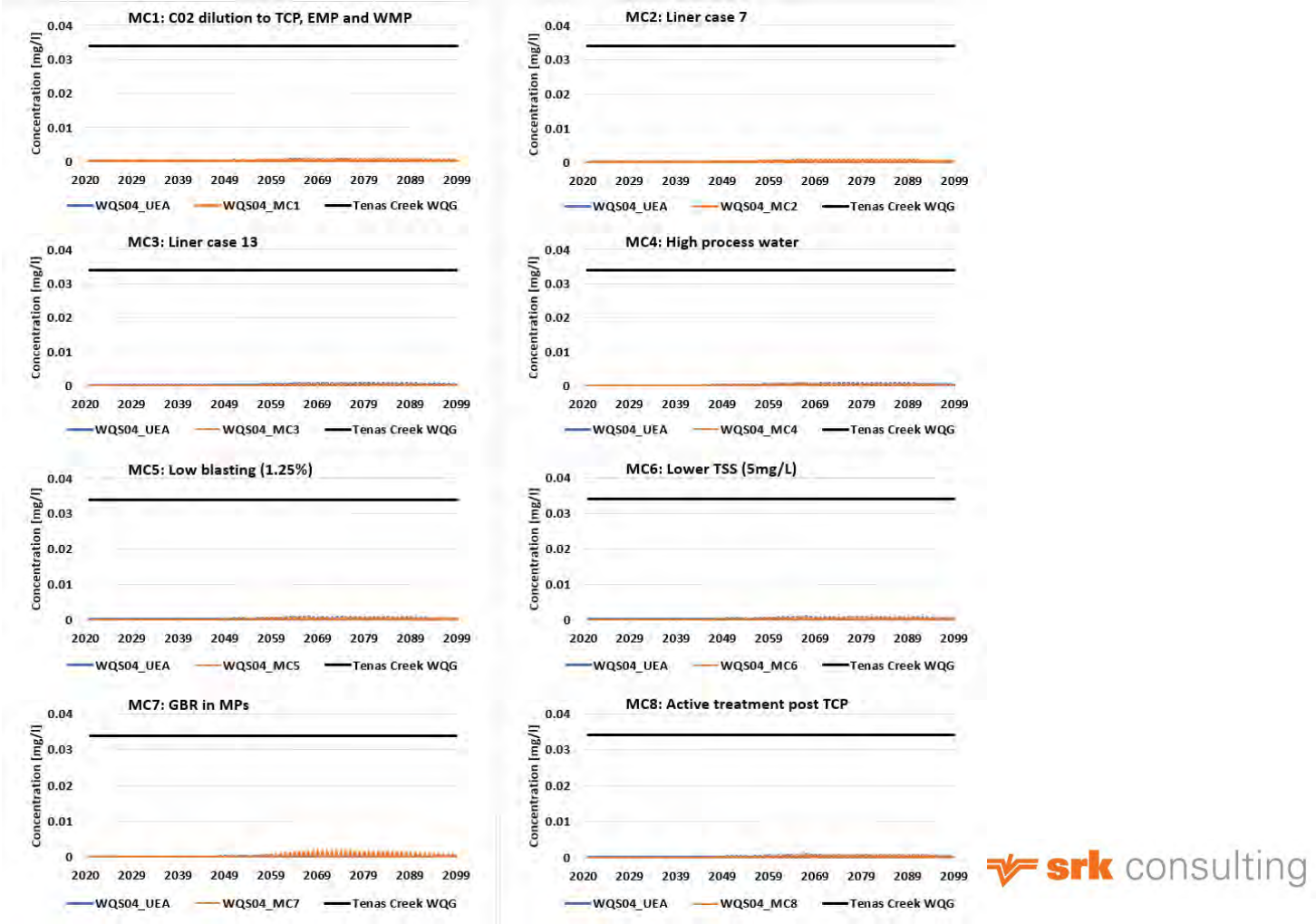

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Figure 6B-10: Total Iron modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

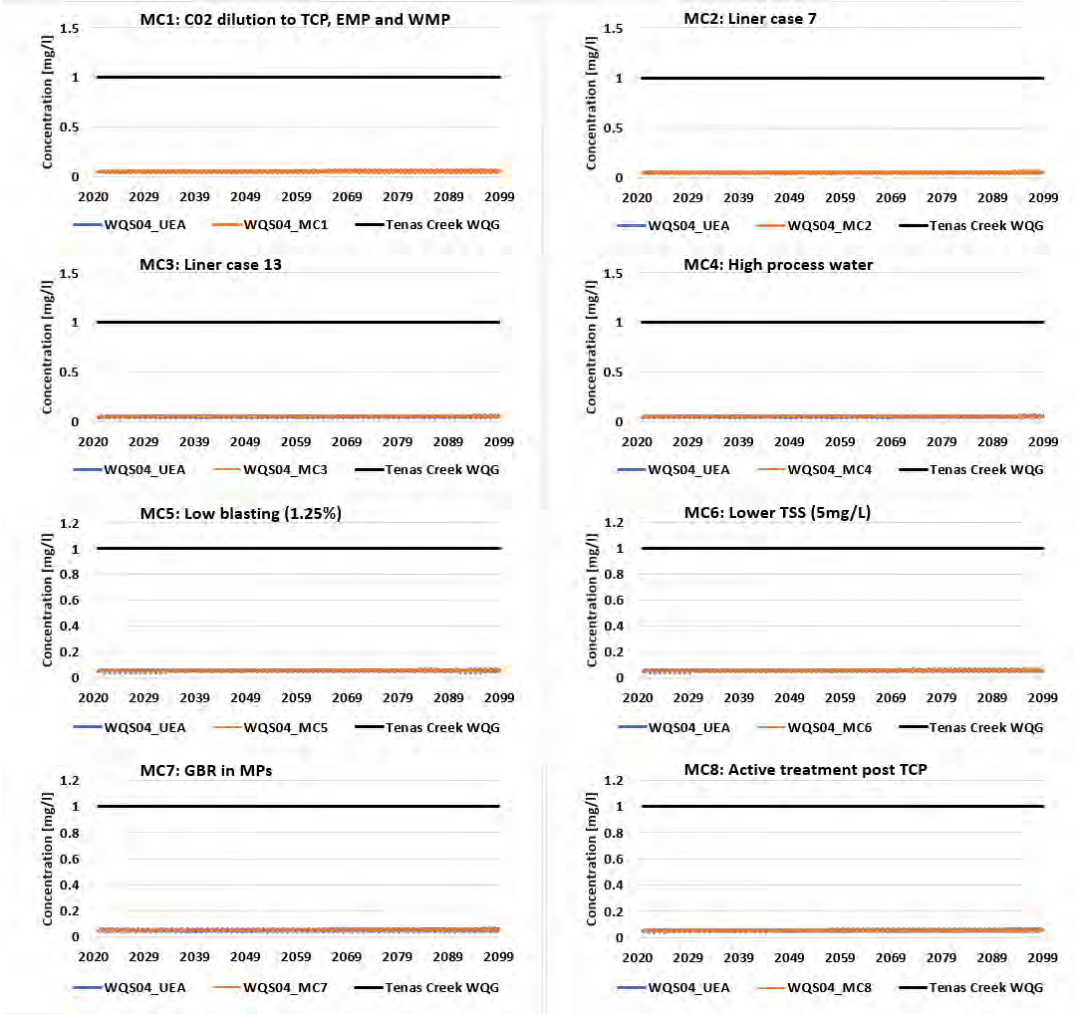

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Figure 6B-11: Total Chromium modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case

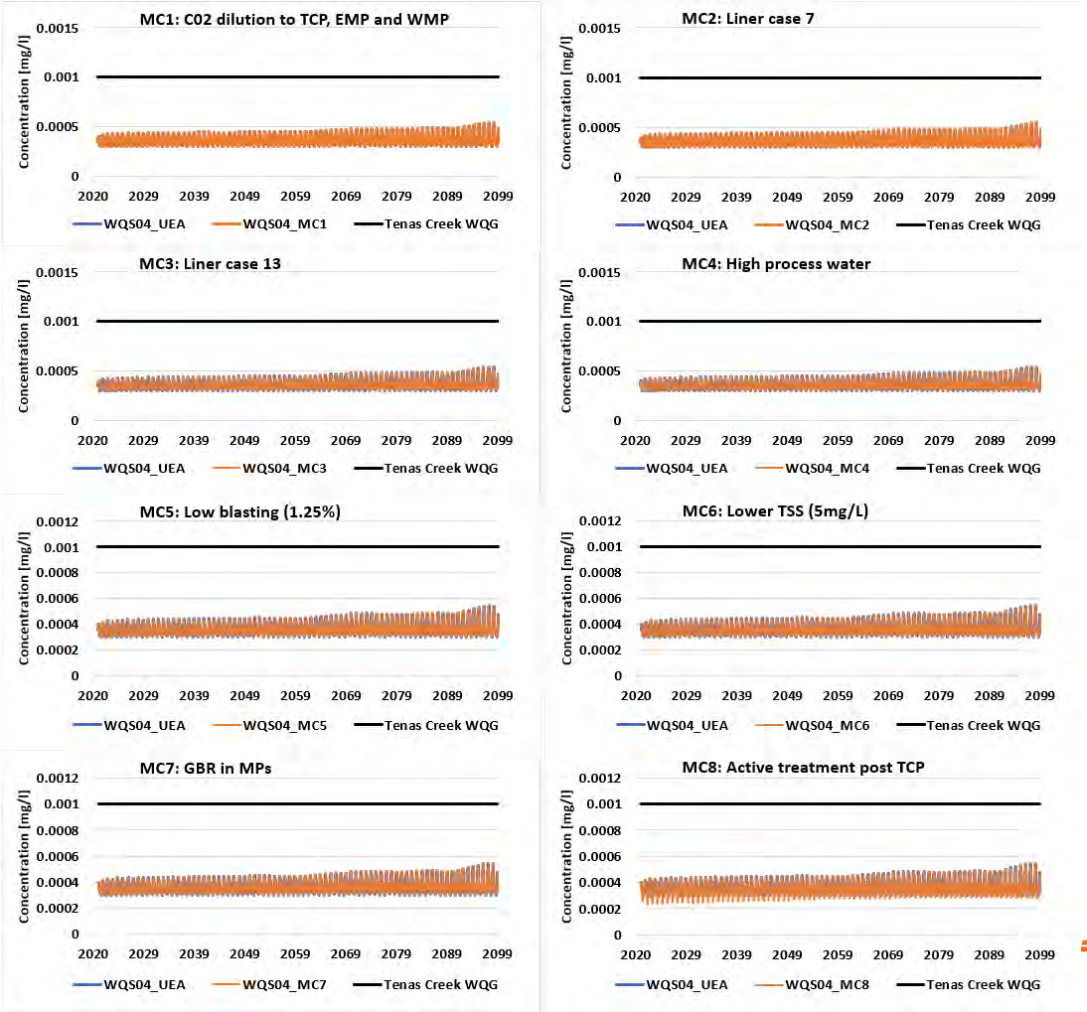

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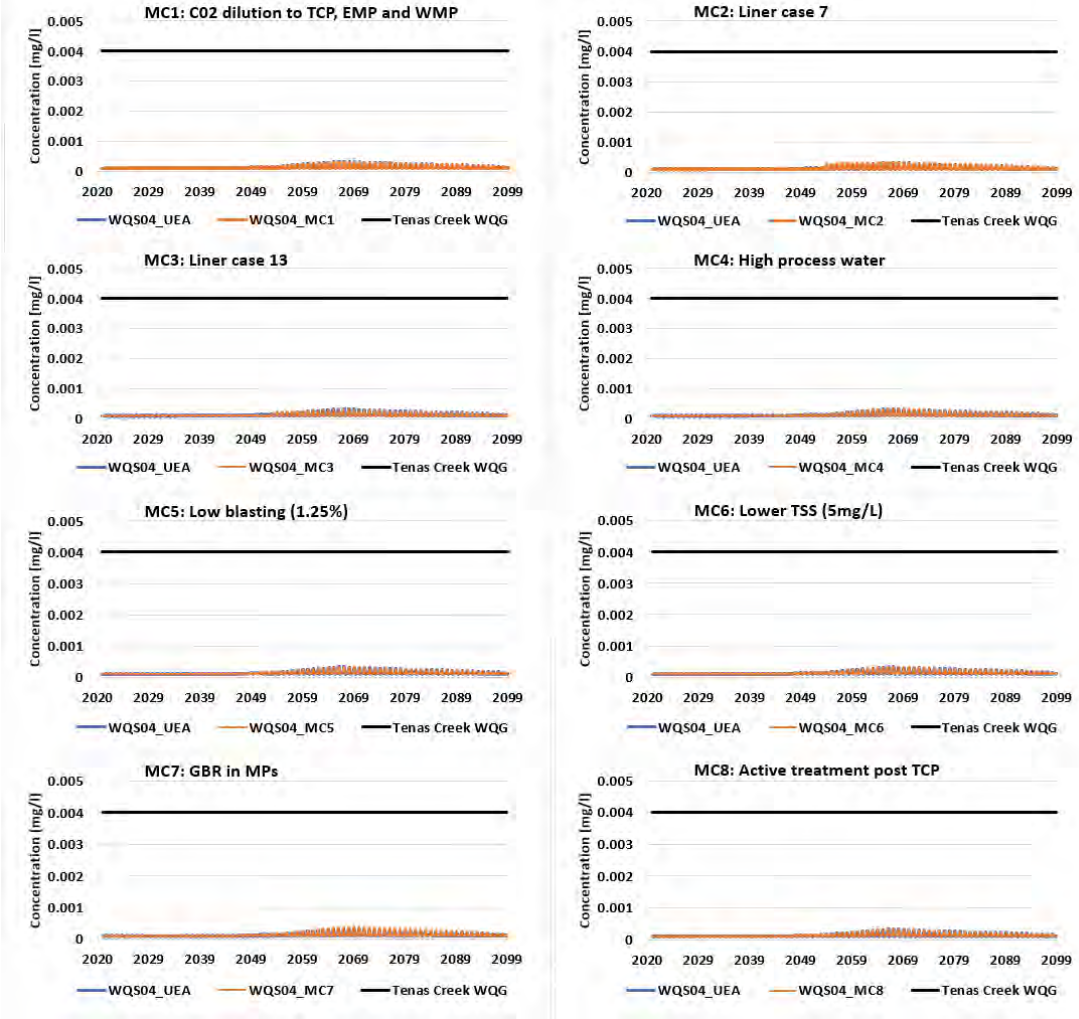
Figure 6B-12: Total Cobalt modelled concentrations in Tenas Creek (WQS04) for mitigation cases compared to project case



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Appendix 6-C

Goathorn Creek water quality exceedances

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Figure 6C-1: Nitrite modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

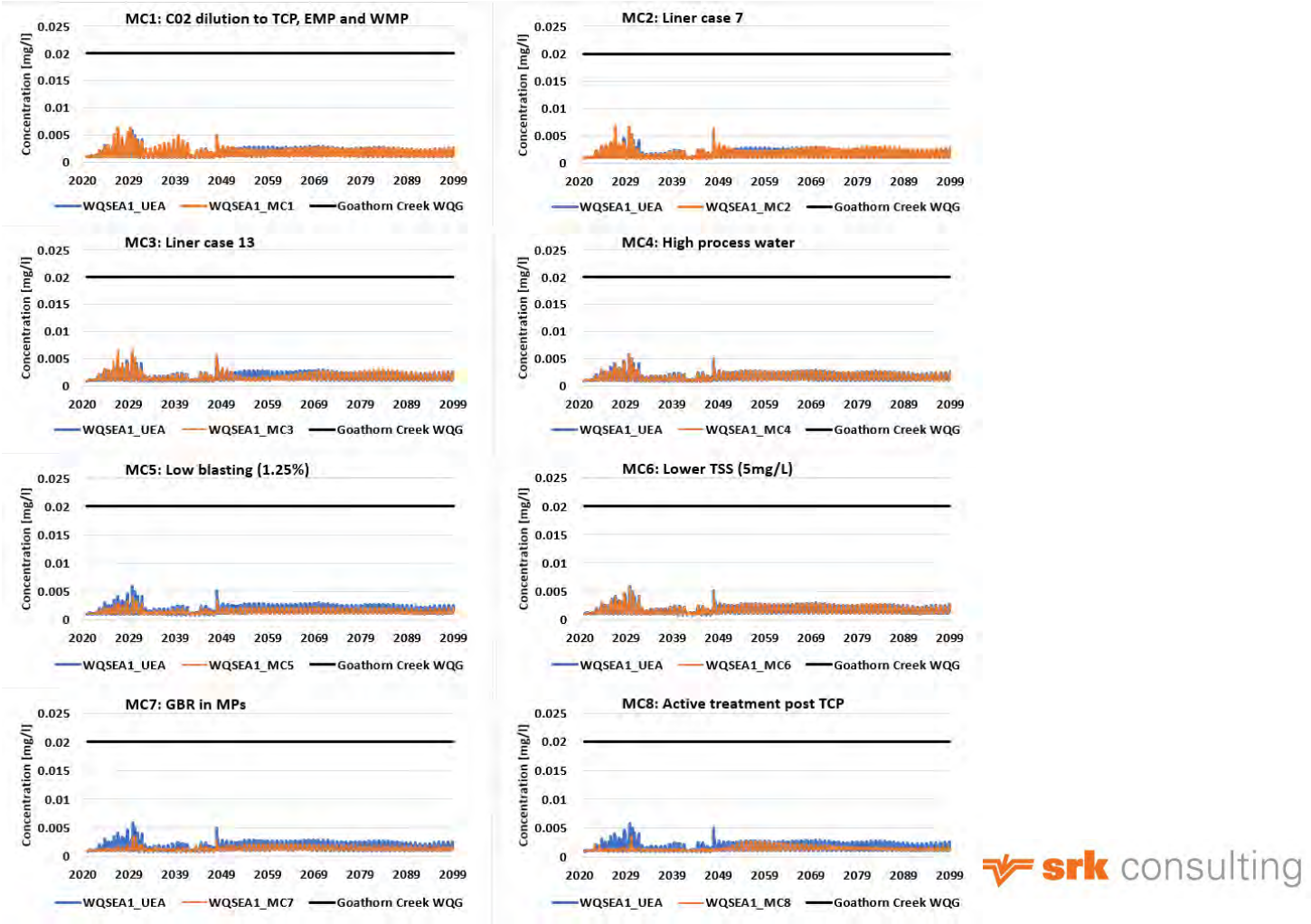

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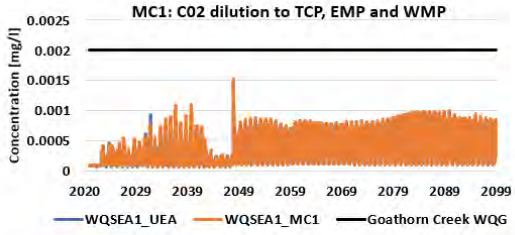
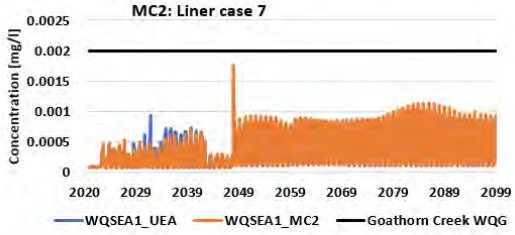
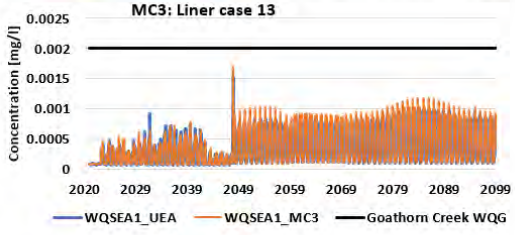
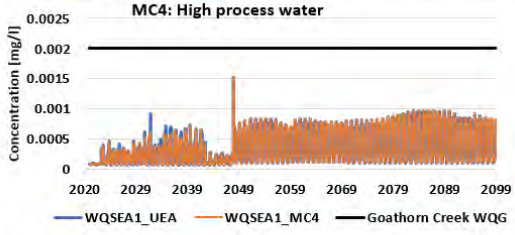
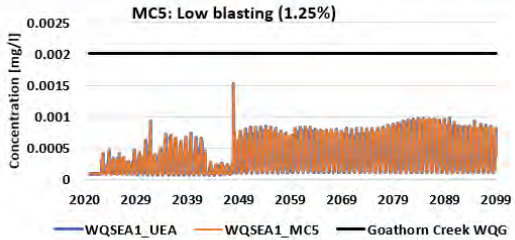
Figure 6C-2: Total Selenium modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

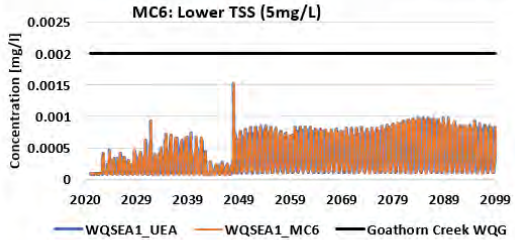


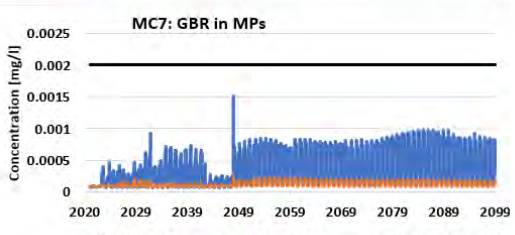












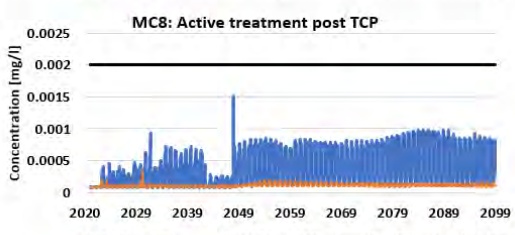


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Figure 6C-3: Sulphate modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

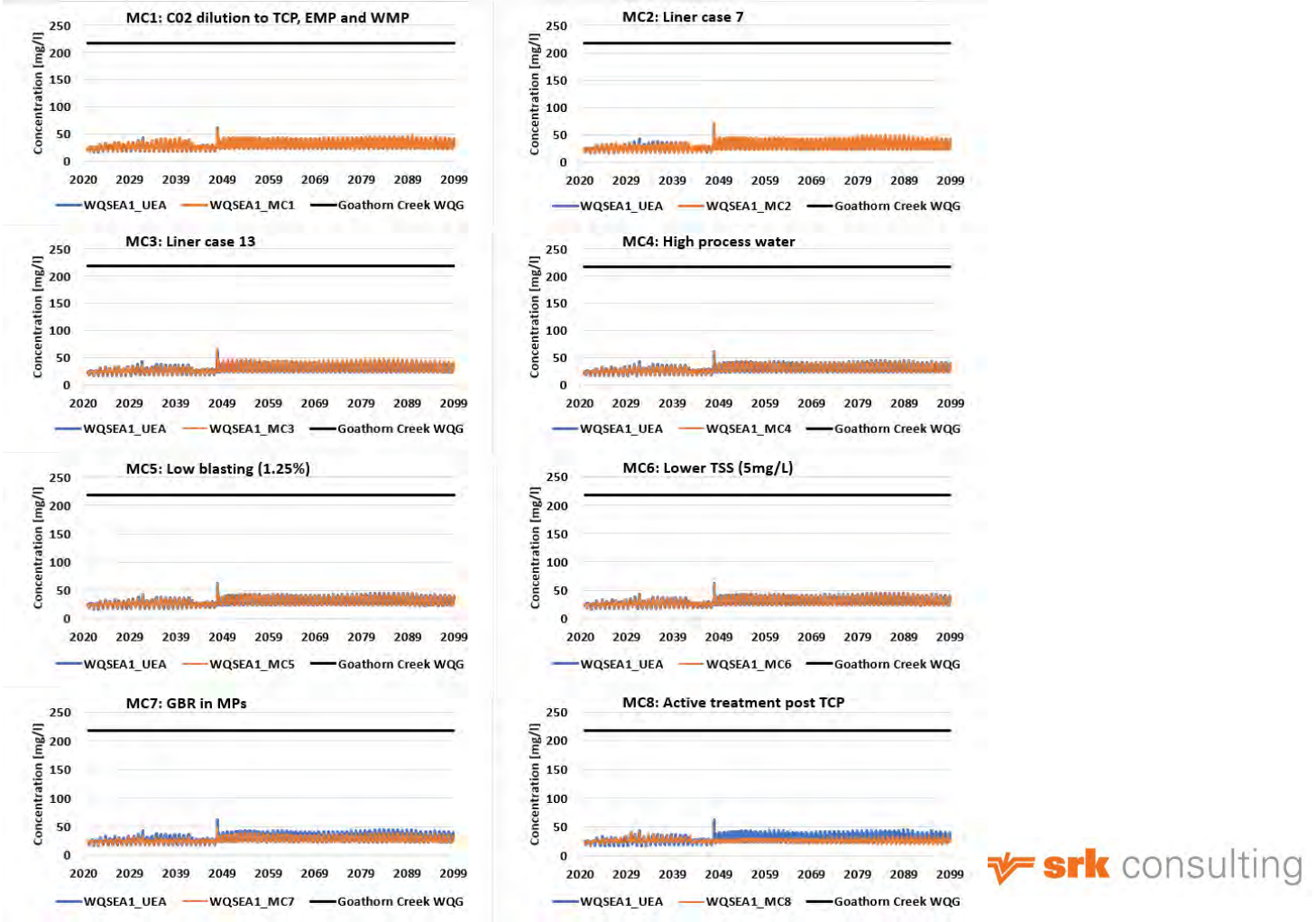

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Figure 6C-4: Total Aluminium modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

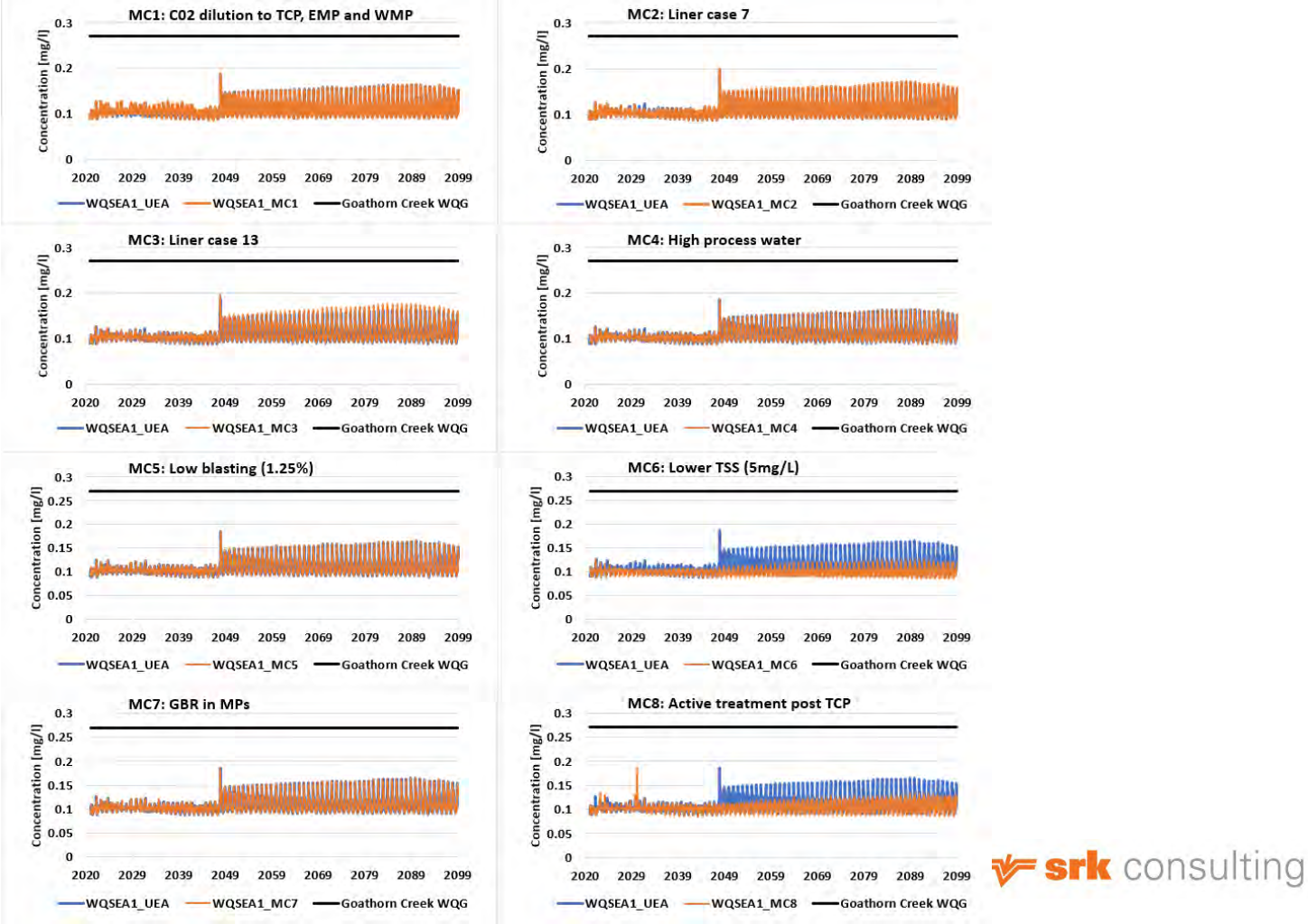

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Figure 6C-5: Nitrate modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

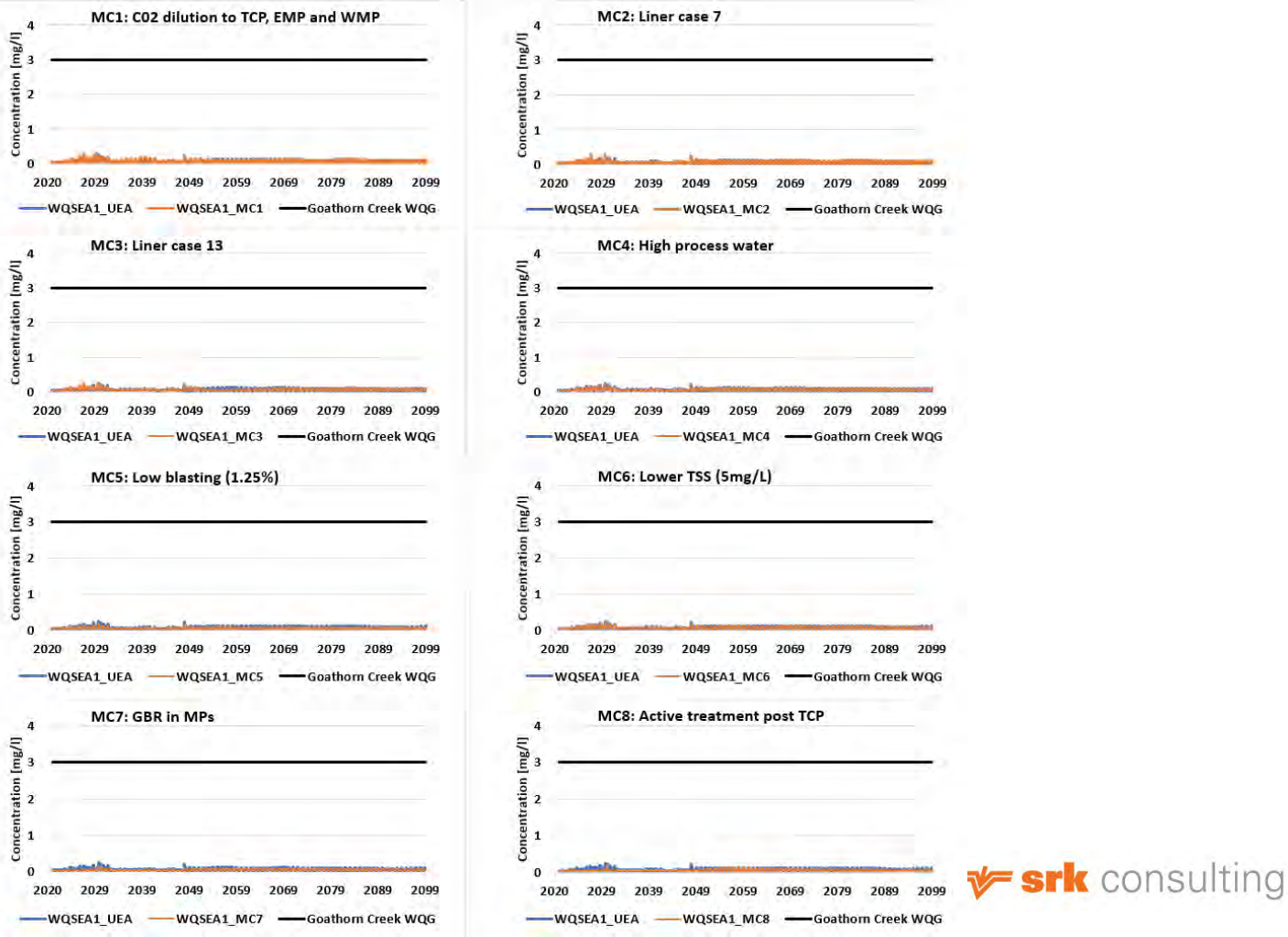

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Figure 6C-6: Dissolved Zinc modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

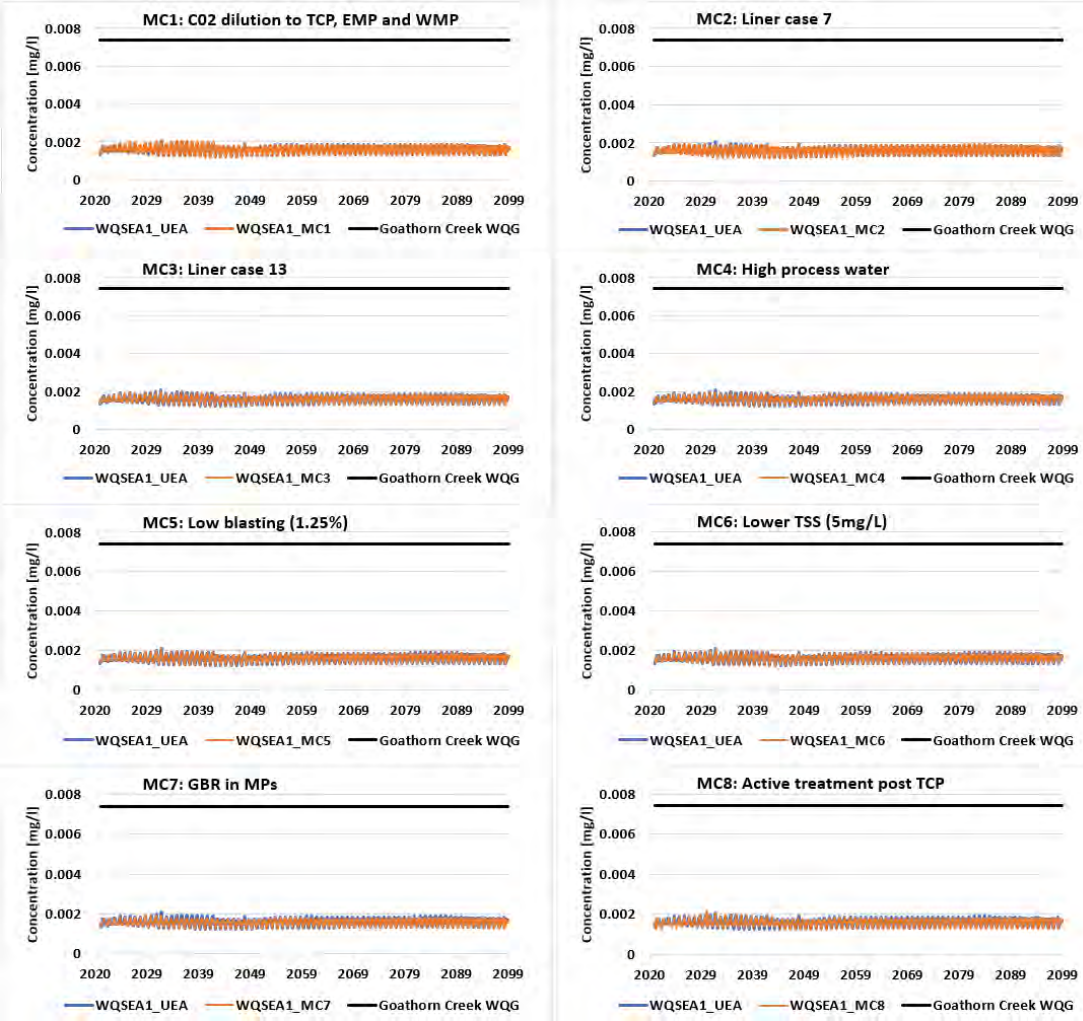

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Figure 6C-7: Dissolved Copper modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

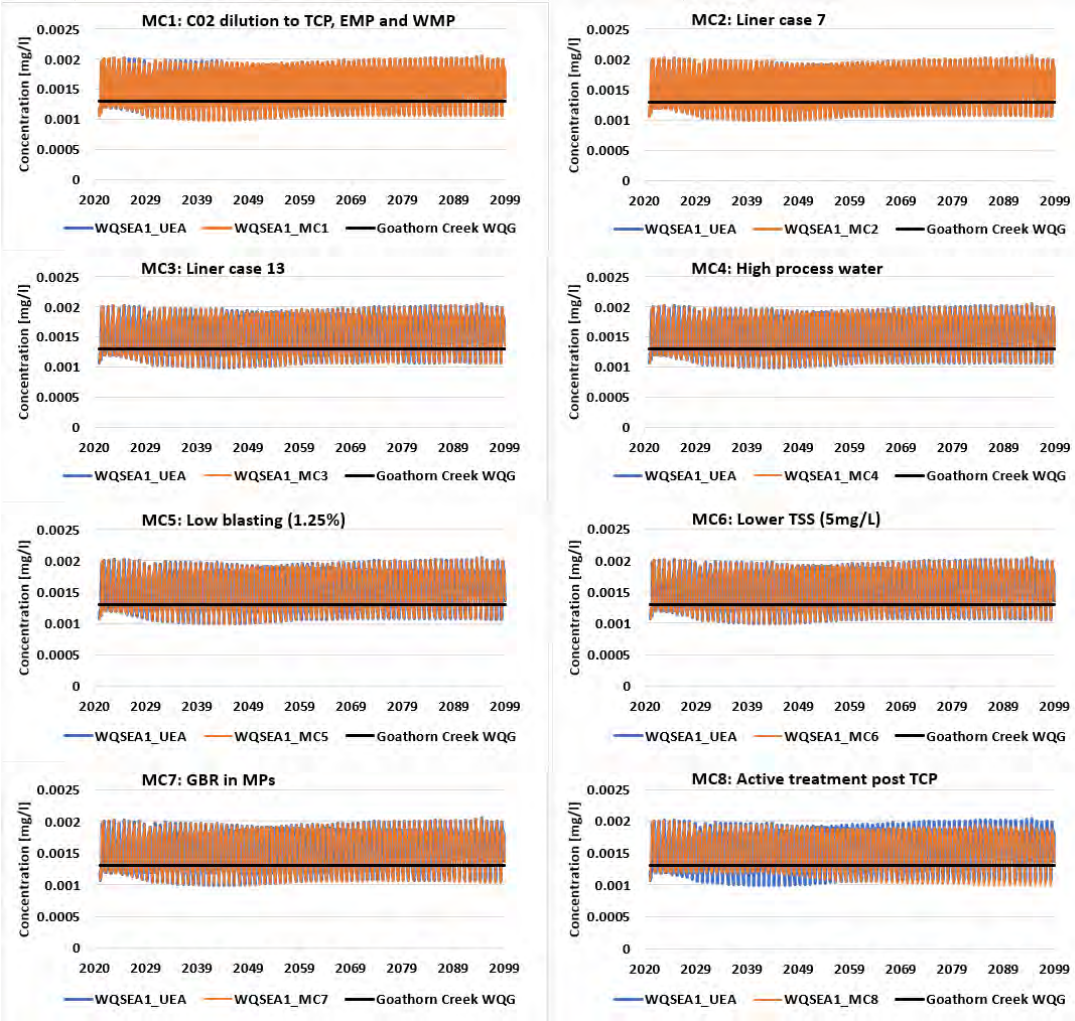

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Figure 6C-8: Dissolved Nickel modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

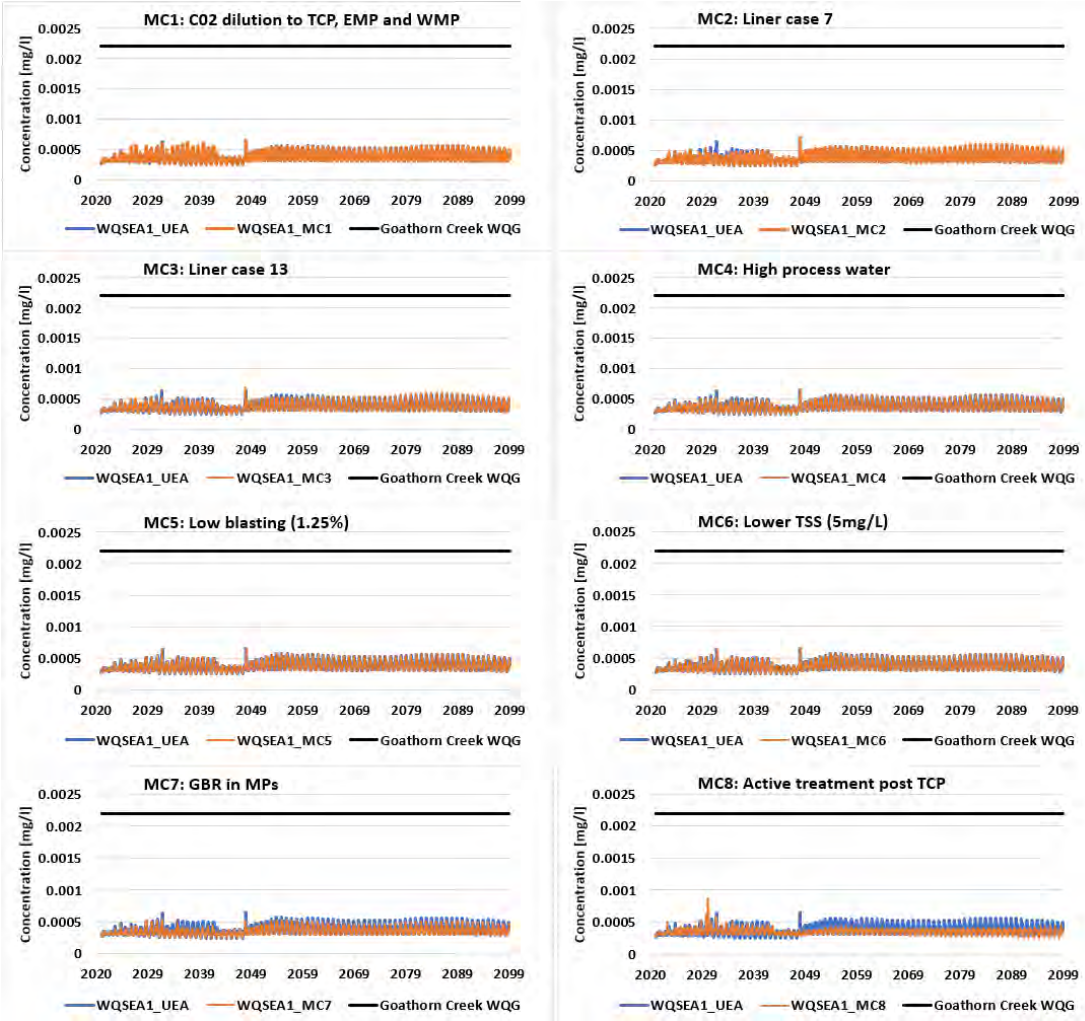

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Figure 6C-9: Total Molybdenum modelled concentrations in Goathorn Creek (WQSEA1) mitigation cases compared to project case

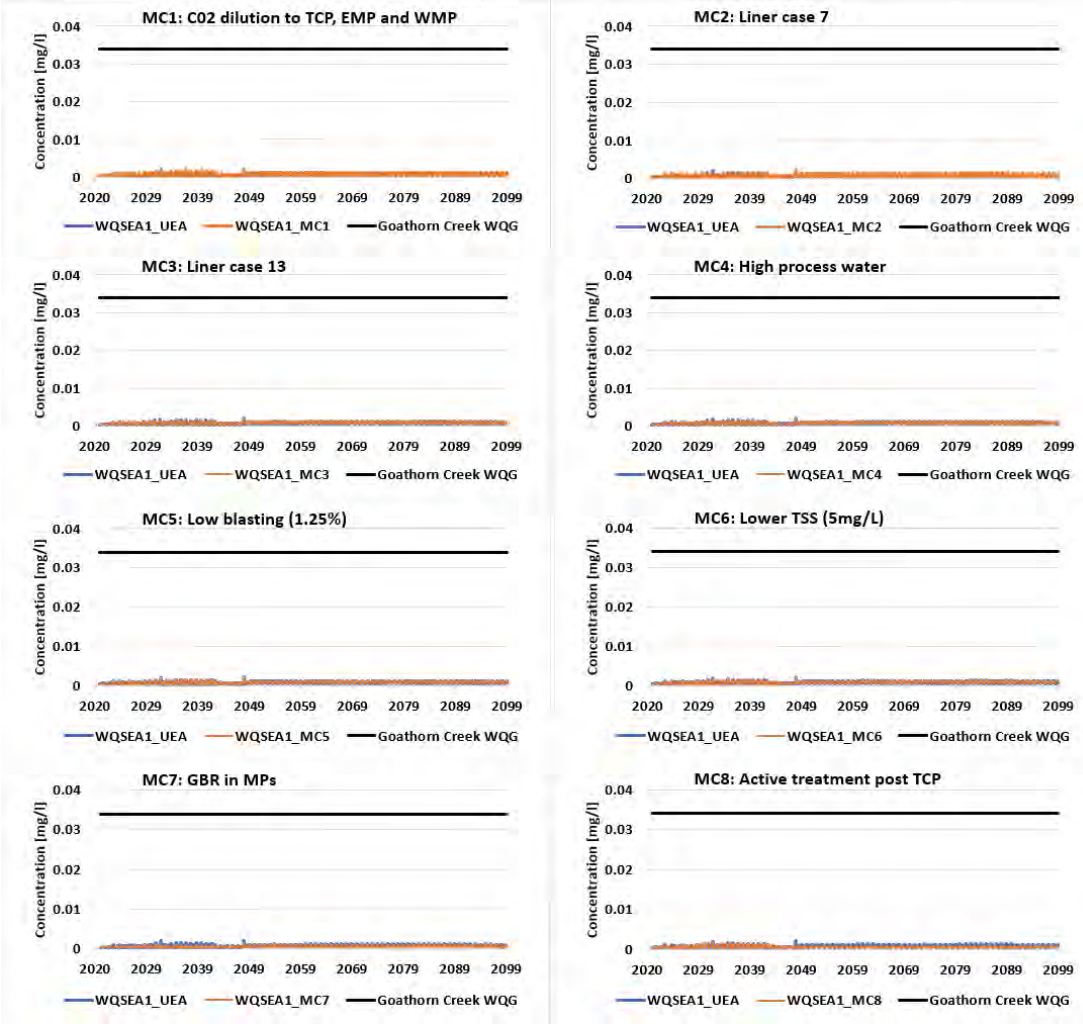

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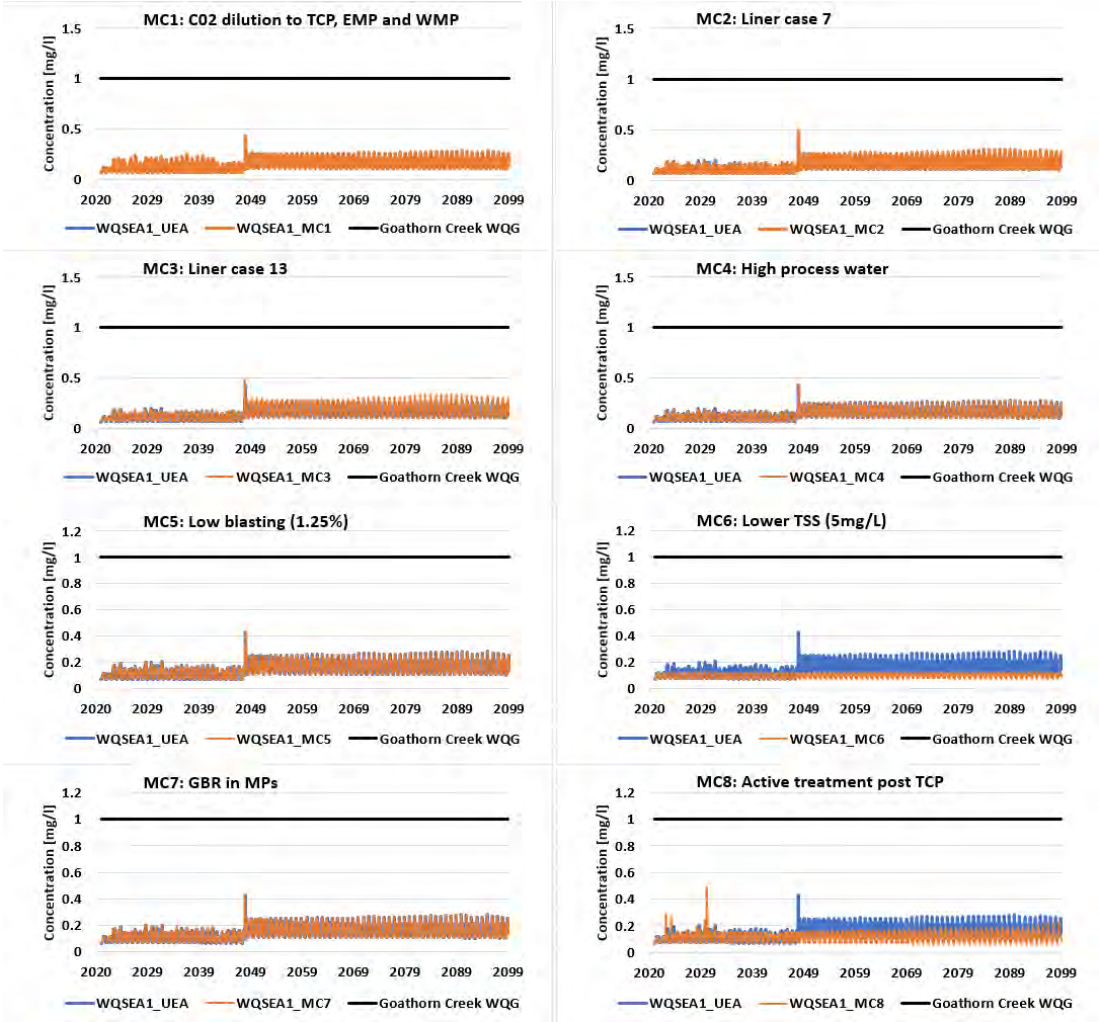
Figure 6C-10: Total Iron modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case



srk consulting

Figure 6C-11: Total Chromium modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case

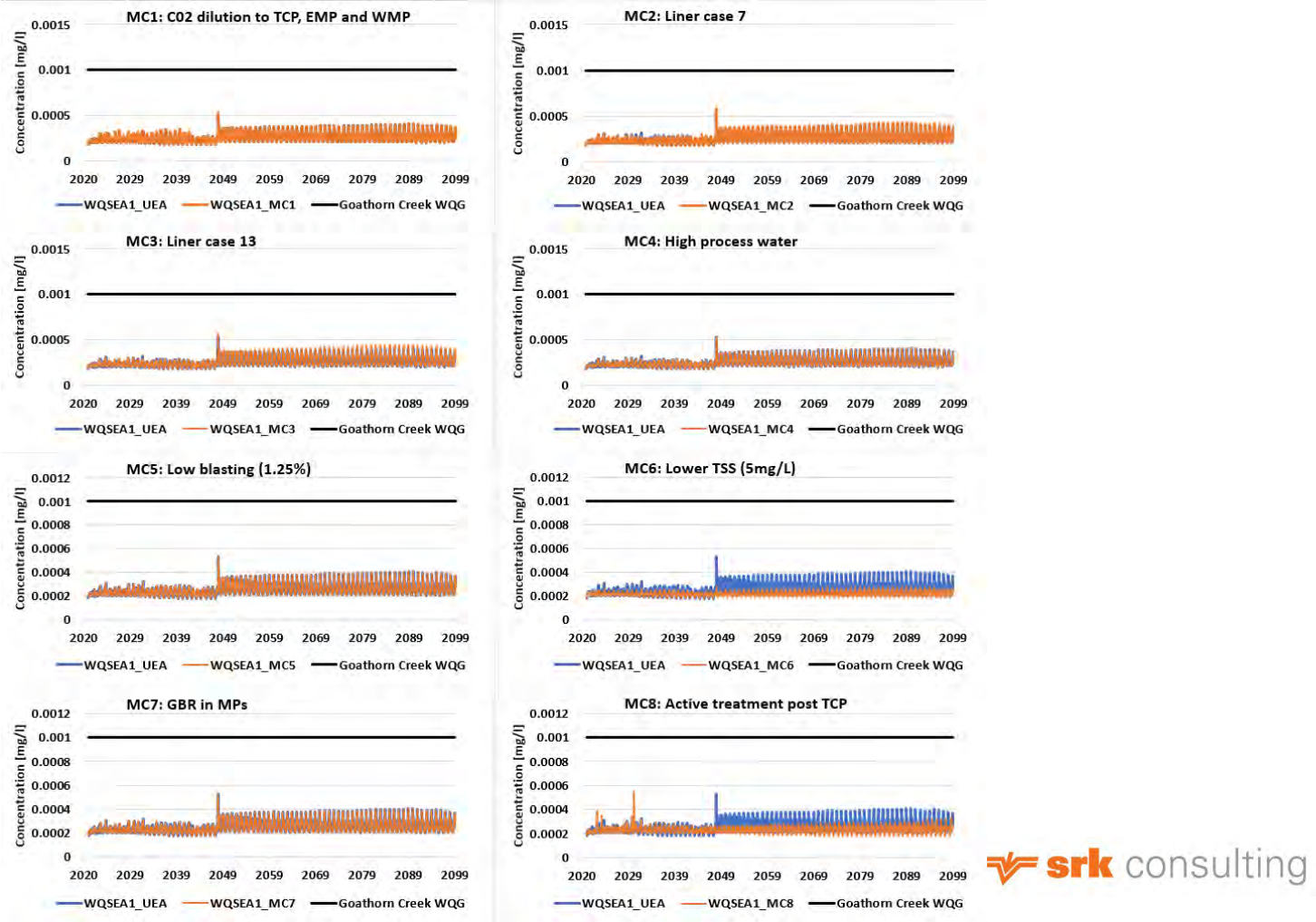


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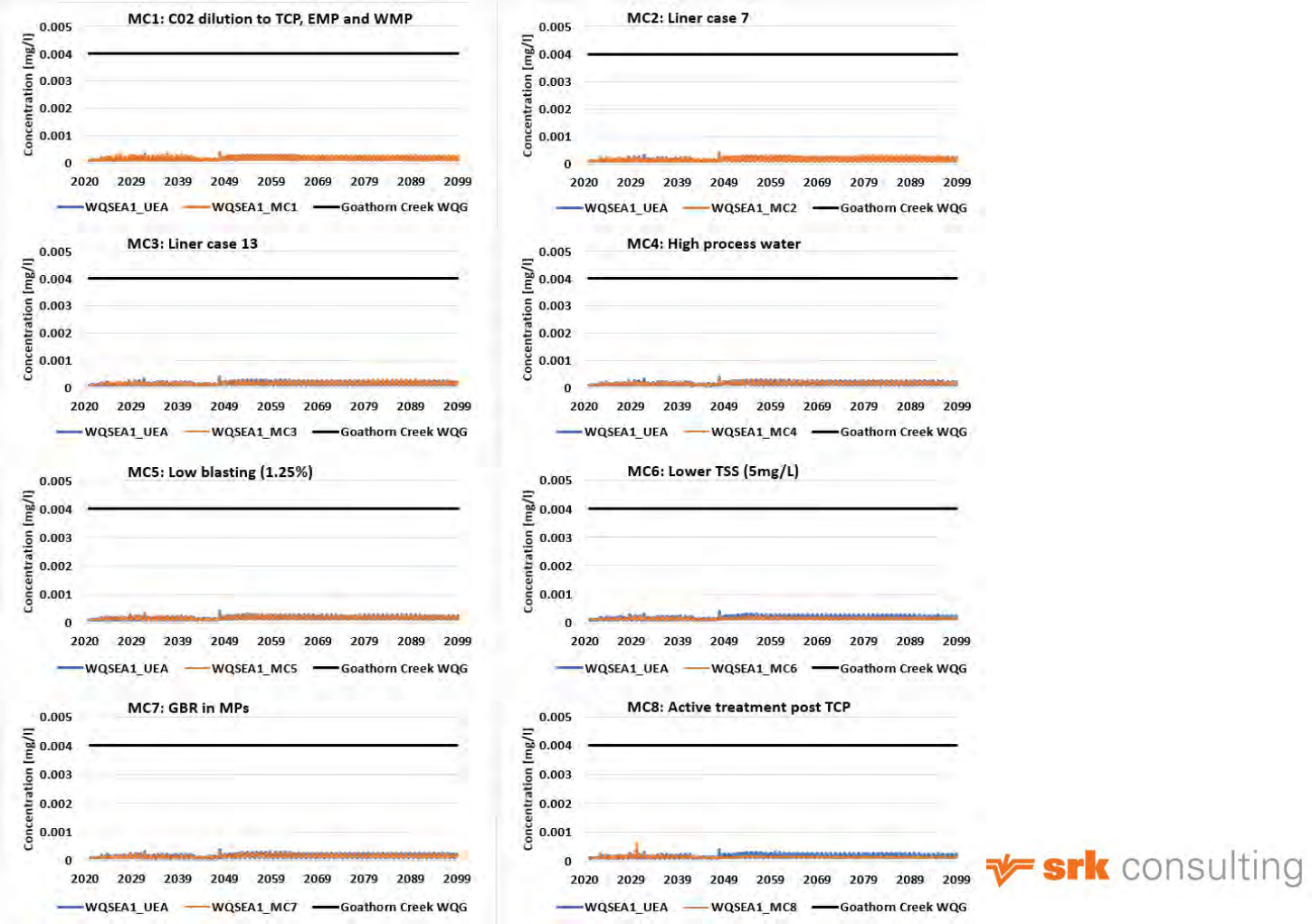
Figure 6C-12: Total Cobalt modelled concentrations in Goathorn Creek (WQSEA1) for mitigation cases compared to project case



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Appendix G Parameters of Concern for Mitigation Controls in Surface and Groundwater Discharges

Appendix 7-A

Tenas Control Pond surface discharge (operations

Figure 7A-1: Nitrite modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

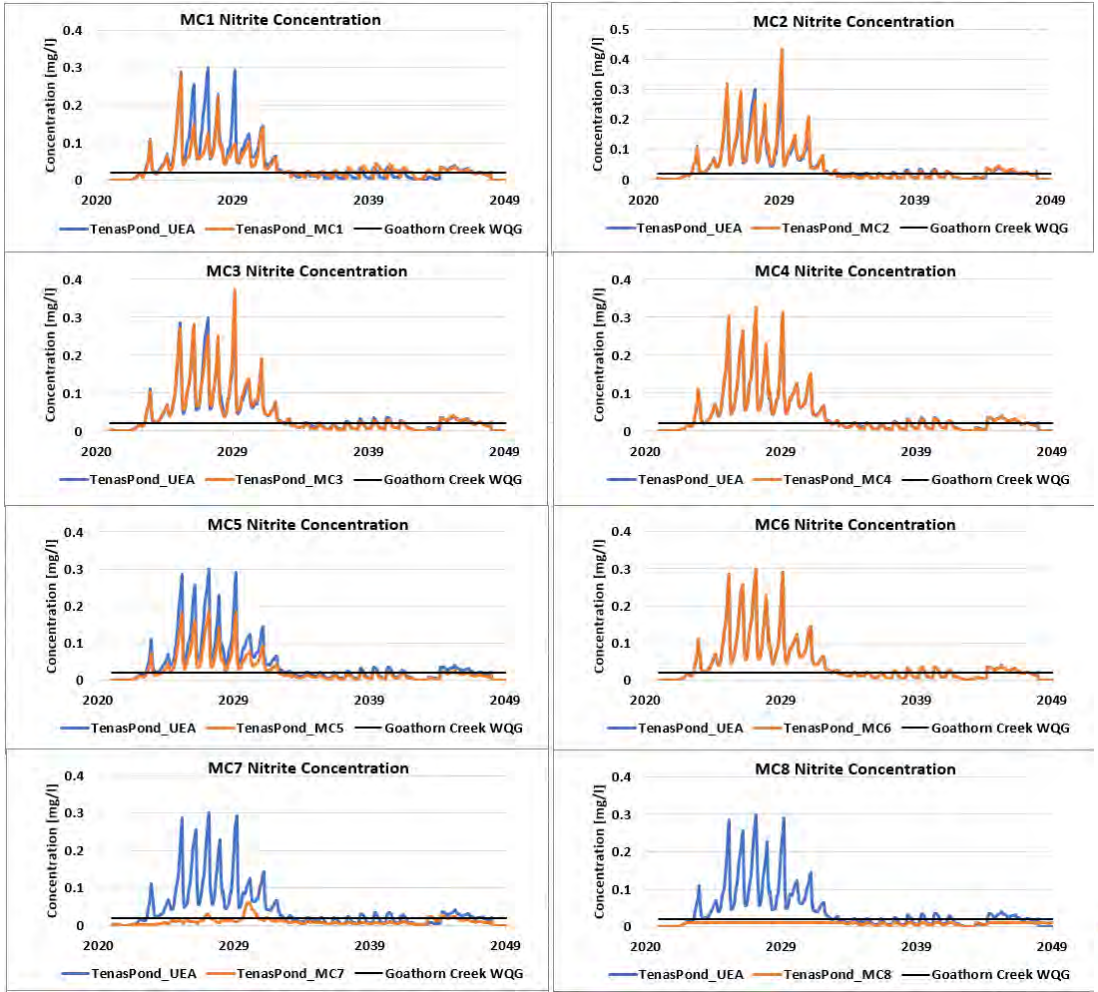

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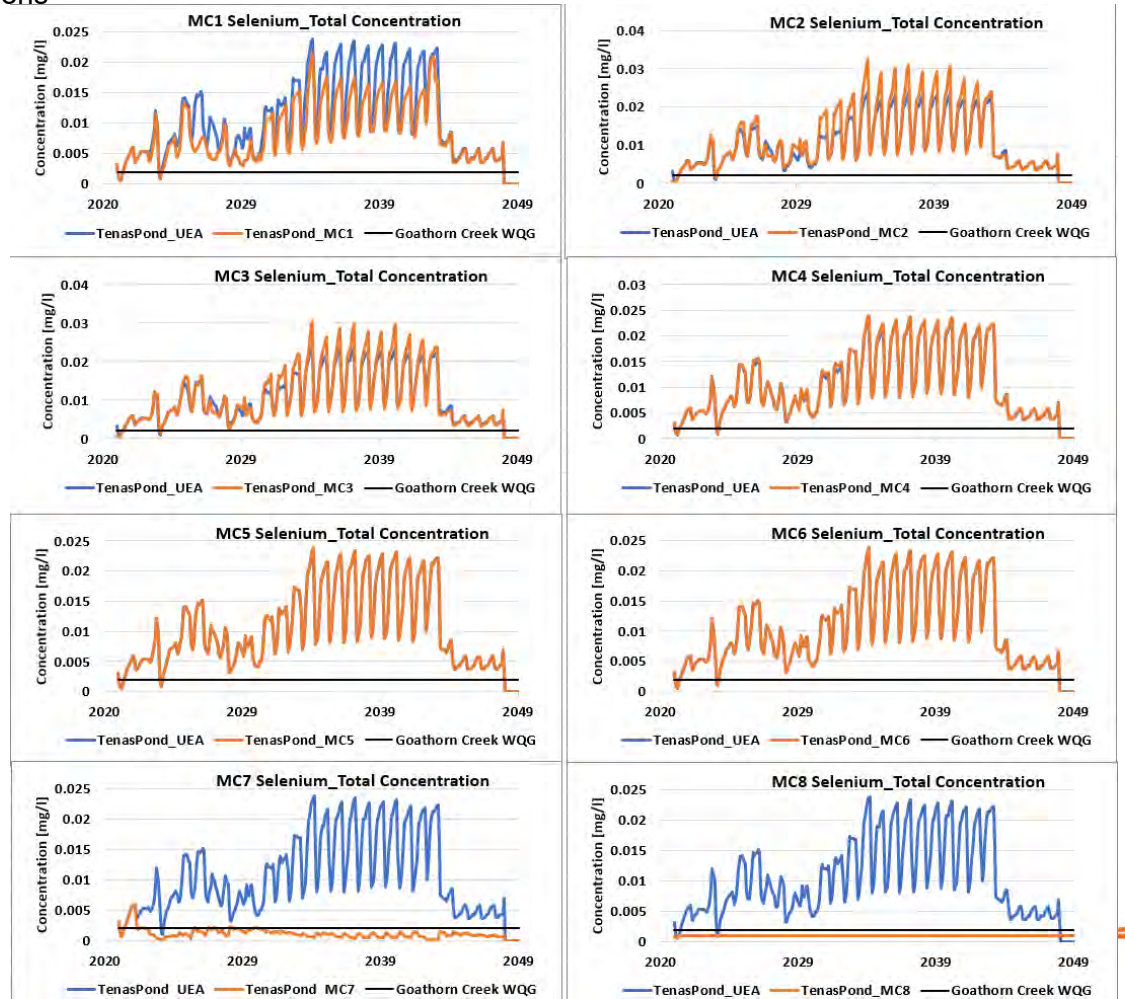
Figure 7A-2: Total Selenium modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations



srk consulting

Figure 7A-3: Sulphate modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

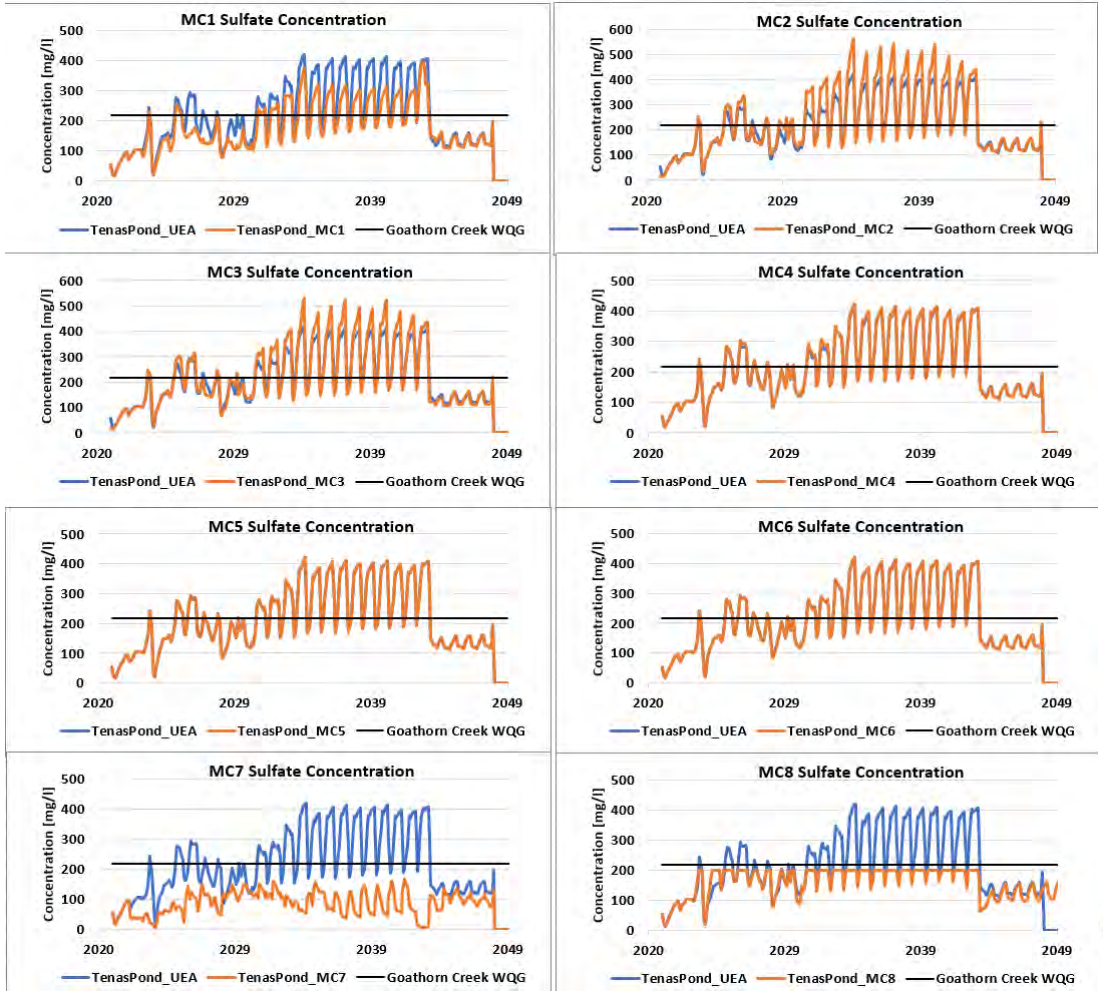


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Figure 7A-4: Total Aluminium modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

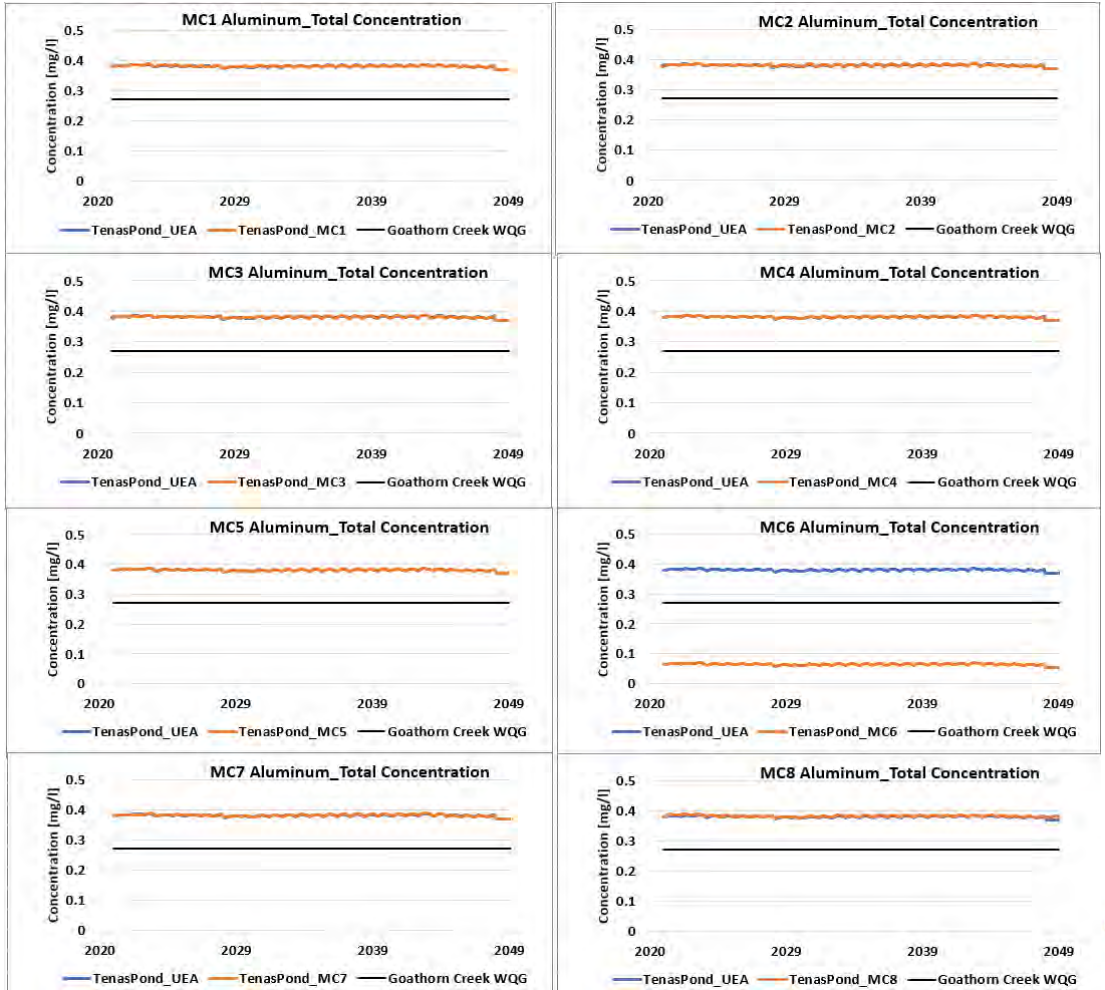

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Figure 7A-5: Nitrate modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

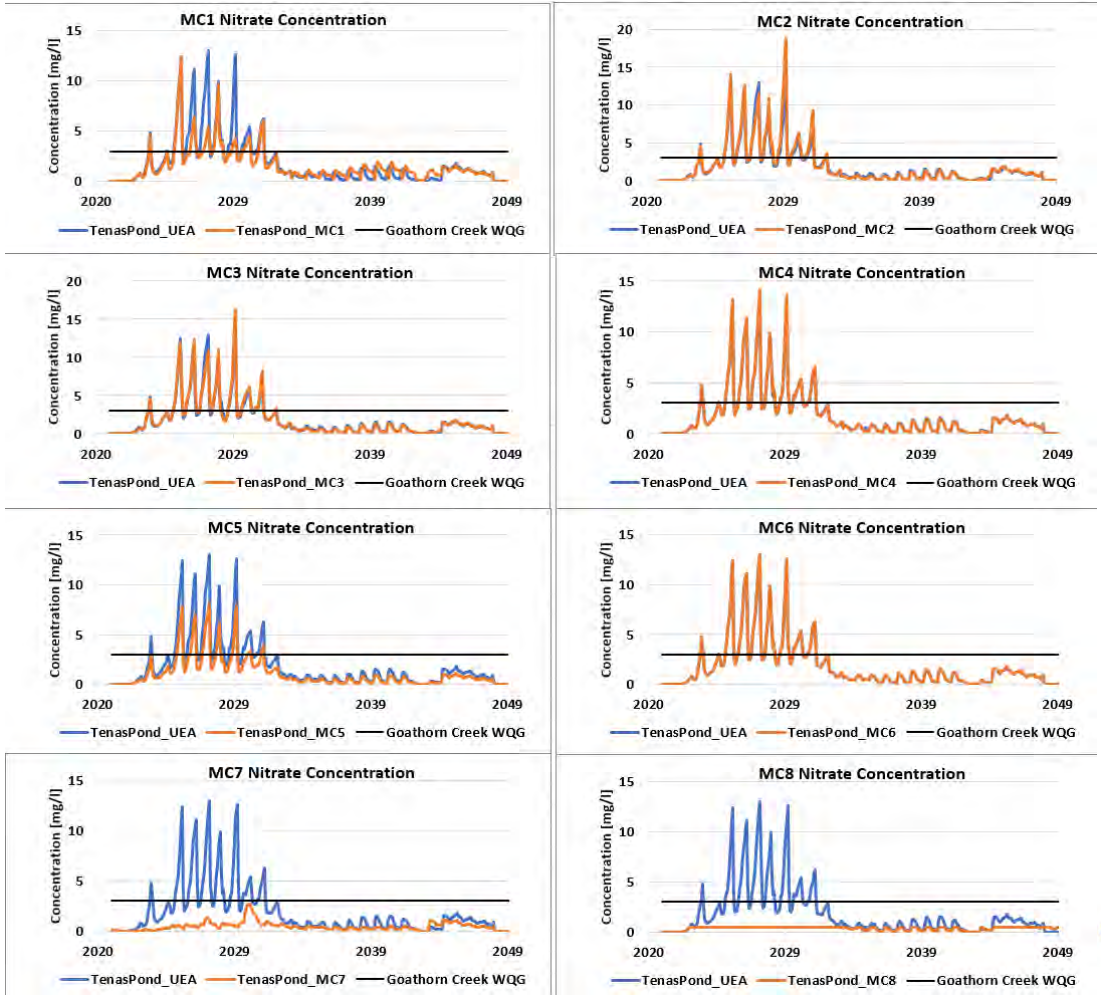

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Figure 7A-6: Dissolved Zinc modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

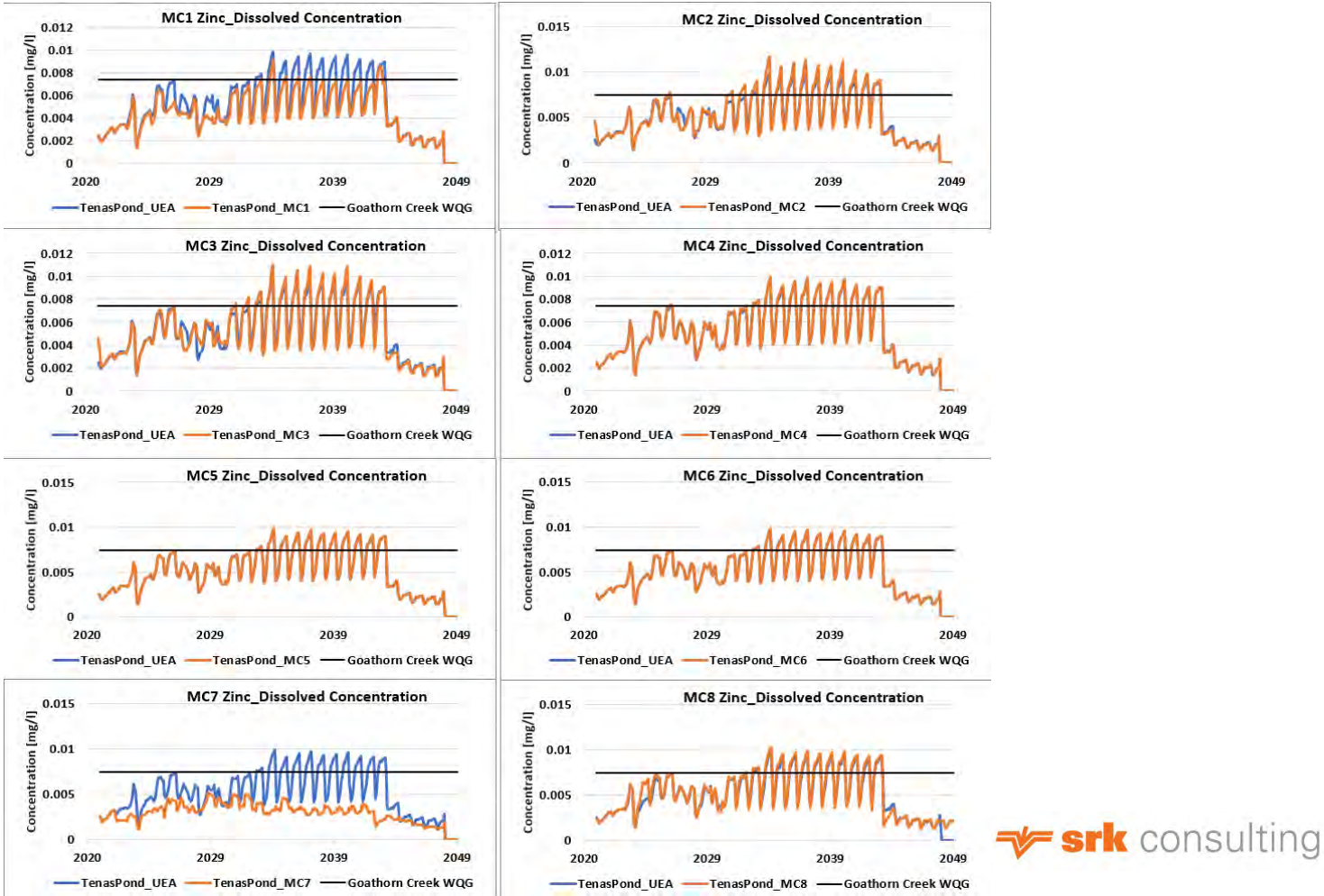

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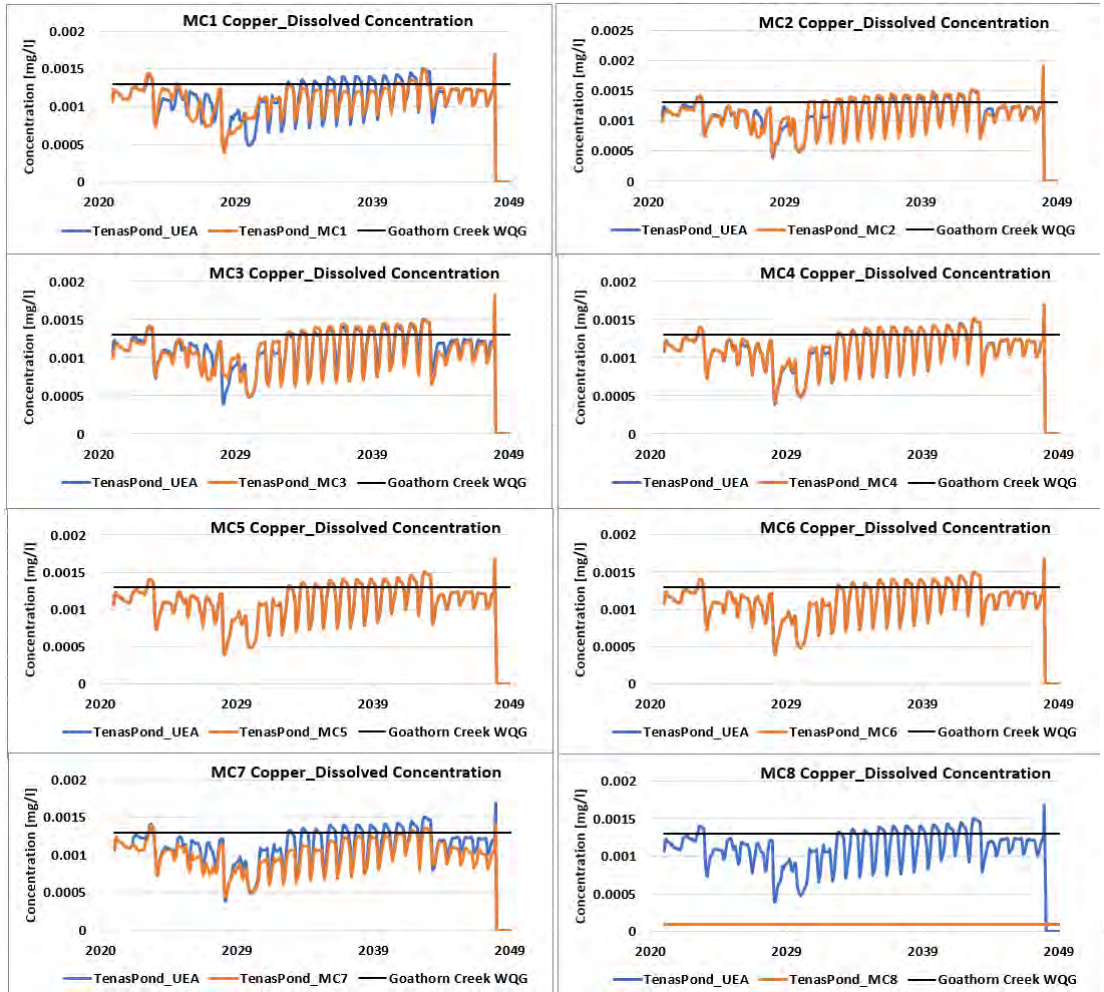
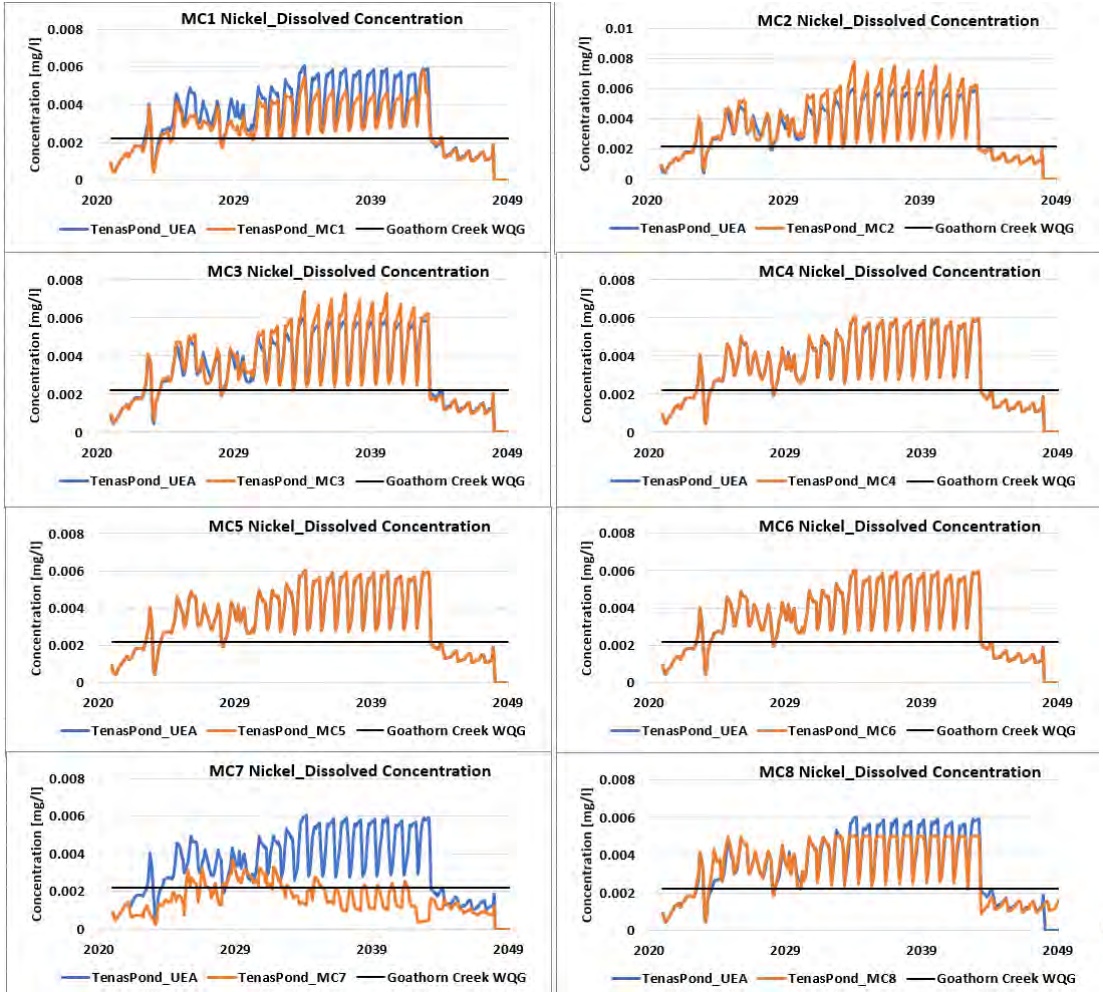
Figure 7A-7: Dissolved Copper modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations



srk consulting

Figure 7A-8: Dissolved Nickel modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations



srk consulting

Figure 7A-9: Total Molybdenum modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

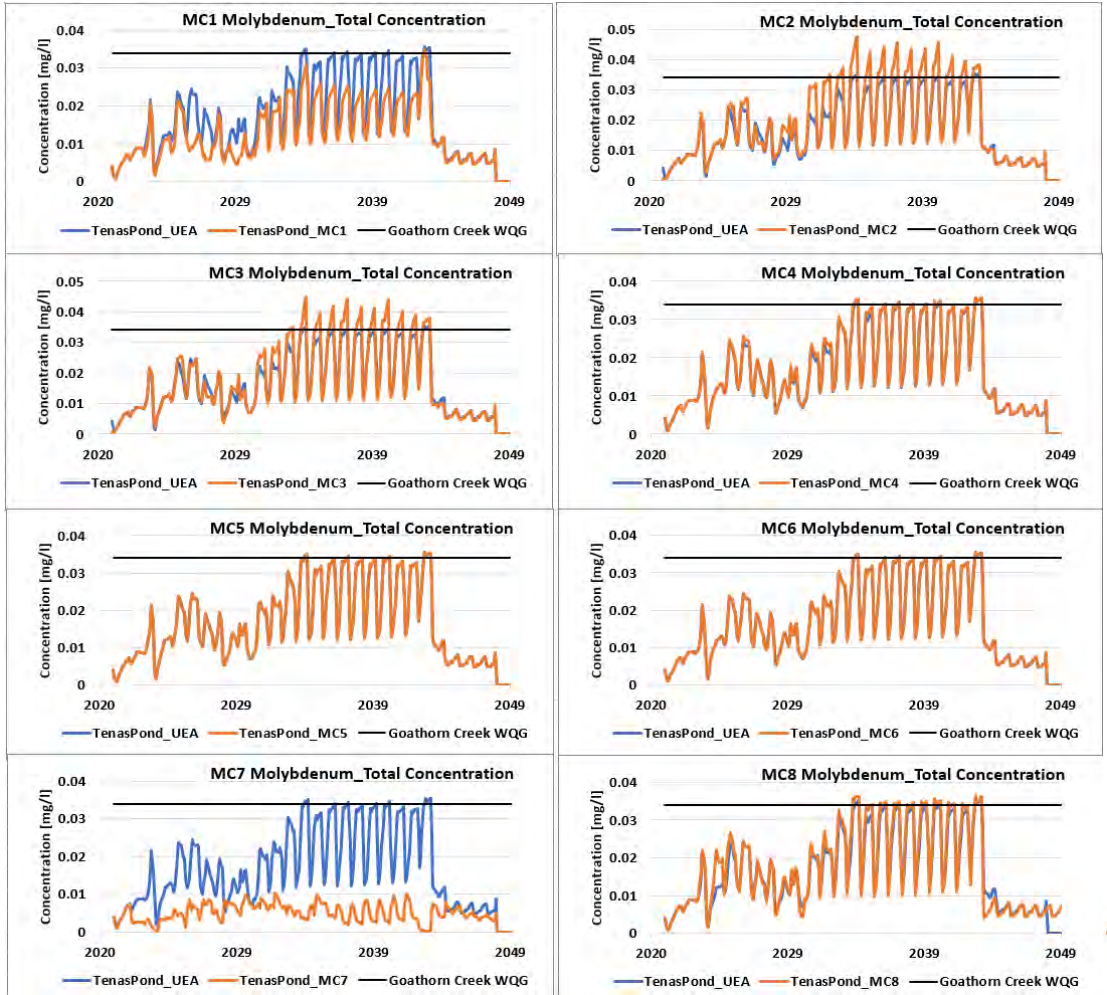


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Figure 7A-10: Total Iron modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

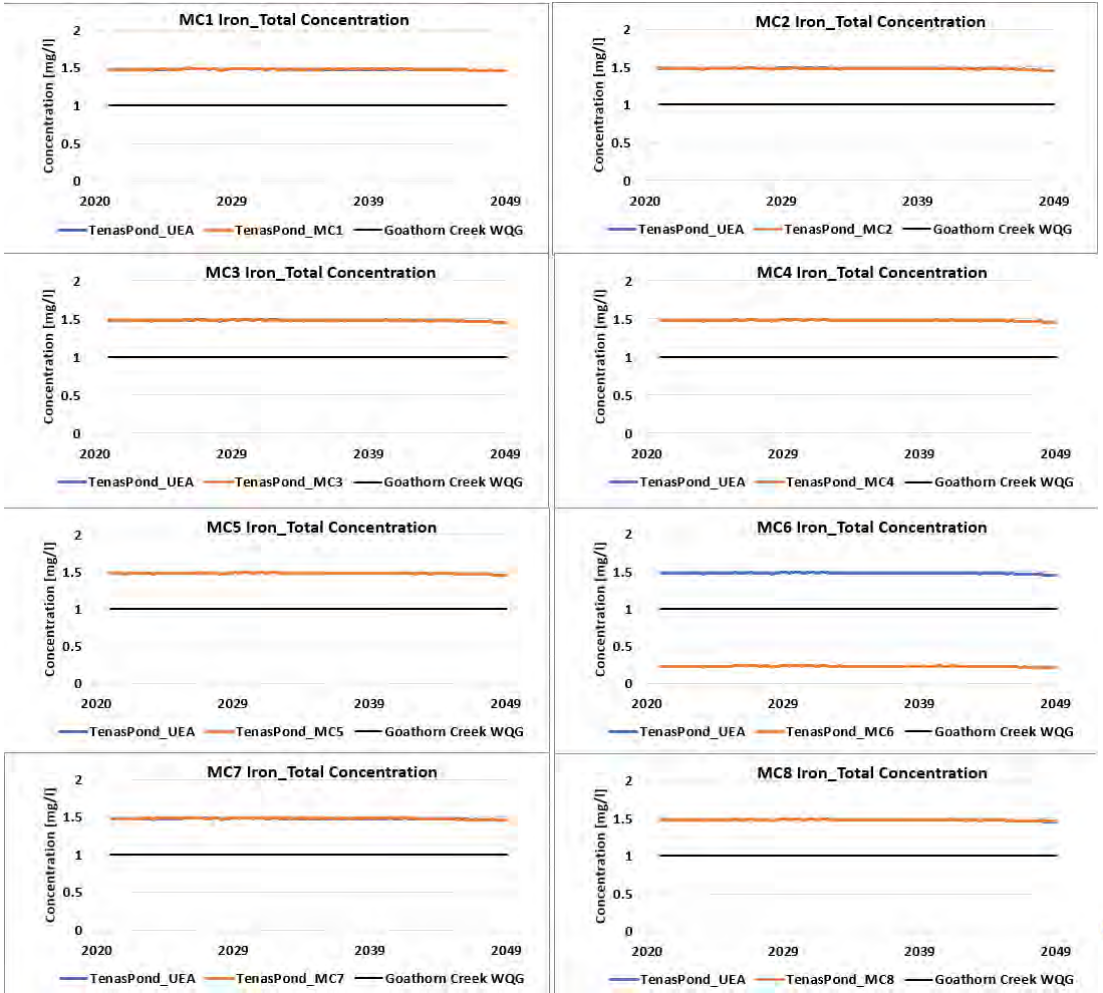

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Figure 7A-11: Total Chromium modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations

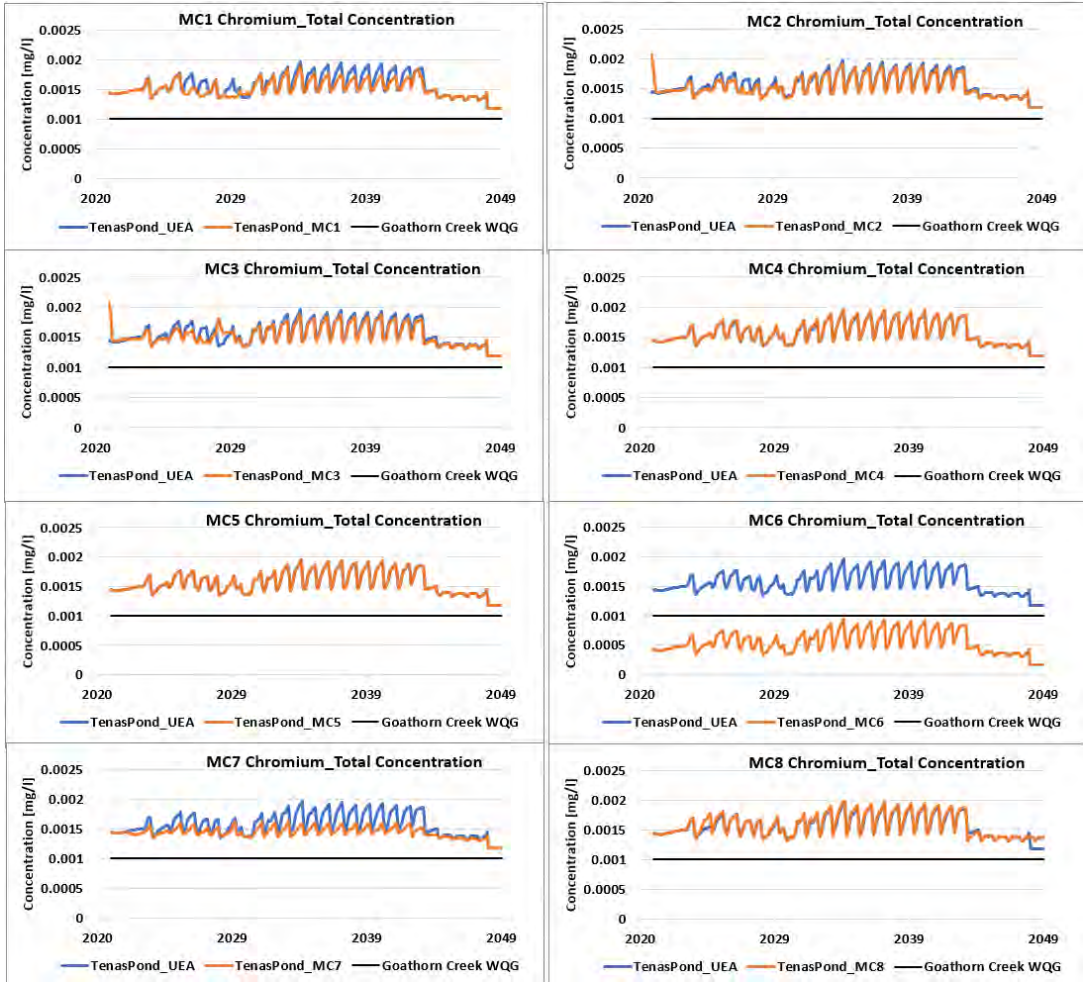

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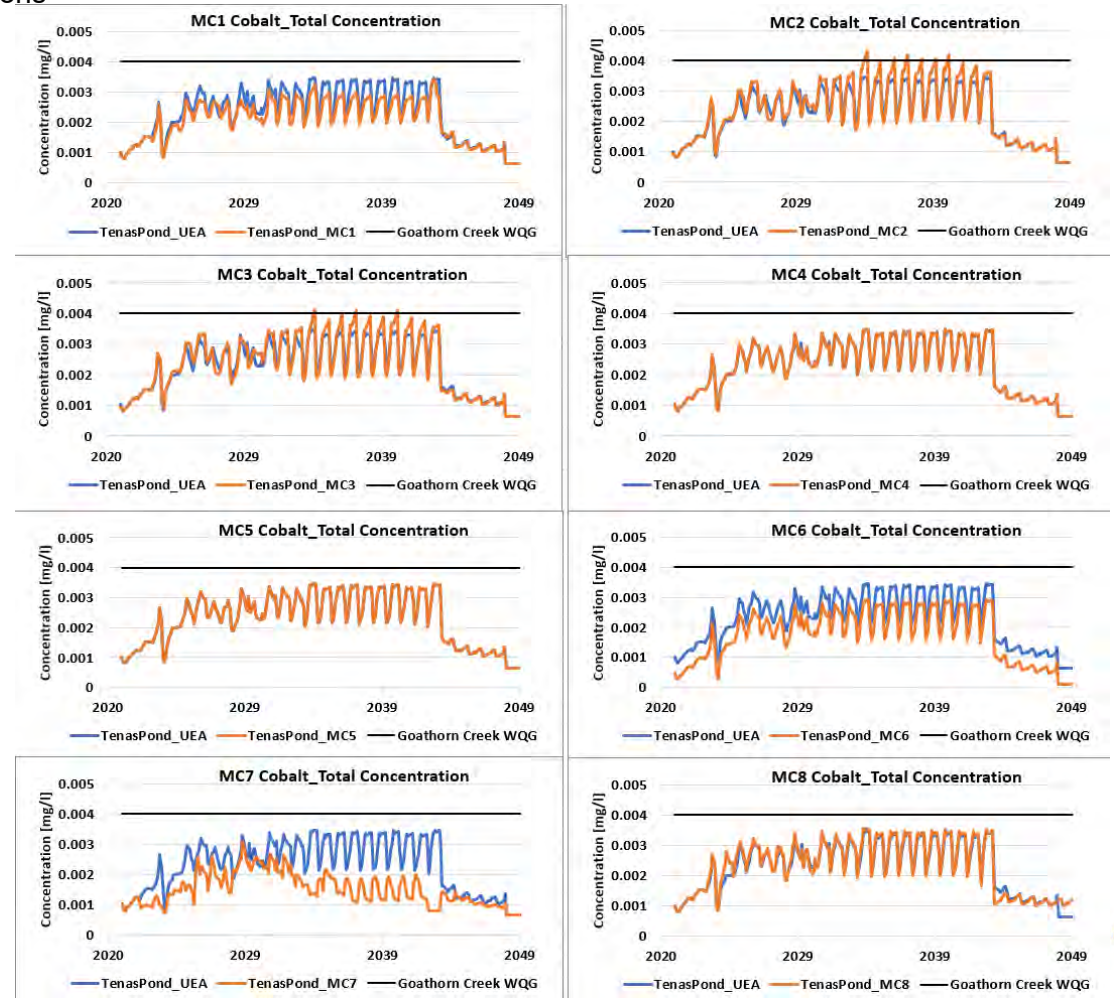
Figure 7A-12: Total Cobalt modelled concentrations in Tenas Control Pond surface discharge for mitigation cases compared to project case in Operations



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Appendix 7-B

North Management Pond surface discharge (Post-Closure)

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Figure 7B-1: Nitrite modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project case in Post-Closure

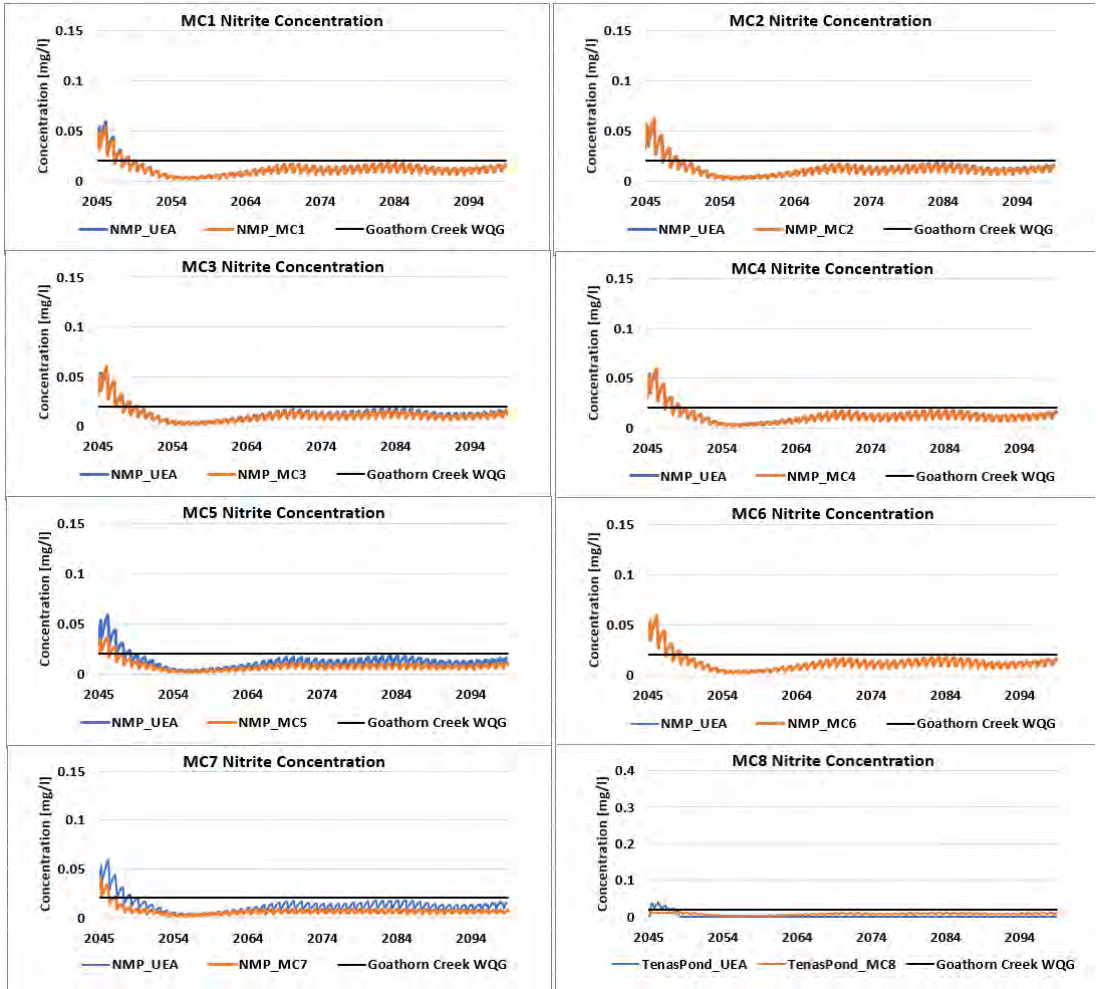

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Figure 7B-2: Total Selenium modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project cas
in Post-Closure

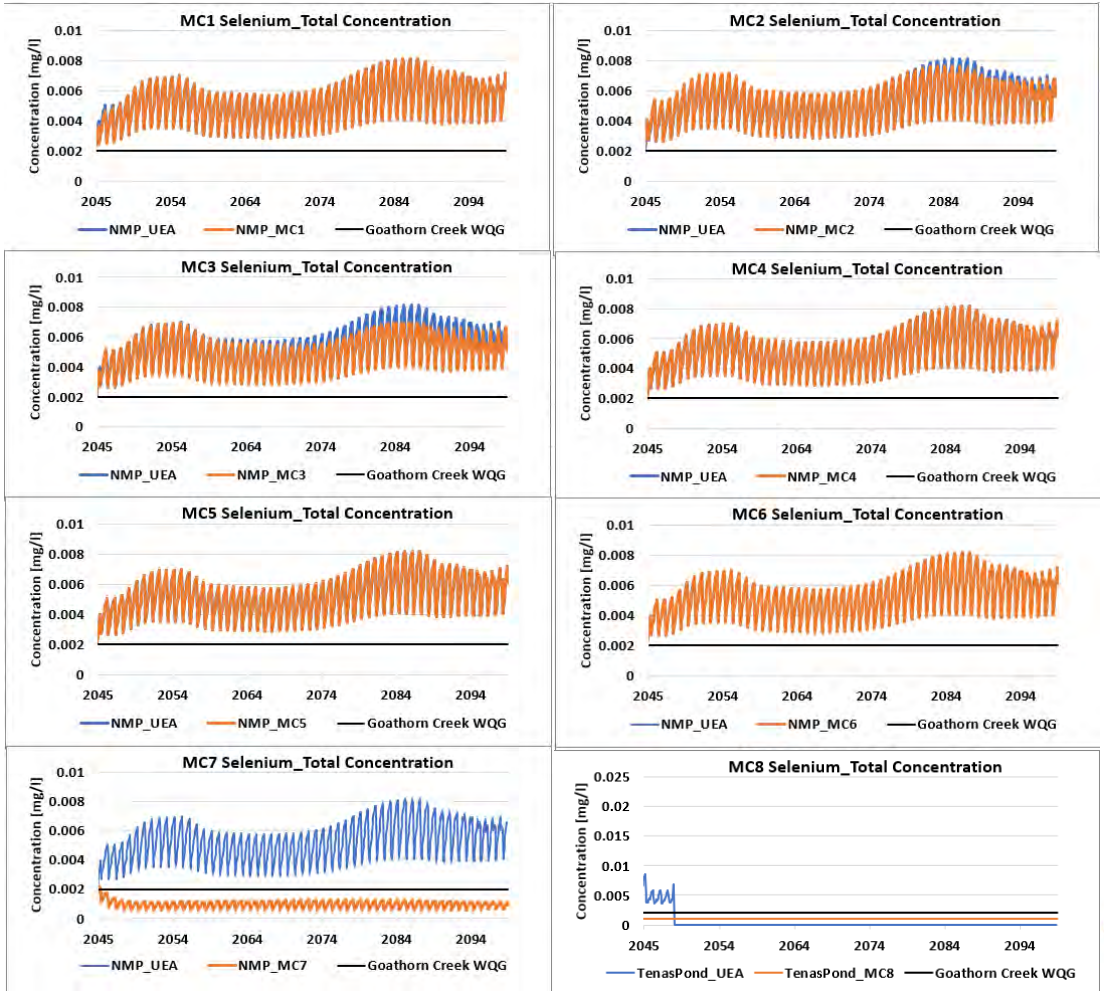

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Figure 7B-3: Sulphate modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project case in Post-Closure

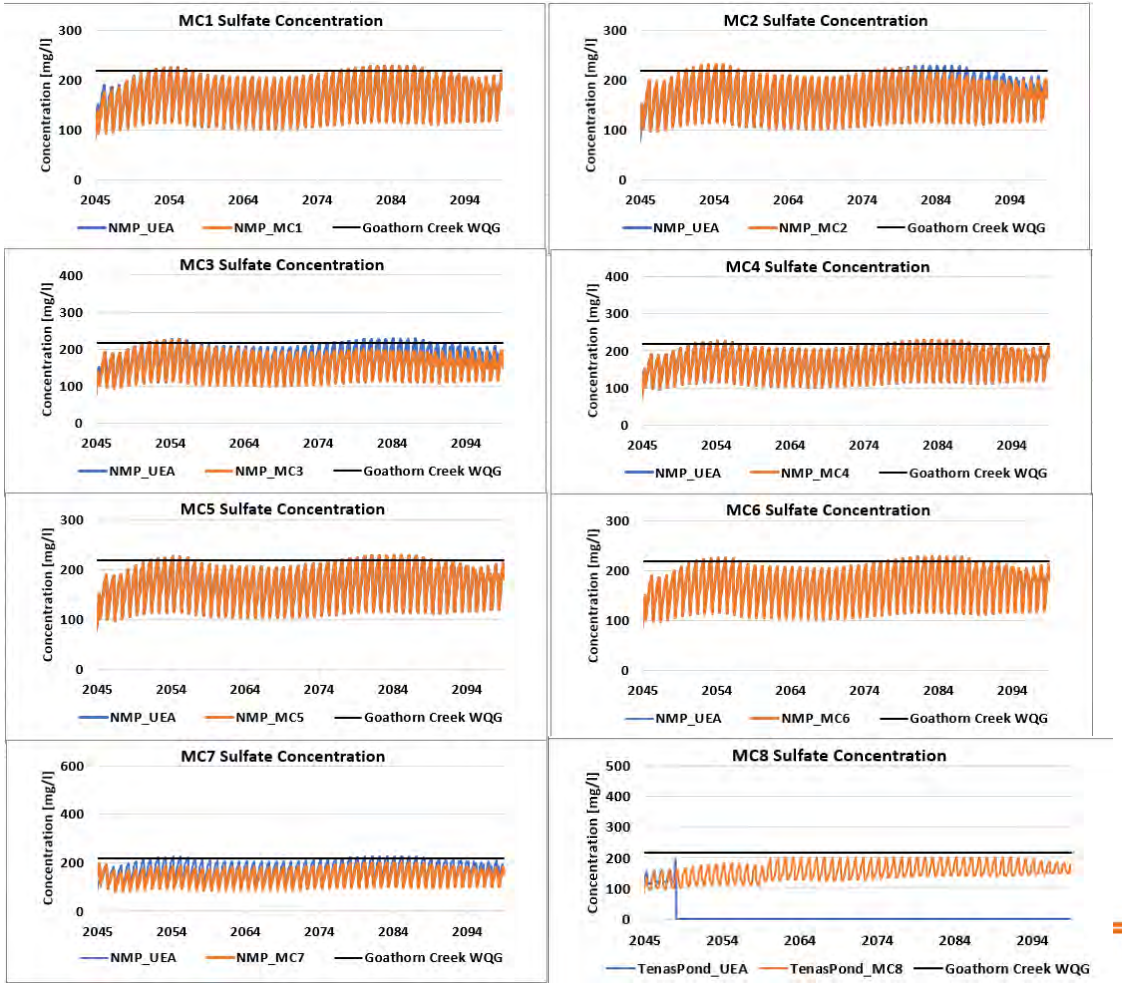

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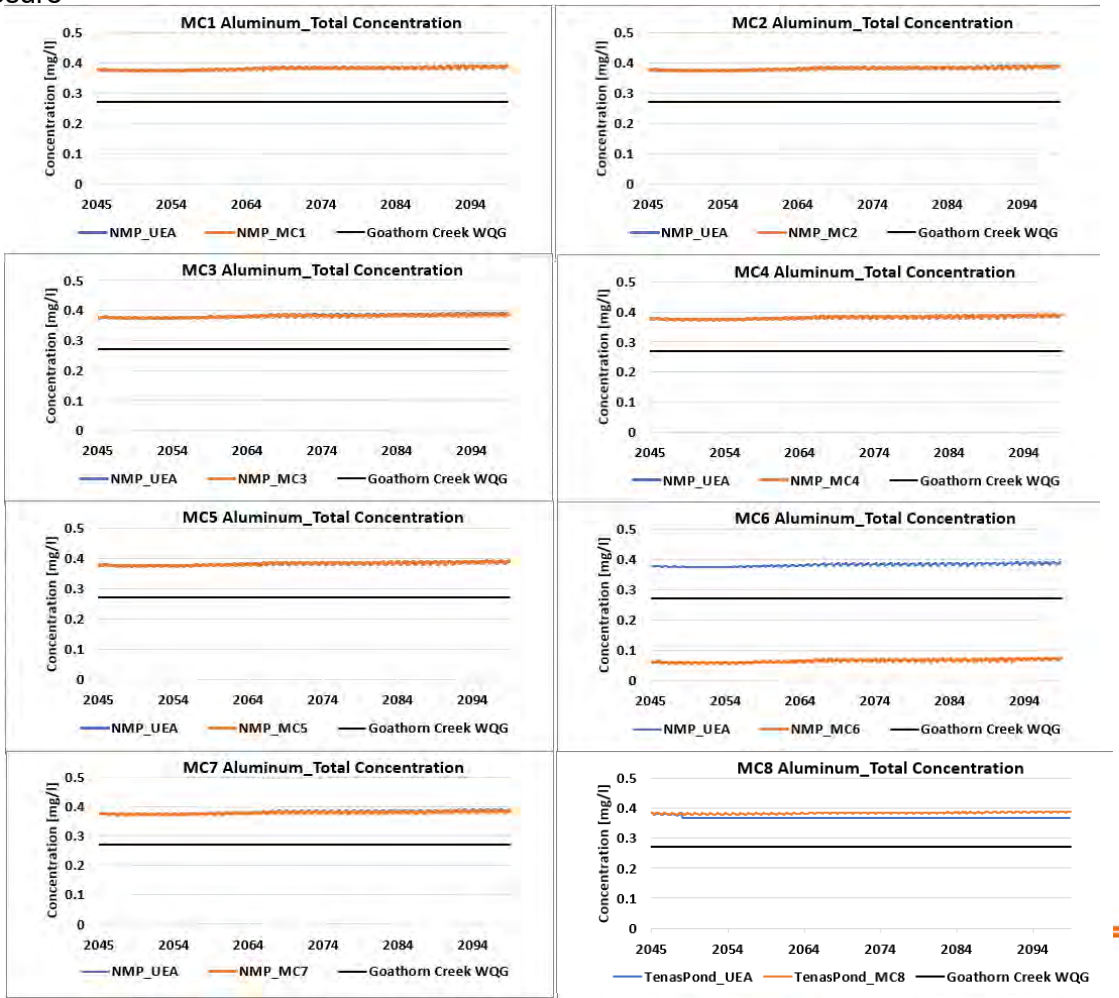
Figure 7B-4: Total Aluminium modelled concentrations inNorth Management Pond surface discharge for mitigation cases compared to project ca
in Post-Closure



srk consulting

Figure 7B-5: Nitrate modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project case in Post-Closure

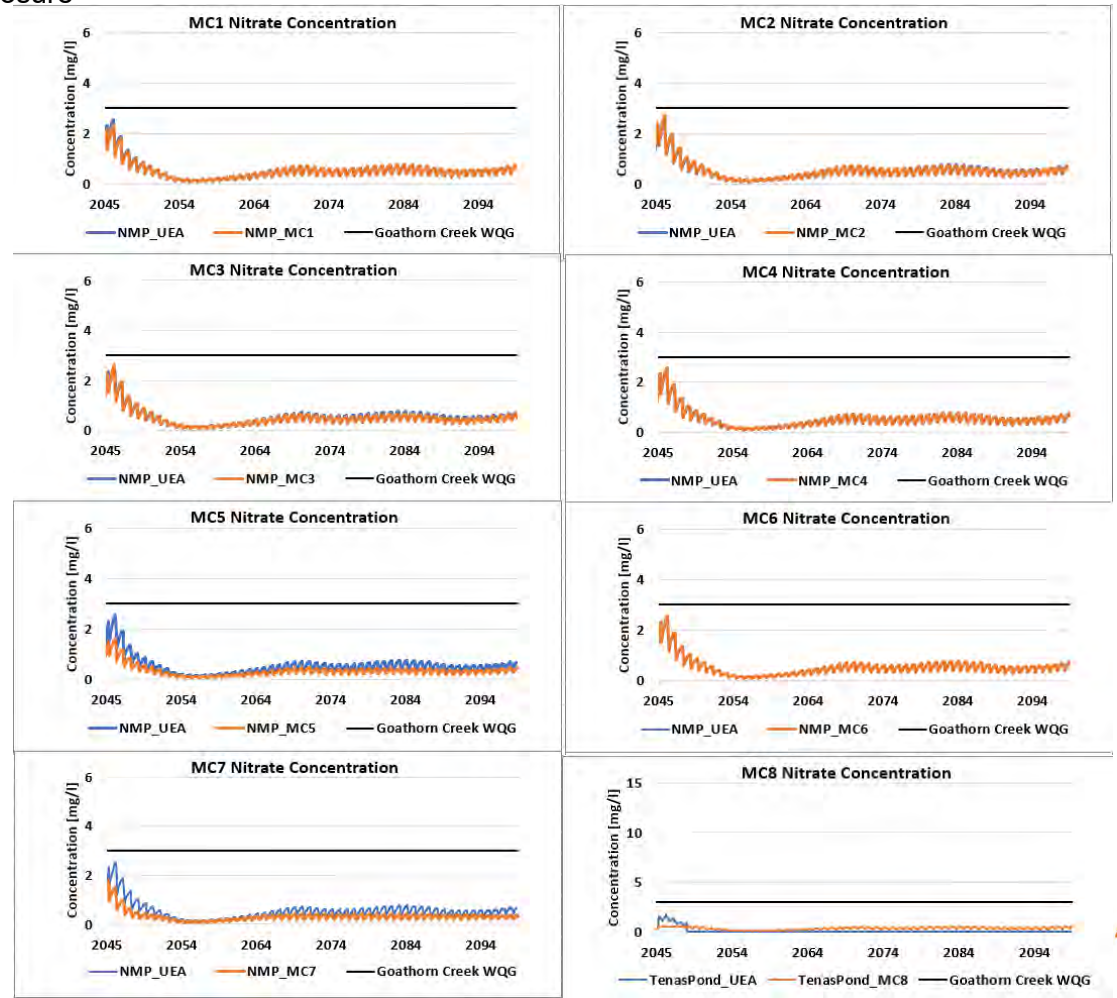


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Figure 7B-6: Dissolved Zinc modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project cas
in Post-Closure

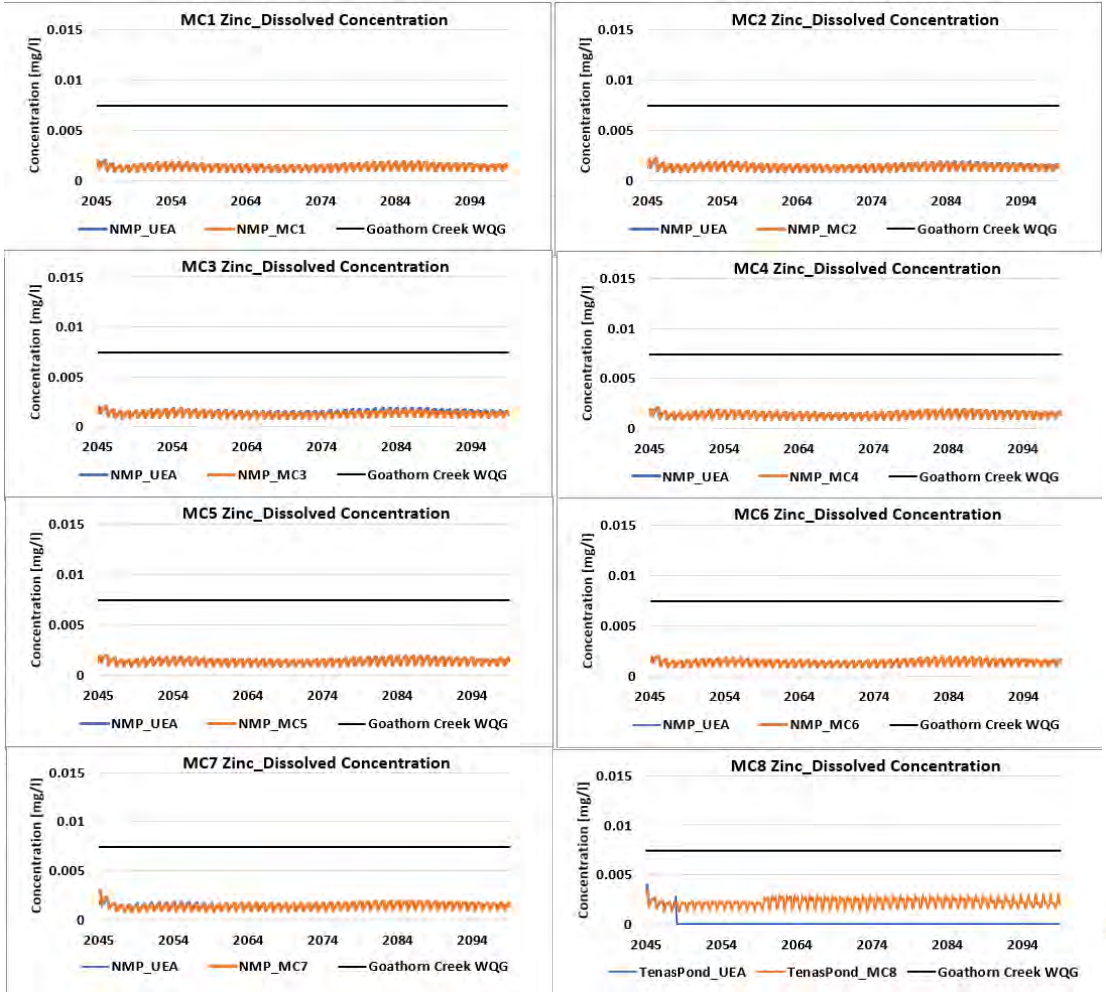

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Figure 7B-7: Dissolved Copper modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project in Post-Closure

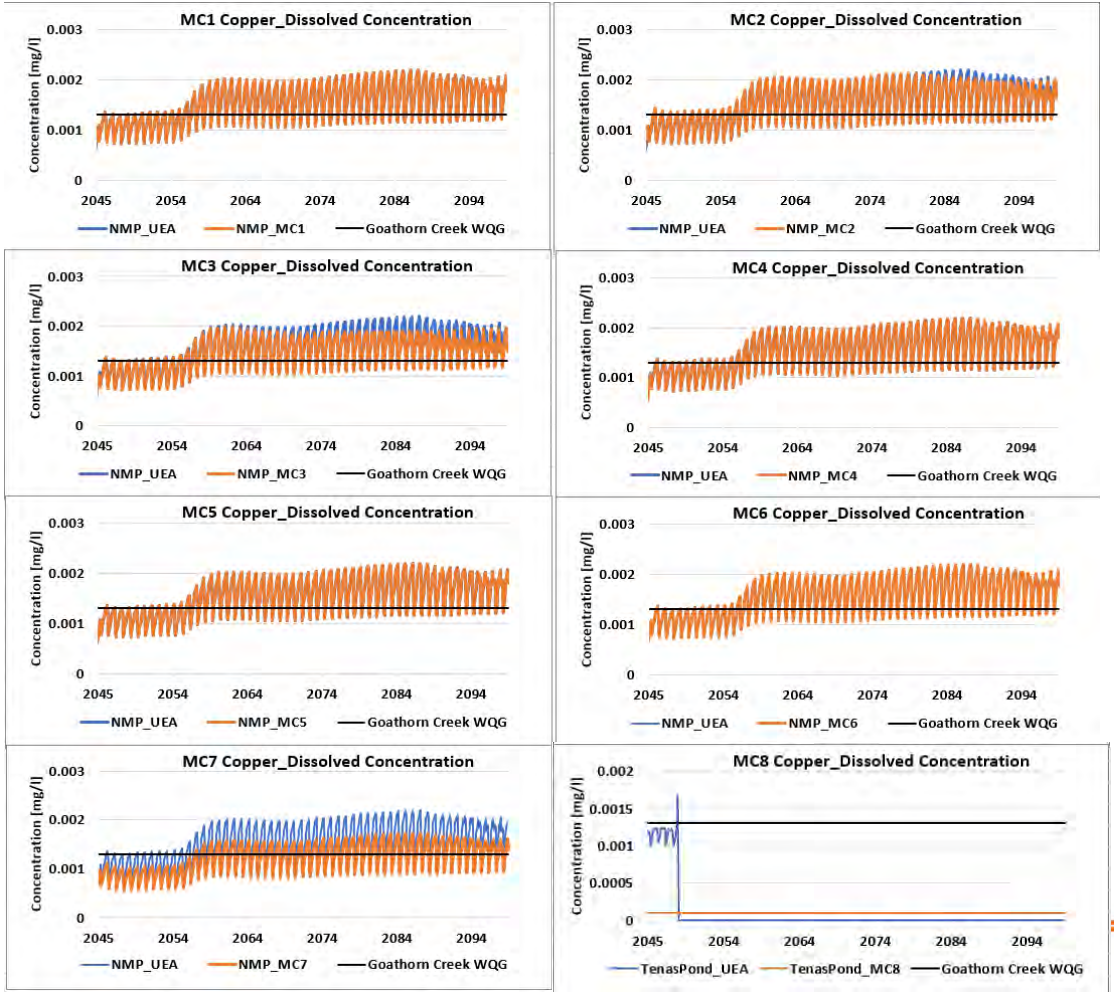

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Figure 7B-8: Dissolved Nickel modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project c
in Post-Closure

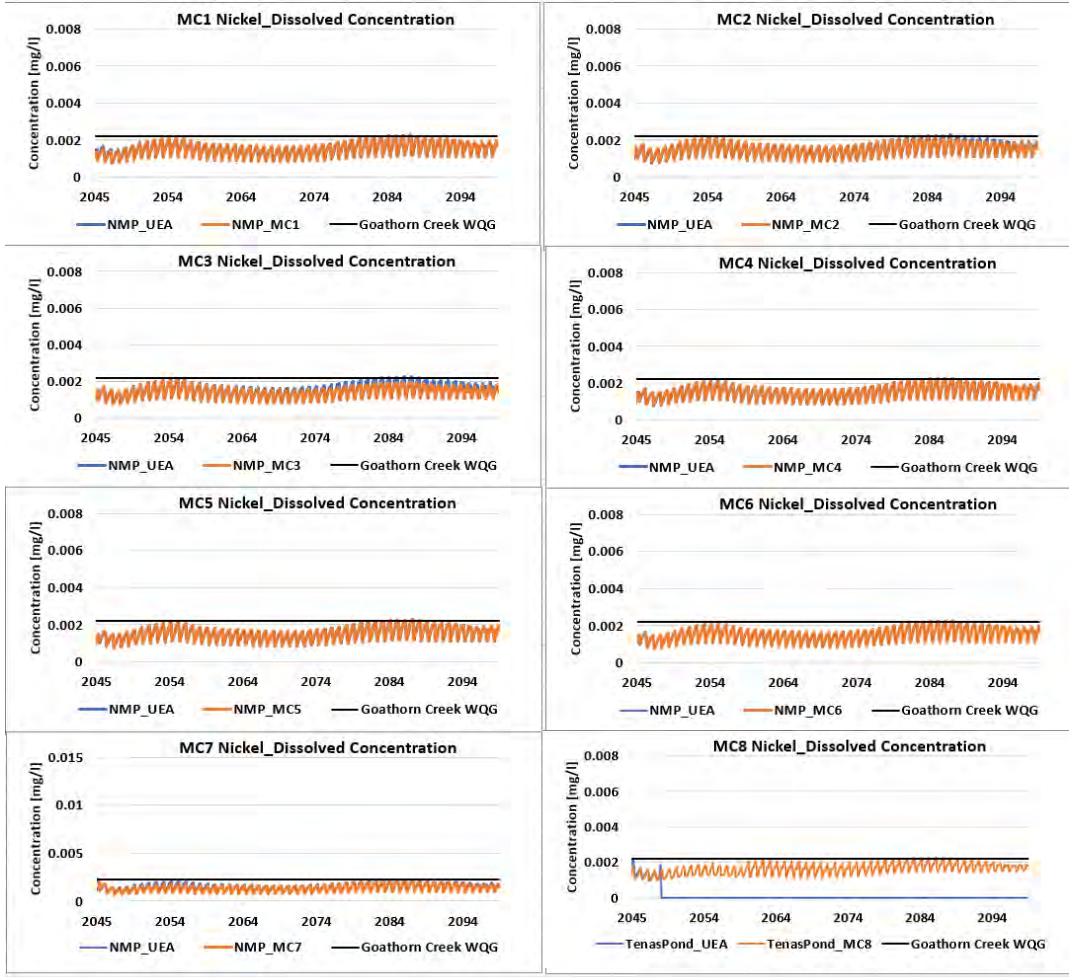

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Figure 7B-9: Total Molybdenum modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project in Post-Closure

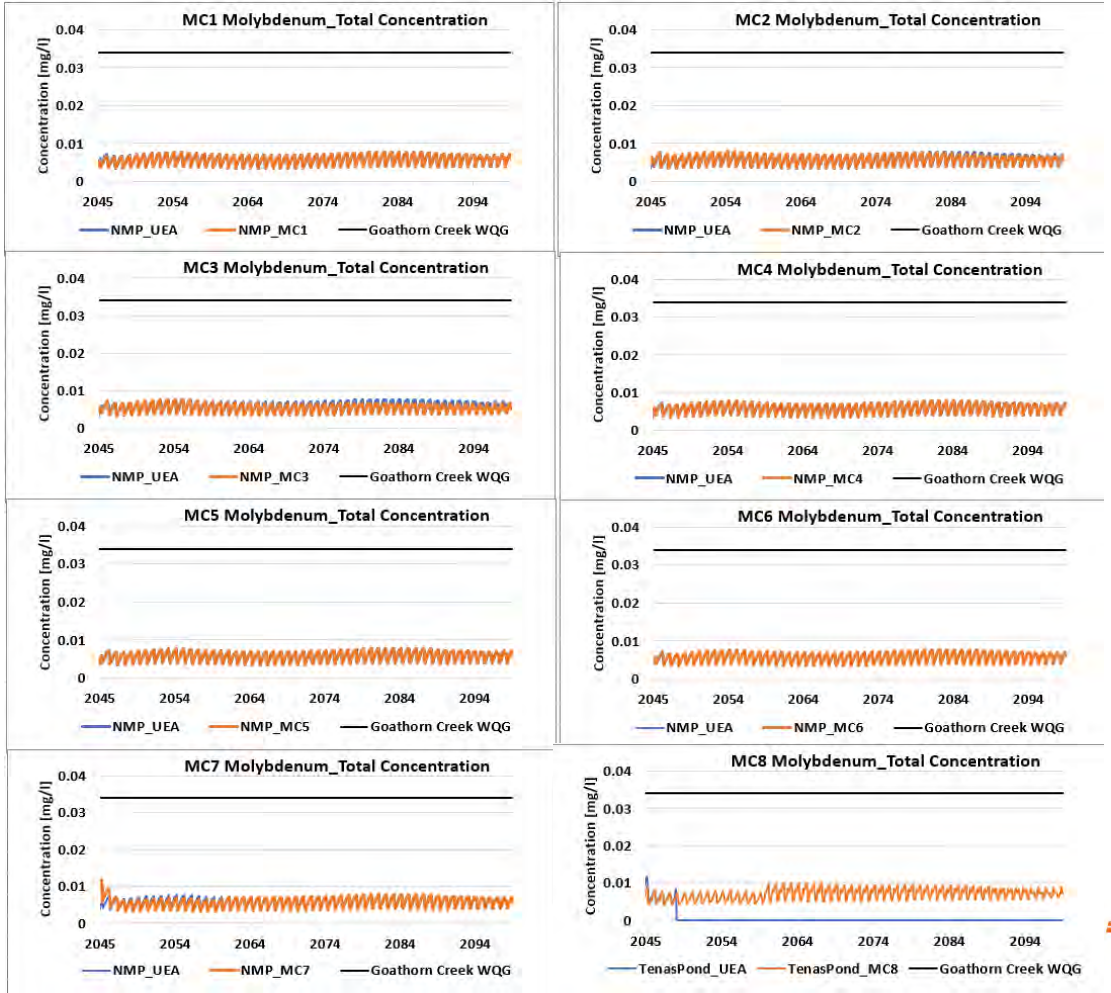

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Figure 7B-10: Total Iron modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project case in Post-Closure

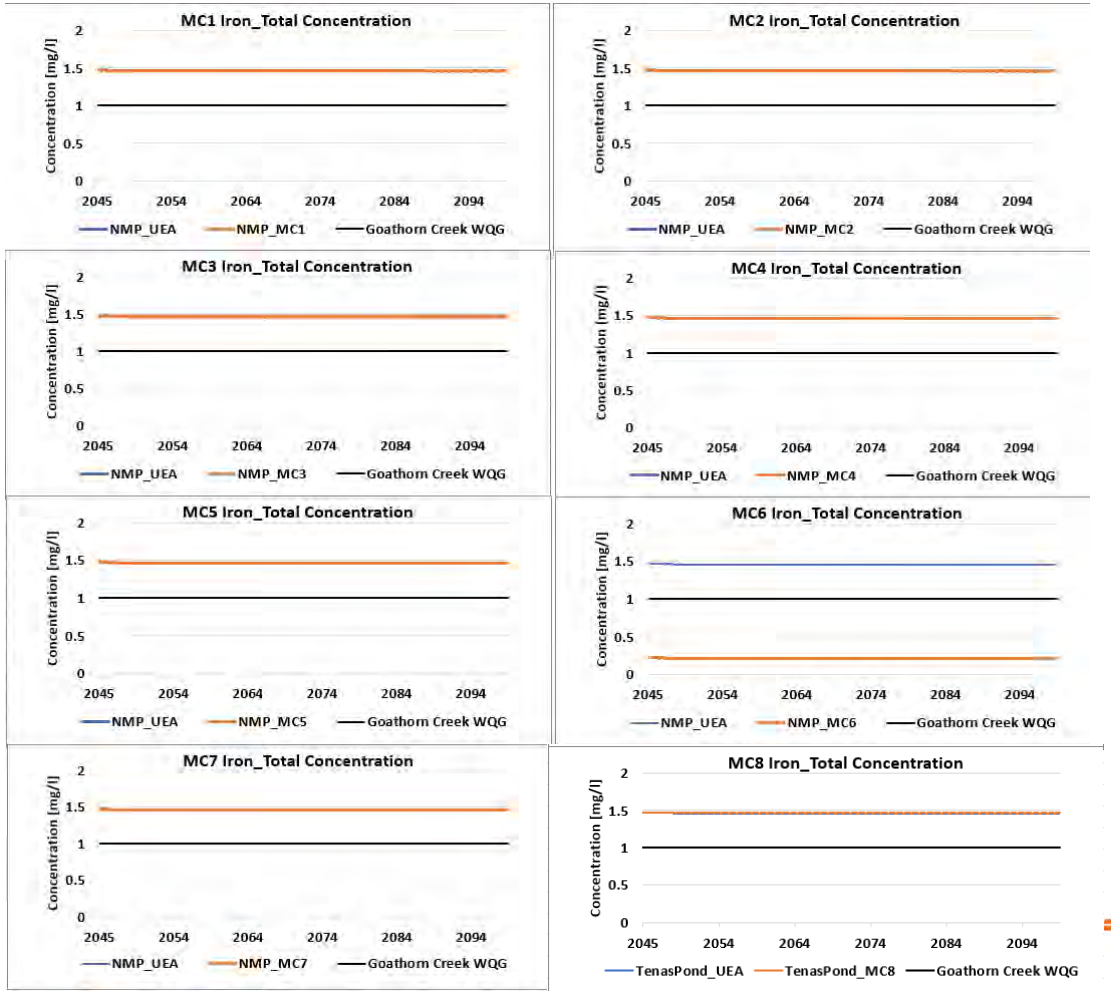

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Figure 7B-11: Total Chromium modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project c
in Post-Closure

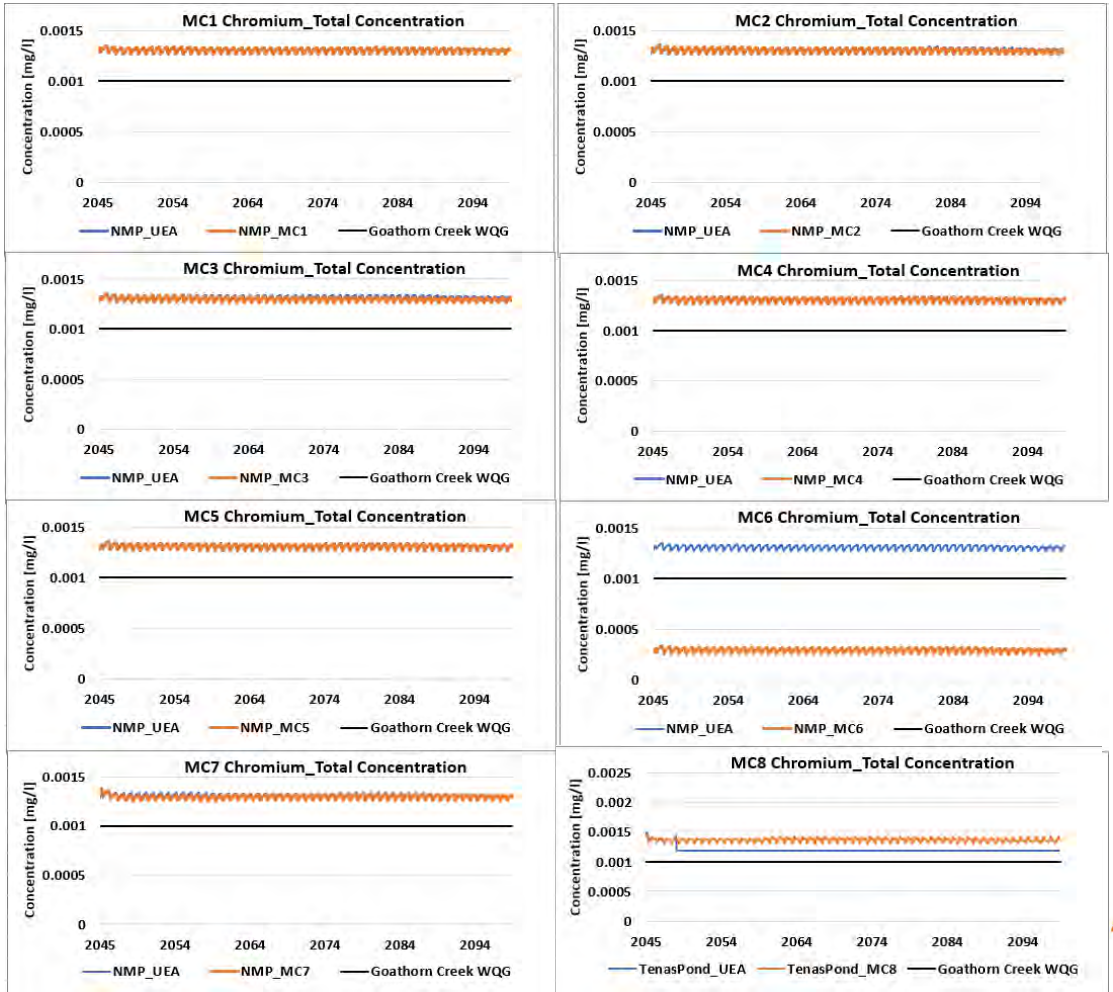

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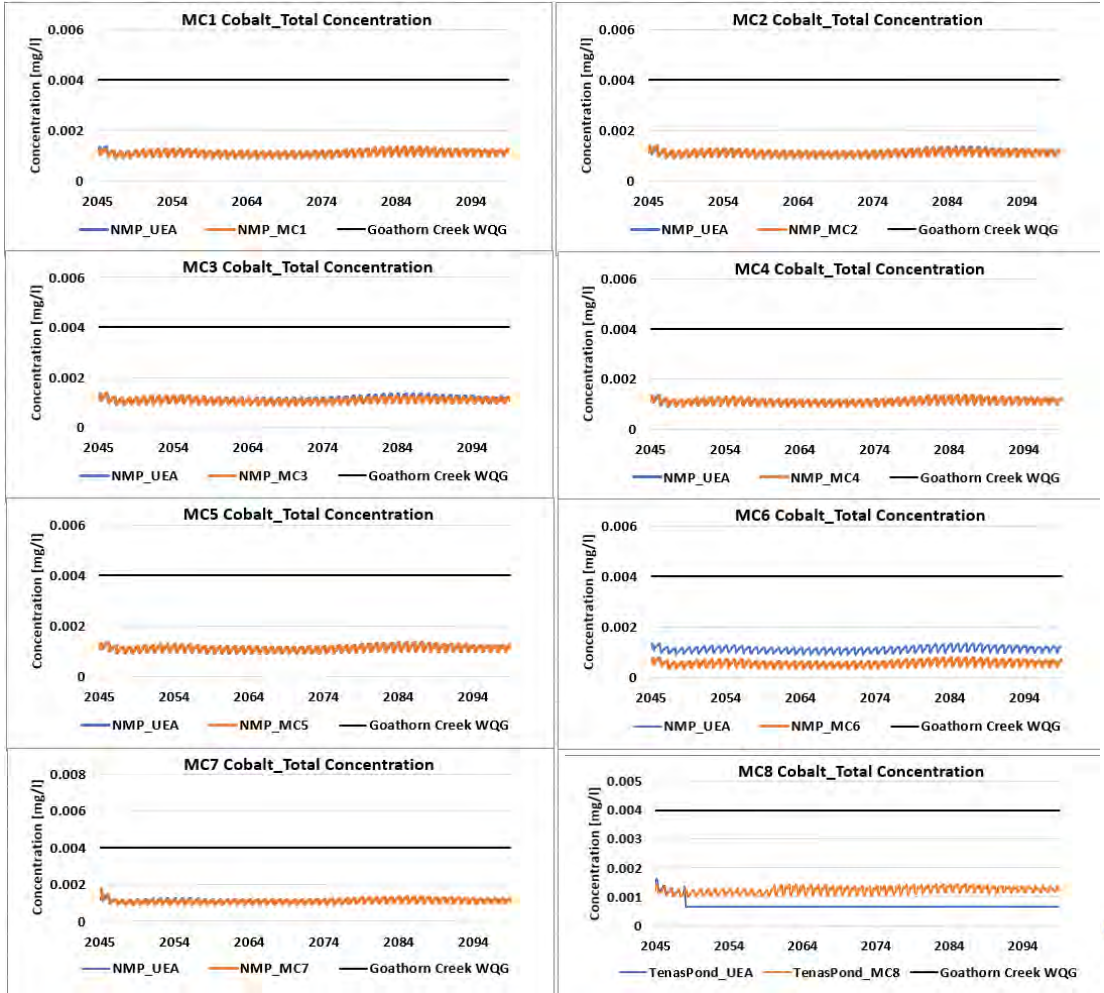
Figure 7A-12: Total Cobalt modelled concentrations in North Management Pond surface discharge for mitigation cases compared to project case in Post-Closure



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Appendix 7-C

Tenas Control Pond groundwater seepage (Operations and Post-Closure)

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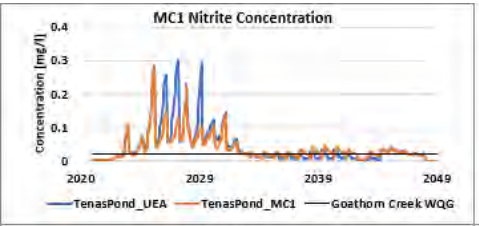
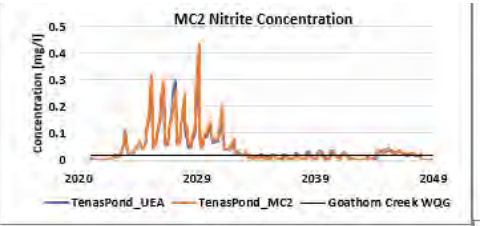
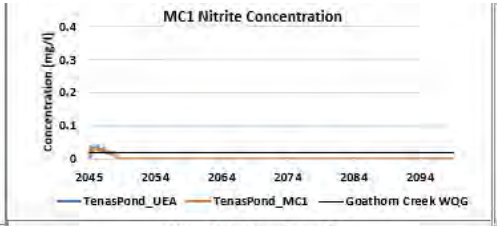
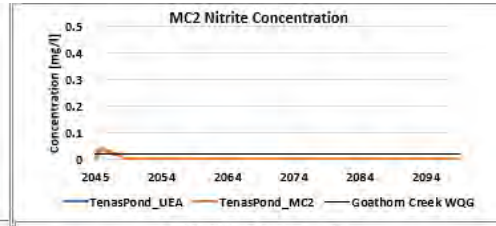
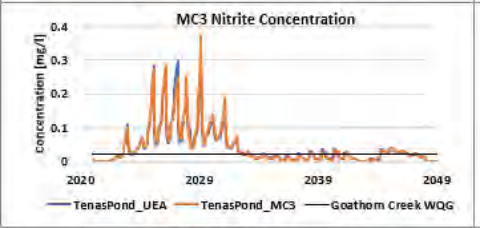
Figure 7C-1: Nitrite modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

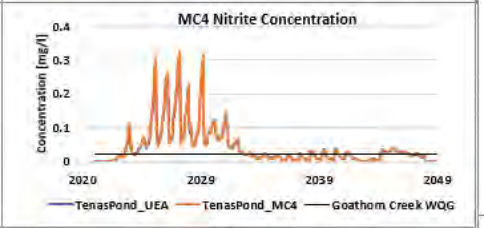


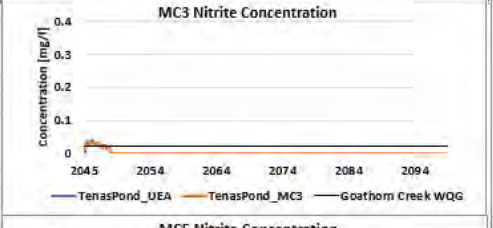


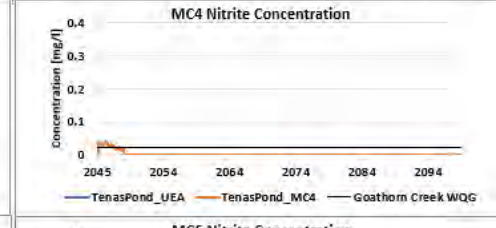


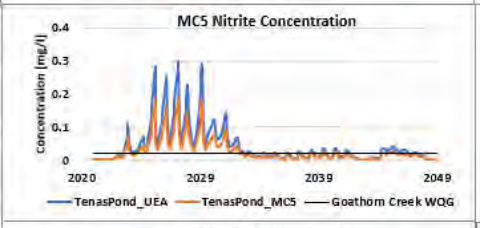


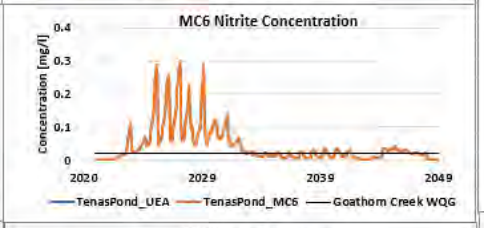


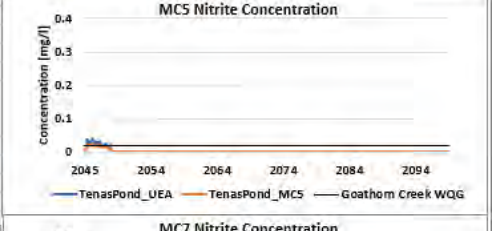


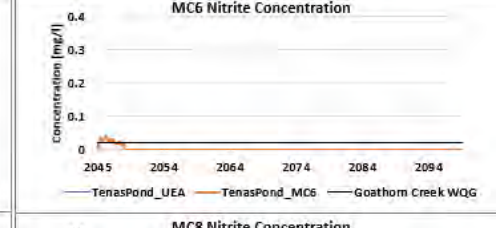


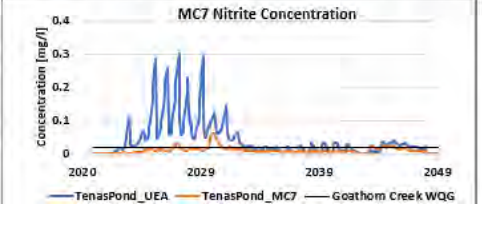


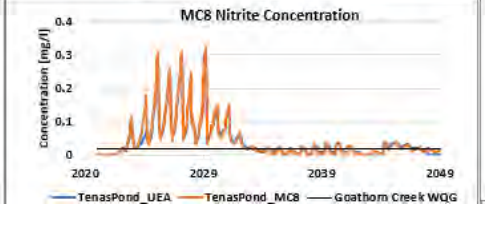












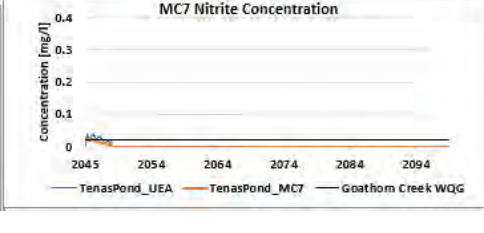


Figure 7C-2: Total Selenium modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

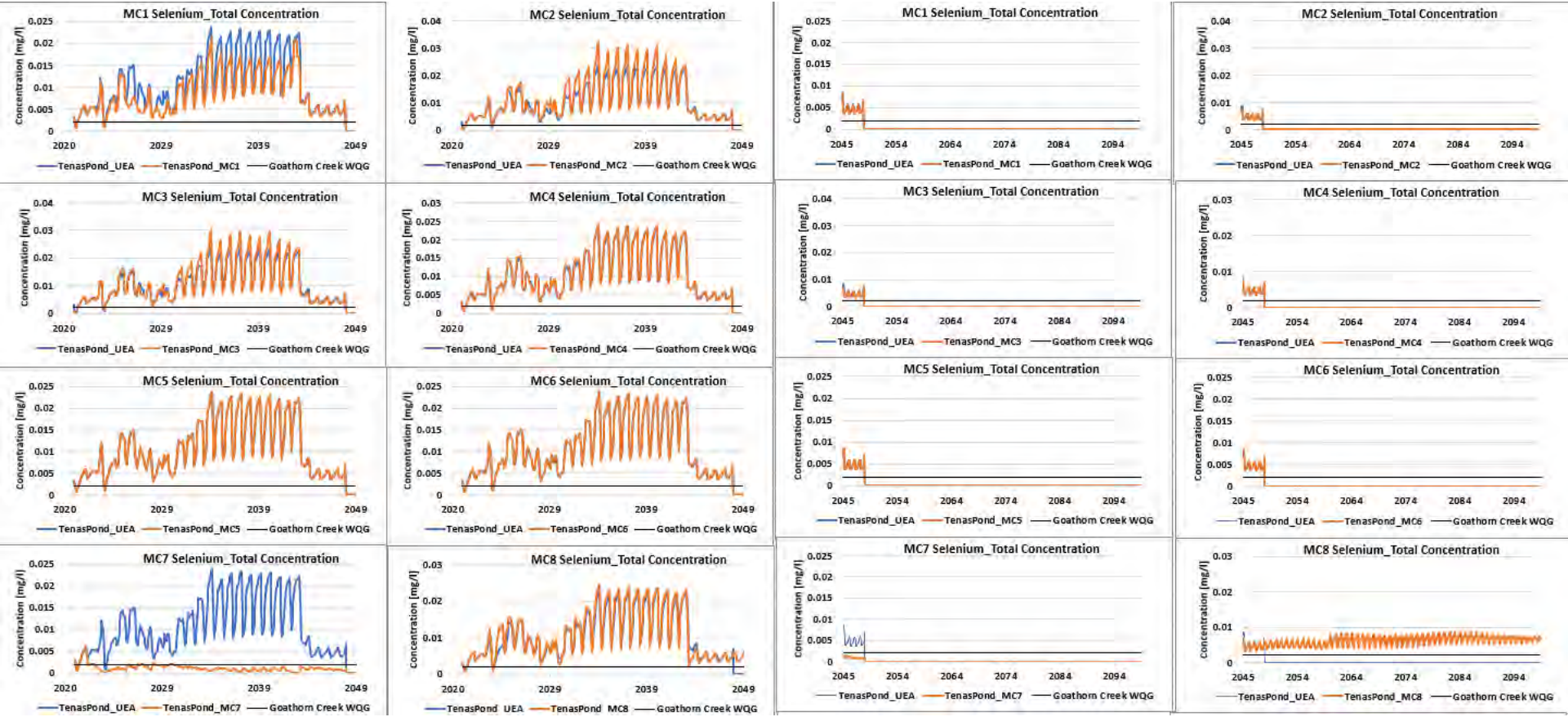


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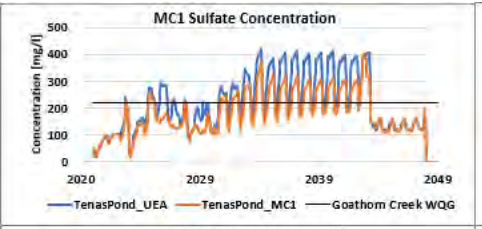
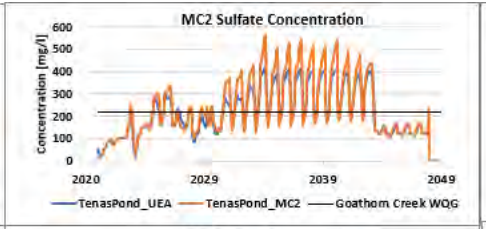
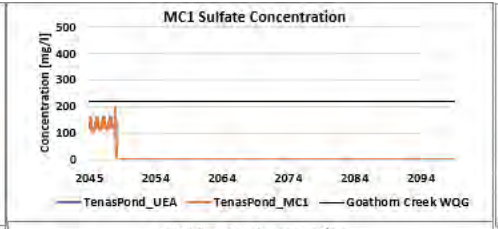
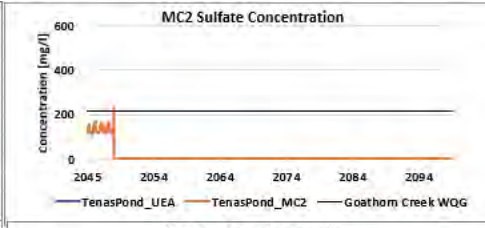
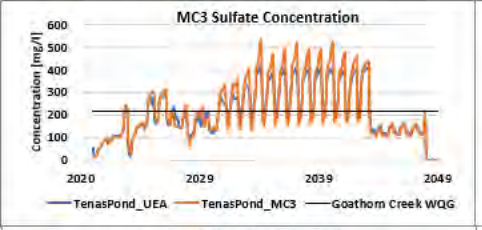
Figure 7C-3: Sulphate modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

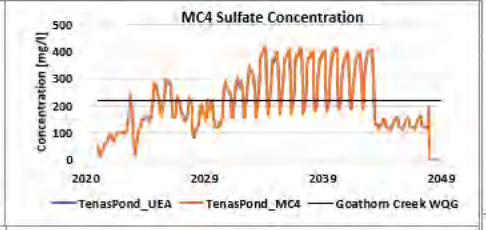


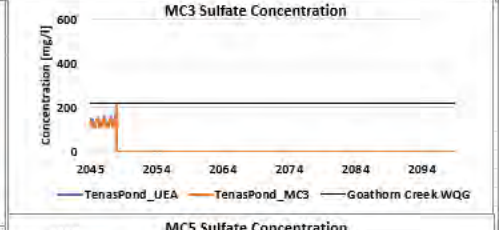


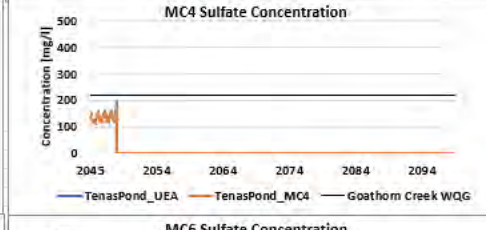


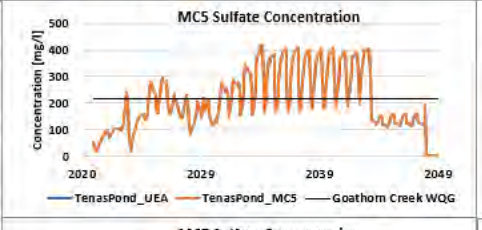


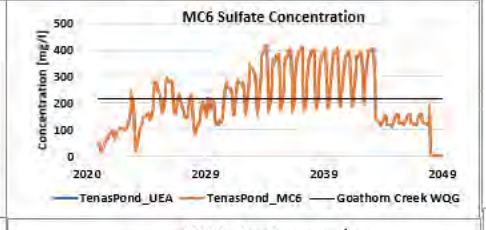


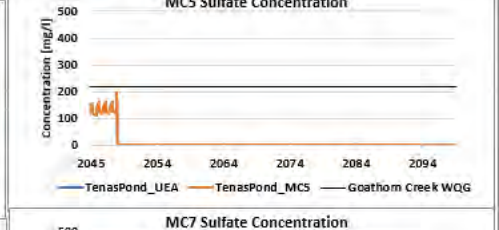


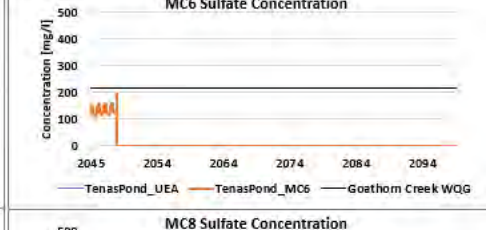


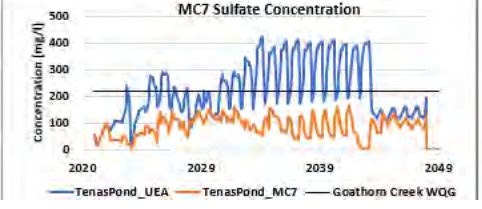


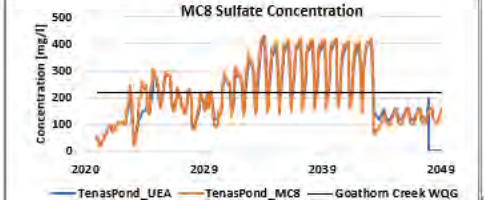


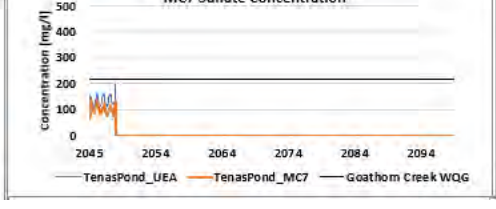












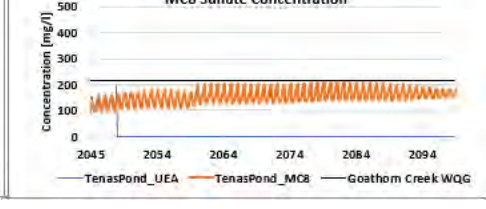
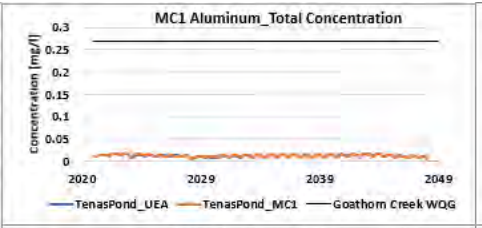
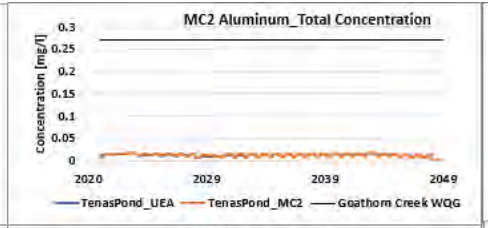
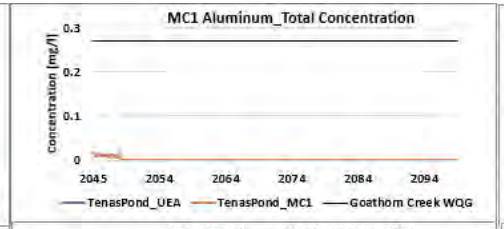
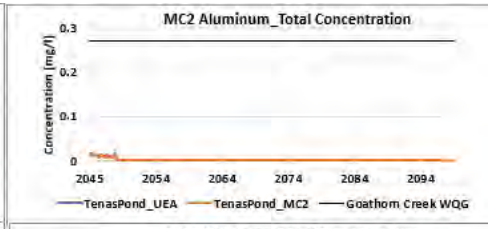


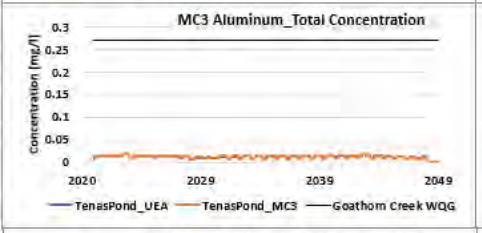
Figure 7C-4: Total Aluminium modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

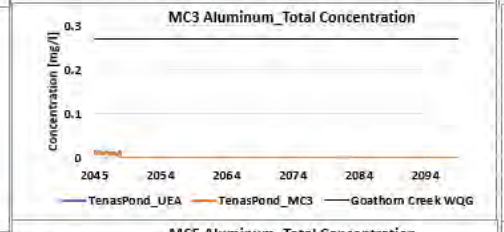


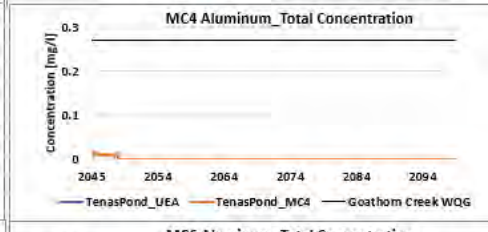


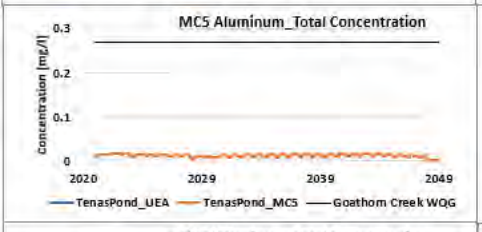


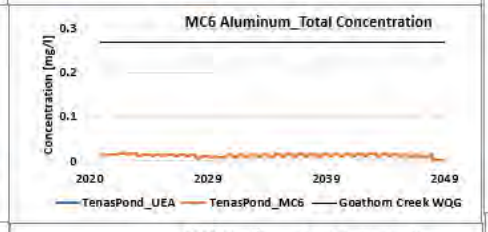


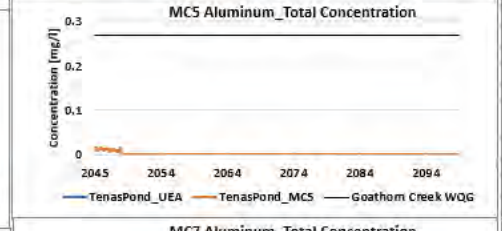


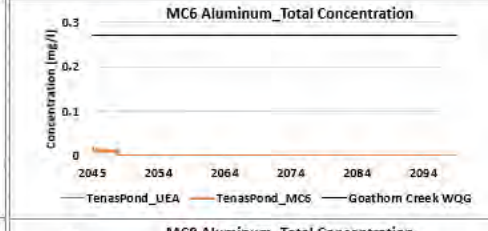


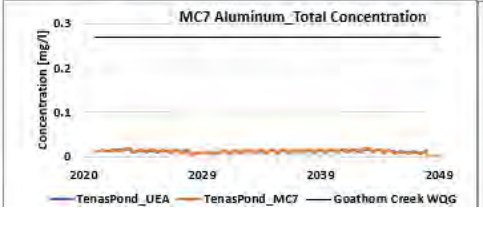


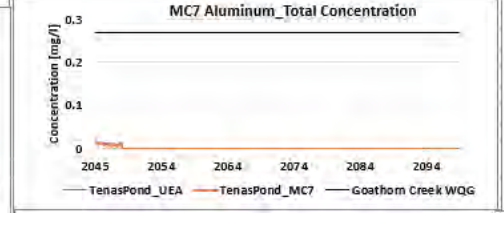












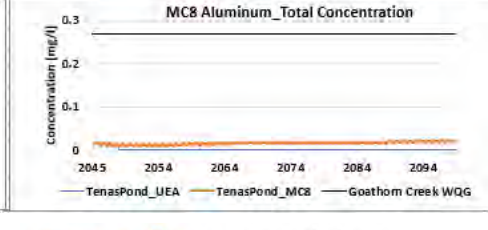
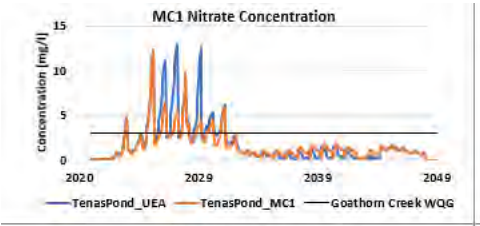
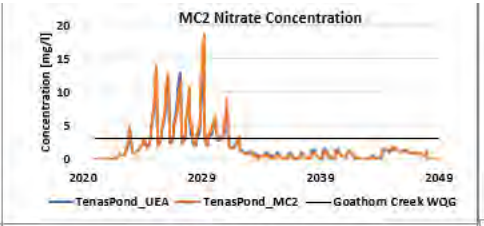
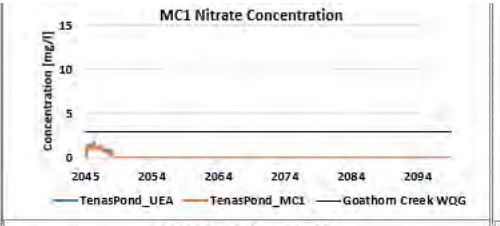
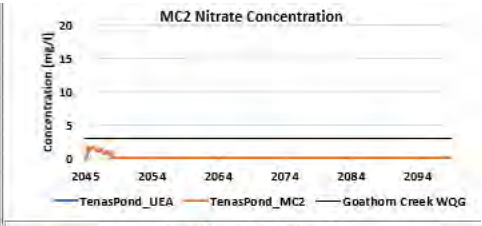


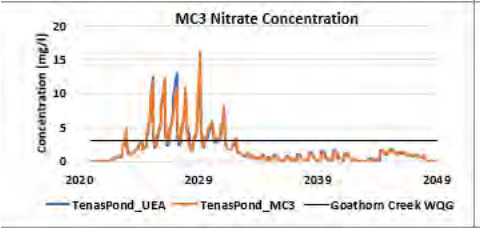
Figure 7C-5: Nitrate modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

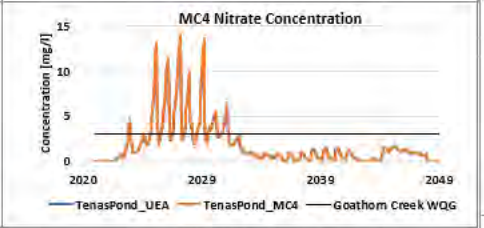


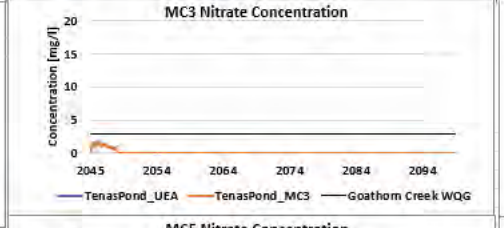


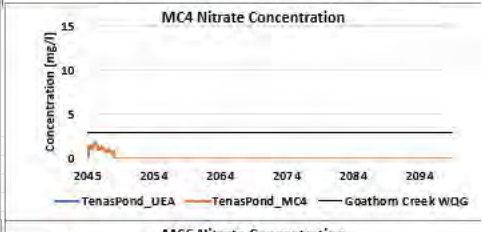


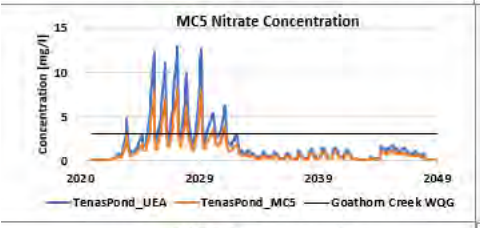


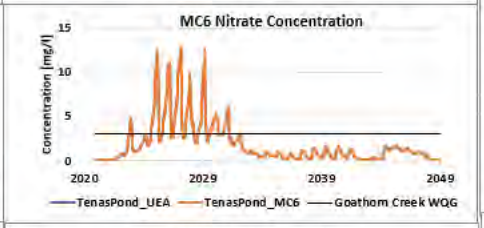


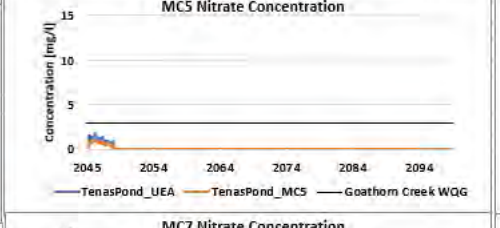


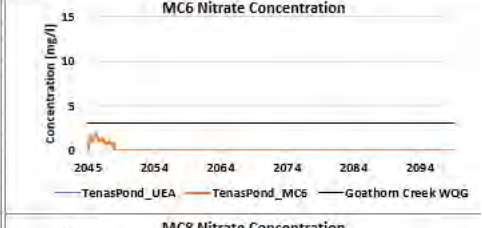


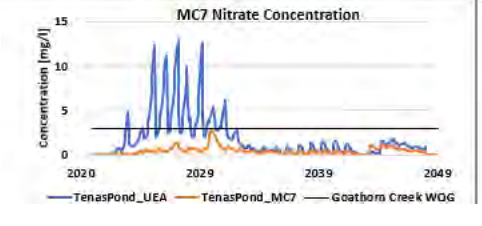


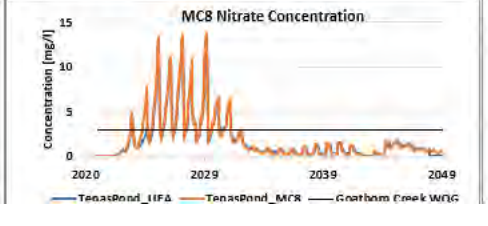


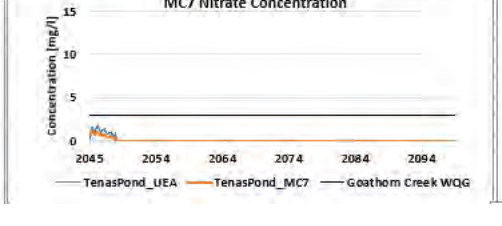












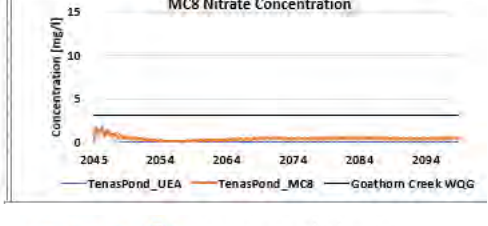


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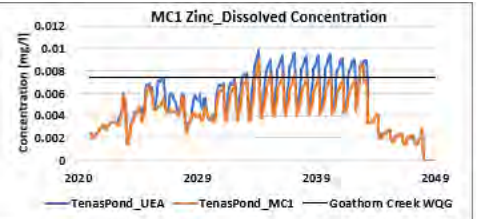
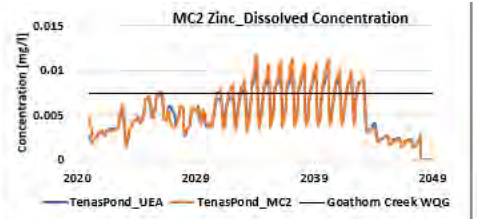
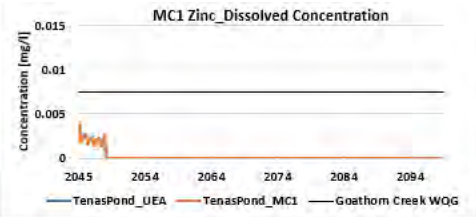
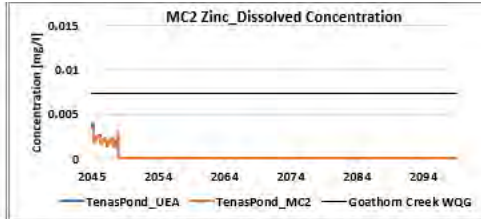
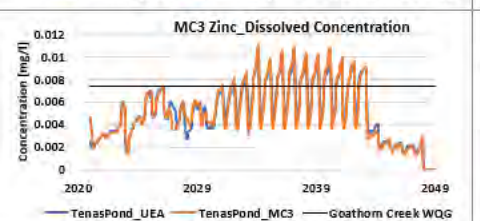
Figure 7C-6: Dissolved Zinc modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

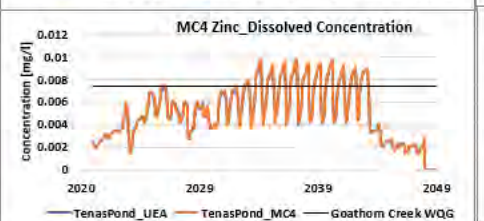


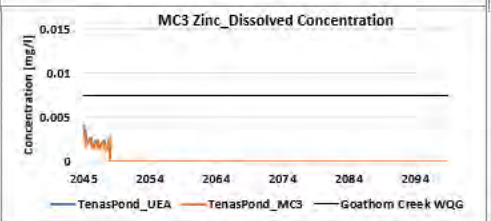


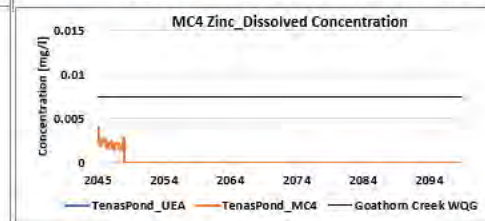


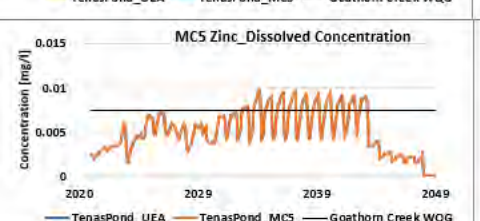


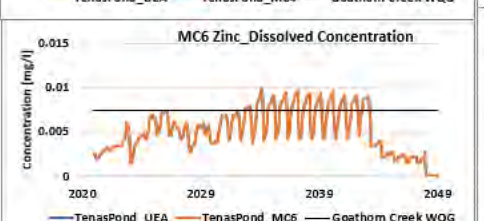


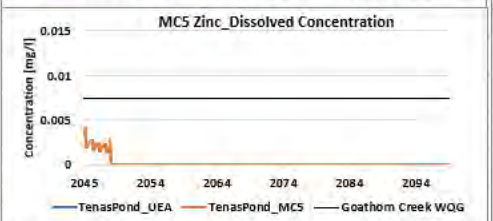


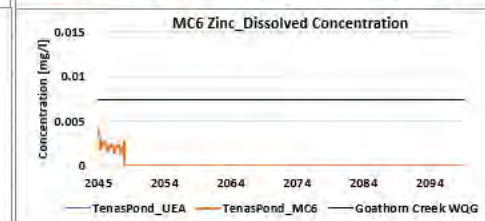


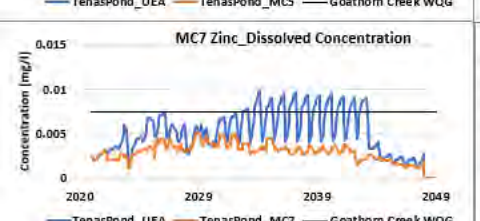


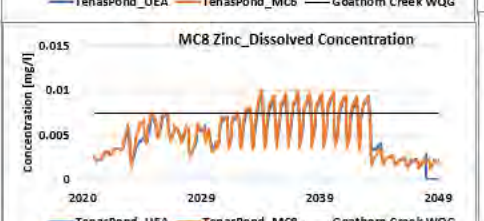


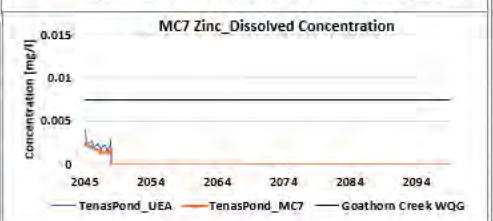












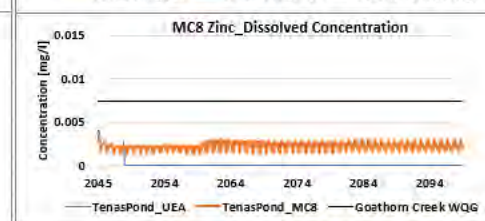


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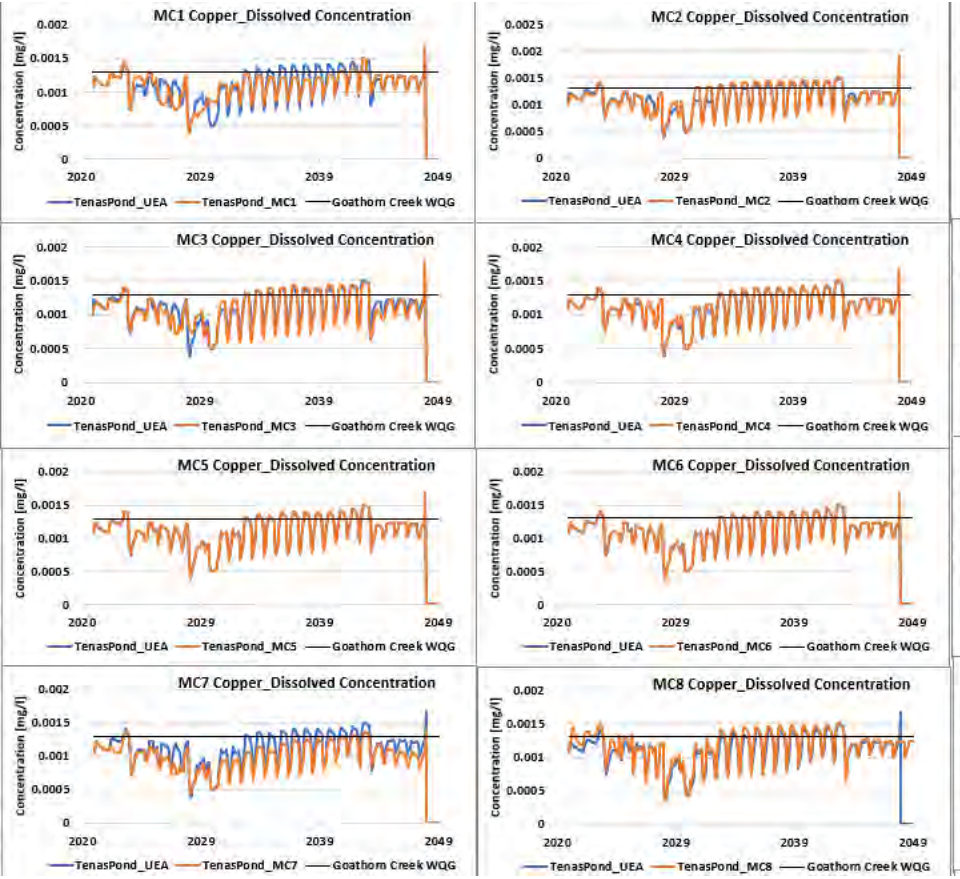
Figure 7C-7: Dissolved Copper modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure



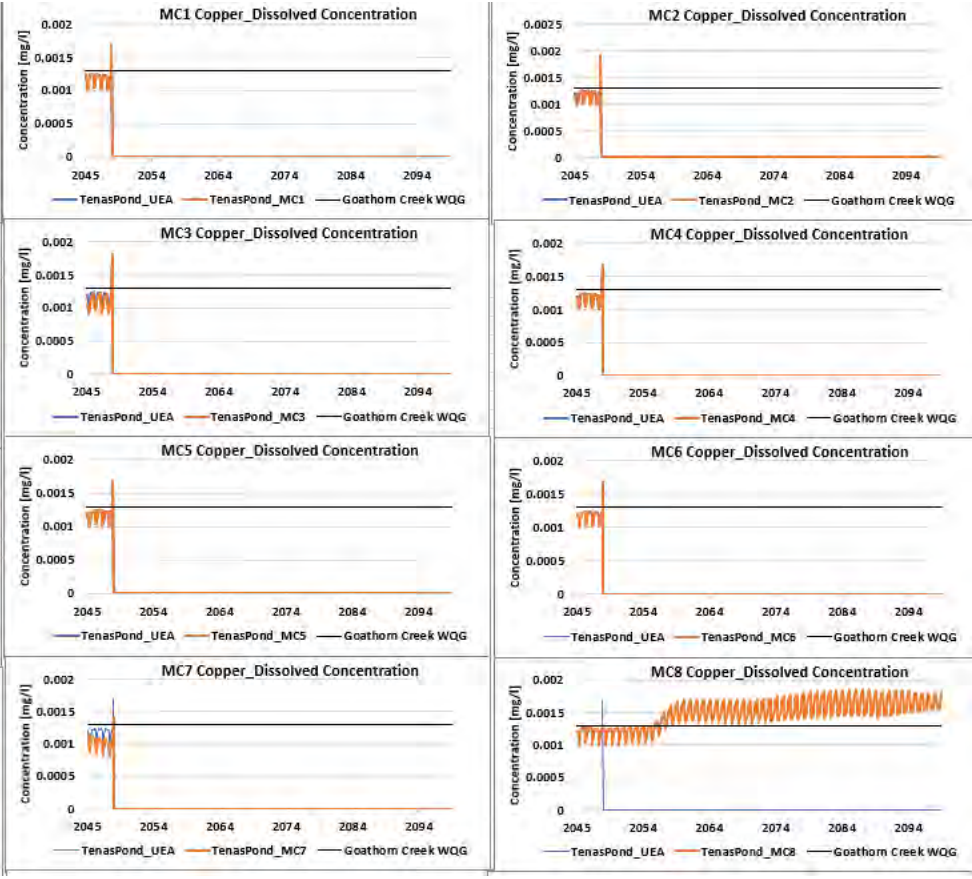


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Figure 7C-8: Dissolved Nickel modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

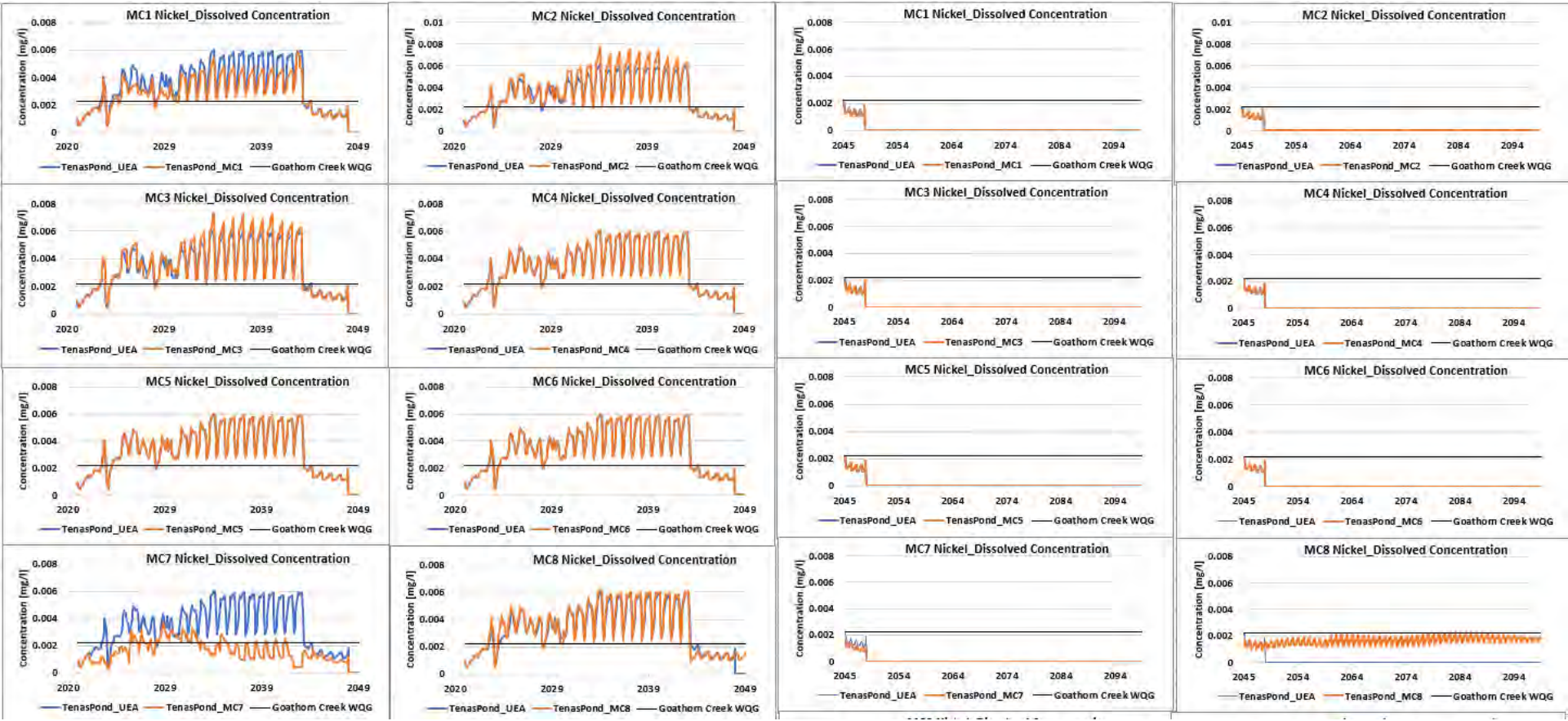

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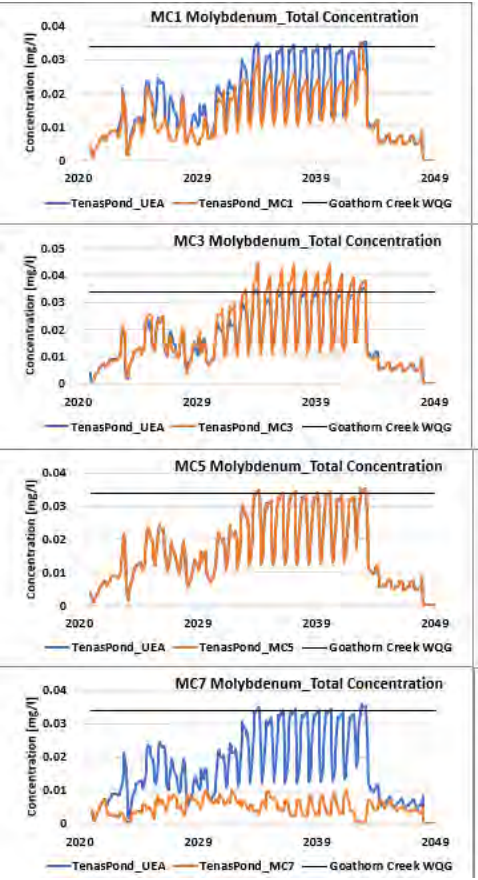
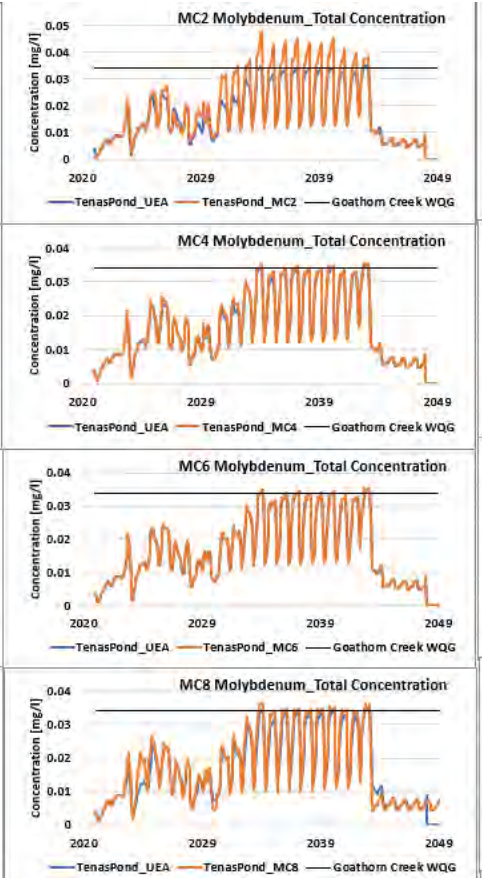
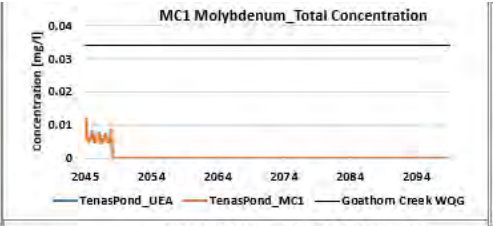
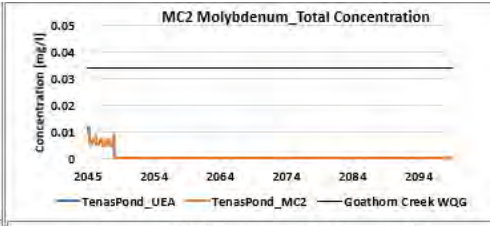
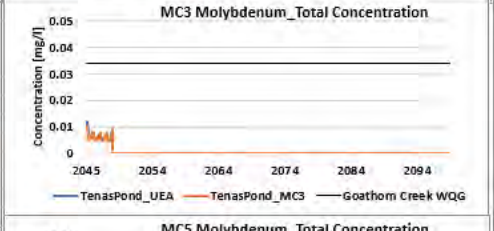
Figure 7C-9: Total Molybdenum modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

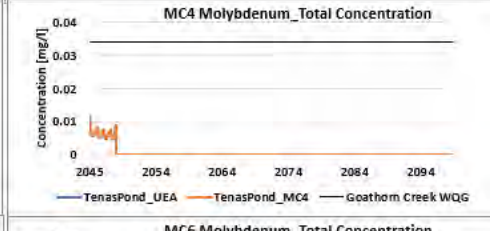


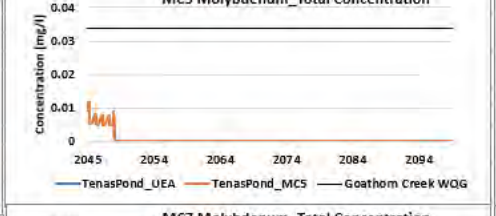


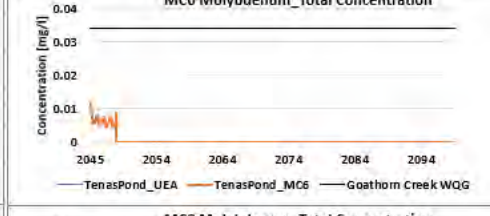


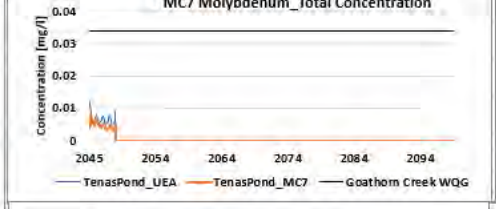












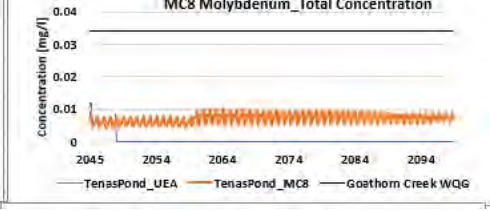
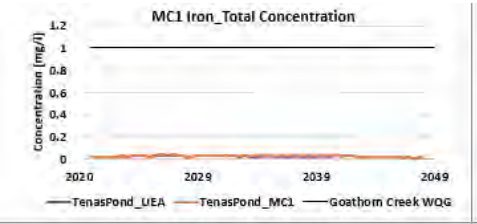
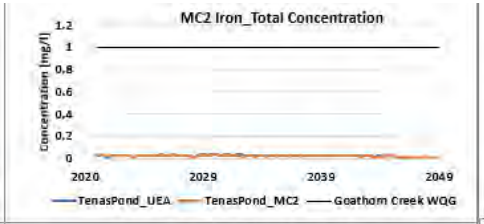
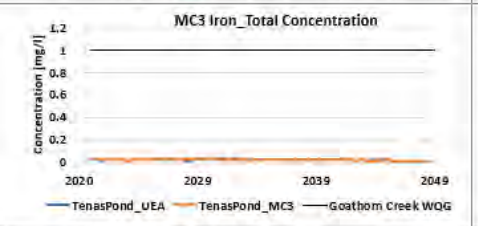
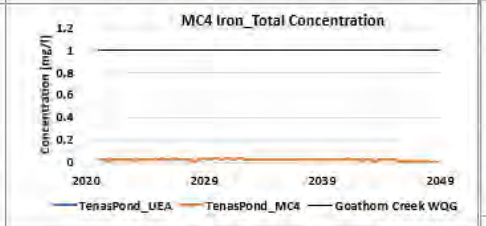


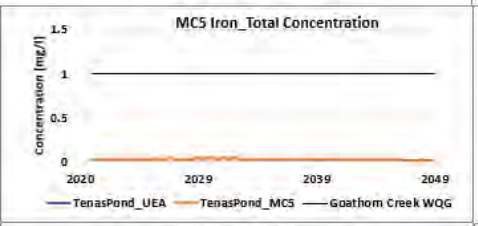
Figure 7C-10: Total Iron modelled concentrations in Tenas Control Pond surface groundwater seepage for mitigation cases compared to project cas
in Operations and Post-Closure

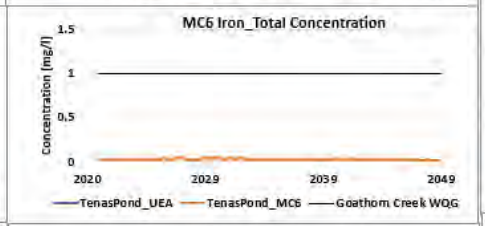


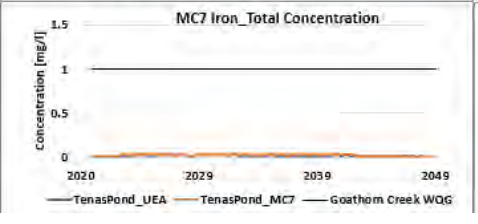


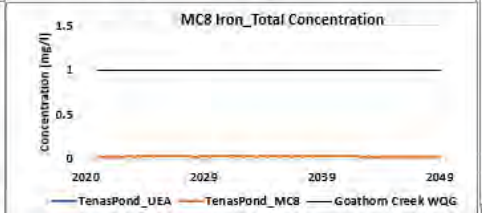


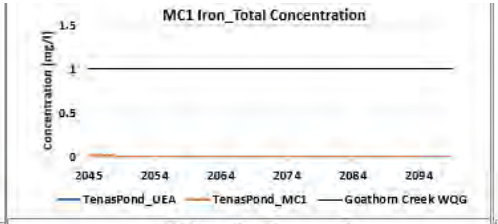


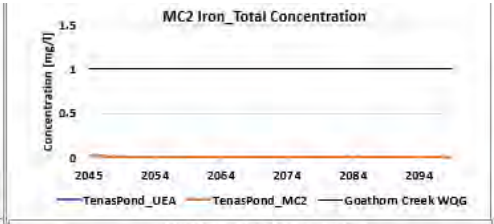


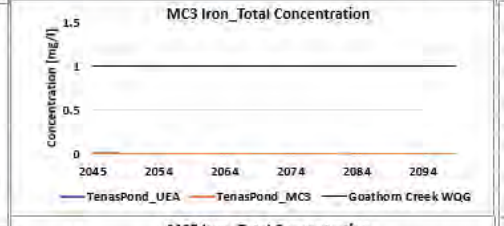


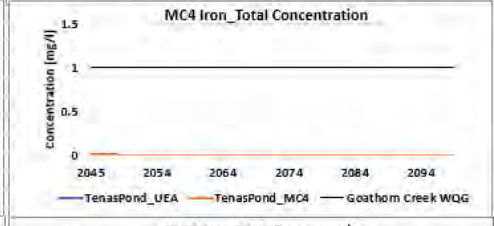


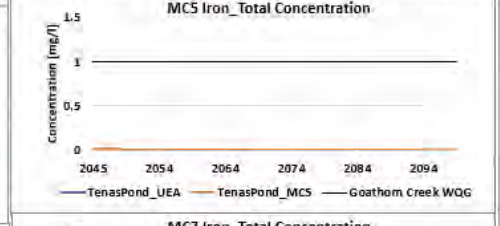


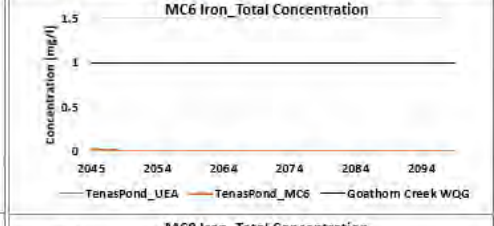


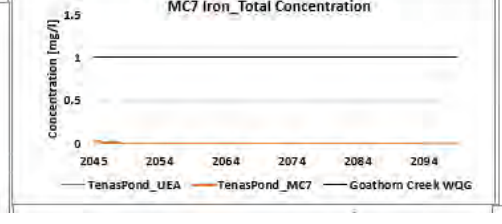












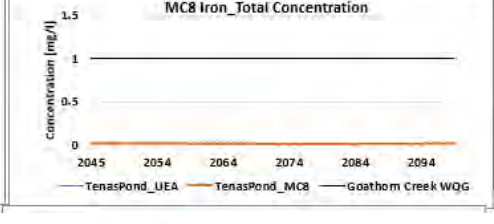
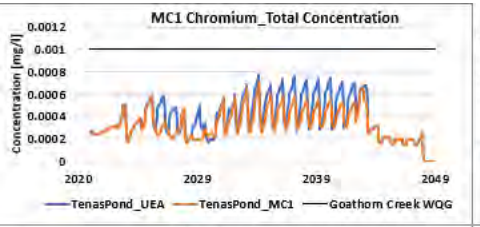
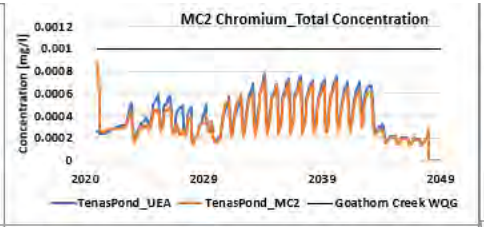
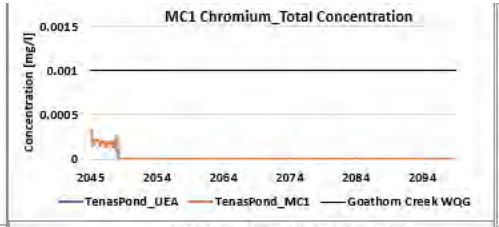
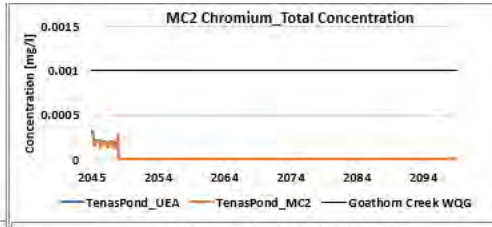


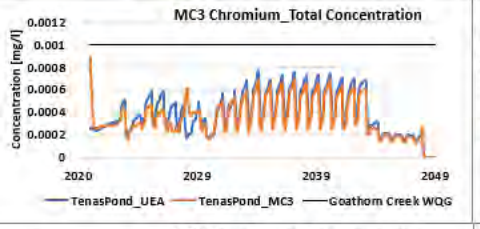
Figure 7C-11: Total Chromium modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

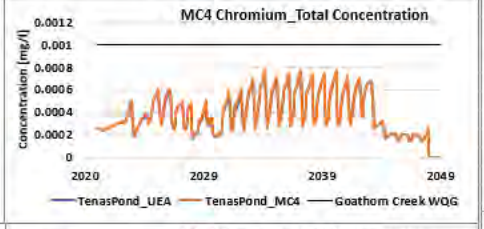


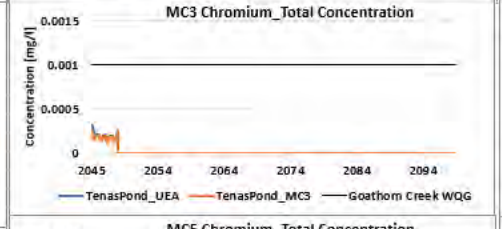


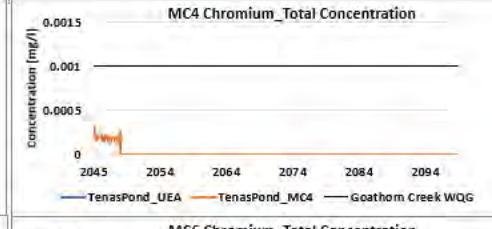


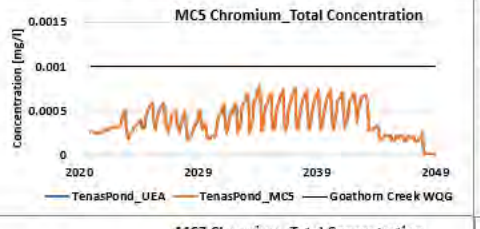


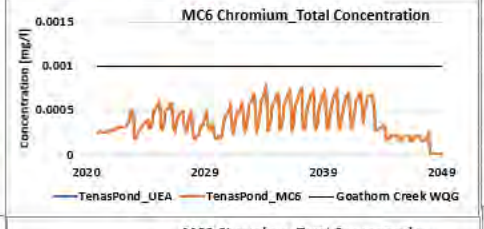


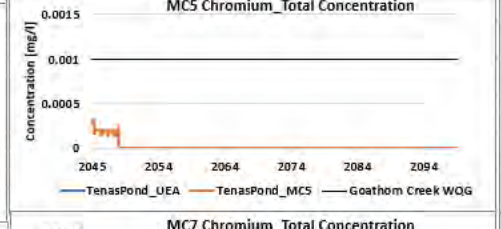


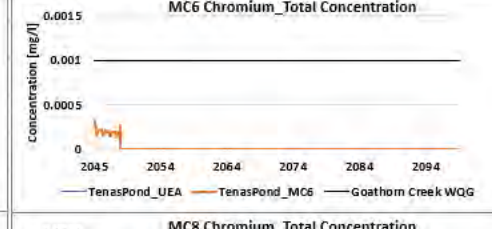


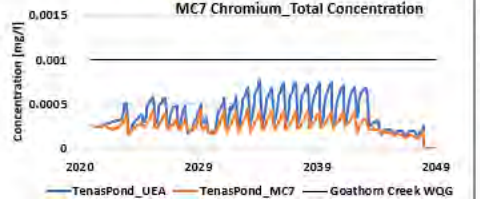


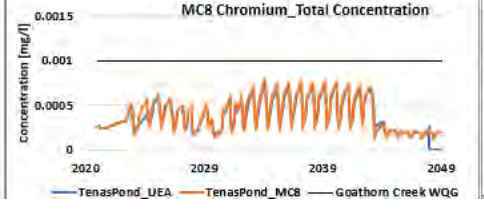


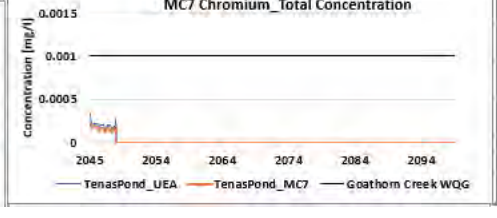












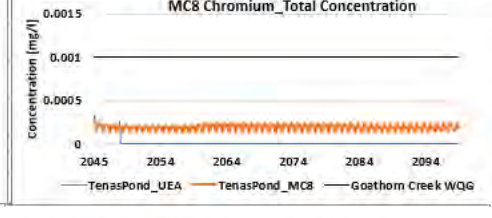
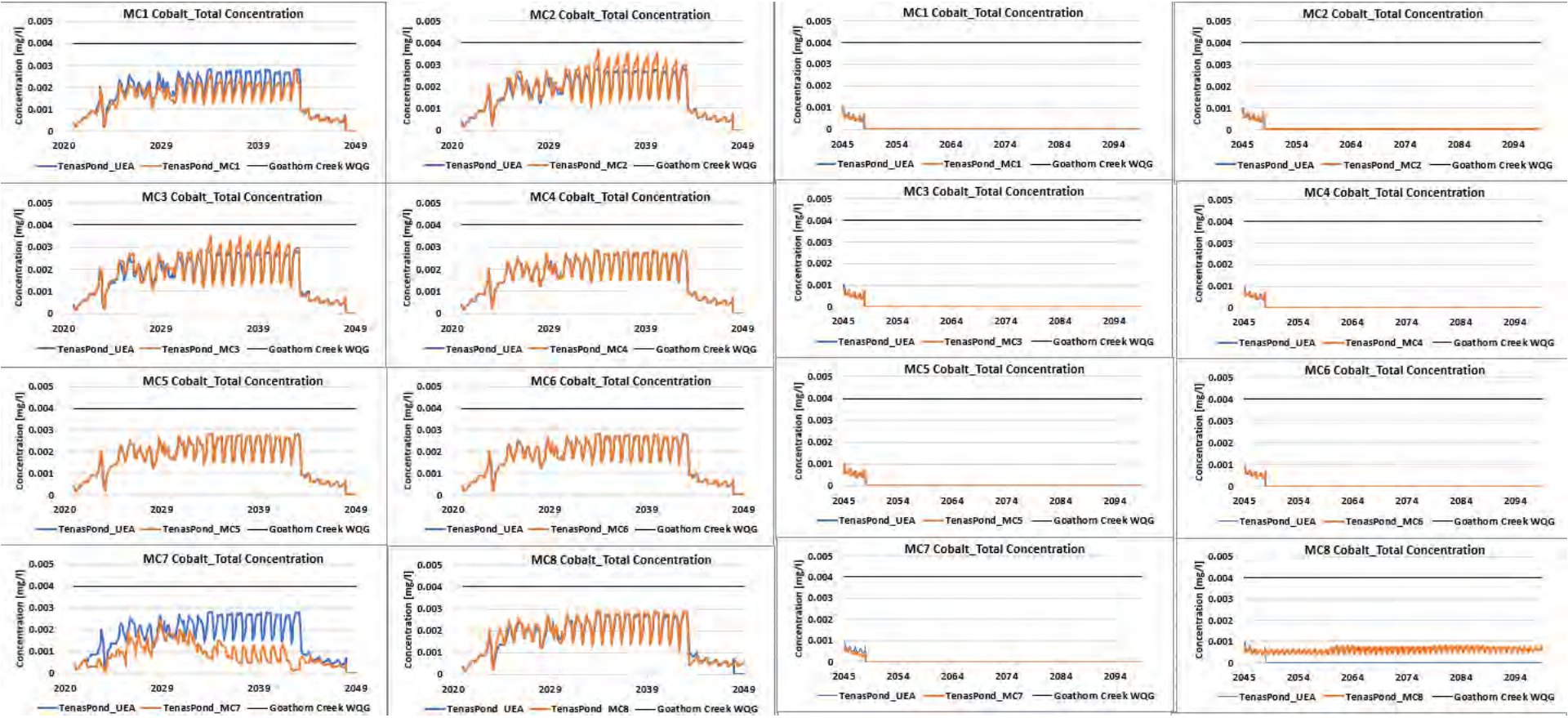


Figure 7C-12: Total Cobalt modelled concentrations in Tenas Control Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure



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Appendix 7-D

North Management Pond groundwater seepage (Operations and Post-Closure)

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Figure 7D-1: Nitrite modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

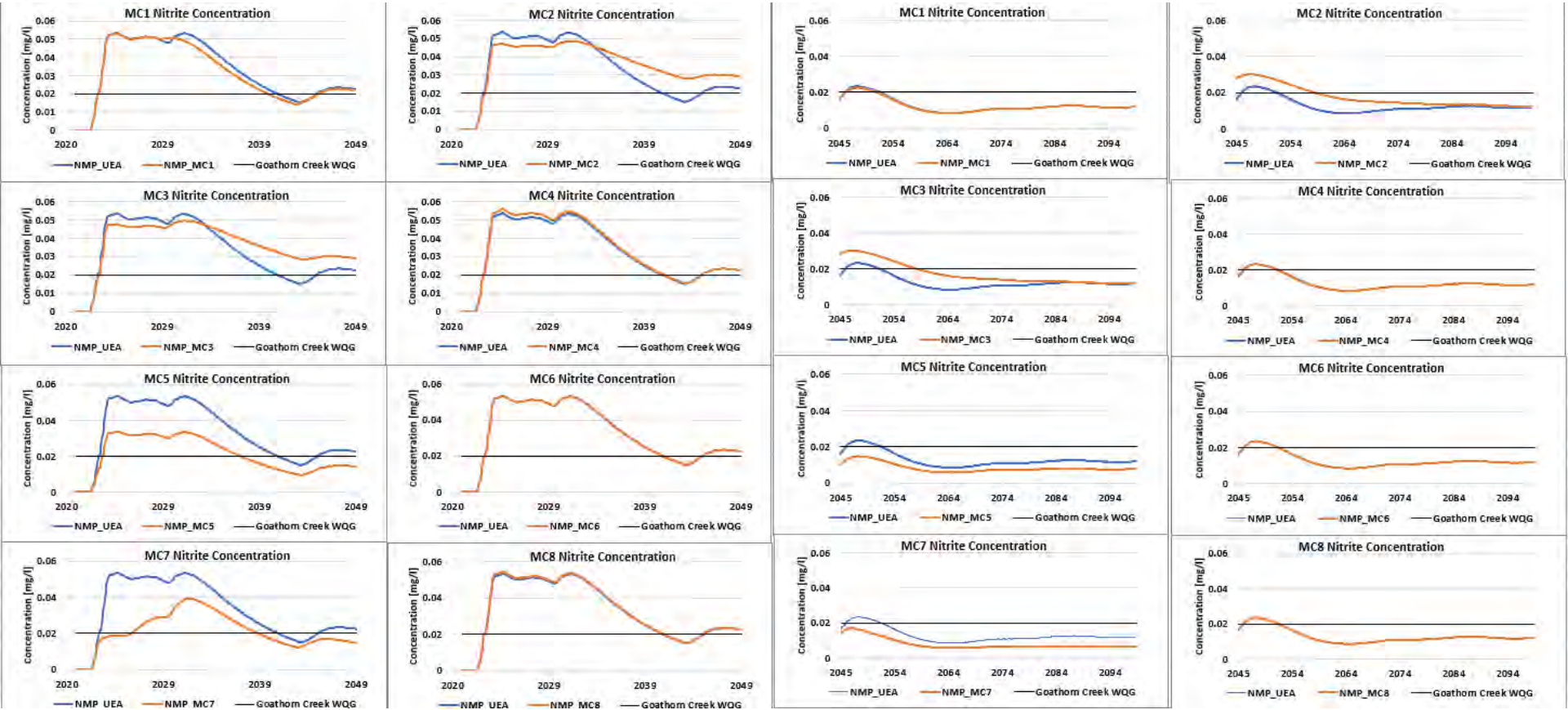

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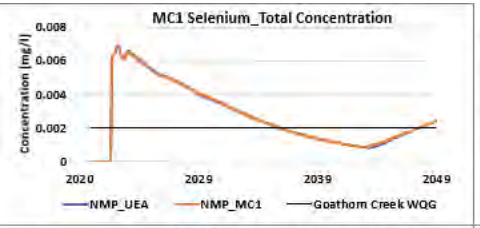
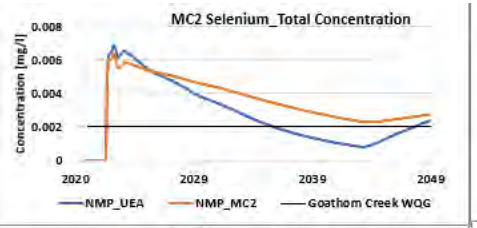
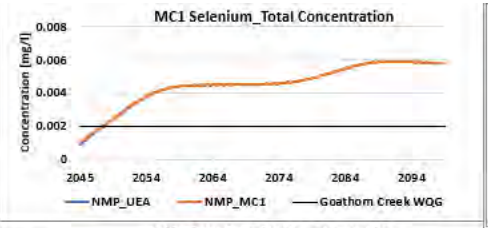
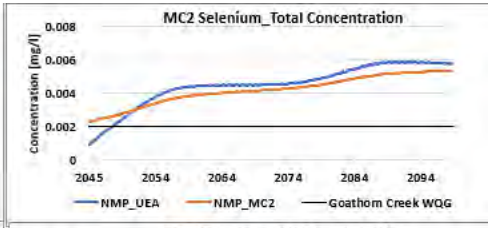
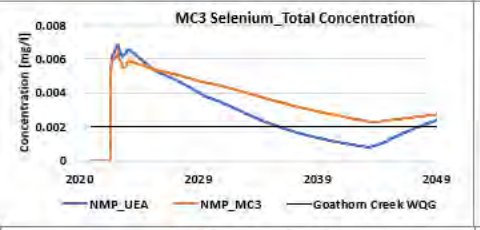
Figure 7D-2: Total Selenium modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project c
in Operations and Post-Closure

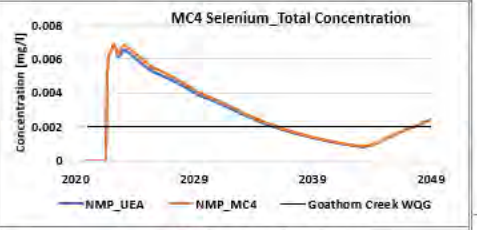


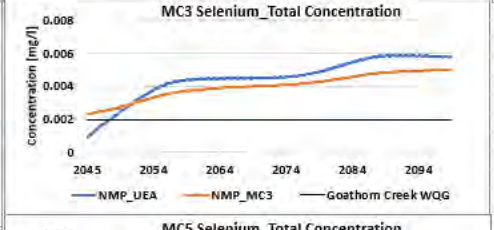


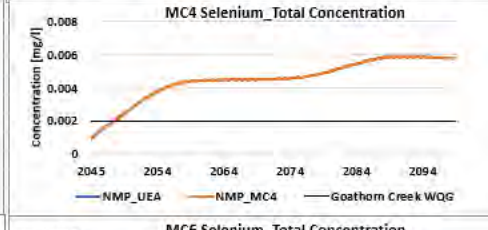


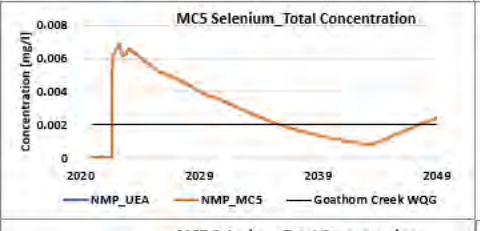


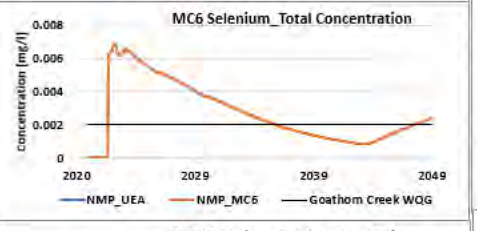


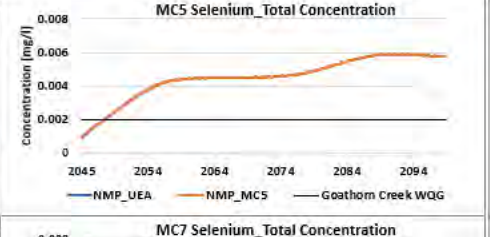


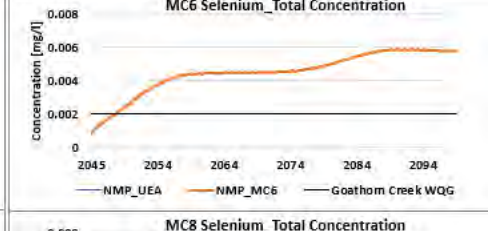


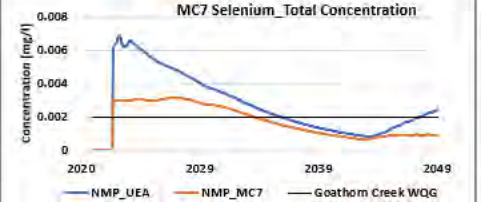


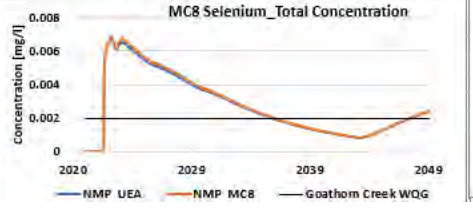


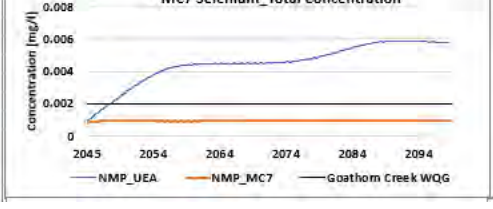












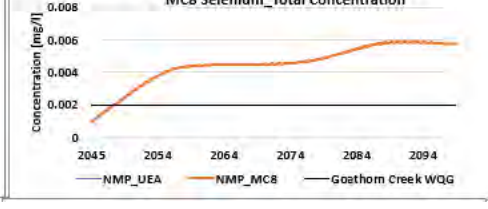
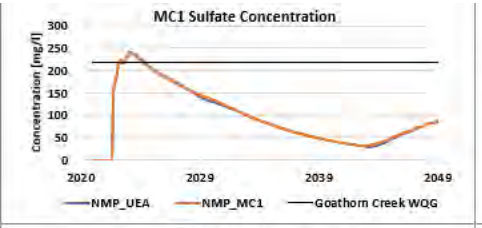
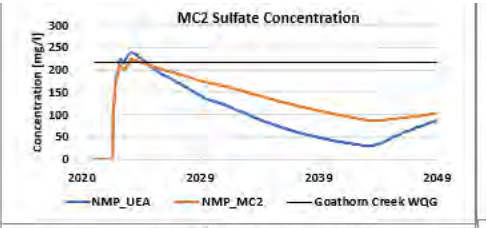
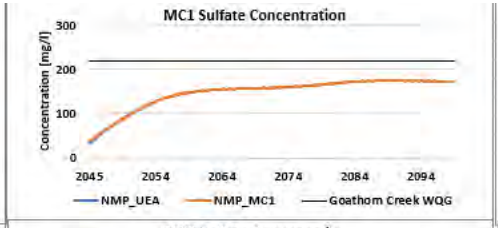
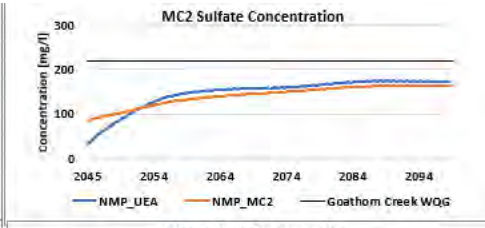


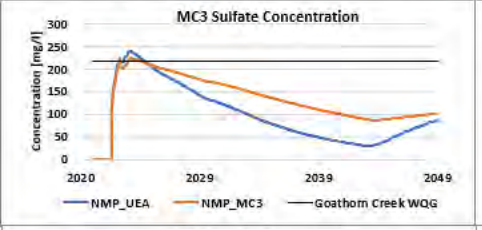
Figure 7D-3: Sulphate modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

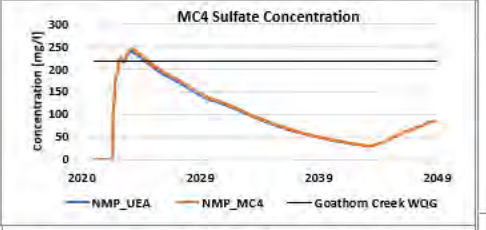


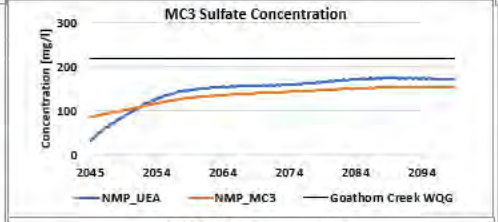


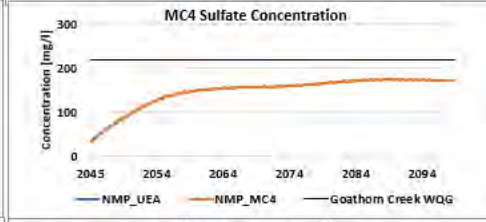


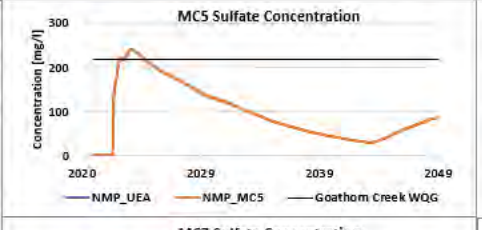


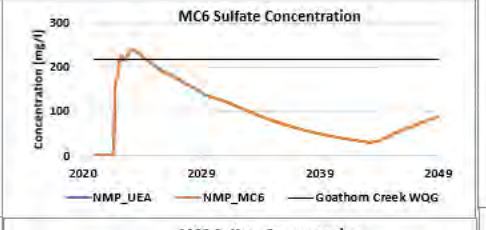


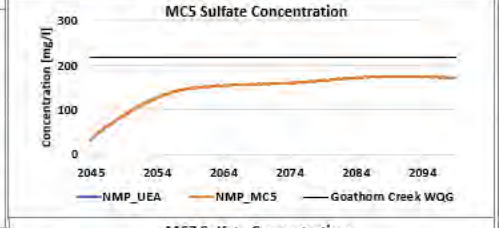


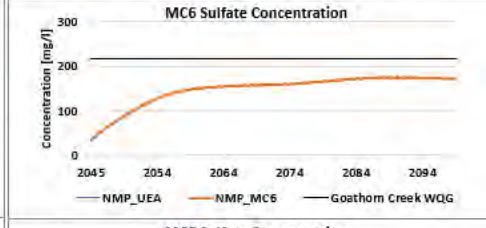


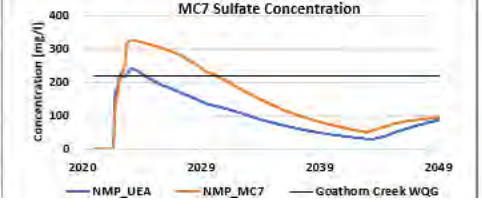


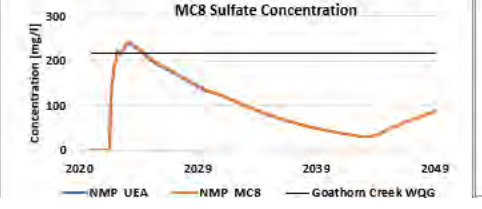


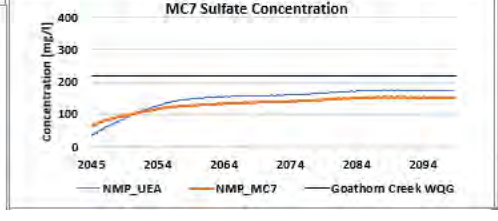












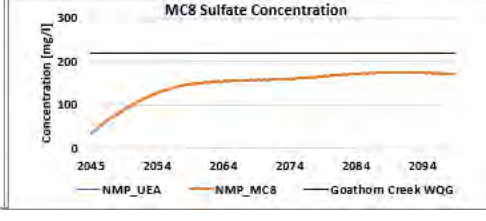
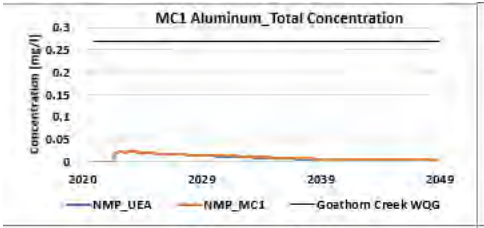
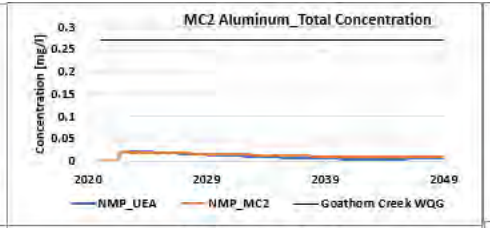
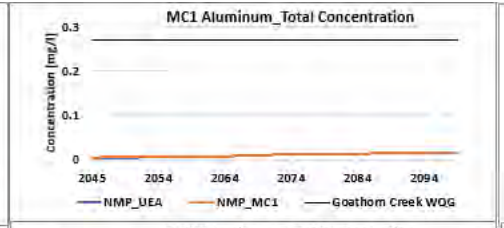
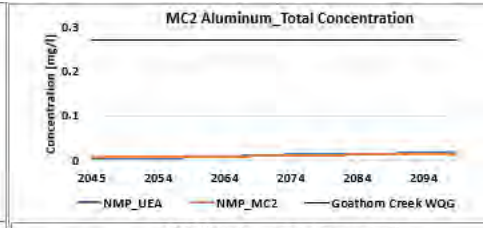


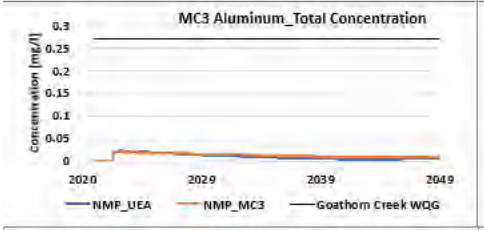
Figure 7D-4: Total Aluminium modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project c
in Operations and Post-Closure

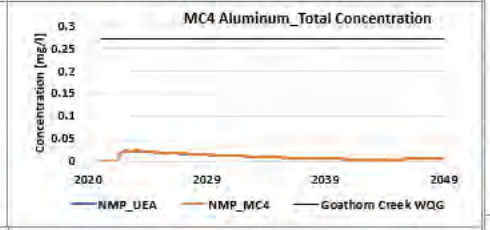


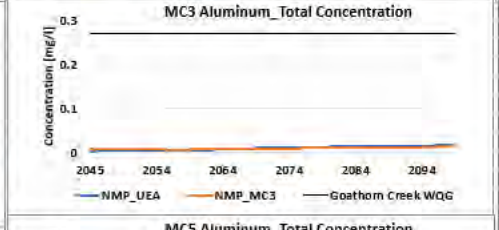


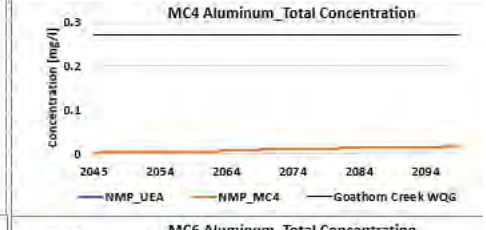


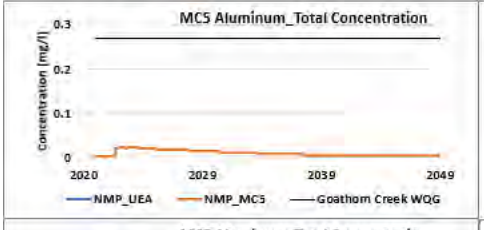


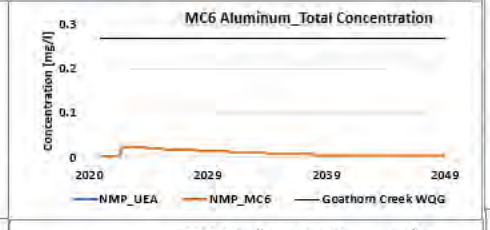


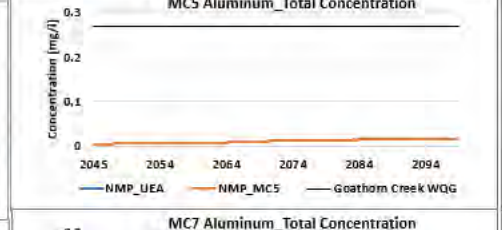


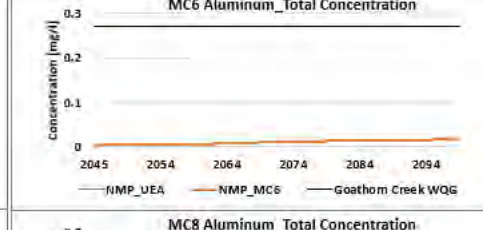


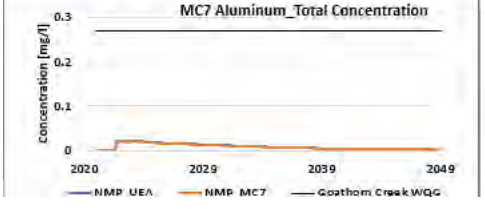


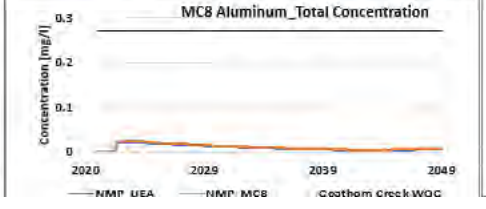


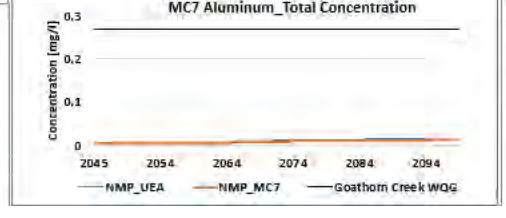












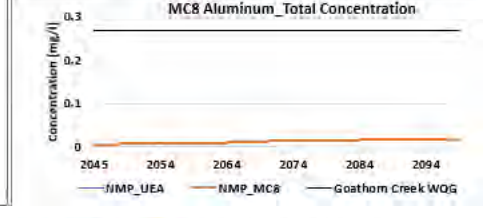


Figure 7D-5: Nitrate modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

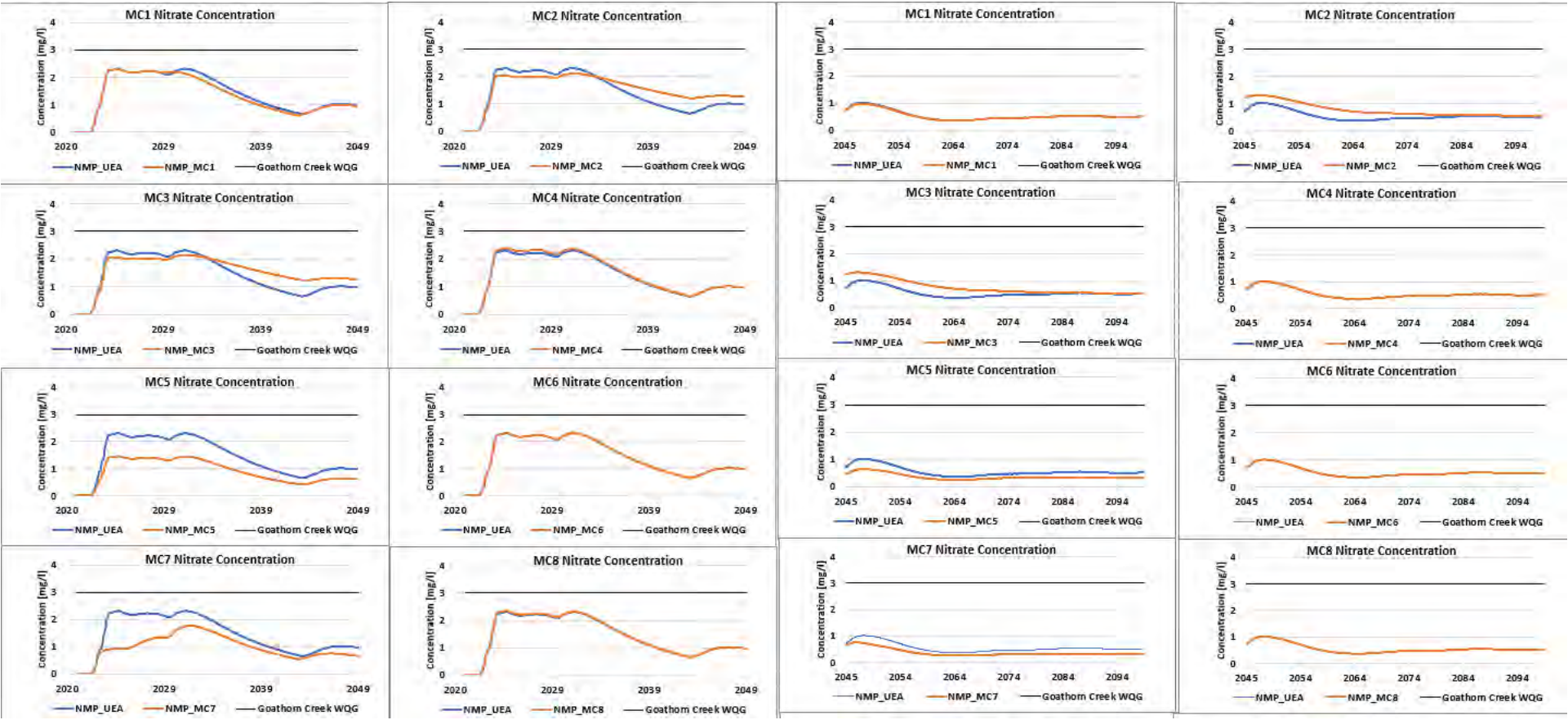


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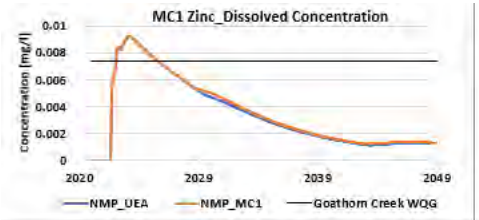
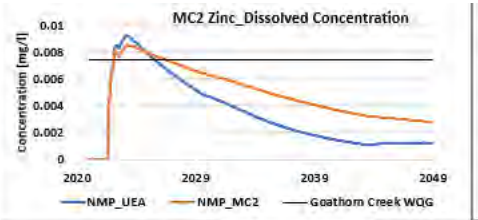
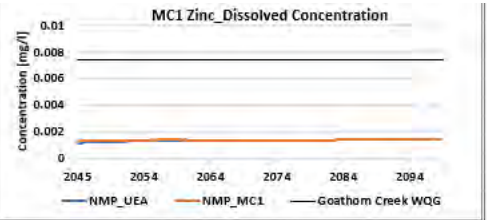
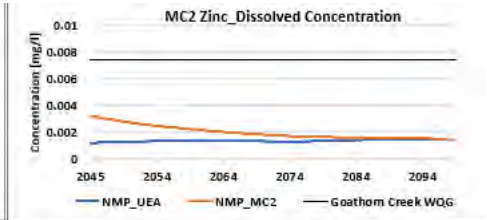
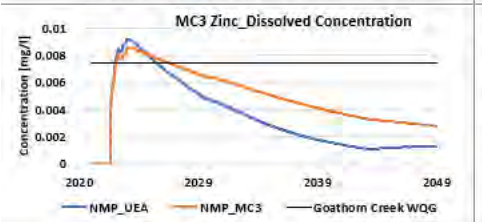
Figure 7D-6: Dissolved Zinc modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project c
in Operations and Post-Closure

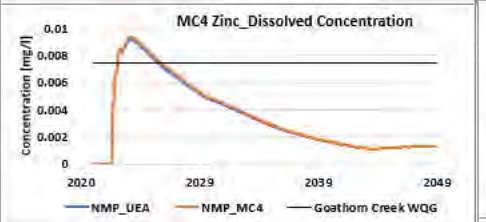


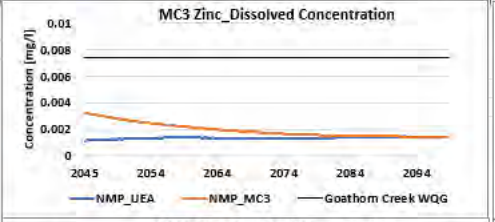


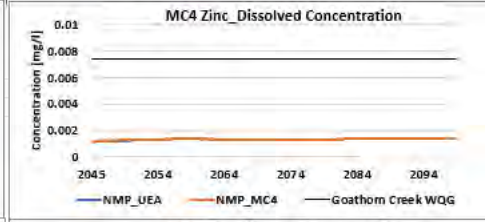


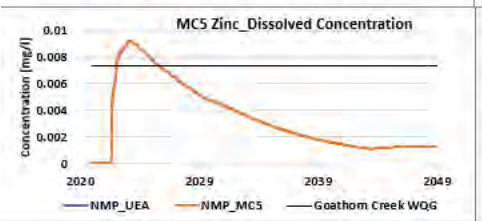


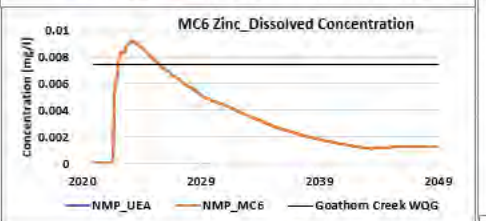


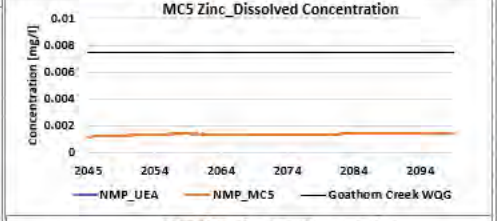


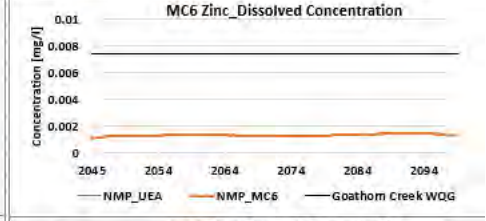


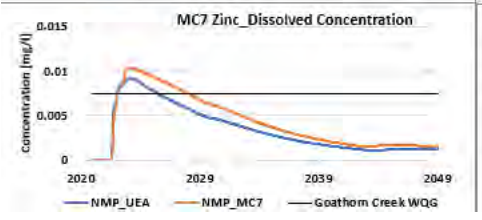


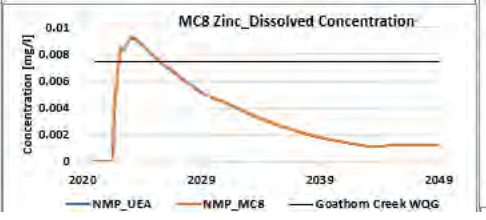


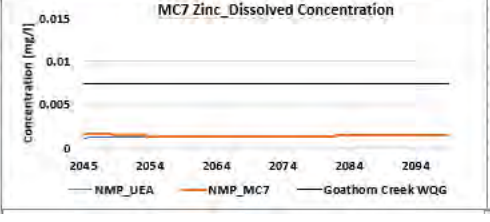












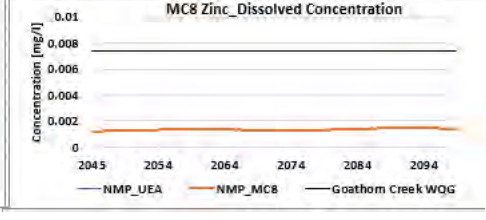


Figure 7D-7: Dissolved Copper modelled concentrations in North Management groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

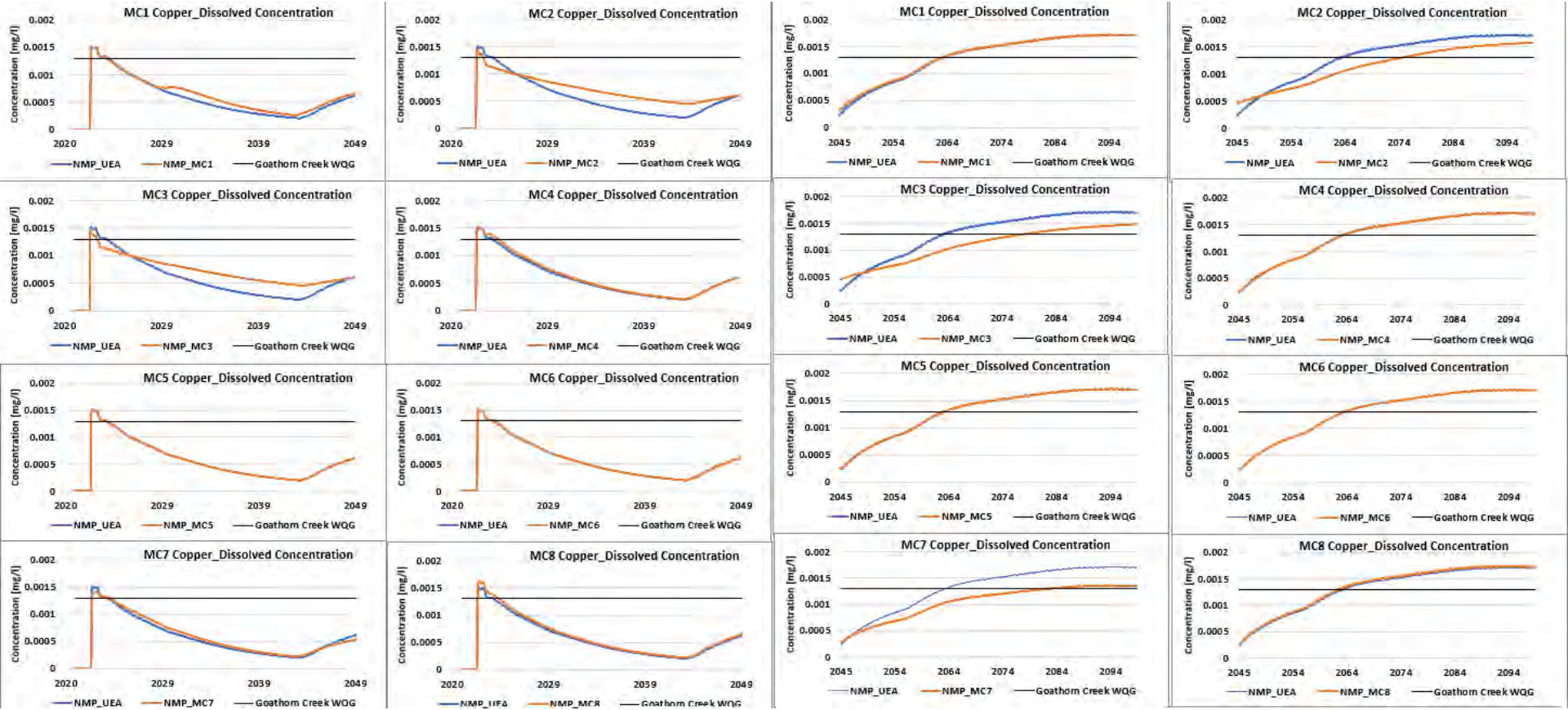


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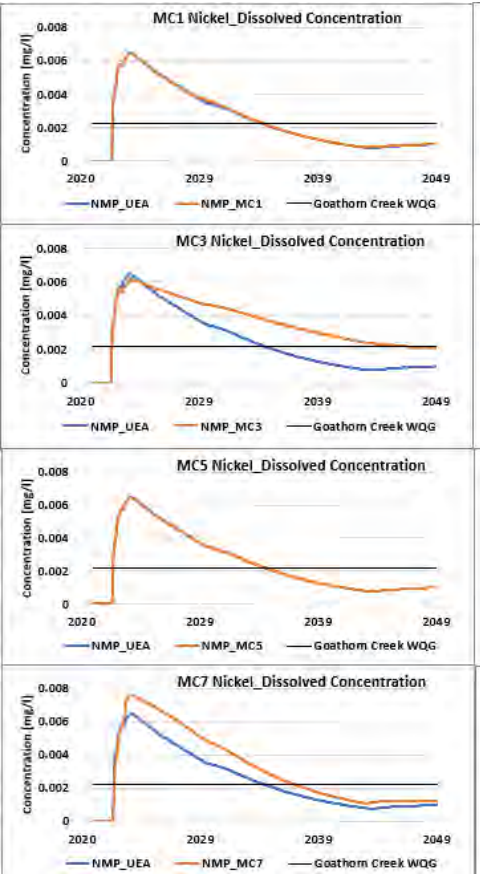
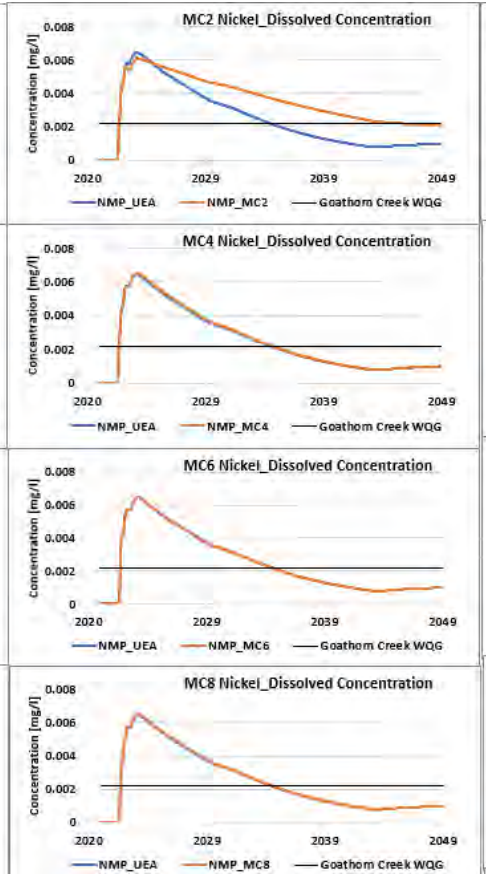
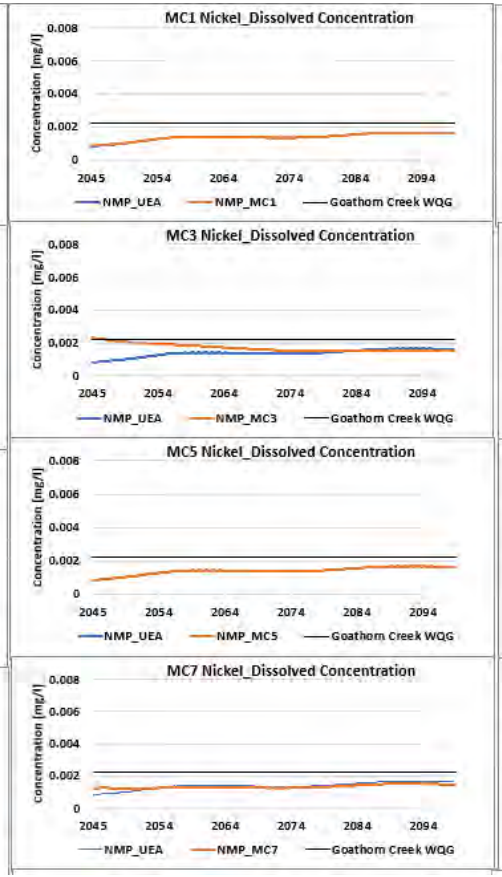
Figure 7D-8: Dissolved Nickel modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project c
in Operations and Post-Closure







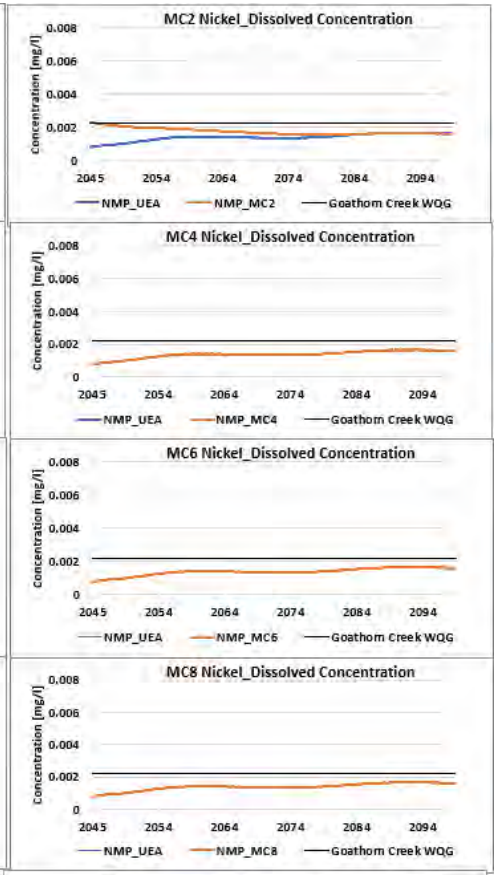
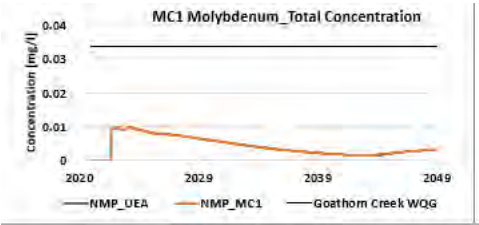
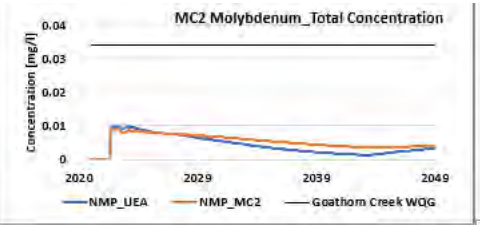
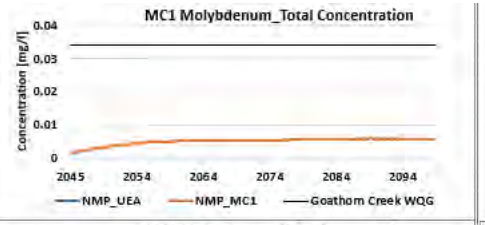
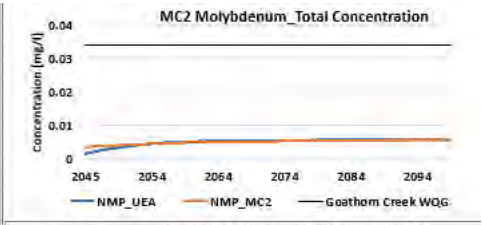


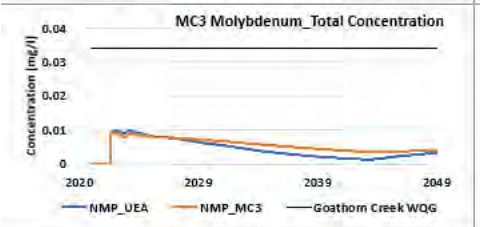
Figure 7D-9: Total Molybdenum modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project in Operations and Post-Closure

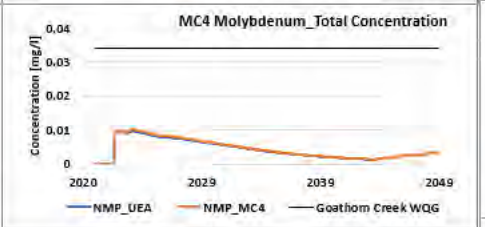


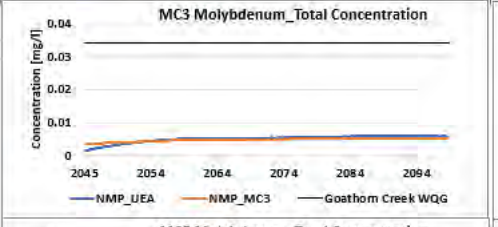


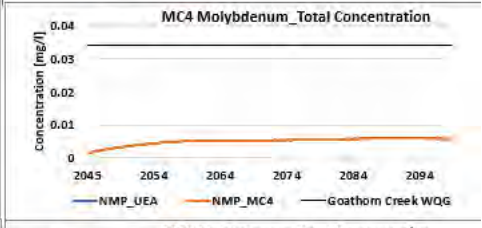


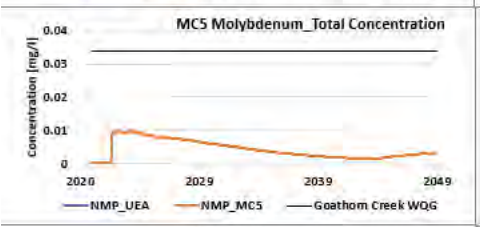


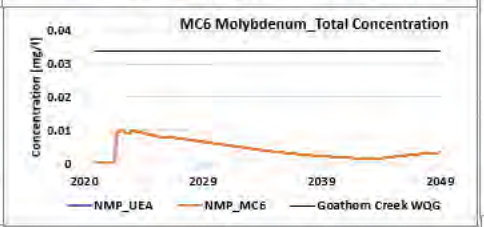


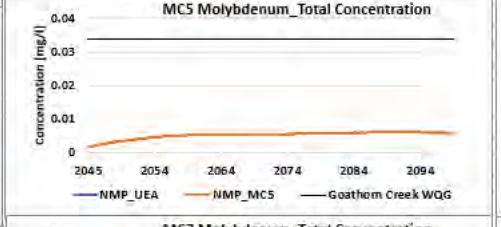


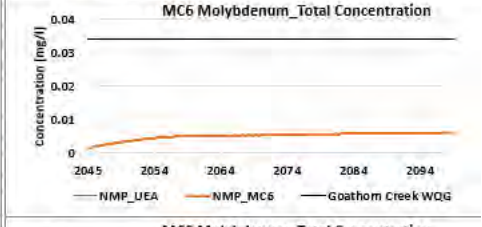


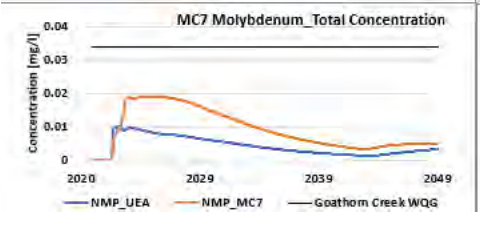


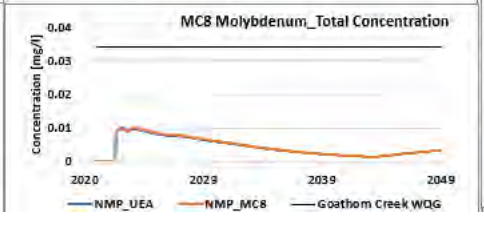


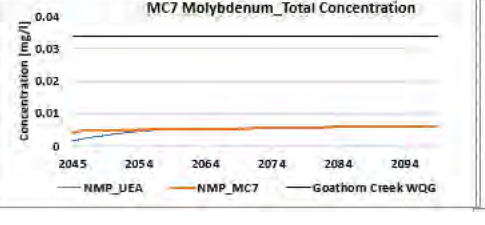












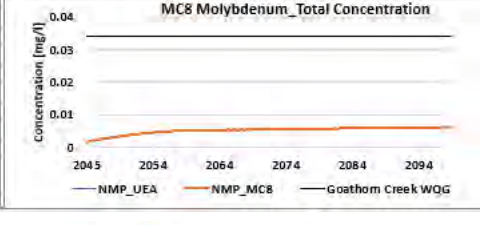
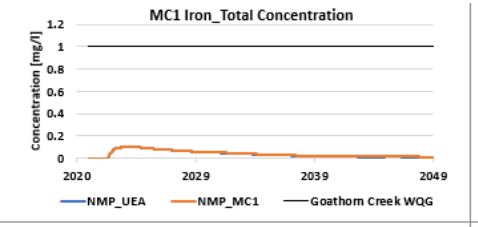
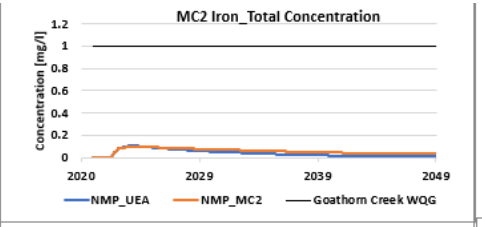
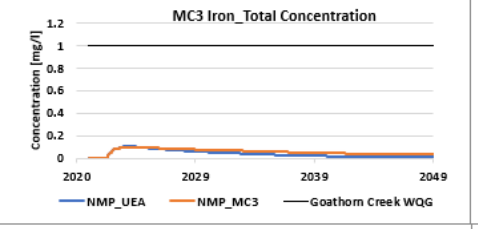
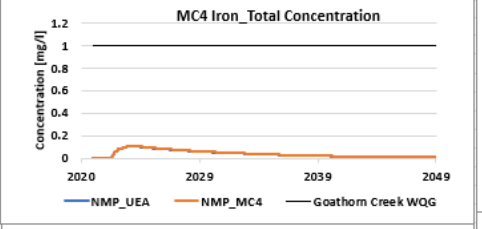


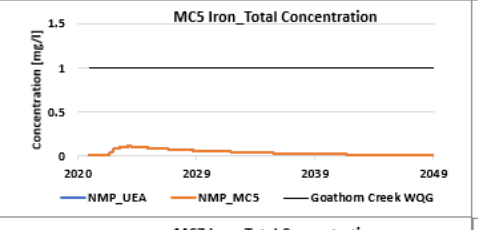
Figure 7D-10: Total Iron modelled concentrations in North Management Pond surface groundwater seepage for mitigation cases compared to projec
in Operations and Post-Closure

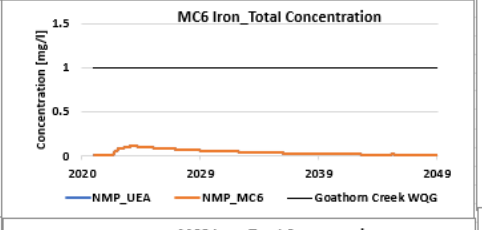


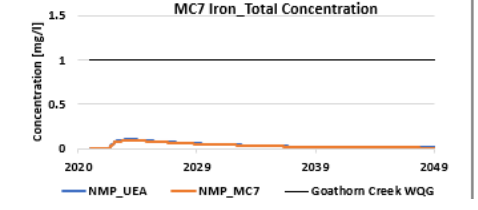


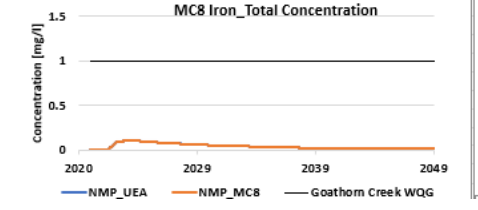


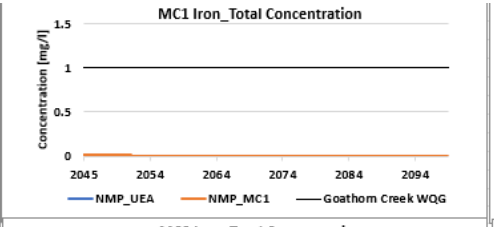


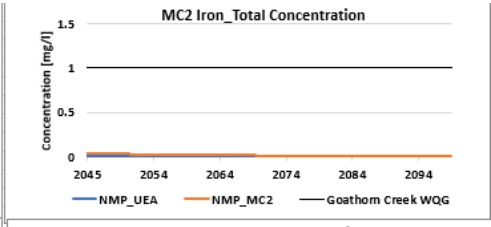


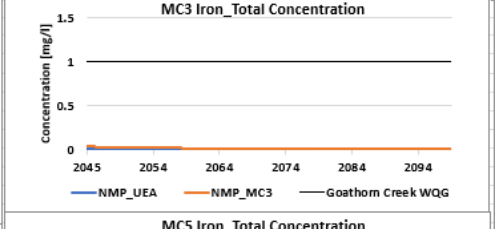


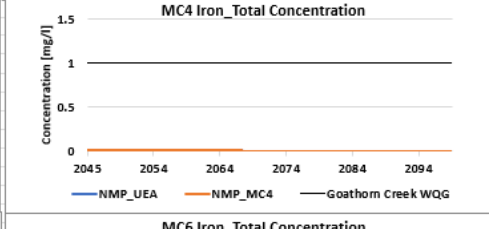


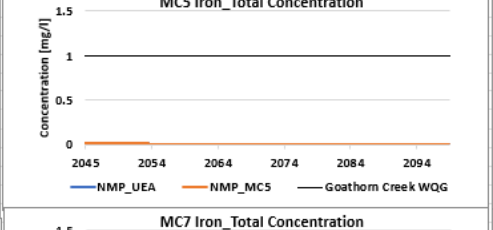


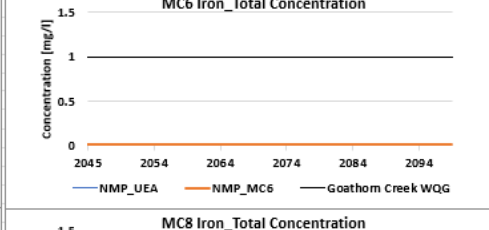


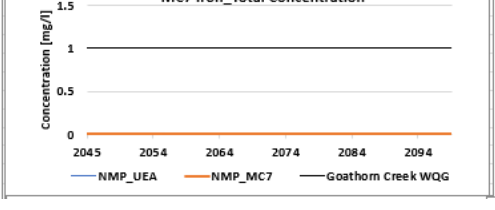












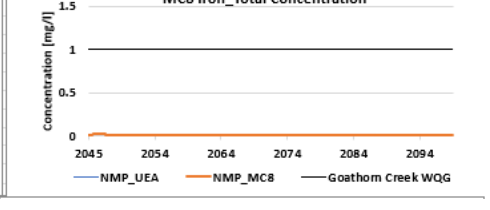


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Figure 7D-11: Total Chromium modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project in Operations and Post-Closure

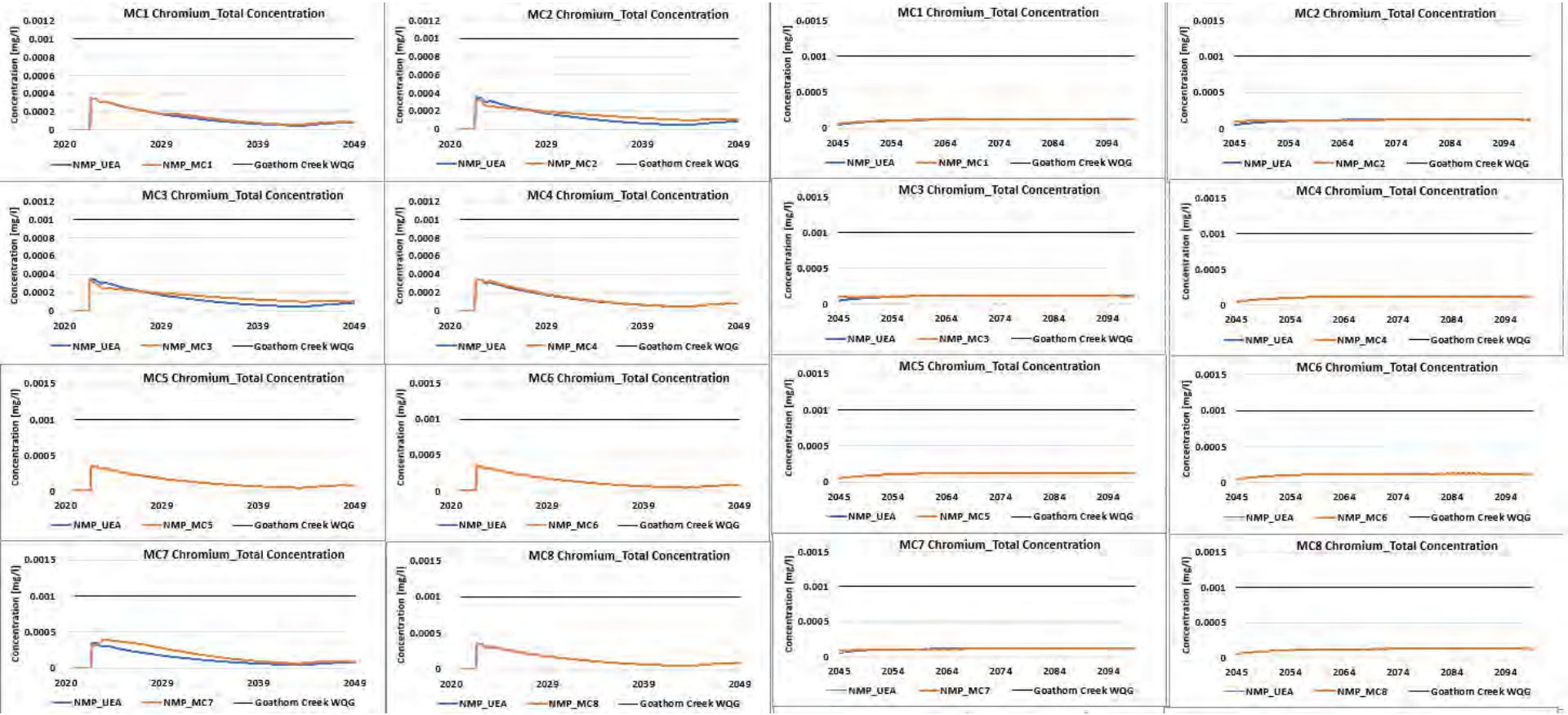

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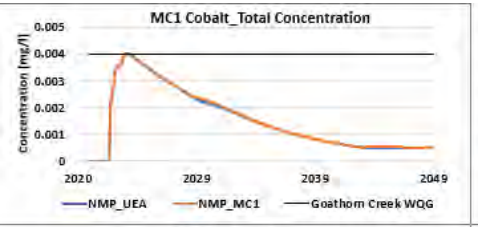
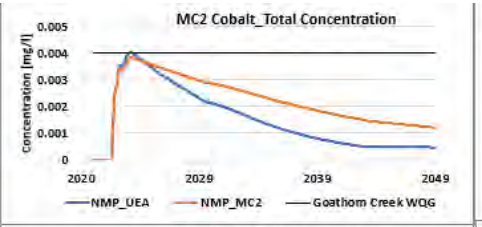
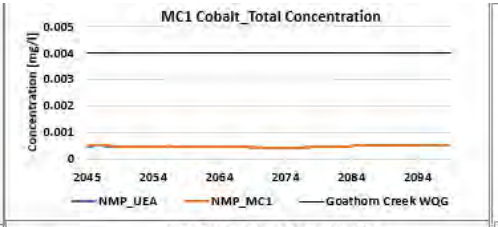
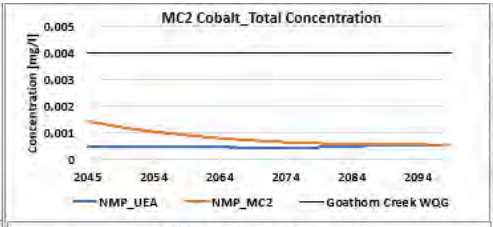
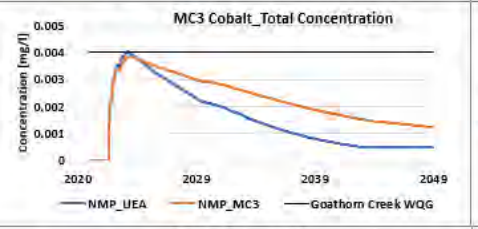
Figure 7D-12: Total Cobalt modelled concentrations in North Management Pond groundwater seepage for mitigation cases compared to project
in Operations and Post-Closure

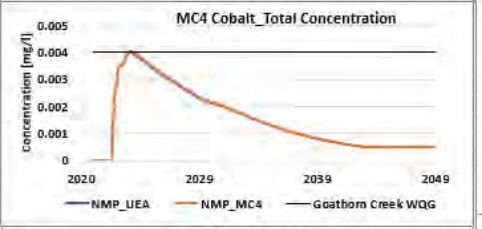


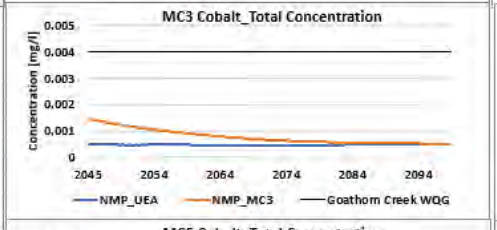


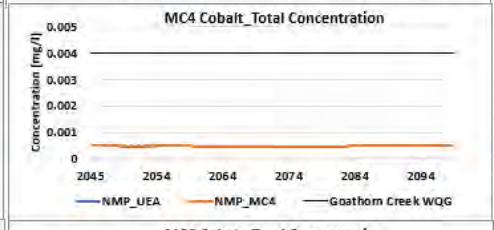


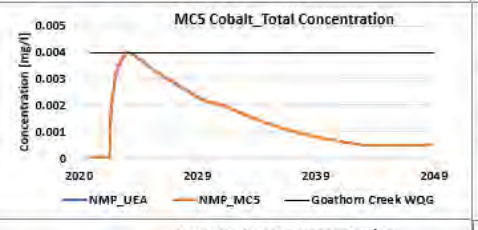


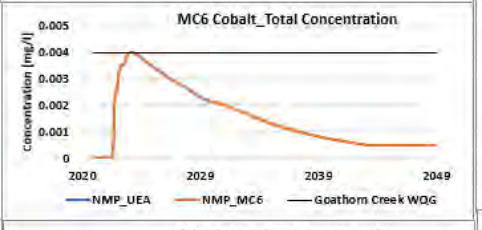


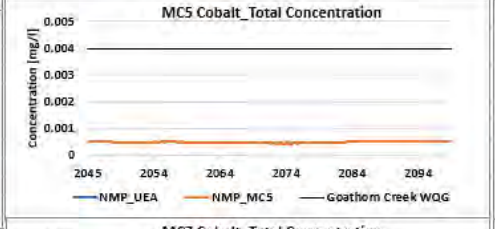


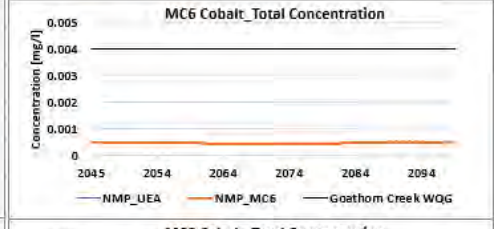


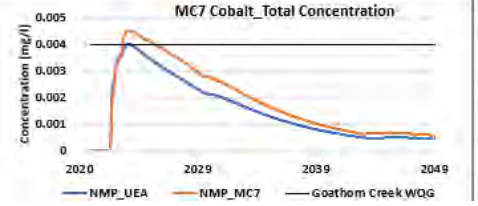


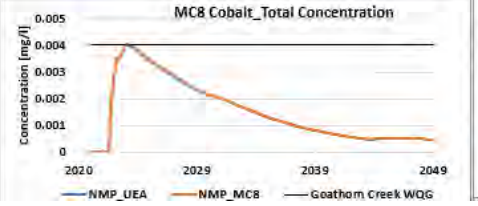


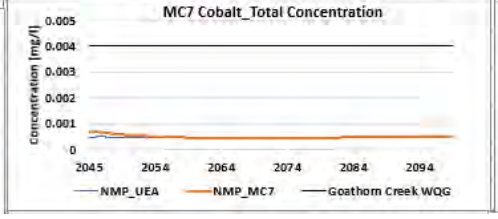


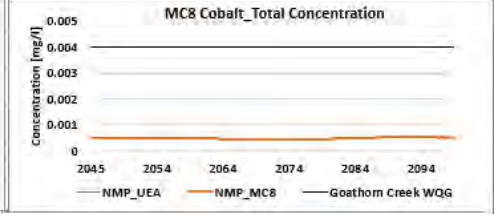












Appendix 7-E

East Management Pond groundwater seepage (Operations and Post-Closure)

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Figure 7E-1: Nitrite modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

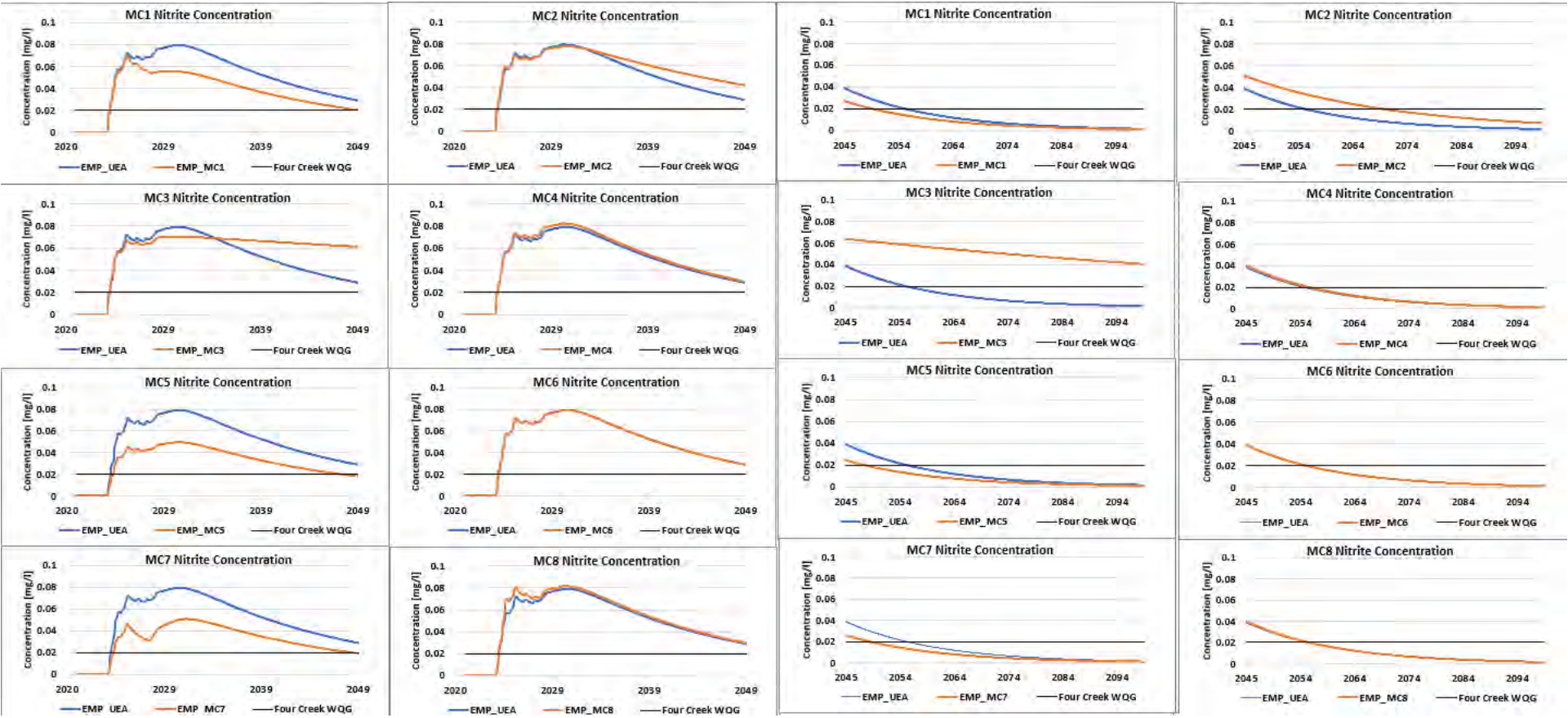

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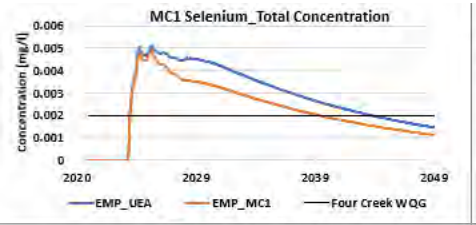
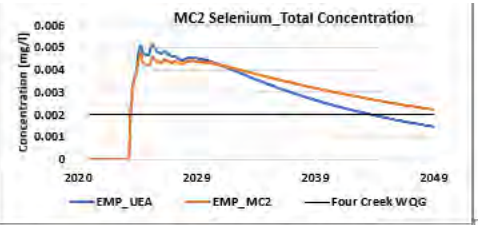
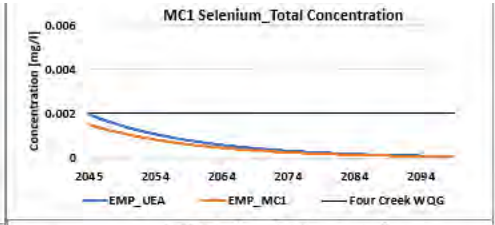
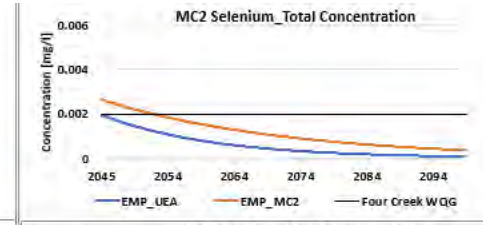
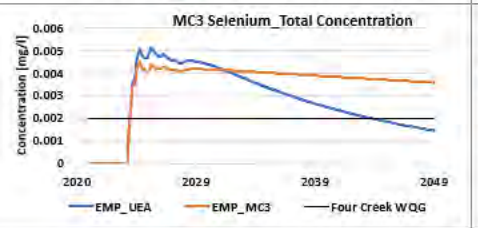
Figure 7E-2: Total Selenium modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project ca
in Operations and Post-Closure

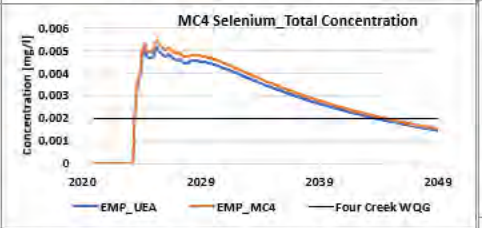


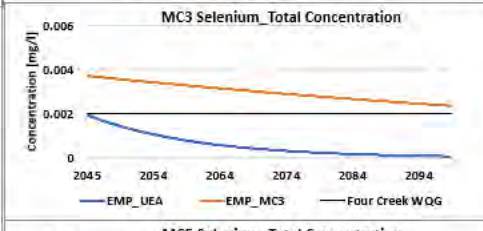


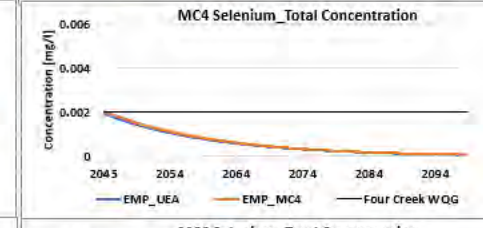


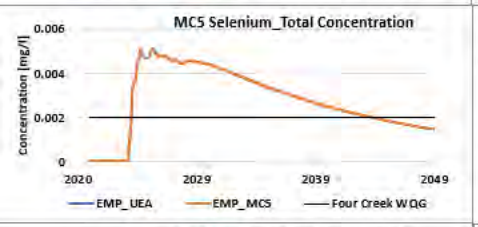


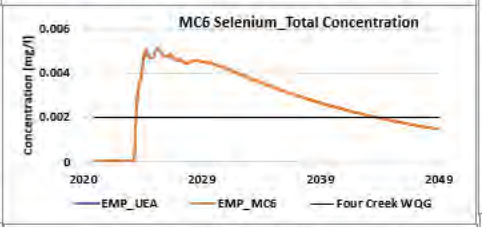


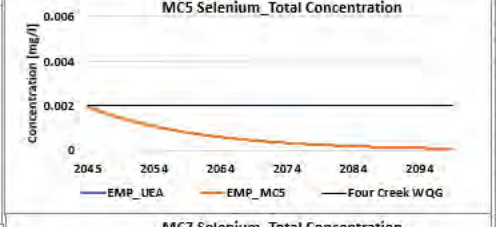


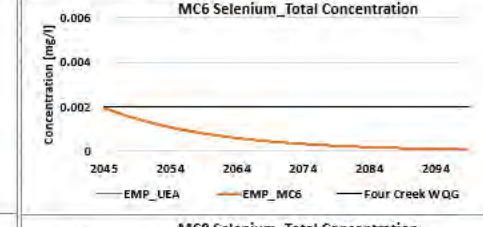


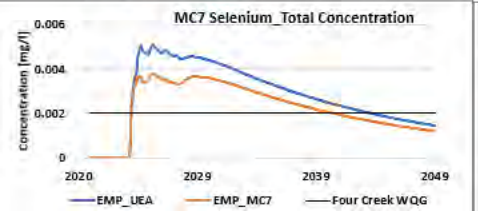


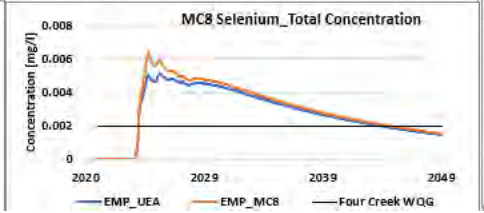


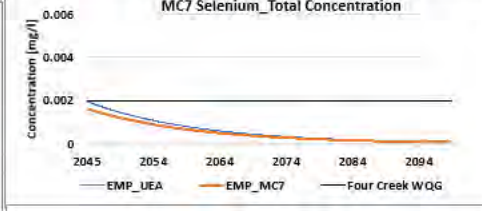












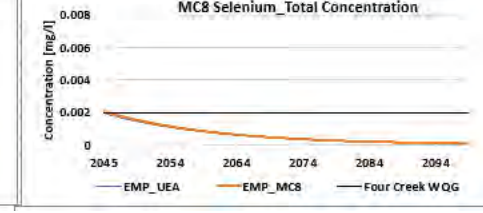
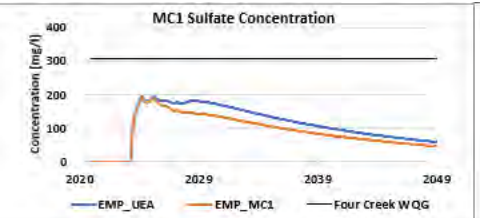
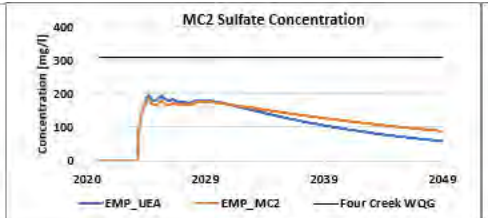
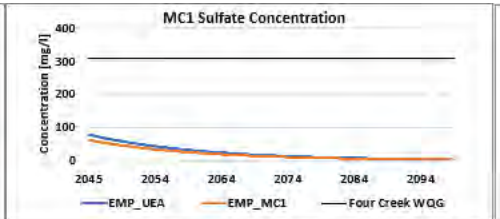
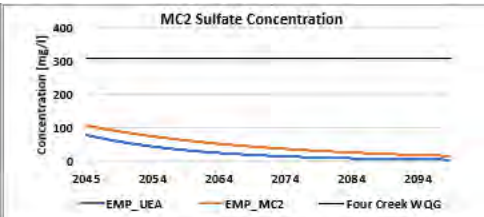


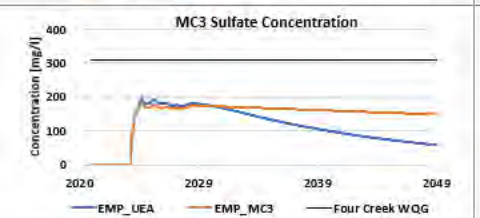
Figure 7E-3: Sulphate modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

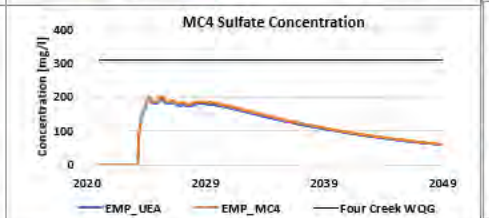


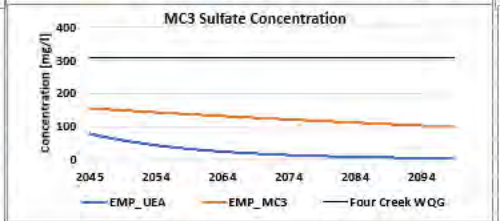


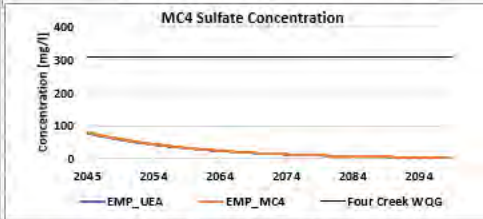


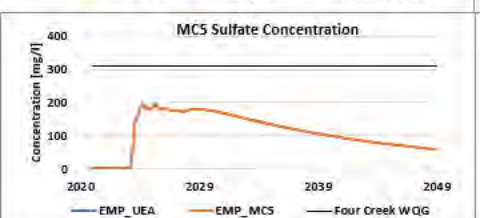


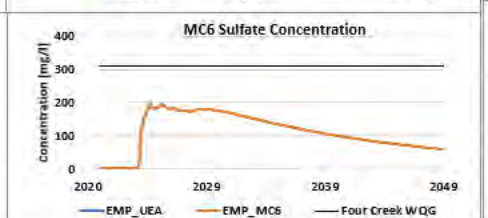


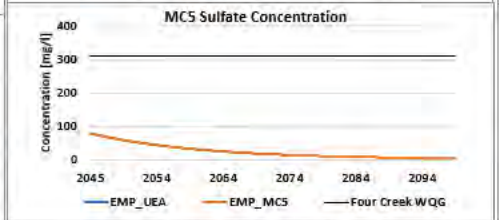


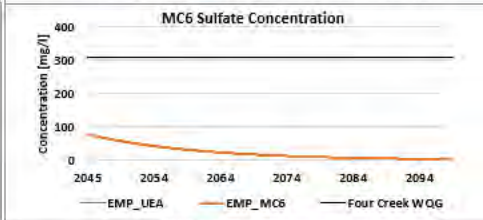


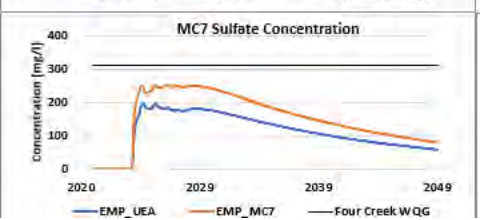


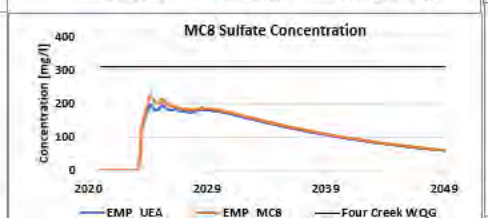


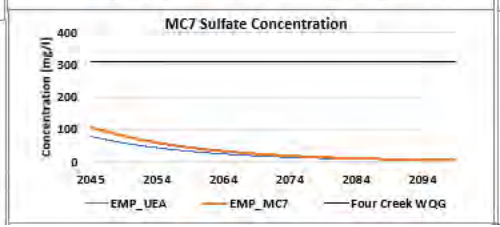












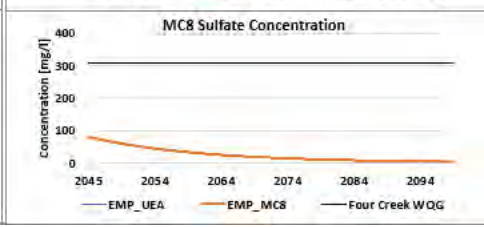


Figure 7E-4: Total Aluminium modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project ca
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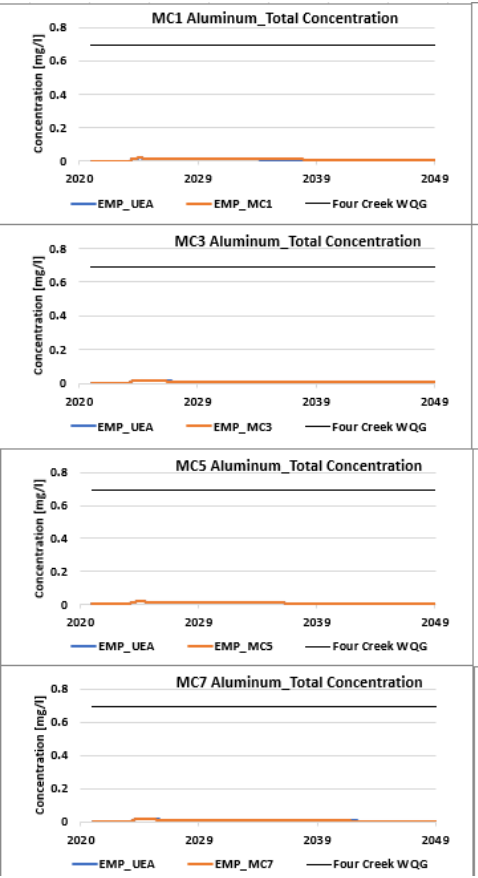

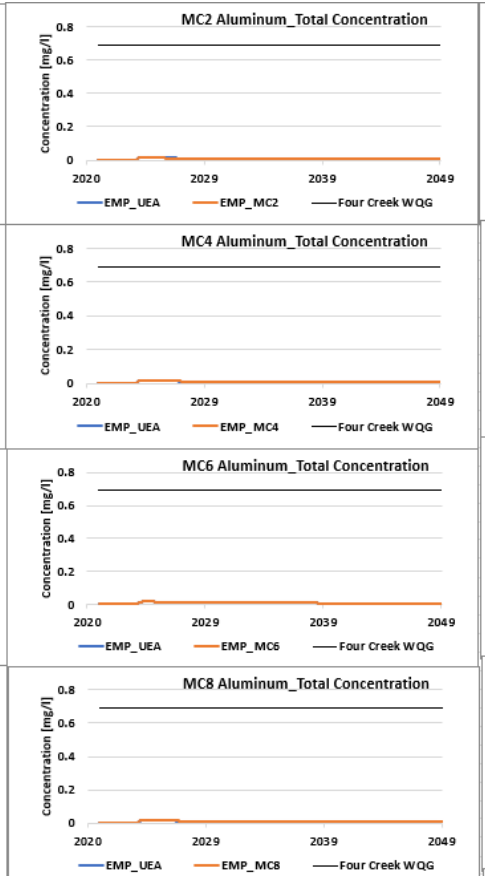

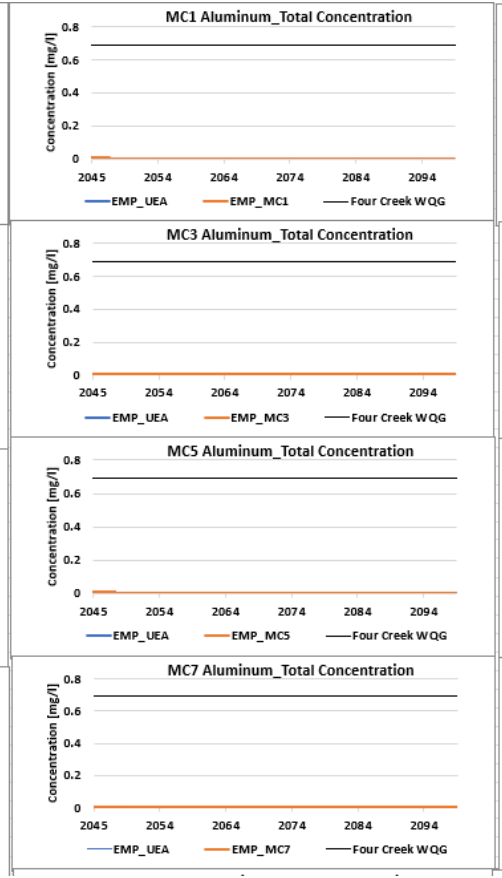

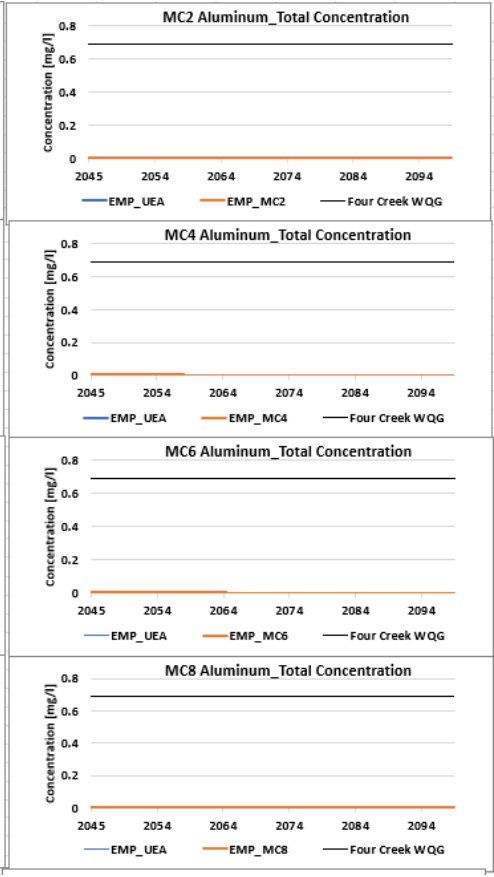

Figure 7E-5: Nitrate modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

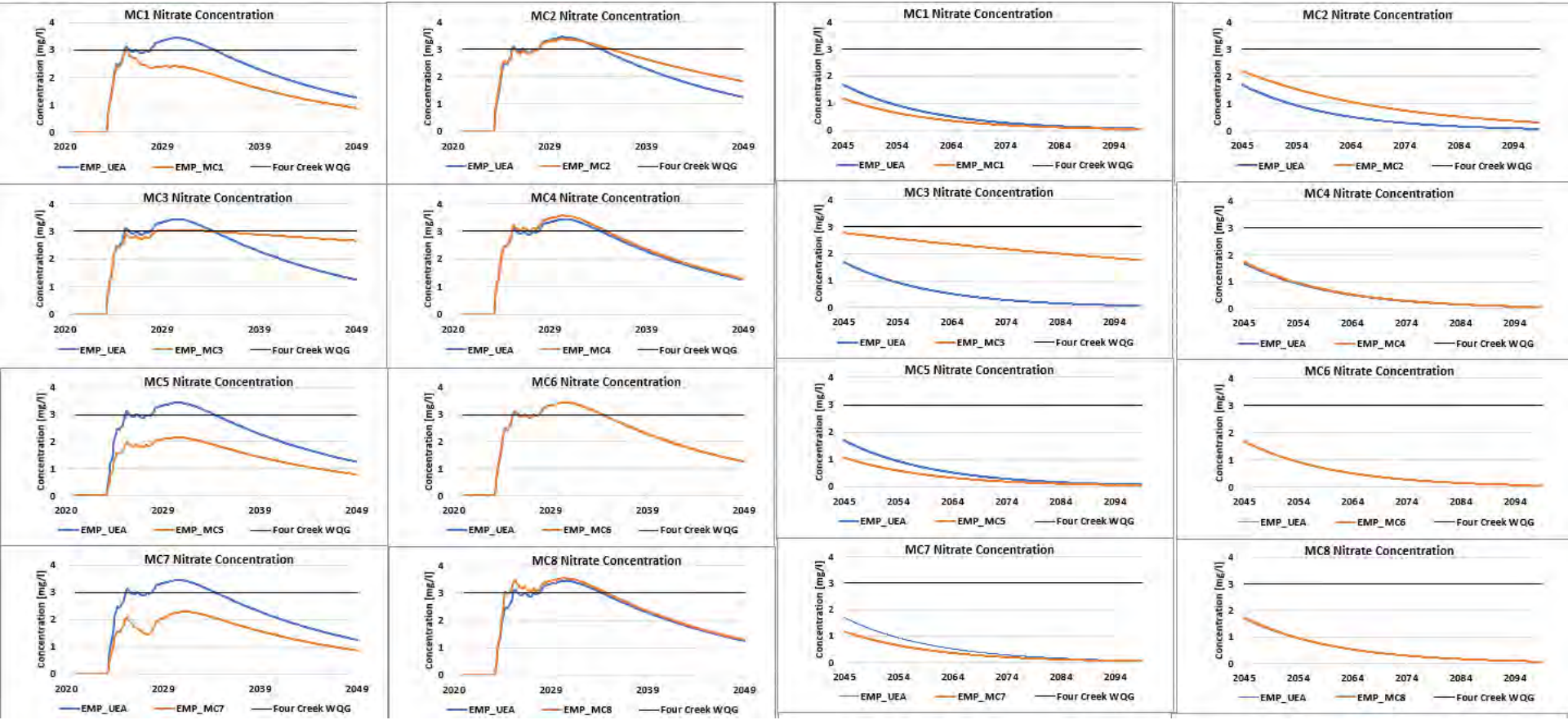

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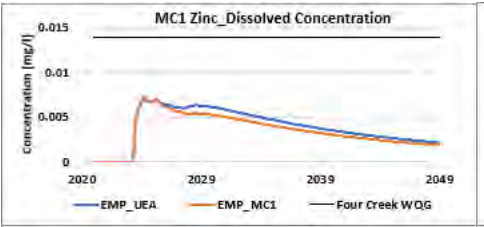
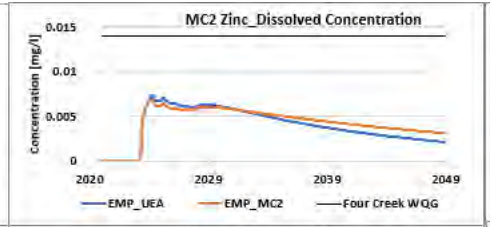
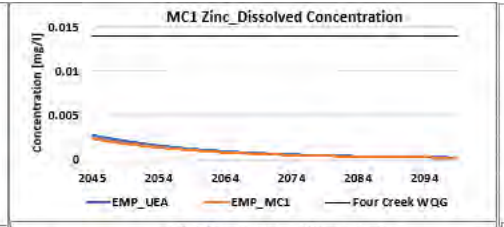
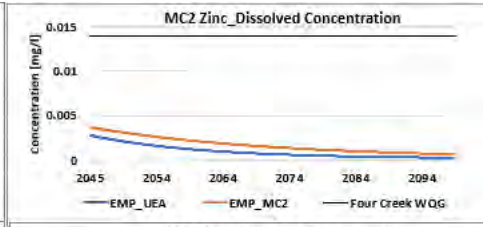
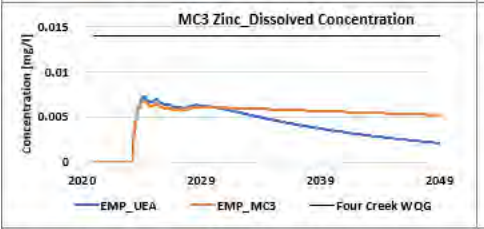
Figure 7E-6: Dissolved Zinc modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project ca
in Operations and Post-Closure

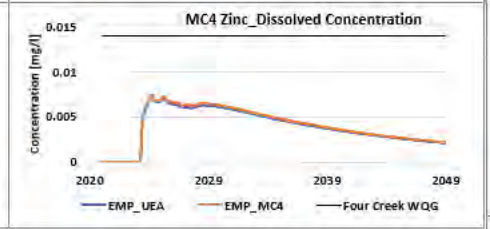


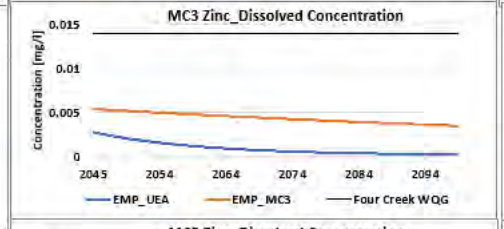


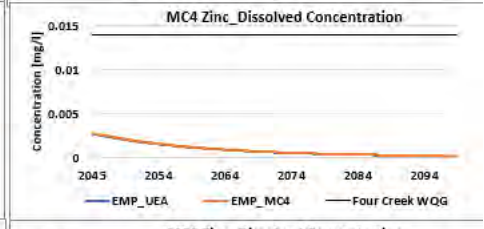


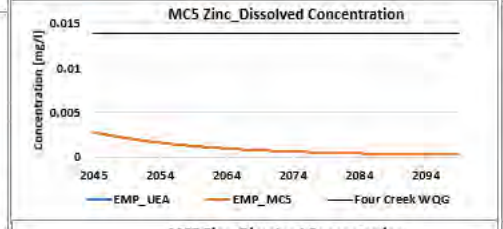


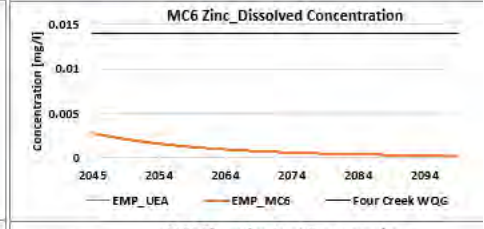


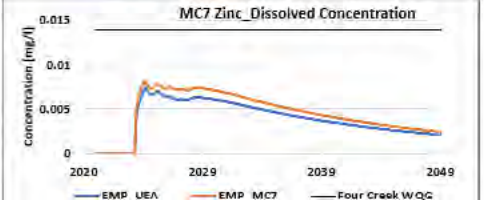


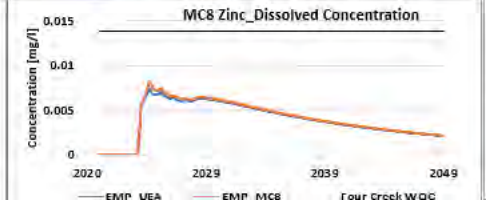


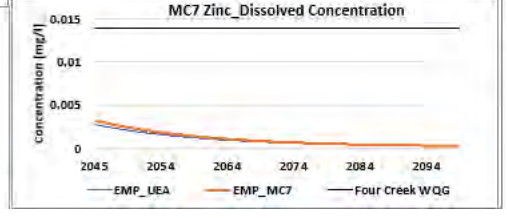












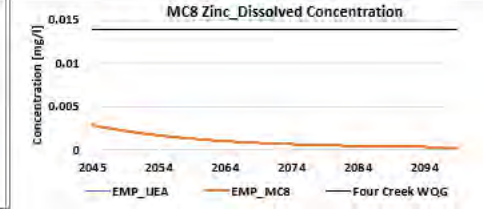


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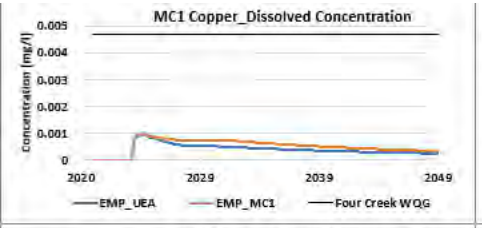
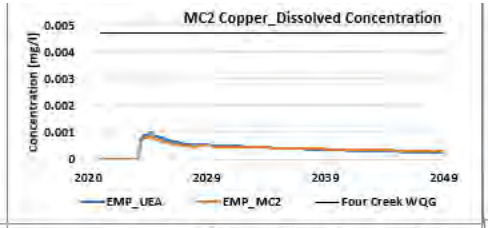
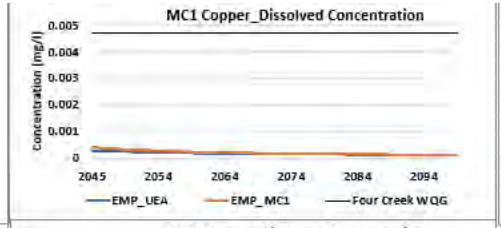
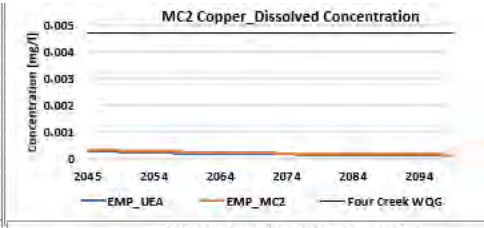
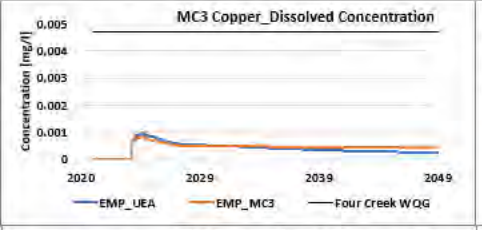
Figure 7E-7: Dissolved Copper modelled concentrations in East Management groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

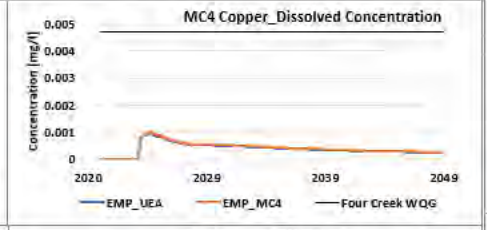


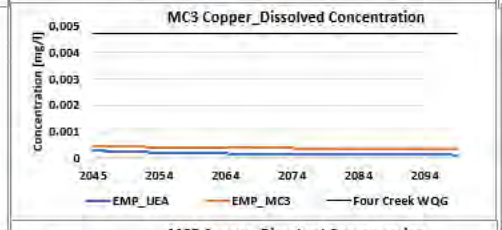


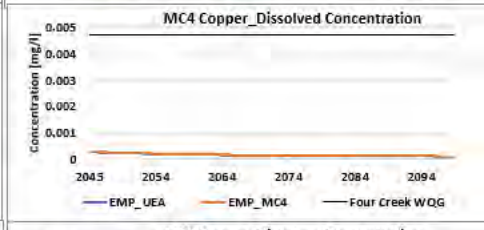


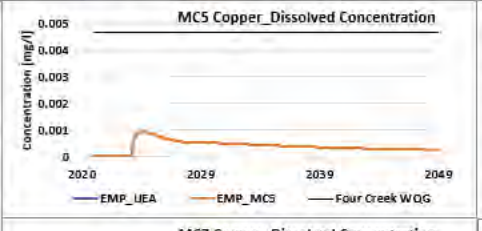


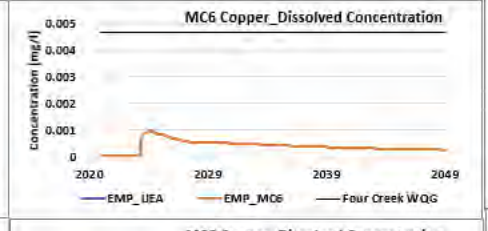


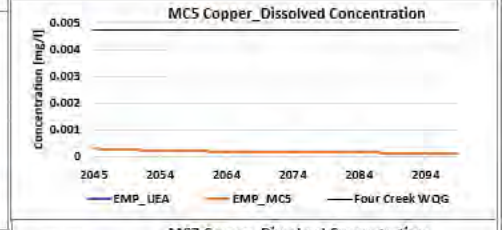


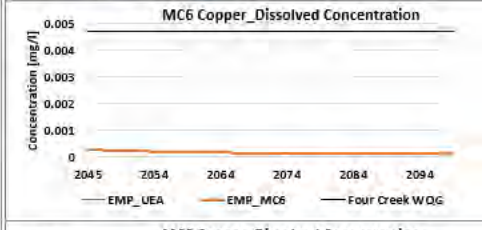


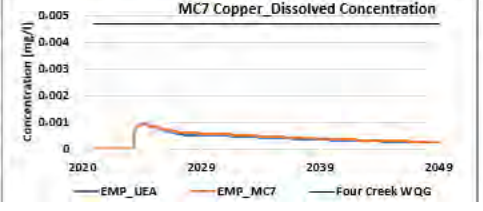


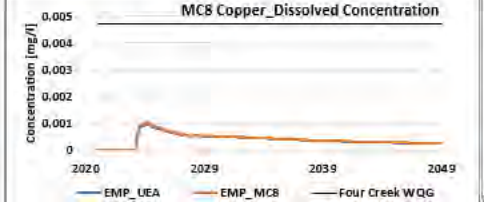


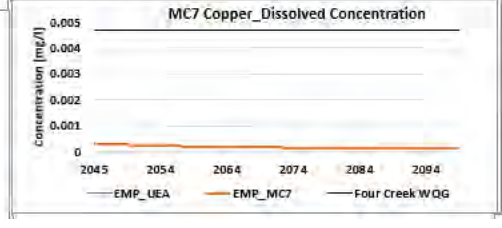












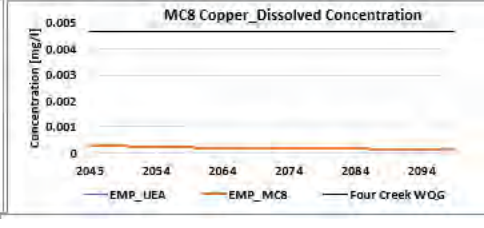
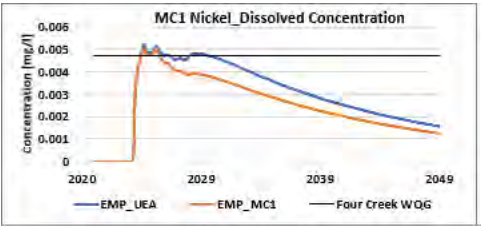
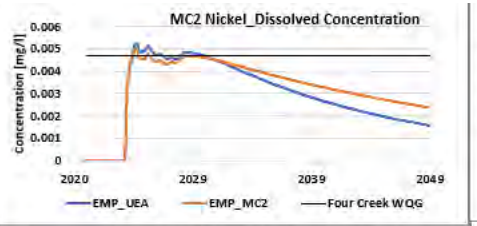
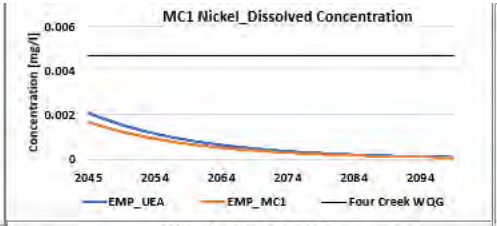
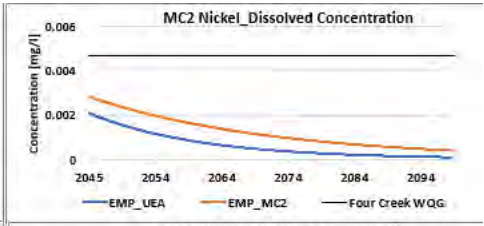


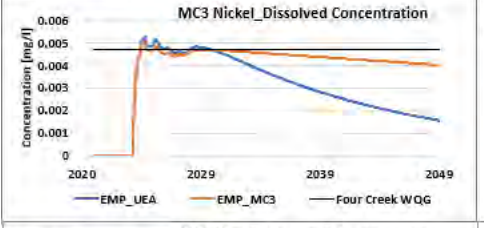
Figure 7E-8: Dissolved Nickel modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project ca
in Operations and Post-Closure

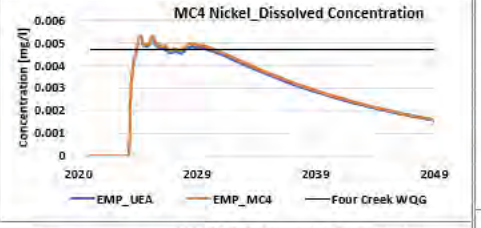


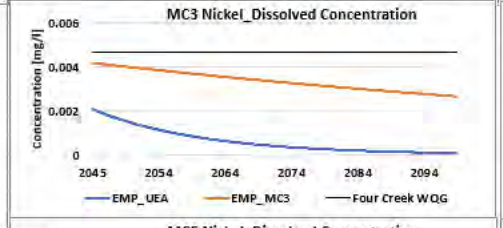


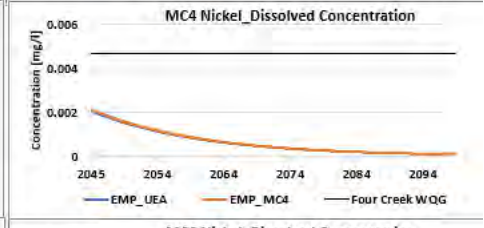


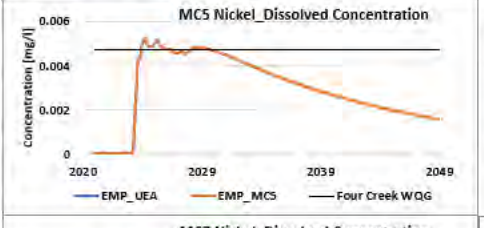


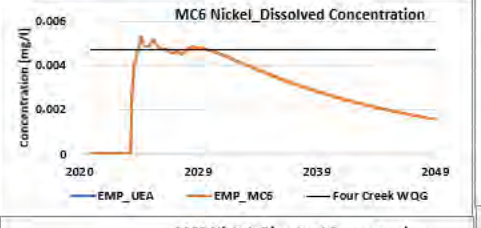


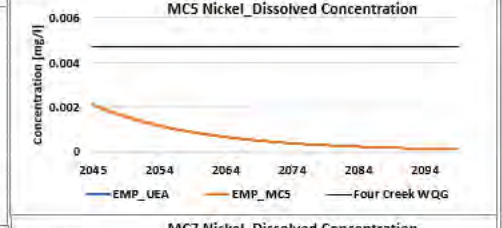


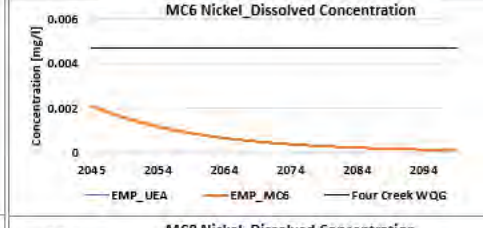


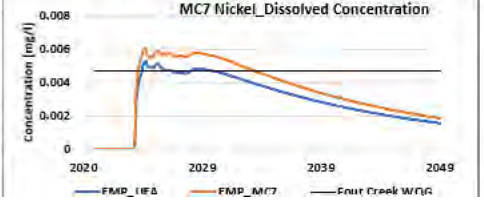


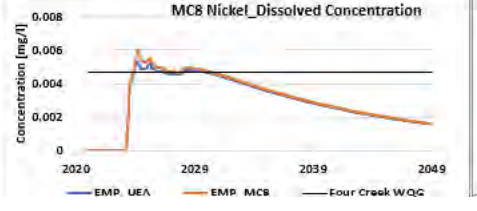


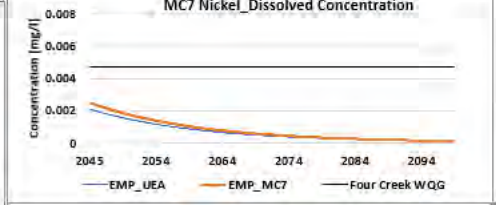












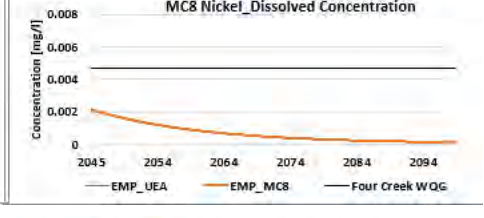
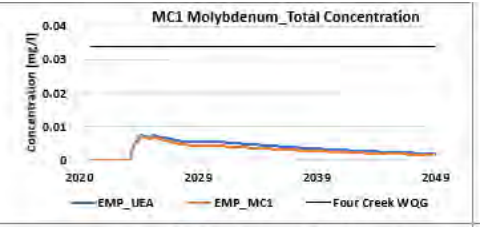
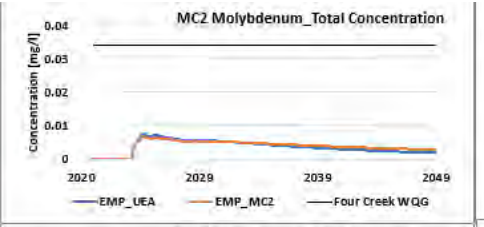
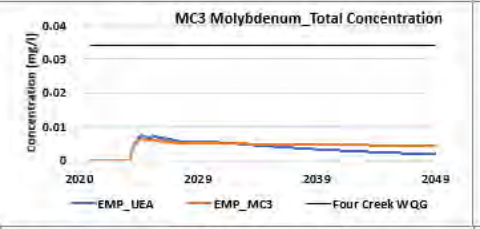
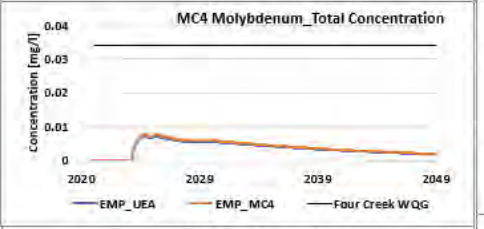


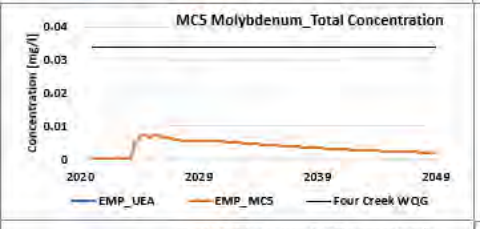
Figure 7E-9: Total Molybdenum modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project
in Operations and Post-Closure

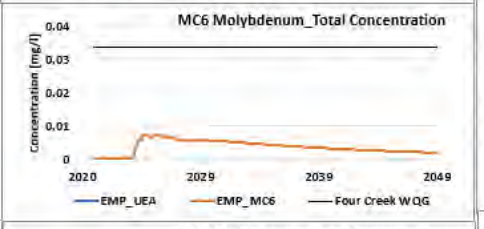


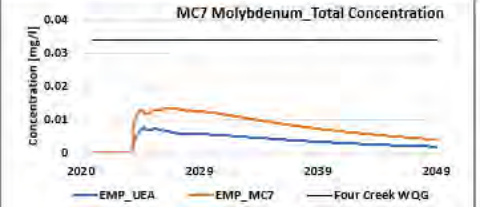


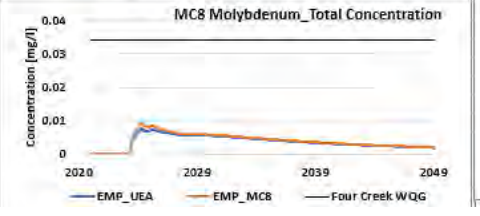


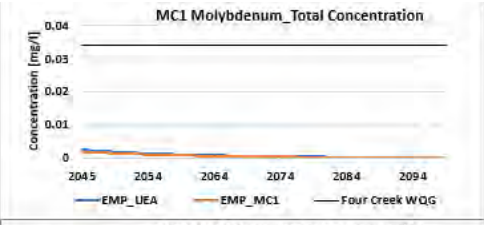


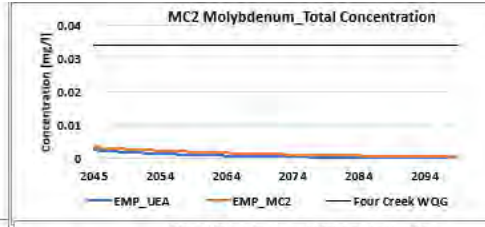


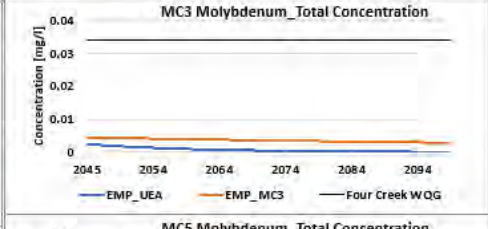


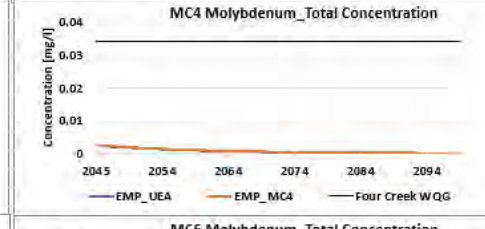


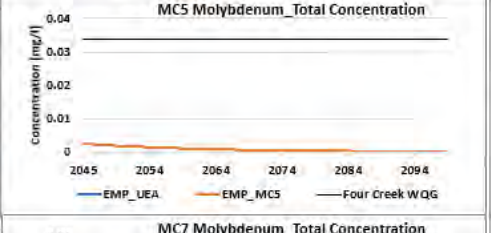


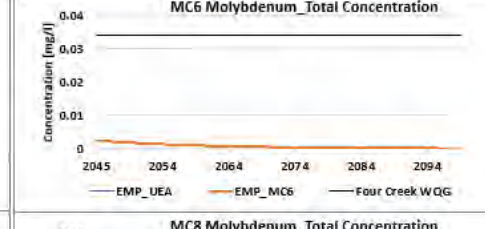


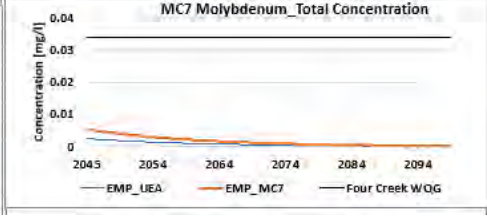












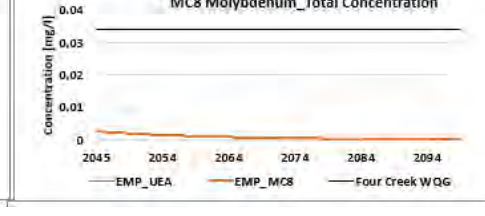
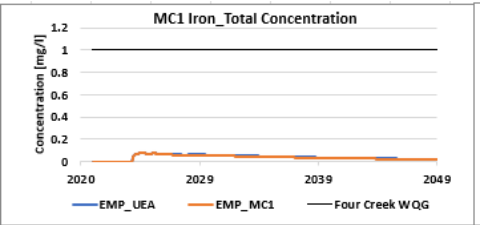
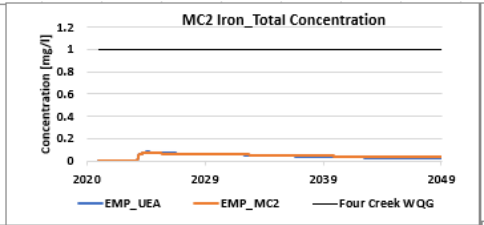
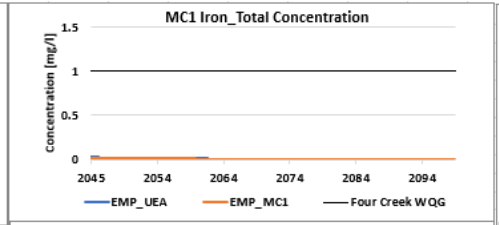
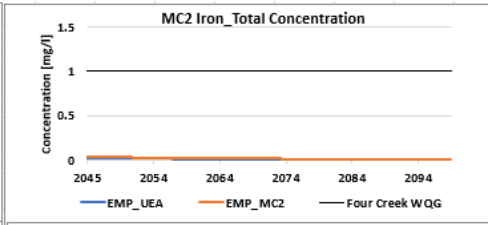


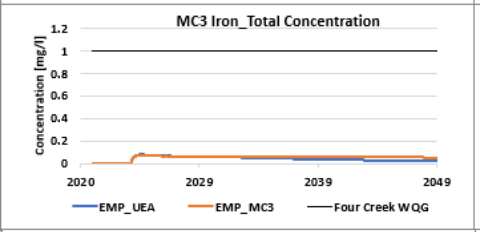
Figure 7E-10: Total Iron modelled concentrations in East Management Pond surface groundwater seepage for mitigation cases compared to project in Operations and Post-Closure

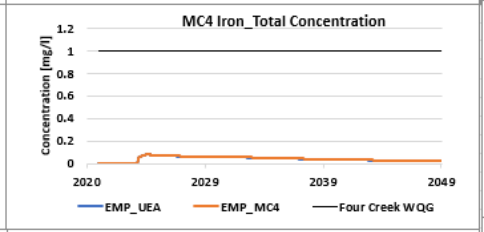


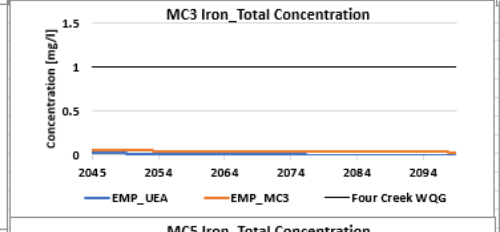


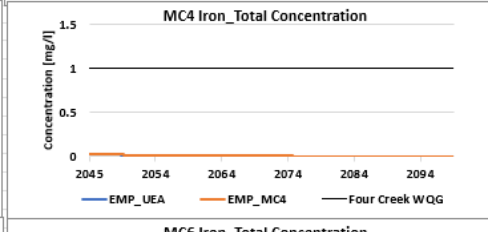


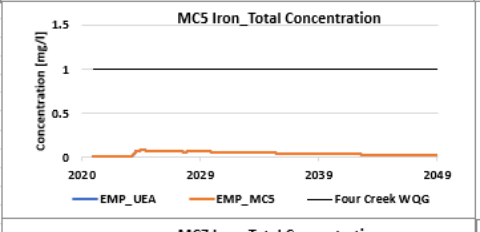


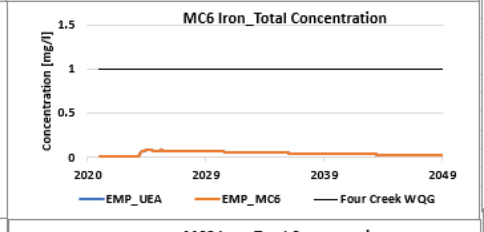


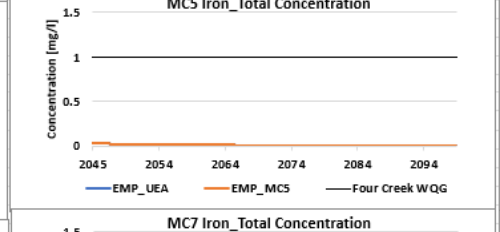


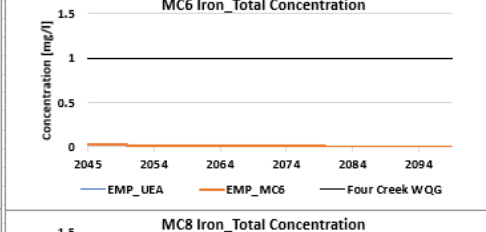


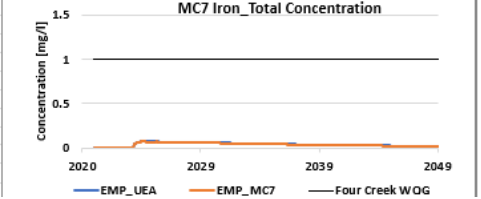


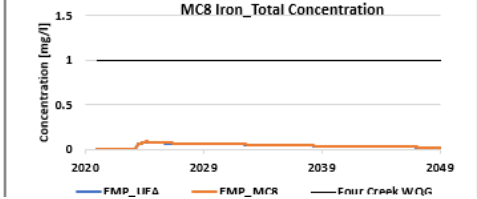


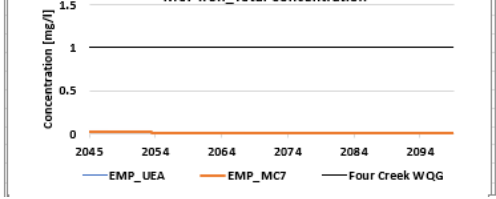












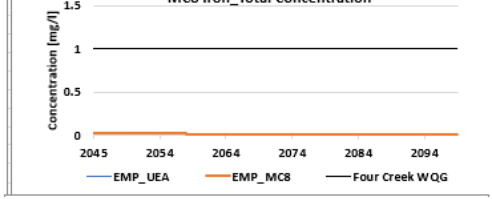
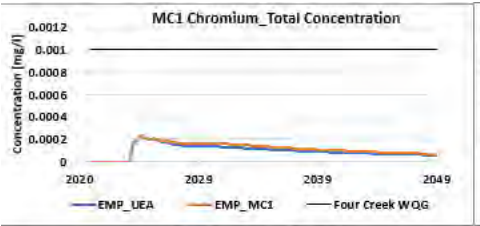
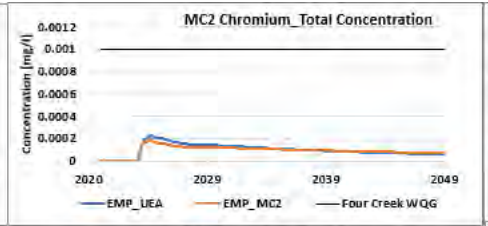
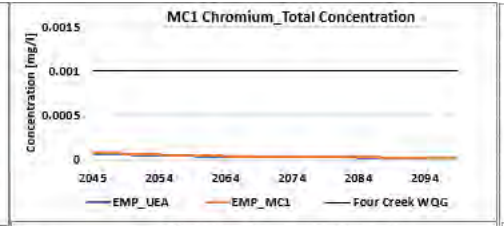
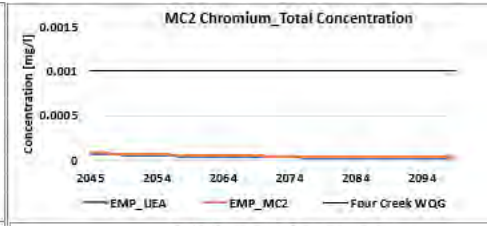


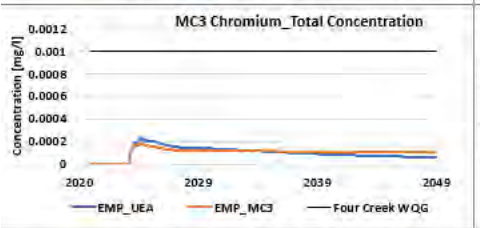
Figure 7E-11: Total Chromium modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project c
in Operations and Post-Closure

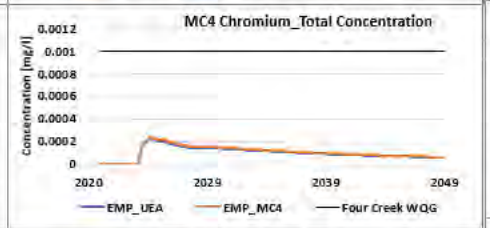


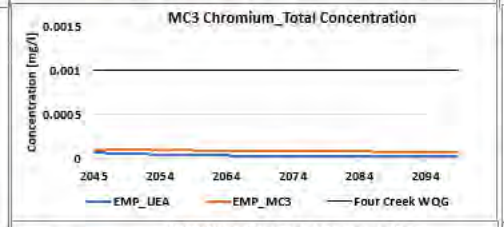


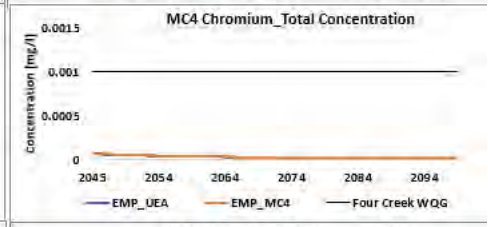


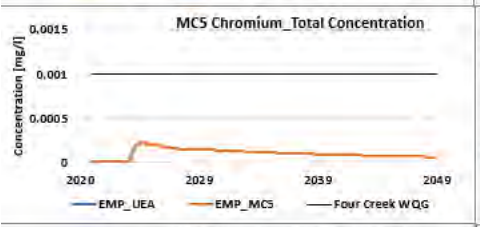


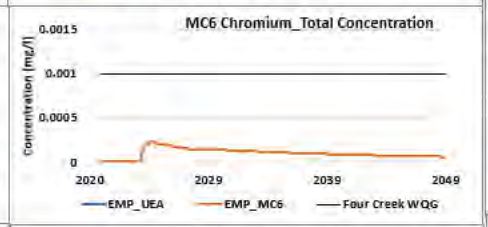


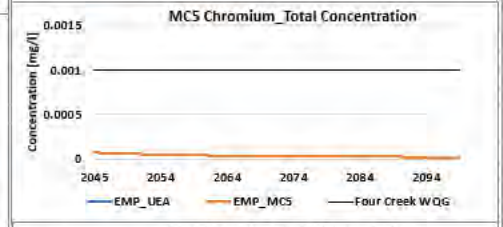


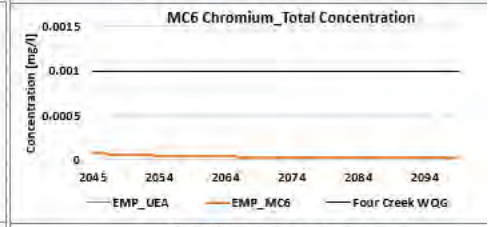


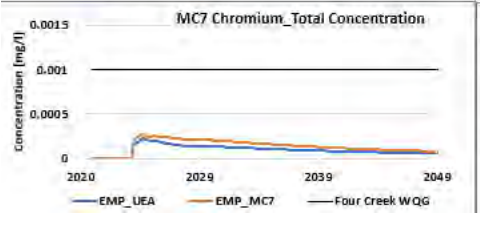


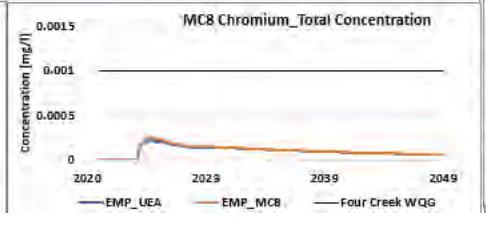


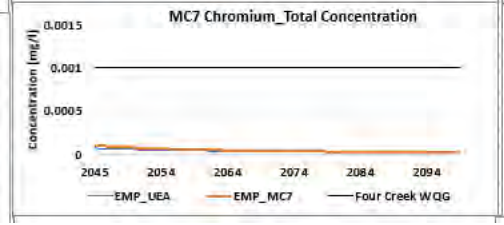












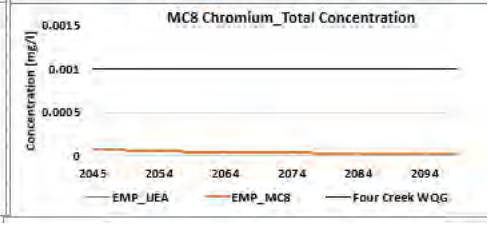
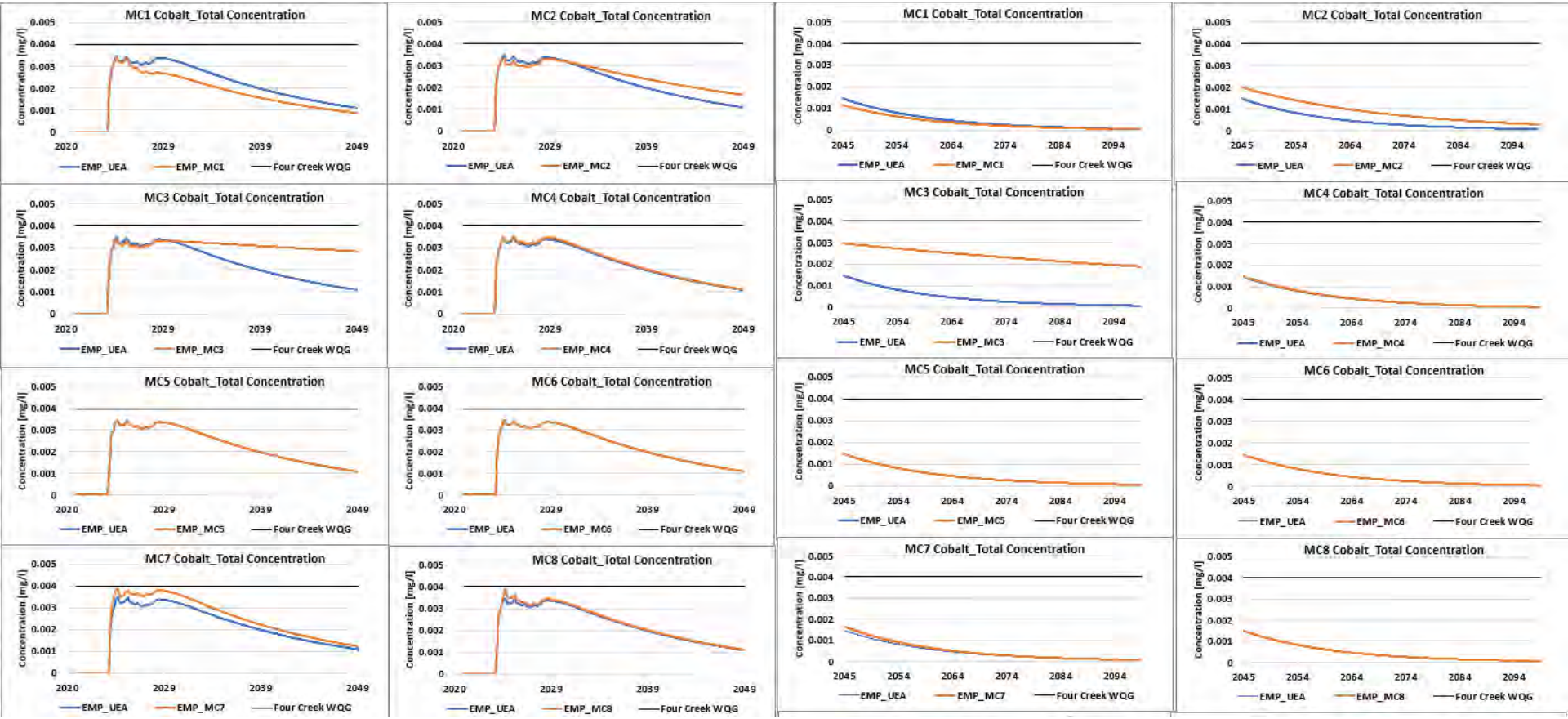


Figure 7E-12: Total Cobalt modelled concentrations in East Management Pond groundwater seepage for mitigation cases compared to project ca
in Operations and Post-Closure



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Appendix 7-F

West Management Pond groundwater seepage (Operations and Post-Closure)

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Figure 7F-1: Nitrite modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

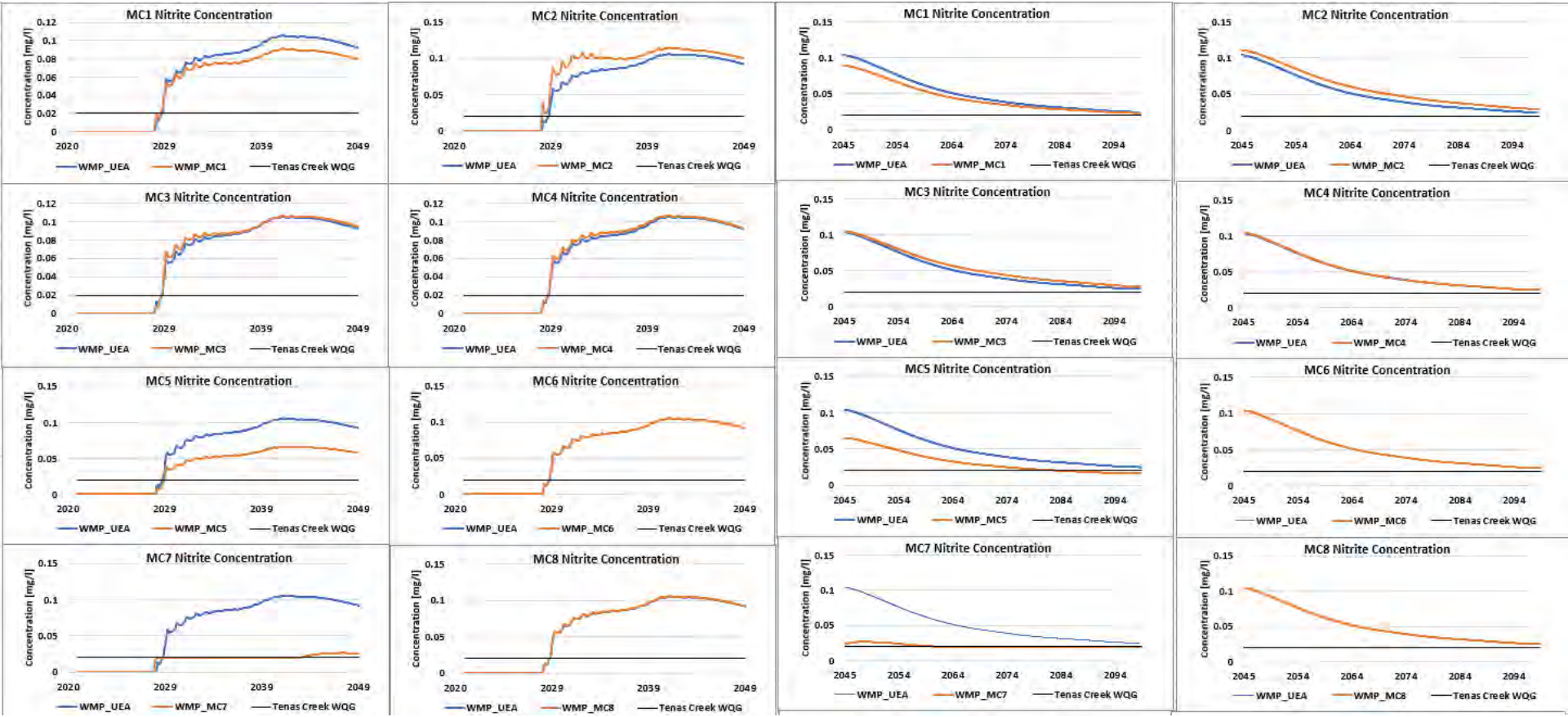

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Figure 7F-2: Total Selenium modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

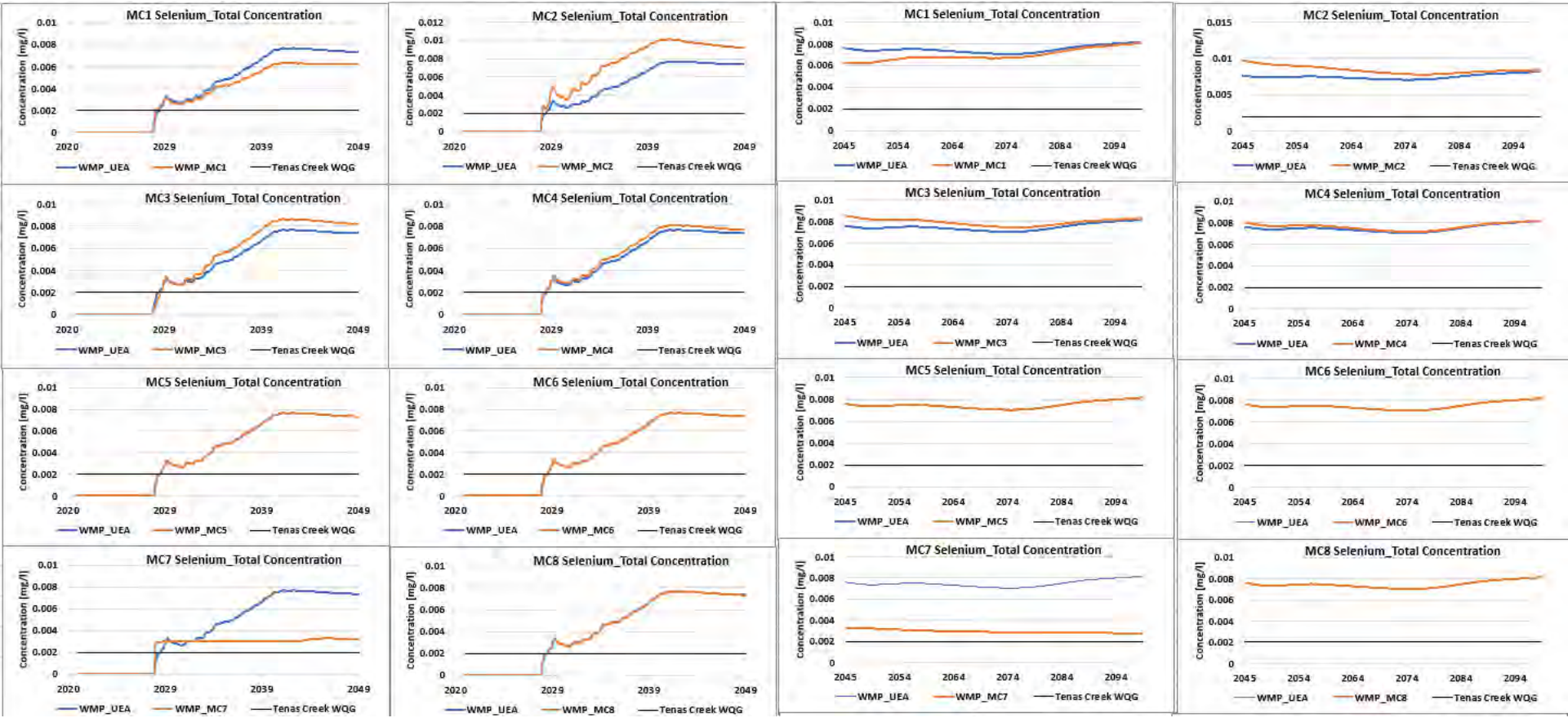

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Figure 7F-3: Sulphate modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

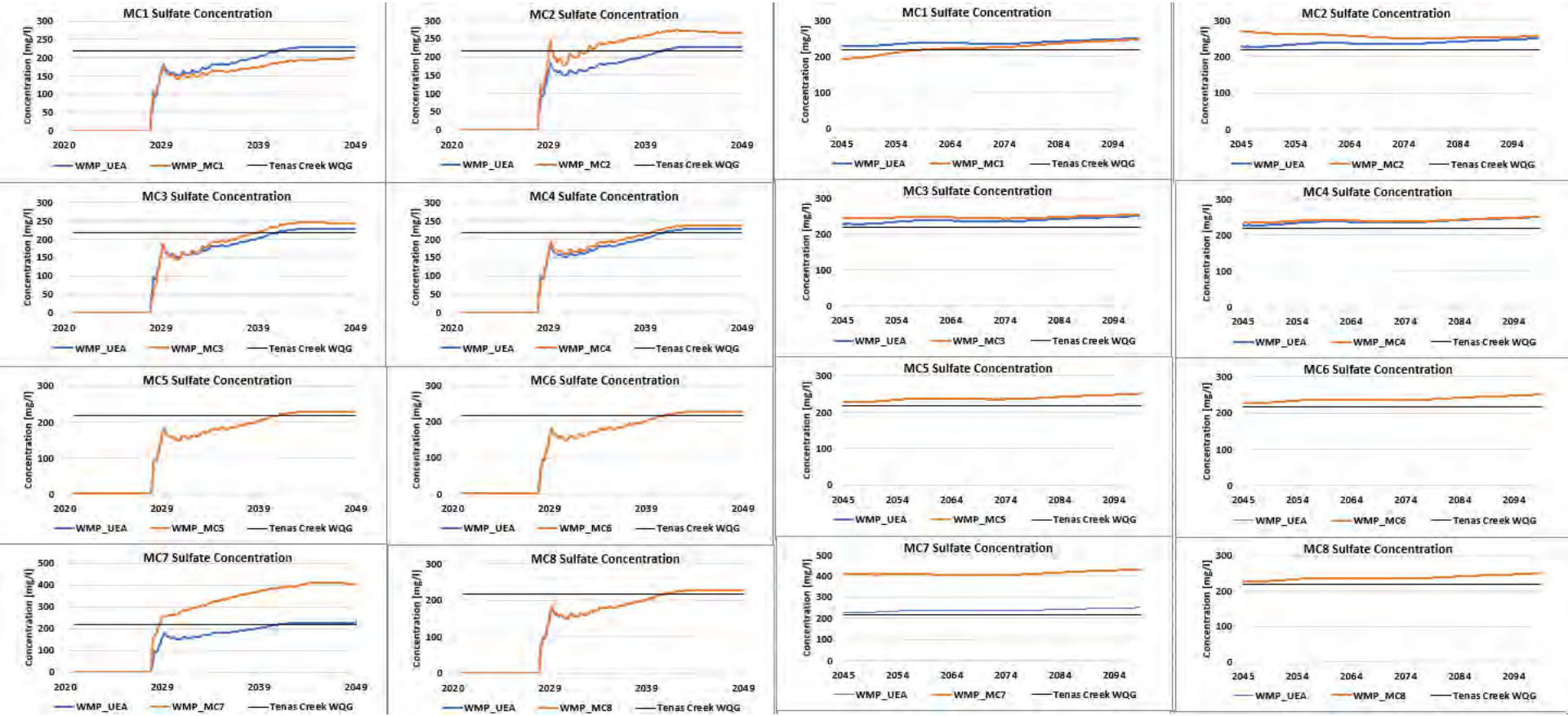

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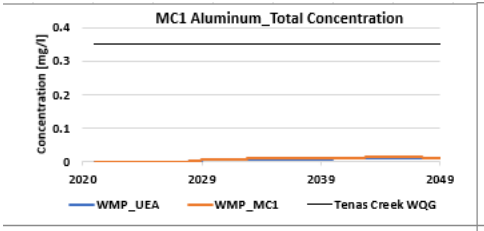
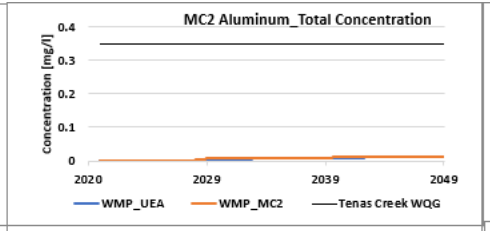
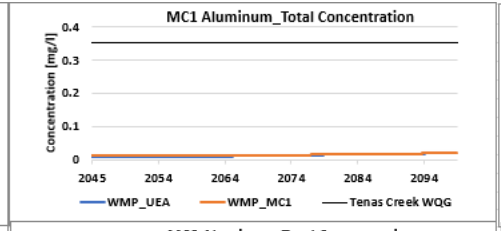
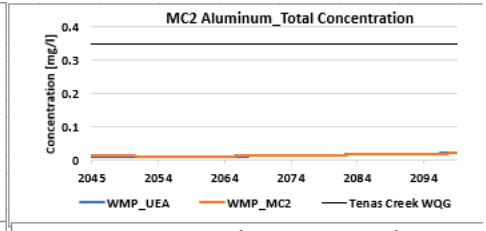
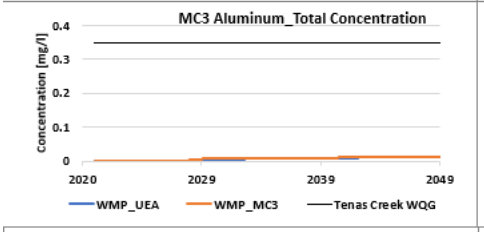
Figure 7F-4: Total Aluminium modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

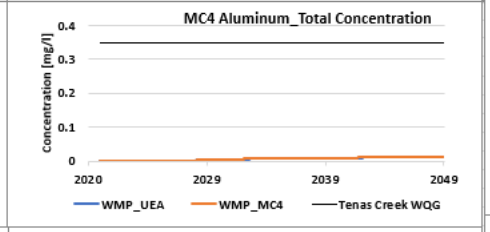


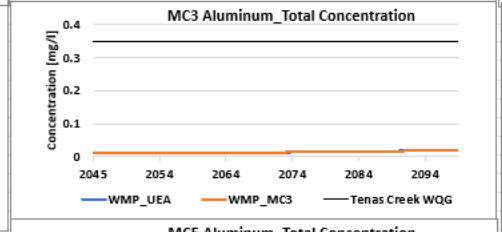


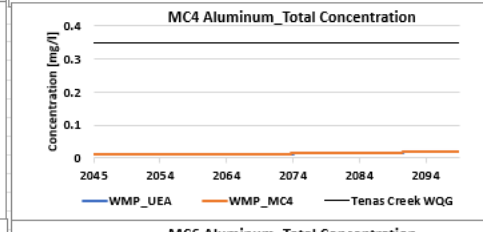


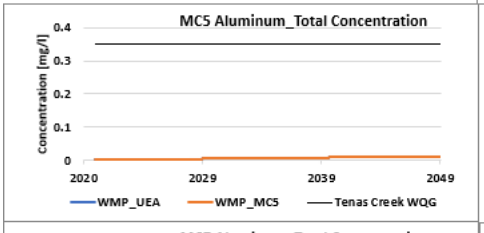


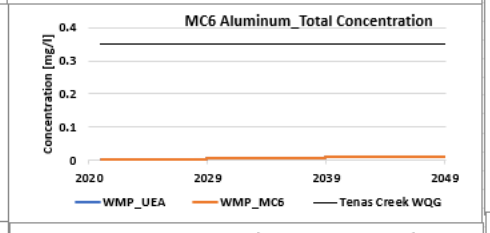


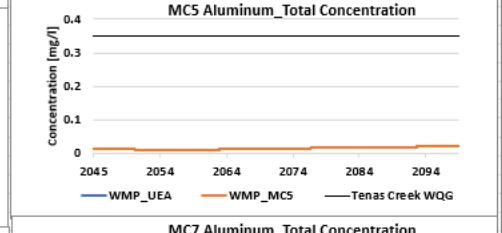


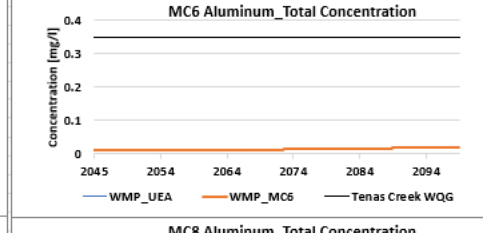


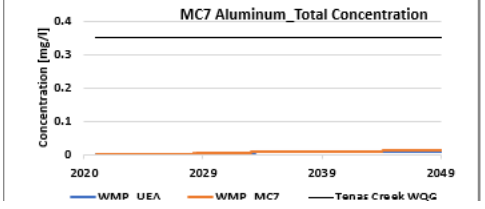


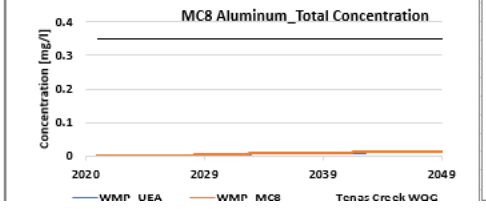


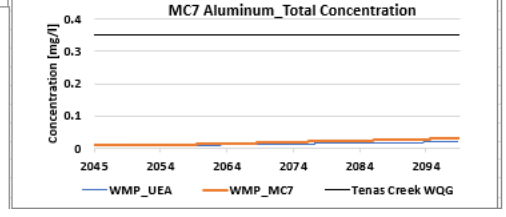












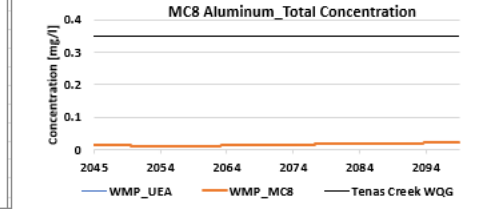


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Figure 7F-5: Nitrate modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

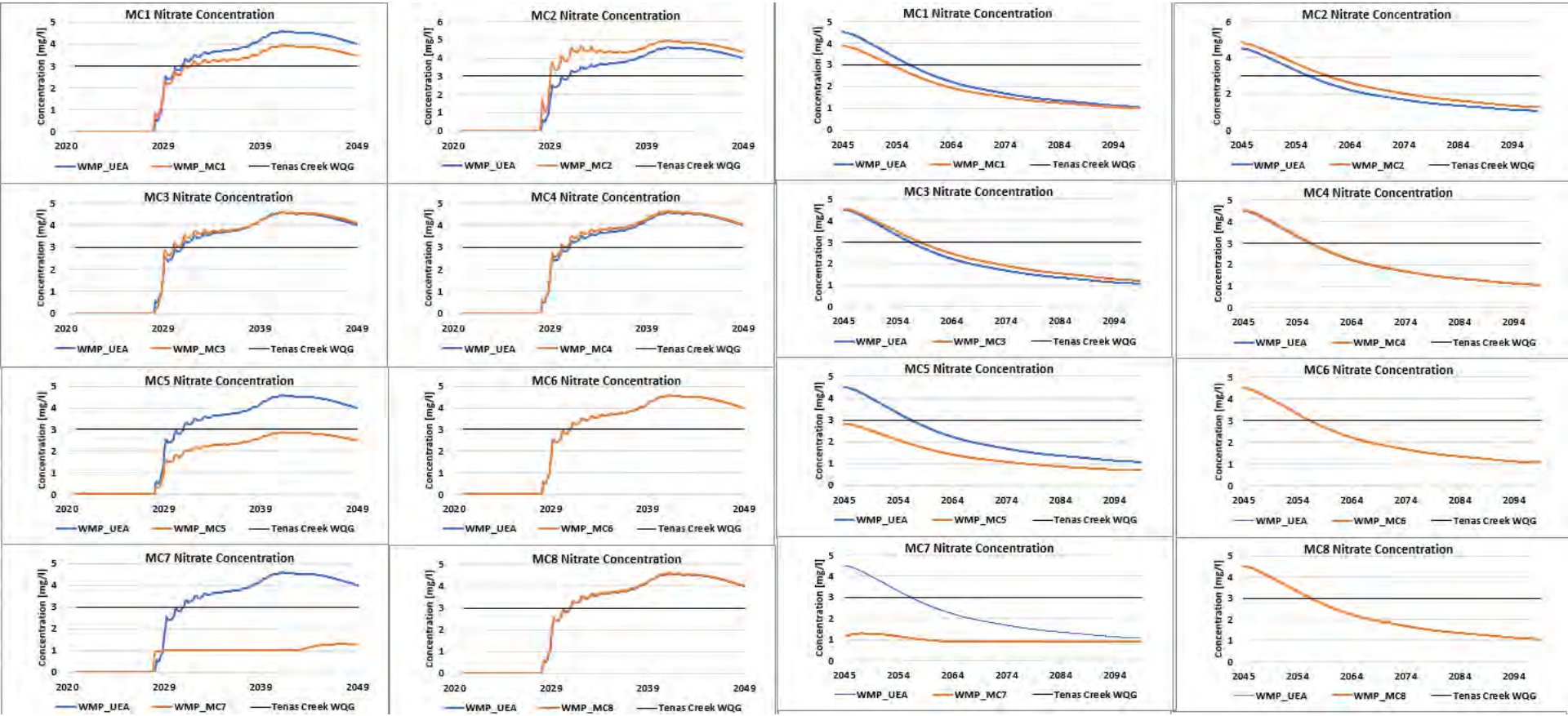

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Figure 7F-6: Dissolved Zinc modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

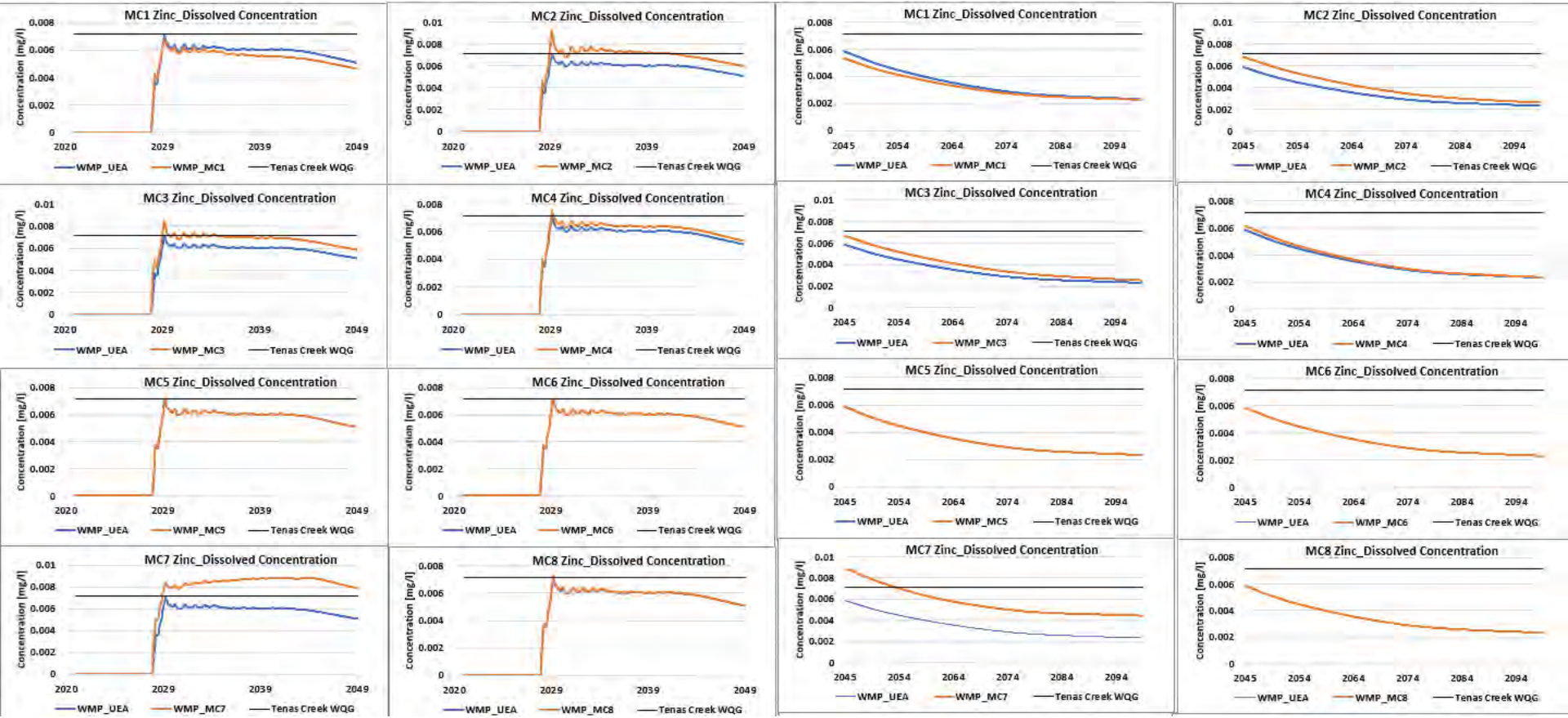

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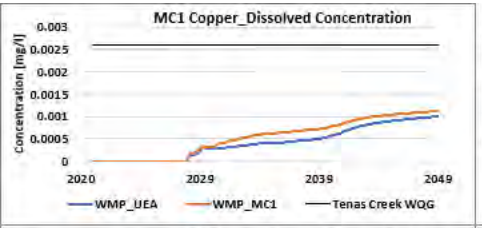
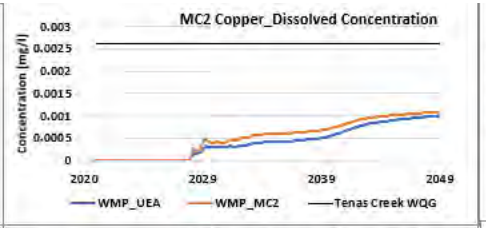
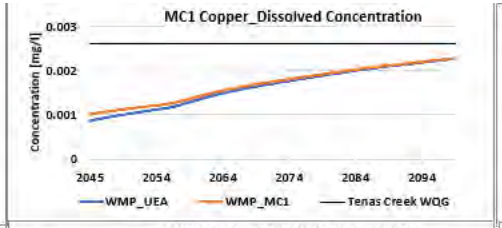
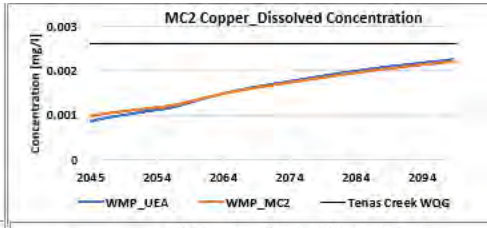
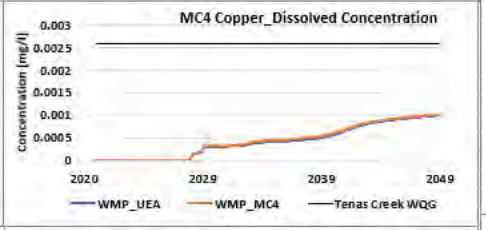
Figure 7F-7: Dissolved Copper modelled concentrations in West Management groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

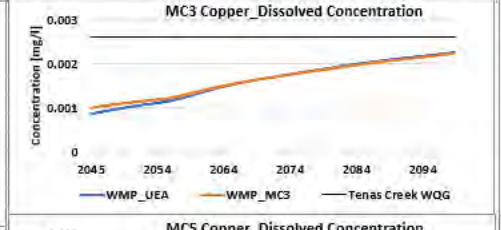


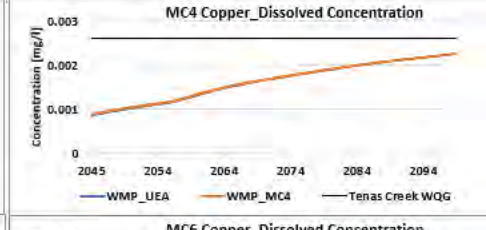


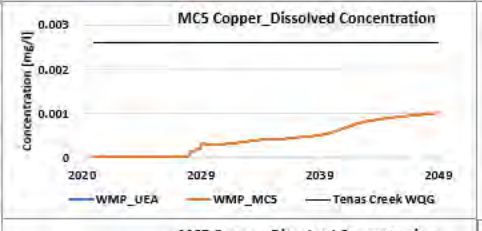


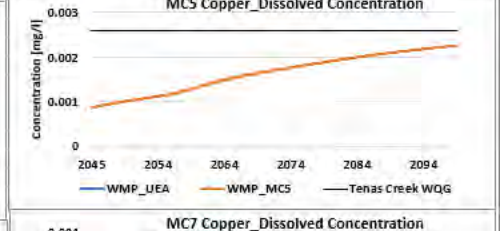


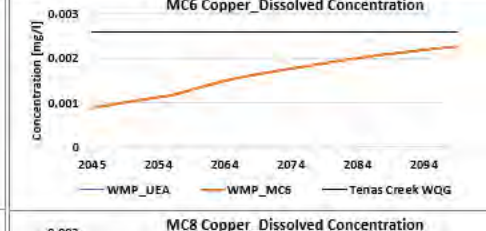


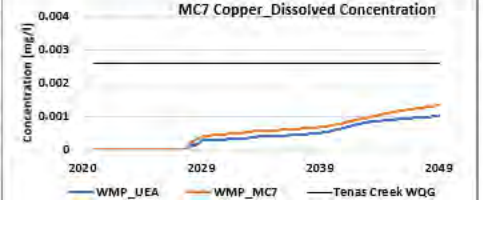


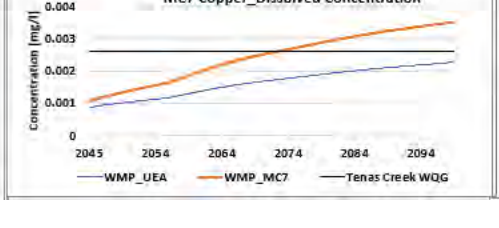












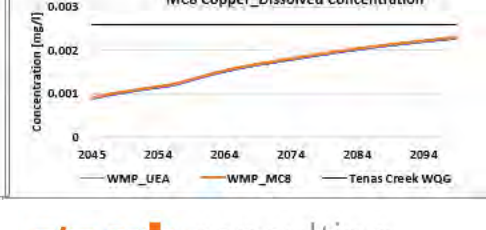


Figure 7F-8: Dissolved Nickel modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

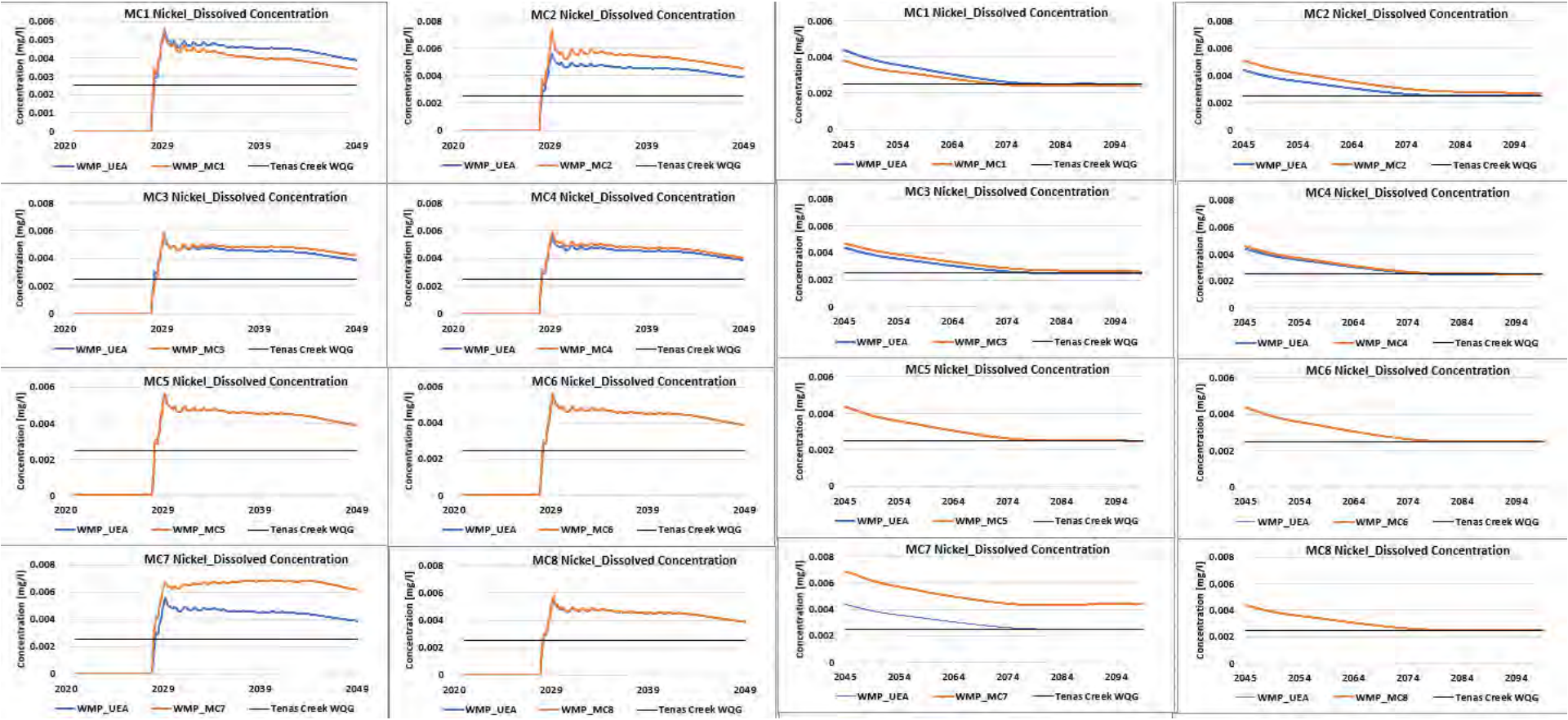


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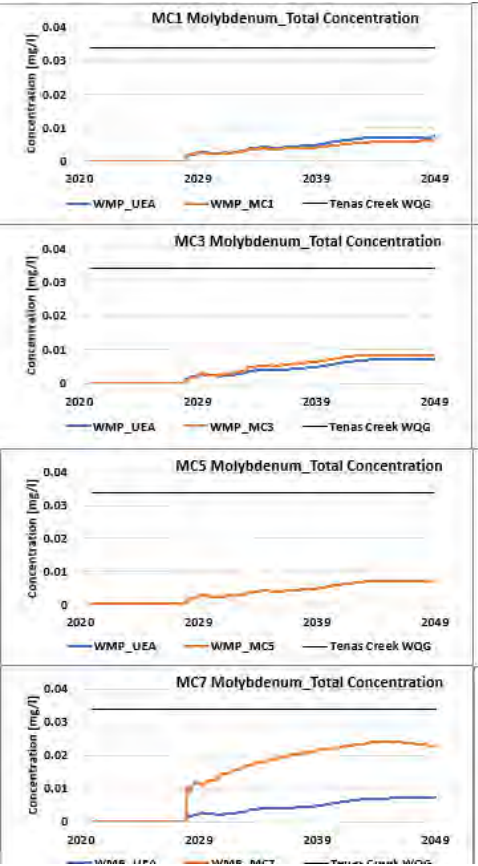
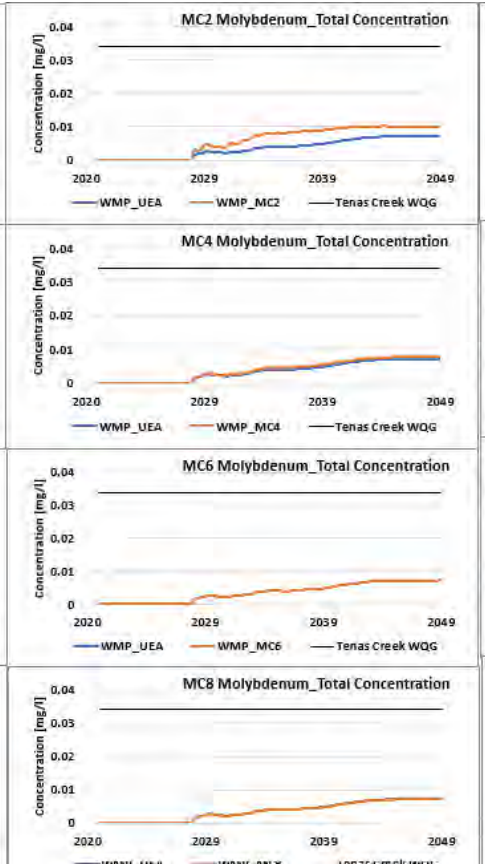
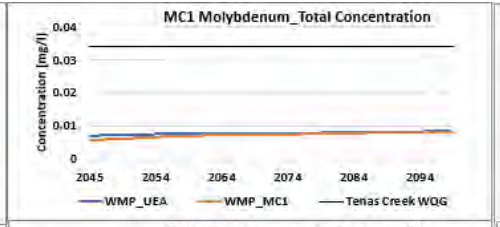
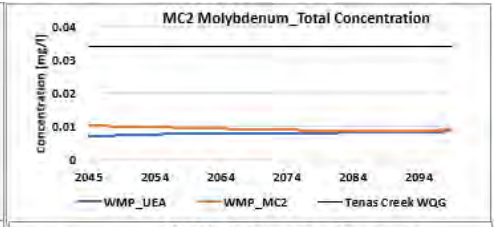
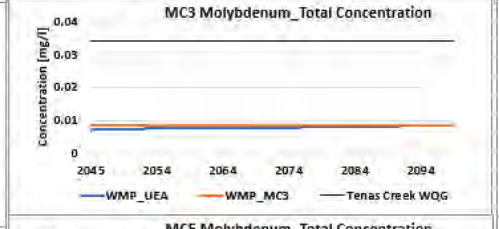
Figure 7F-9: Total Molybdenum modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

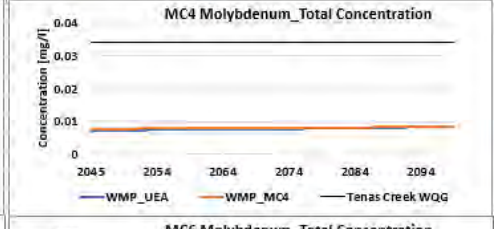


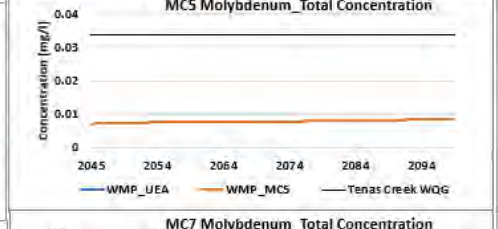


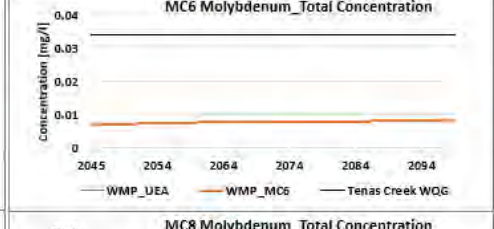


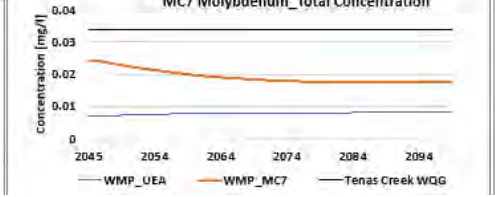












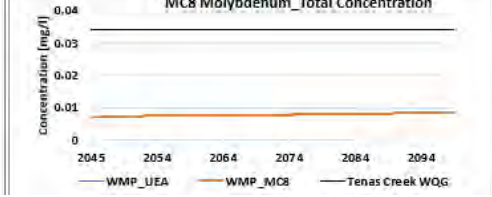
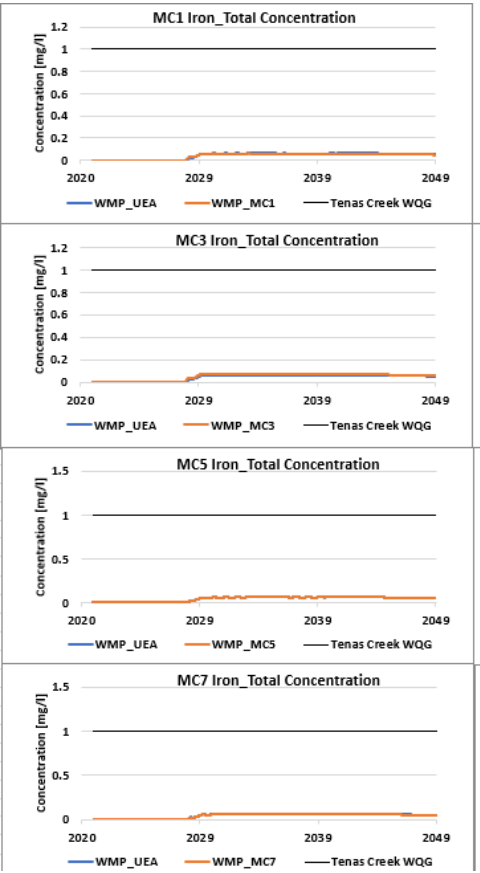
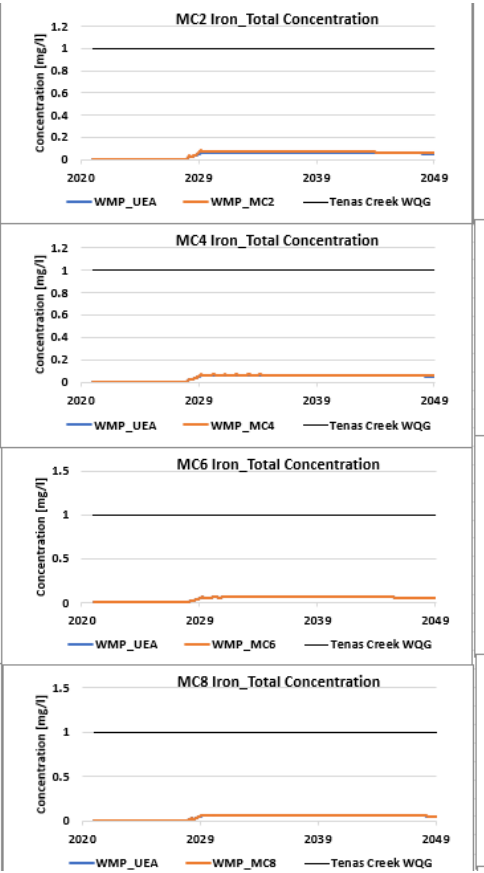
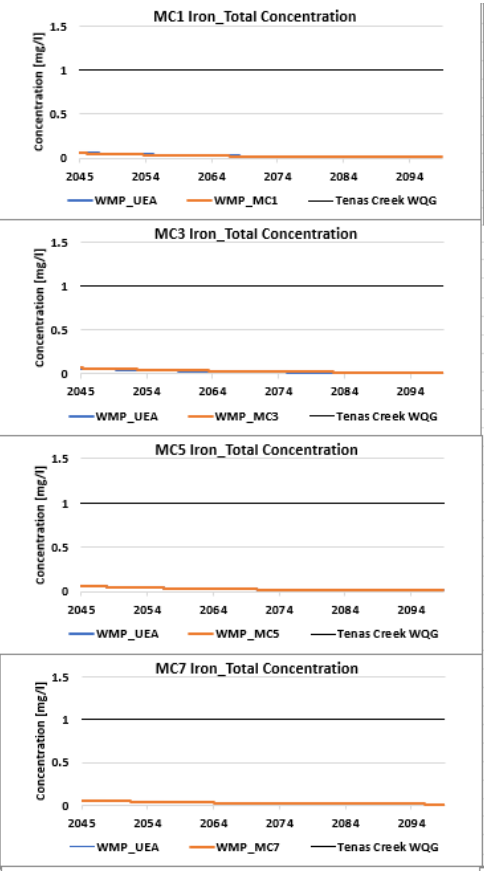


Figure 7F-10: Total Iron modelled concentrations in West Management Pond surface groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure







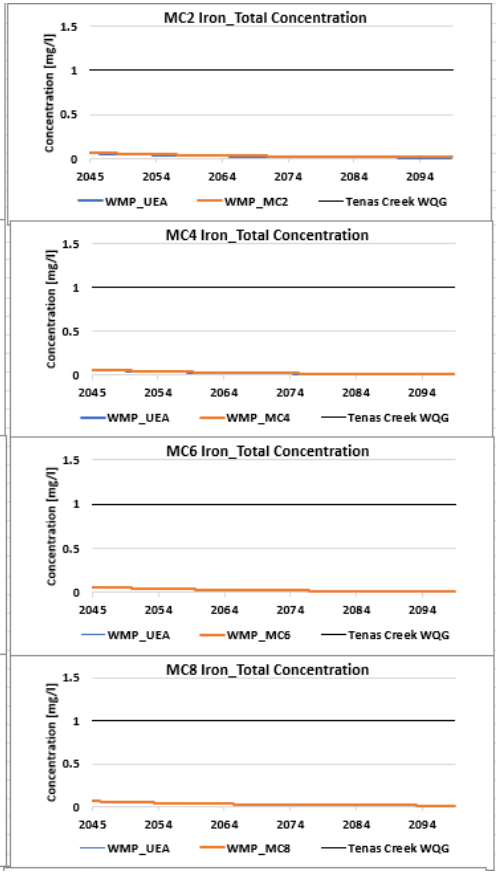
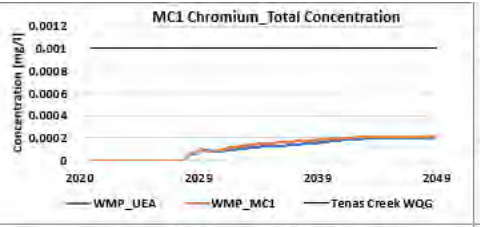
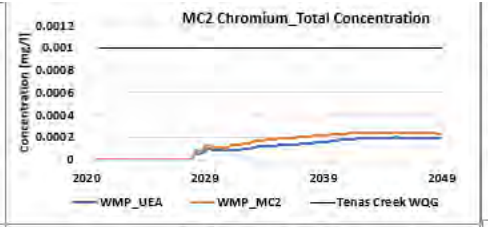
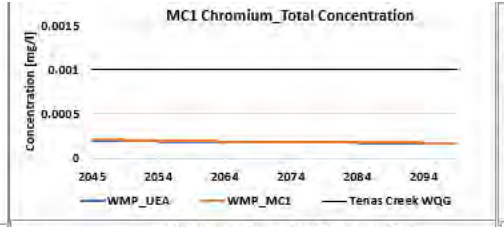
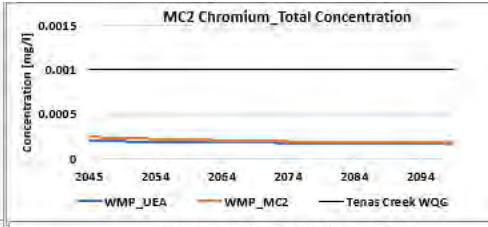


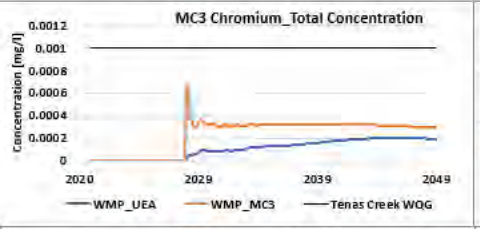
Figure 7F-11: Total Chromium modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure

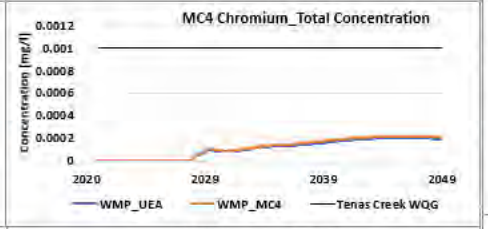


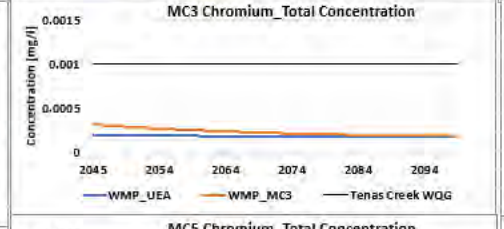


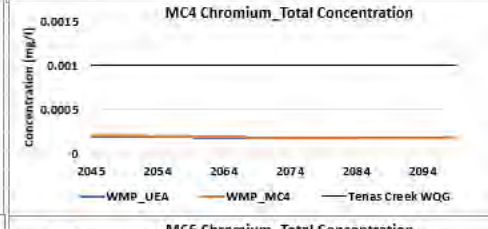


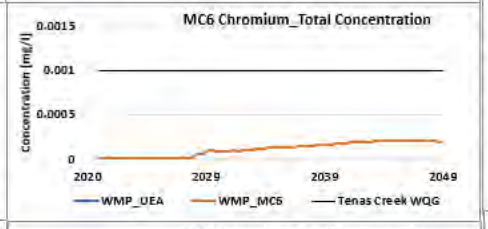


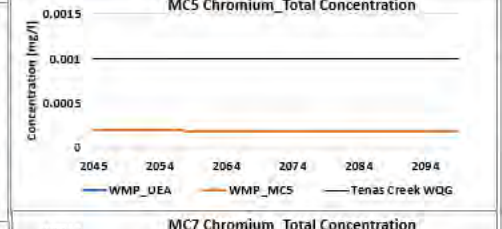


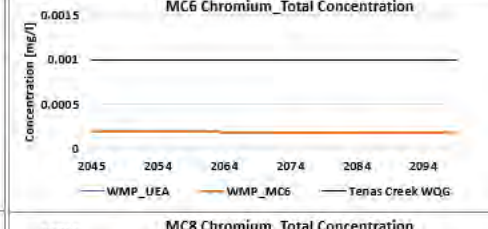


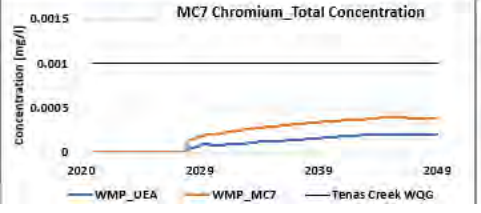


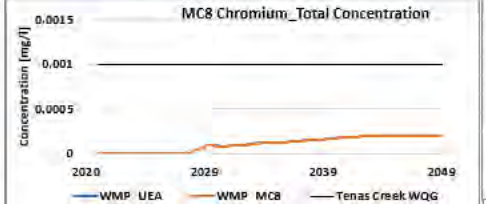


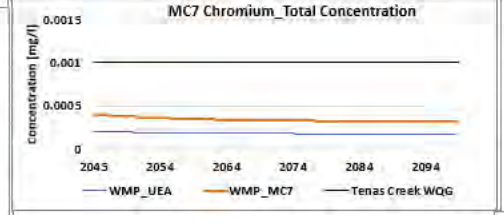












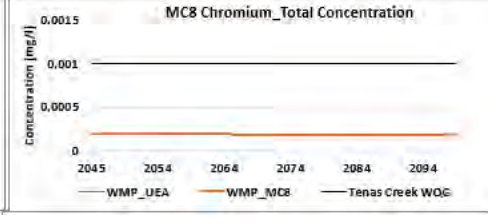
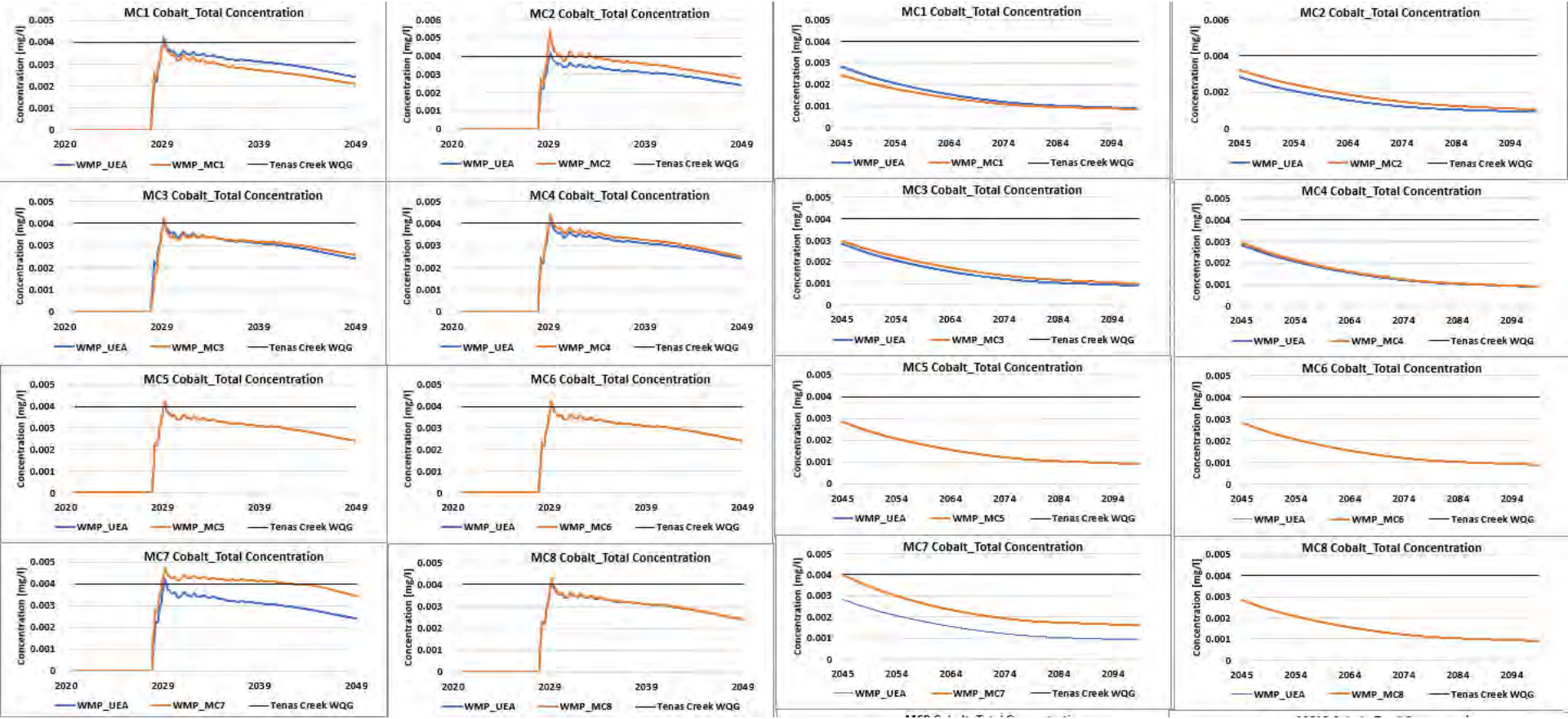


Figure 7F-12: Total Cobalt modelled concentrations in West Management Pond groundwater seepage for mitigation cases compared to project case in Operations and Post-Closure



Appendix 7-G

Tables for surface discharge and groundwater seepage

Table 7G-1: Nitrite in surface discharge from Tenas Control Pond (Operations) and North Management Pond (Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.299	0%	15.0	0.059	0%	2.9
MC1	0.282	-6%	14.1	0.054	-9%	2.7
MC2	0.432	+44%	21.6	0.062	+6%	3.1
MC3	0.373	+25%	18.6	0.060	+3%	3.0
MC4	0.326	+9%	16.3	0.0590	+1%	2.9
MC5	0.188	-37%	9.4	0.0368	-37%	1.8
MC6	0.299	0%	15.0	0.0586	0%	2.9
MC7	0.061	-80%	3.1	0.0408	-30%	2.0
MC8	0.010	-97%	0.5	0.0586	0%	2.9

Table 7G-2: Total Selenium in surface discharge from Tenas Control Pond (Operations) and North Management P
(Post-Closure)

	Operations			Post-Closure		
Case	Tenas Control Pond			North Management Pond		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.024	0%	11.9	0.0082	0%	4.1
MC1	0.021	-10%	10.7	0.0082	0%	4.1
MC2	0.032	+36%	16.2	0.0077	-6%	3.8
MC3	0.030	+28%	15.2	0.0070	-15%	3.5
MC4	0.024	+1%	12.0	0.0082	0%	4.1
MC5	0.024	0%	11.9	0.0082	0%	4.1
MC6	0.024	-0%	11.9	0.0082	-0%	4.1
MC7	0.006	-75%	3.0	0.0022	-73%	1.1
MC8	0.001	-96%	0.5	0.0082	-0%	4.1

Table 7G-3: Sulphate in surface discharge from Tenas Control Pond (Operations) and North Management Pond (Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	419	0%	1.9	228	0%	1.0
MC1	394	-6%	1.8	228	0%	1.0
MC2	564	+35%	2.6	233	+2%	1.1
MC3	531	+27%	2.4	225	-1%	1.0
MC4	422	+1%	1.9	228	0%	1.0
MC5	419	0%	1.9	228	0%	1.0
MC6	419	0%	1.9	228	0%	1.0
MC7	167	-60%	0.8	199	-13%	0.9
MC8	200	-52%	0.9	228	-0%	1.0

Table 7G-4: Total Aluminum in surface discharge from Tenas Control Pond (Operations) and North Management P
(Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.39	0%	2.0	0.39	0%	2.1
MC1	0.39	+0%	2.0	0.39	0%	2.1
MC2	0.39	+0%	2.0	0.39	-0%	2.1
MC3	0.39	+0%	2.0	0.39	-0%	2.1
MC4	0.39	0%	2.0	0.39	0%	2.1
MC5	0.39	0%	2.0	0.39	0%	2.1
MC6	0.07	-82%	0.4	0.08	-81%	0.4
MC7	0.39	+0%	2.0	0.39	-1%	2.0
MC8	0.39	+1%	2.1	0.39	+0%	2.1

Table 7G-5: Nitrate in surface discharge from Tenas Control Pond (Operations) and North Management Pond (Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	13.0	0%	4.3	2.54	0%	0.8
MC1	12.2	-6%	4.1	2.32	-9%	0.8
MC2	18.8	+45%	6.3	2.70	+6%	0.9
MC3	16.2	+25%	5.4	2.61	+3%	0.9
MC4	14.1	+9%	4.7	2.55	+1%	0.9
MC5	8.1	-37%	2.7	1.59	-37%	0.5
MC6	13.0	0%	4.3	2.54	0%	0.8
MC7	2.7	-79%	0.9	1.79	-29%	0.6
MC8	0.5	-96%	0.2	2.54	-0%	0.8

Table 7G-6: Dissolved Zinc in surface discharge from Tenas Control Pond (Operations) and North Management P
(Post-Closure)

	Operations			Post-Closure		
Case	Tenas Control Pond			North Management Pond		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.010	0%	2.3	0.0020	0%	0.5
MC1	0.0091	-8%	2.2	0.0020	-3%	0.5
MC2	0.012	+18%	2.8	0.0022	+8%	0.5
MC3	0.011	+12%	2.6	0.0021	+5%	0.5
MC4	0.010	+1%	2.4	0.0021	+2%	0.5
MC5	0.010	0%	2.3	0.0020	0%	0.5
MC6	0.010	0%	2.3	0.0020	0%	0.5
MC7	0.0051	-48%	1.2	0.0031	+51%	0.7
MC8	0.010	+3%	2.4	0.0020	-0%	0.5

Table 7G-7: Dissolved Copper in surface discharge from Tenas Control Pond (Operations) and North Managemer
(Post-Closure)

	Operations			Post-Closure		
Case	Tenas Control Pond			North Management Pond		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.0017	0%	2.1	0.0022	0%	2.8
MC1	0.0017	-0%	2.1	0.0022	0%	2.8
MC2	0.0019	+14%	2.4	0.0021	-3%	2.7
MC3	0.0018	+8%	2.3	0.0020	-11%	2.5
MC4	0.0017	0%	2.1	0.0022	0%	2.8
MC5	0.0017	0%	2.1	0.0022	0%	2.8
MC6	0.0017	0%	2.1	0.0022	0%	2.8
MC7	0.0014	-16%	1.8	0.0017	-21%	2.2
MC8	0.00010	-94%	0.1	0.0022	+1%	2.8

Table 7G-8: Dissolved Nickel in surface discharge from Tenas Control Pond (Operations) and North Management (Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.0060	0%	2.7	0.0023	0%	1.0
MC1	0.0058	-4%	2.6	0.0023	0%	1.0
MC2	0.0078	+29%	3.5	0.0022	-4%	1.0
MC3	0.0074	+22%	3.4	0.0021	-7%	1.0
MC4	0.0061	+0%	2.8	0.0023	0%	1.0
MC5	0.0060	0%	2.7	0.0023	0%	1.0
MC6	0.0060	0%	2.7	0.0023	0%	1.0
MC7	0.0037	-40%	1.7	0.0023	+3%	1.1
MC8	0.0050	-17%	2.3	0.0023	0%	1.0

Table 7G-9: Total Molybdenum in surface discharge from Tenas Control Pond (Operations) and North Managemer
(Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.035	0%	1.0	0.0077	0%	0.2
MC1	0.035	-2%	1.0	0.0077	0%	0.2
MC2	0.048	+34%	1.4	0.0079	+2%	0.2
MC3	0.045	+26%	1.3	0.0076	-1%	0.2
MC4	0.036	+1%	1.1	0.0077	0%	0.2
MC5	0.035	0%	1.0	0.0077	0%	0.2
MC6	0.035	-0%	1.0	0.0077	-0%	0.2
MC7	0.010	-71%	0.3	0.012	+49%	0.3
MC8	0.037	+3%	1.1	0.0077	-0%	0.2

Table 7G-10: Total Iron in surface discharge from Tenas Control Pond (Operations) and North Management Pond (Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	1.5	0%	1.5	1.5	0%	1.5
MC1	1.5	+0%	1.5	1.5	0%	1.5
MC2	1.5	+0%	1.5	1.5	+0%	1.5
MC3	1.5	+0%	1.5	1.5	0%	1.5
MC4	1.5	-0%	1.5	1.5	-0%	1.5
MC5	1.5	0%	1.5	1.5	0%	1.5
MC6	0.2	-84%	0.2	0.2	-84%	0.2
MC7	1.5	+0%	1.5	1.5	-0%	1.5
MC8	1.5	0%	1.5	1.5	0%	1.5

Table 7G-11: Total Chromium in surface discharge from Tenas Control Pond (Operations) and North Management (Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.0020	0%	2.0	0.0014	0%	1.4
MC1	0.0019	-3%	1.9	0.0014	0%	1.4
MC2	0.0021	+6%	2.1	0.0014	+1%	1.4
MC3	0.0021	+6%	2.1	0.0014	+0%	1.4
MC4	0.0020	+0%	2.0	0.0014	+0%	1.4
MC5	0.0020	0%	2.0	0.0014	0%	1.4
MC6	0.0009	-52%	0.9	0.0003	-75%	0.3
MC7	0.0016	-17%	1.6	0.0014	+2%	1.4
MC8	0.0020	+2%	2.0	0.0014	0%	1.4

Table 7G-12: Total Cobalt in surface discharge from Tenas Control Pond (Operations) and North Management Pon (Post-Closure)

	Operations			Post-Closure		
Case	**Tenas Control Pond**			**North Management Pond**		
	Max Monthly (	Change over	Limit Exceed	Max Monthly (	Change over	Limit Exceed
Project Case	0.003	0%	0.9	0.0013	0%	0.3
MC1	0.0034	-2%	0.9	0.0013	0%	0.3
MC2	0.004	+25%	1.1	0.0014	+5%	0.4
MC3	0.004	+19%	1.0	0.0014	+3%	0.3
MC4	0.003	+1%	0.9	0.0014	+1%	0.3
MC5	0.003	0%	0.9	0.0013	0%	0.3
MC6	0.003	-16%	0.7	0.0008	-41%	0.2
MC7	0.0031	-12%	0.8	0.0018	+30%	0.4
MC8	0.004	+2%	0.9	0.0013	0%	0.3

Table 7G-1: Nitrite in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

NITRITE - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.30	0%	15.0	0.054	0%	2.7	0.079	0%	4.0	0.106	0%	5.3
MC1	0.28	-6%	14.1	0.054	-0%	2.7	0.070	-12%	3.5	0.091	-14%	4.6
MC2	0.43	+44%	21.6	0.049	-10%	2.4	0.078	-2%	3.9	0.114	+8%	5.7
MC3	0.37	+25%	18.6	0.050	-8%	2.5	0.070	-12%	3.5	0.107	+1%	5.3
MC4	0.33	+9%	16.3	0.056	+4%	2.8	0.082	+4%	4.1	0.107	+1%	5.4
MC5	0.19	-37%	9.4	0.034	-37%	1.7	0.050	-37%	2.5	0.066	-37%	3.3
MC6	0.30	0%	15.0	0.054	0%	2.7	0.079	0%	4.0	0.106	0%	5.3
MC7	0.06	-80%	3.1	0.039	-28%	1.9	0.051	-36%	2.5	0.027	-75%	1.3
MC8	0.32	+7%	16.0	0.055	+2%	2.7	0.082	+3%	4.1	0.106	+0%	5.3

NITRITE - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.041	0%	2.1	0.024	0%	1.2	0.039	0%	1.9	0.10	0%	5.2
MC1	0.038	-8%	1.9	0.023	-3%	1.1	0.027	-30%	1.4	0.09	-14%	4.5
MC2	0.044	+6%	2.2	0.030	+28%	1.5	0.050	+30%	2.5	0.11	+7%	5.6
MC3	0.041	-1%	2.1	0.030	+29%	1.5	0.064	+64%	3.2	0.11	+1%	5.3
MC4	0.042	+0%	2.1	0.024	-0%	1.2	0.040	+3%	2.0	0.10	+1%	5.2
MC5	0.026	-37%	1.3	0.015	-37%	0.7	0.024	-37%	1.2	0.07	-37%	3.3
MC6	0.041	0%	2.1	0.024	0%	1.2	0.039	0%	1.9	0.10	0%	5.2
MC7	0.028	-32%	1.4	0.017	-28%	0.8	0.026	-33%	1.3	0.03	-74%	1.3
MC8	0.040	-2%	2.0	0.024	+0%	1.2	0.040	+3%	2.0	0.10	+0%	5.2

Table 7G-2: Total Selenium in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

TOTAL SELENIUM - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.024	0%	11.9	0.0069	0%	3.4	0.0051	0%	2.6	0.0082	0%	4.1
MC1	0.021	-10%	10.7	0.0069	0%	3.4	0.0049	-5%	2.5	0.0081	-1%	4.0
MC2	0.032	+36%	16.2	0.0064	-8%	3.2	0.0047	-8%	2.4	0.0101	+24%	5.1
MC3	0.030	+28%	15.2	0.0064	-7%	3.2	0.0045	-12%	2.2	0.0087	+6%	4.3
MC4	0.024	+1%	12.0	0.0069	+0%	3.4	0.0055	+6%	2.7	0.0082	+0%	4.1
MC5	0.024	0%	11.9	0.0069	0%	3.4	0.0051	0%	2.6	0.0082	0%	4.1
MC6	0.024	0%	11.9	0.0069	0%	3.4	0.0051	0%	2.6	0.0082	0%	4.1
MC7	0.006	-75%	3.0	0.0031	-54%	1.6	0.0038	-26%	1.9	0.0033	-60%	1.6
MC8	0.025	+4%	12.3	0.0069	-0%	3.4	0.0064	+25%	3.2	0.0082	-0%	4.1

TOTAL SELENIUM - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.0085	0%	4.3	0.0059	0%	2.9	0.0020	0%	1.0	0.0082	0%	4.1
MC1	0.0084	-1%	4.2	0.0059	0%	2.9	0.0015	-23%	0.8	0.0081	-1%	4.0
MC2	0.0079	-8%	3.9	0.0053	-9%	2.7	0.0026	+35%	1.3	0.0097	+19%	4.9
MC3	0.0075	-12%	3.8	0.0050	-15%	2.5	0.0037	+91%	1.9	0.0085	+4%	4.3
MC4	0.0085	-1%	4.2	0.0059	0%	2.9	0.0021	+5%	1.0	0.0082	+0%	4.1
MC5	0.0085	0%	4.3	0.0059	0%	2.9	0.0020	0%	1.0	0.0082	0%	4.1
MC6	0.0085	0%	4.3	0.0059	0%	2.9	0.0020	0%	1.0	0.0082	0%	4.1
MC7	0.0015	-83%	0.7	0.0010	-84%	0.5	0.0016	-17%	0.8	0.0033	-60%	1.6
MC8	0.0088	+3%	4.4	0.0059	-0%	2.9	0.0021	+5%	1.0	0.0082	-0%	4.1

Table 7G-3: Sulphate in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

SULFATE - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	419	0%	1.9	240	0%	1.1	196	0%	0.9	251	0%	1.2
MC1	394	-6%	1.8	239	-1%	1.1	189	-3%	0.9	248	-1%	1.1
MC2	564	+35%	2.6	223	-7%	1.0	186	-5%	0.9	274	+9%	1.3
MC3	531	+27%	2.4	224	-7%	1.0	184	-6%	0.8	255	+2%	1.2
MC4	422	+1%	1.9	245	+2%	1.1	203	+4%	0.9	252	+0%	1.2
MC5	419	0%	1.9	240	0%	1.1	196	0%	0.9	251	0%	1.2
MC6	419	0%	1.9	240	0%	1.1	196	0%	0.9	251	0%	1.2
MC7	167	-60%	0.8	328	+37%	1.5	252	+29%	1.2	433	+72%	2.0
MC8	432	+3%	2.0	243	+1%	1.1	229	+17%	1.1	251	-0%	1.2

SULFATE - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	195	0%	0.9	176	0%	0.8	78	0%	0.4	251	0%	1.2
MC1	193	-1%	0.9	176	0%	0.8	61	-21%	0.3	248	-1%	1.1
MC2	231	+19%	1.1	165	-6%	0.8	106	+36%	0.5	271	+8%	1.2
MC3	218	+12%	1.0	155	-12%	0.7	155	+98%	0.7	255	+2%	1.2
MC4	195	+0%	0.9	176	0%	0.8	81	+3%	0.4	252	+0%	1.2
MC5	195	0%	0.9	176	0%	0.8	78	0%	0.4	251	0%	1.2
MC6	195	0%	0.9	176	0%	0.8	78	0%	0.4	251	0%	1.2
MC7	138	-29%	0.6	154	-12%	0.7	107	+37%	0.5	433	+72%	2.0
MC8	212	+9%	1.0	175	-0%	0.8	80	+3%	0.4	251	-0%	1.2

Table 7G-4: Total Aluminum in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

ALUMINUM TOTAL - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.018	0%	0.1	0.022	0%	0.1	0.018	0%	0.1	0.021	0%	0.1
MC1	0.019	+7%	0.1	0.022	0%	0.1	0.018	+4%	0.1	0.021	+1%	0.1
MC2	0.018	+3%	0.1	0.021	-8%	0.1	0.016	-10%	0.1	0.020	-2%	0.1
MC3	0.018	+3%	0.1	0.021	-7%	0.1	0.016	-9%	0.1	0.020	-2%	0.1
MC4	0.018	-0%	0.1	0.023	+1%	0.1	0.018	+3%	0.1	0.021	+0%	0.1
MC5	0.018	0%	0.1	0.022	0%	0.1	0.018	0%	0.1	0.021	0%	0.1
MC6	0.018	0%	0.1	0.022	0%	0.1	0.018	0%	0.1	0.021	0%	0.1
MC7	0.019	+10%	0.1	0.021	-5%	0.1	0.016	-7%	0.1	0.032	+52%	0.2
MC8	0.021	+21%	0.1	0.026	+15%	0.1	0.020	+12%	0.1	0.022	+6%	0.1

ALUMINUM TOTAL - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.016	0%	0.1	0.017	0%	0.1	0.0056	0%	0.0	0.021	0%	0.1
MC1	0.016	+2%	0.1	0.017	0%	0.1	0.0067	+18%	0.0	0.021	+1%	0.1
MC2	0.016	+2%	0.1	0.015	-13%	0.1	0.0069	+22%	0.0	0.020	-2%	0.1
MC3	0.015	-2%	0.1	0.014	-18%	0.1	0.0096	+70%	0.1	0.020	-2%	0.1
MC4	0.016	-1%	0.1	0.017	0%	0.1	0.0058	+3%	0.0	0.021	+0%	0.1
MC5	0.016	0%	0.1	0.017	0%	0.1	0.0056	0%	0.0	0.021	0%	0.1
MC6	0.016	0%	0.1	0.017	0%	0.1	0.0056	0%	0.0	0.021	0%	0.1
MC7	0.016	+2%	0.1	0.013	-21%	0.1	0.0055	-3%	0.0	0.032	+52%	0.2
MC8	0.021	+33%	0.1	0.018	+5%	0.1	0.0060	+7%	0.0	0.022	+6%	0.1

Table 7G-5: Nitrate in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

NITRATE - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	13.0	0%	4.3	2.32	0%	0.8	3.45	0%	1.1	4.60	0%	1.5
MC1	12.2	-6%	4.1	2.31	-0%	0.8	3.05	-12%	1.0	3.96	-14%	1.3
MC2	18.8	+45%	6.3	2.11	-9%	0.7	3.37	-2%	1.1	4.96	+8%	1.7
MC3	16.2	+25%	5.4	2.15	-7%	0.7	3.05	-12%	1.0	4.60	+0%	1.5
MC4	14.1	+9%	4.7	2.42	+4%	0.8	3.58	+4%	1.2	4.65	+1%	1.5
MC5	8.1	-37%	2.7	1.46	-37%	0.5	2.16	-37%	0.7	2.88	-37%	1.0
MC6	13.0	0%	4.3	2.32	0%	0.8	3.45	0%	1.1	4.60	0%	1.5
MC7	2.7	-79%	0.9	1.77	-24%	0.6	2.29	-34%	0.8	1.29	-72%	0.4
MC8	13.8	+7%	4.6	2.36	+2%	0.8	3.55	+3%	1.2	4.62	+0%	1.5

NITRATE - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	1.8	0%	0.6	1.02	0%	0.3	1.69	0%	0.6	4.51	0%	1.5
MC1	1.6	-8%	0.5	0.99	-3%	0.3	1.18	-30%	0.4	3.87	-14%	1.3
MC2	1.9	+6%	0.6	1.31	+28%	0.4	2.19	+30%	0.7	4.82	+7%	1.6
MC3	1.8	-1%	0.6	1.31	+29%	0.4	2.77	+64%	0.9	4.55	+1%	1.5
MC4	1.8	+0%	0.6	1.02	0%	0.3	1.75	+3%	0.6	4.55	+1%	1.5
MC5	1.1	-37%	0.4	0.64	-37%	0.2	1.06	-37%	0.4	2.83	-37%	0.9
MC6	1.8	0%	0.6	1.02	0%	0.3	1.69	0%	0.6	4.51	0%	1.5
MC7	1.2	-31%	0.4	0.76	-26%	0.3	1.16	-31%	0.4	1.29	-71%	0.4
MC8	1.7	-3%	0.6	1.02	0%	0.3	1.73	+3%	0.6	4.52	+0%	1.5

Table 7G-6: Dissolved Zinc in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

ZINC DISSOLVED - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.010	0%	2.3	0.0092	0%	2.2	0.0073	0%	1.7	0.0071	0%	1.7
MC1	0.0091	-8%	2.2	0.0092	-0%	2.2	0.0072	-2%	1.7	0.0068	-4%	1.6
MC2	0.012	+18%	2.8	0.0086	-7%	2.0	0.0069	-6%	1.6	0.009	+32%	2.2
MC3	0.011	+12%	2.6	0.0086	-7%	2.0	0.0069	-6%	1.6	0.0085	+19%	2.0
MC4	0.010	+1%	2.4	0.0094	+2%	2.2	0.0074	+2%	1.8	0.0076	+7%	1.8
MC5	0.010	0%	2.3	0.0092	0%	2.2	0.0073	0%	1.7	0.0071	0%	1.7
MC6	0.010	0%	2.3	0.0092	0%	2.2	0.0073	0%	1.7	0.0071	0%	1.7
MC7	0.0051	-48%	1.2	0.010	+13%	2.5	0.0081	+10%	1.9	0.0089	+25%	2.1
MC8	0.0101	+3%	2.4	0.009	+1%	2.2	0.0083	+13%	2.0	0.0073	+2%	1.7

ZINC DISSOLVED - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.0040	0%	1.0	0.0015	0%	0.3	0.0028	0%	0.7	0.0059	0%	1.4
MC1	0.0041	+1%	1.0	0.0015	+0%	0.3	0.0024	-14%	0.6	0.0053	-9%	1.3
MC2	0.0035	-13%	0.8	0.0032	+118%	0.8	0.0037	+32%	0.9	0.0068	+16%	1.6
MC3	0.0034	-17%	0.8	0.0032	+122%	0.8	0.0054	+95%	1.3	0.0067	+14%	1.6
MC4	0.0040	-1%	1.0	0.0015	0%	0.3	0.0029	+3%	0.7	0.0062	+5%	1.5
MC5	0.0040	0%	1.0	0.0015	0%	0.3	0.0028	0%	0.7	0.0059	0%	1.4
MC6	0.0040	0%	1.0	0.0015	0%	0.3	0.0028	0%	0.7	0.0059	0%	1.4
MC7	0.0025	-38%	0.6	0.0017	+17%	0.4	0.0032	+17%	0.8	0.0088	+51%	2.1
MC8	0.0035	-14%	0.8	0.0015	0%	0.3	0.0028	+2%	0.7	0.0059	+0%	1.4

Table 7G-7: Dissolved Copper in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

COPPER DISSOLVED - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.0017	0%	2.1	0.0017	0%	2.1	0.0010	0%	1.2	0.0023	0%	2.8
MC1	0.0017	-0%	2.1	0.0017	0%	2.1	0.0010	+5%	1.3	0.0023	+1%	2.8
MC2	0.0019	+14%	2.4	0.0016	-8%	2.0	0.0008	-14%	1.0	0.0022	-2%	2.8
MC3	0.0018	+8%	2.3	0.0015	-14%	1.9	0.0008	-14%	1.0	0.0022	-1%	2.8
MC4	0.0017	0%	2.1	0.0017	0%	2.1	0.0010	+5%	1.3	0.0023	+0%	2.8
MC5	0.0017	0%	2.1	0.0017	0%	2.1	0.0010	0%	1.2	0.0023	0%	2.8
MC6	0.0017	0%	2.1	0.0017	0%	2.1	0.0010	0%	1.2	0.0023	0%	2.8
MC7	0.0014	-16%	1.8	0.0014	-18%	1.8	0.00095	-3%	1.2	0.0035	+55%	4.4
MC8	0.0019	+11%	2.3	0.0017	+2%	2.2	0.0011	+8%	1.3	0.0023	+2%	2.9

COPPER DISSOLVED - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.0017	0%	2.1	0.0017	0%	2.1	0.00029	0%	0.4	0.0023	0%	2.8
MC1	0.0017	-0%	2.1	0.0017	0%	2.1	0.00040	+40%	0.5	0.0023	+1%	2.8
MC2	0.0019	+14%	2.4	0.0016	-8%	2.0	0.00033	+15%	0.4	0.0022	-2%	2.8
MC3	0.0018	+8%	2.3	0.0015	-14%	1.9	0.00044	+54%	0.6	0.0022	-1%	2.8
MC4	0.0017	0%	2.1	0.0017	0%	2.1	0.00030	+4%	0.4	0.0023	+0%	2.8
MC5	0.0017	0%	2.1	0.0017	0%	2.1	0.00029	0%	0.4	0.0023	0%	2.8
MC6	0.0017	0%	2.1	0.0017	0%	2.1	0.00029	0%	0.4	0.0023	0%	2.8
MC7	0.0014	-16%	1.8	0.0014	-21%	1.7	0.00031	+9%	0.4	0.0035	+55%	4.4
MC8	0.0019	+11%	2.3	0.0017	+2%	2.2	0.00030	+4%	0.4	0.00230	+2%	2.9

Table 7G-8: Dissolved Nickel in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

NICKEL DISSOLVED - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.0060	0%	2.7	0.0065	0%	2.9	0.0053	0%	1.1	0.0056	0%	2.2
MC1	0.0058	-4%	2.6	0.0065	-0%	2.9	0.0051	-2%	1.1	0.0054	-4%	2.1
MC2	0.0078	+29%	3.5	0.0061	-6%	2.8	0.0050	-4%	1.1	0.0074	+32%	3.0
MC3	0.0074	+22%	3.4	0.0061	-5%	2.8	0.0051	-4%	1.1	0.0058	+4%	2.3
MC4	0.0061	+0%	2.8	0.0065	+1%	3.0	0.0053	+1%	1.1	0.0060	+7%	2.4
MC5	0.0060	0%	2.7	0.0065	0%	2.9	0.0053	0%	1.1	0.0056	0%	2.2
MC6	0.0060	0%	2.7	0.0065	0%	2.9	0.0053	0%	1.1	0.0056	0%	2.2
MC7	0.0037	-40%	1.7	0.0076	+17%	3.4	0.0060	+14%	1.3	0.0069	+22%	2.7
MC8	0.0062	+2%	2.8	0.0065	+1%	3.0	0.0060	+14%	1.3	0.0057	+2%	2.3

NICKEL DISSOLVED - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.0022	0%	1.0	0.0017	0%	0.8	0.0021	0%	0.4	0.0044	0%	1.8
MC1	0.0023	+5%	1.0	0.0017	0%	0.8	0.0017	-20%	0.4	0.0038	-13%	1.5
MC2	0.0021	-1%	1.0	0.0023	+37%	1.0	0.0028	+35%	0.6	0.0051	+16%	2.0
MC3	0.0020	-6%	0.9	0.0023	+39%	1.1	0.0042	+100%	0.9	0.0047	+7%	1.9
MC4	0.0021	-1%	1.0	0.0017	0%	0.8	0.0021	+2%	0.5	0.0046	+5%	1.8
MC5	0.0022	0%	1.0	0.0017	0%	0.8	0.0021	0%	0.4	0.0044	0%	1.8
MC6	0.0022	0%	1.0	0.0017	0%	0.8	0.0021	0%	0.4	0.0044	0%	1.8
MC7	0.0017	-23%	0.8	0.0015	-9%	0.7	0.0025	+19%	0.5	0.0068	+56%	2.7
MC8	0.0023	+4%	1.0	0.0017	0%	0.8	0.0021	+2%	0.5	0.0044	+0%	1.8

Table 7G-9: Total Molybdenum in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

MOLYBDENUM TOTAL - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.035	0%	1.0	0.010	0%	0.3	0.0075	0%	0.2	0.0084	0%	0.2
MC1	0.035	-2%	1.0	0.010	0%	0.3	0.0070	-7%	0.2	0.0083	-1%	0.2
MC2	0.048	+34%	1.4	0.009	-8%	0.3	0.0069	-8%	0.2	0.010	+21%	0.3
MC3	0.045	+26%	1.3	0.009	-8%	0.3	0.0066	-13%	0.2	0.0086	+3%	0.3
MC4	0.036	+1%	1.1	0.010	+3%	0.3	0.0080	+6%	0.2	0.0085	+1%	0.2
MC5	0.035	0%	1.0	0.010	0%	0.3	0.0075	0%	0.2	0.0084	0%	0.2
MC6	0.035	0%	1.0	0.010	0%	0.3	0.0075	0%	0.2	0.0084	0%	0.2
MC7	0.010	-71%	0.3	0.019	+90%	0.6	0.013	+77%	0.4	0.024	+188%	0.7
MC8	0.036	+3%	1.1	0.010	+2%	0.3	0.009	+25%	0.3	0.008	-0%	0.2

MOLYBDENUM TOTAL - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.012	0%	0.3	0.0059	0%	0.2	0.0025	0%	0.1	0.0084	0%	0.2
MC1	0.012	-1%	0.3	0.0059	0%	0.2	0.0019	-23%	0.1	0.0083	-1%	0.2
MC2	0.010	-12%	0.3	0.0056	-6%	0.2	0.0033	+33%	0.1	0.010	+21%	0.3
MC3	0.010	-15%	0.3	0.0053	-11%	0.2	0.0045	+83%	0.1	0.0086	+3%	0.3
MC4	0.012	-1%	0.3	0.0059	+0%	0.2	0.0026	+6%	0.1	0.0085	+1%	0.2
MC5	0.012	0%	0.3	0.0059	0%	0.2	0.0025	0%	0.1	0.0084	0%	0.2
MC6	0.012	0%	0.3	0.0059	0%	0.2	0.0025	0%	0.1	0.0084	0%	0.2
MC7	0.0078	-34%	0.2	0.0060	+1%	0.2	0.005	+118%	0.2	0.024	+188%	0.7
MC8	0.010	-15%	0.3	0.006	-0%	0.2	0.003	+5%	0.1	0.008	-0%	0.2

Table 7G-10: Total Iron in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

IRON TOTAL - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.036	0%	0.0	0.11	0%	0.1	0.080	0%	0.1	0.063	0%	0.1
MC1	0.041	+13%	0.0	0.11	+0%	0.1	0.080	-1%	0.1	0.062	-2%	0.1
MC2	0.041	+13%	0.0	0.10	-6%	0.1	0.076	-5%	0.1	0.080	+27%	0.1
MC3	0.041	+13%	0.0	0.10	-5%	0.1	0.077	-4%	0.1	0.074	+18%	0.1
MC4	0.035	-2%	0.0	0.11	+2%	0.1	0.080	+1%	0.1	0.067	+7%	0.1
MC5	0.036	0%	0.0	0.11	0%	0.1	0.080	0%	0.1	0.063	0%	0.1
MC6	0.036	0%	0.0	0.11	0%	0.1	0.080	0%	0.1	0.063	0%	0.1
MC7	0.039	+8%	0.0	0.10	-6%	0.1	0.077	-4%	0.1	0.062	-1%	0.1
MC8	0.036	+0%	0.0	0.106	0%	0.1	0.087	+9%	0.1	0.064	+2%	0.1

IRON TOTAL - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.021	0%	0.0	0.01	0%	0.0	0.028	0%	0.0	0.061	0%	0.1
MC1	0.023	+9%	0.0	0.02	+10%	0.0	0.025	-10%	0.0	0.058	-6%	0.1
MC2	0.021	-0%	0.0	0.04	+168%	0.0	0.037	+32%	0.0	0.066	+8%	0.1
MC3	0.019	-6%	0.0	0.04	+172%	0.0	0.055	+98%	0.1	0.067	+9%	0.1
MC4	0.021	-1%	0.0	0.01	+1%	0.0	0.029	+2%	0.0	0.063	+3%	0.1
MC5	0.021	0%	0.0	0.01	0%	0.0	0.028	0%	0.0	0.061	0%	0.1
MC6	0.021	0%	0.0	0.01	0%	0.0	0.028	0%	0.0	0.061	0%	0.1
MC7	0.022	+7%	0.0	0.01	-3%	0.0	0.027	-4%	0.0	0.059	-4%	0.1
MC8	0.021	-0%	0.0	0.014	-0%	0.0	0.028	+1%	0.0	0.062	+0%	0.1

Table 7G-11: Total Chromium groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

CHROMIUM TOTAL - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.00077	0%	0.8	0.00035	0%	0.4	0.00023	0%	0.2	0.00020	0%	0.2
MC1	0.00072	-8%	0.7	0.00035	0%	0.4	0.00023	+0%	0.2	0.00021	+7%	0.2
MC2	0.00089	+14%	0.9	0.00034	-4%	0.3	0.00019	-19%	0.2	0.00024	+22%	0.2
MC3	0.00089	+14%	0.9	0.00034	-4%	0.3	0.00018	-21%	0.2	0.00067	+238%	0.7
MC4	0.00078	+1%	0.8	0.00035	0%	0.4	0.00025	+7%	0.2	0.00021	+7%	0.2
MC5	0.00077	0%	0.8	0.00035	0%	0.4	0.00023	0%	0.2	0.00020	0%	0.2
MC6	0.00077	0%	0.8	0.00035	0%	0.4	0.00023	0%	0.2	0.00020	0%	0.2
MC7	0.00045	-42%	0.4	0.00039	+11%	0.4	0.00027	+17%	0.3	0.00039	+97%	0.4
MC8	0.00080	+3%	0.8	0.00035	0%	0.4	0.00026	+14%	0.3	0.00020	-0%	0.2

CHROMIUM TOTAL - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.00032	0%	0.3	0.00013	0%	0.1	0.00007	0%	0.1	0.00020	0%	0.2
MC1	0.00031	-1%	0.3	0.00013	+0%	0.1	0.00009	+20%	0.1	0.00021	+7%	0.2
MC2	0.00029	-11%	0.3	0.00012	-3%	0.1	0.00008	+12%	0.1	0.00024	+22%	0.2
MC3	0.00027	-15%	0.3	0.00011	-9%	0.1	0.00011	+49%	0.1	0.00031	+59%	0.3
MC4	0.00032	-1%	0.3	0.00013	0%	0.1	0.00008	+6%	0.1	0.00021	+7%	0.2
MC5	0.00032	0%	0.3	0.00013	0%	0.1	0.00007	0%	0.1	0.00020	0%	0.2
MC6	0.00032	0%	0.3	0.00013	0%	0.1	0.00007	0%	0.1	0.00020	0%	0.2
MC7	0.00022	-31%	0.2	0.00012	-8%	0.1	0.00010	+43%	0.1	0.00039	+97%	0.4
MC8	0.00028	-12%	0.3	0.00013	0%	0.1	0.00007	+3%	0.1	0.00020	-0%	0.2

Table 7G-12: Total Cobalt in groundwater seepage from Tenas Control Pond, North Management Pond, East Management Pond and West Management Pond (Operations and Post-Closure)

TOTAL COBALT - OPS

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.003	0%	0.7	0.0040	0%	1.0	0.0035	0%	0.9	0.0042	0%	1.0
MC1	0.0028	-2%	0.7	0.0040	-0%	1.0	0.0034	-2%	0.8	0.0040	-4%	1.0
MC2	0.004	+30%	0.9	0.0038	-5%	1.0	0.0034	-3%	0.8	0.005	+31%	1.4
MC3	0.003	+24%	0.9	0.0039	-4%	1.0	0.0034	-3%	0.8	0.0042	+1%	1.1
MC4	0.003	+1%	0.7	0.0040	+1%	1.0	0.0035	+1%	0.9	0.0045	+7%	1.1
MC5	0.003	0%	0.7	0.0040	0%	1.0	0.0035	0%	0.9	0.0042	0%	1.0
MC6	0.003	0%	0.7	0.0040	0%	1.0	0.0035	0%	0.9	0.0042	0%	1.0
MC7	0.0024	-14%	0.6	0.005	+12%	1.1	0.0038	+11%	1.0	0.0047	+13%	1.2
MC8	0.0029	+3%	0.7	0.004	+1%	1.0	0.0039	+13%	1.0	0.0043	+2%	1.1

TOTAL COBALT - Closure

Case	Tenas Control Pond			North Management Pond			East Management Pond			West Management Pond		
	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier	Max Monthly Concentration [mg/l]	Reduction over Project Case	Limit Exceedance Multiplier
Project Case	0.0010	0%	0.2	0.0005	0%	0.1	0.0015	0%	0.4	0.0028	0%	0.7
MC1	0.0010	+6%	0.3	0.0005	+0%	0.1	0.0012	-21%	0.3	0.0024	-14%	0.6
MC2	0.0009	-8%	0.2	0.0014	+175%	0.4	0.0020	+36%	0.5	0.0032	+13%	0.8
MC3	0.0009	-12%	0.2	0.0015	+180%	0.4	0.0030	+102%	0.7	0.0030	+5%	0.7
MC4	0.0010	-1%	0.2	0.0005	+0%	0.1	0.0015	+2%	0.4	0.0029	+4%	0.7
MC5	0.0010	0%	0.2	0.0005	0%	0.1	0.0015	0%	0.4	0.0028	0%	0.7
MC6	0.0010	0%	0.2	0.0005	0%	0.1	0.0015	0%	0.4	0.0028	0%	0.7
MC7	0.0008	-22%	0.2	0.0007	+32%	0.2	0.0016	+12%	0.4	0.0040	+40%	1.0
MC8	0.0008	-19%	0.2	0.0005	0%	0.1	0.0015	+2%	0.4	0.0028	+0%	0.7

Appendix H Tenas Project Best available Technology assessment report (2025)

Tenas Project
Best Achievable Technology Assessment

Prepared for

Telkwa Mining Limited

Prepared by

SRK Consulting (Canada) Inc.
CAPR002055
March 2025

Tenas Project
Best Achievable Technology Assessment

March 2025

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Project No: CAPR002055

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Executive Summary

Telkwa Mining Limited (TML) is proposing to develop the Tenas Coal Project (the Project) located in northwest British Columbia 25 km Southwest of the town of Smithers, BC. This report documents the Best Achievable Technology (BAT) assessment completed for the Project as part of the Information Requests 176,353,355, and 514 provided by the EAO in their Water IR letter in November of 2022 (SRK 2025) related to the Project's Environmental Assessment Certificate (EAC) application.

The purpose of the BAT assessment is to identify technologies that are best suited for managing or mitigating Parameters of Concern (POCs) in anticipated groundwater and surface water effluents from the Tenas Project site. The BAT assessment methodology followed guidance issued by the BC Ministry of Environment and Climate Change Strategy (BC ENV) in November 2024 (BC ENV 2024).

The BAT assessment considered the following discharges:

- Surface discharge:
  - Tenas Control Pond discharge (during operations until 2048) – discharges to Goathorn Creek
  - North Management Pond (after 2048) – discharges to Goathorn Creek
  - Rail Infrastructure Sedimentation Pond (during operations until 2044) – discharges to the ground
- Groundwater discharges:
  - Tenas Control Pond (TCP) – discharges to Tenas Creek, Goathorn Creek, and Telkwa River.
  - North Management Pond (NMP) – discharges to Tenas Creek, Goathorn Creek, and Telkwa River.
  - East Management Pond (EMP) – discharges to Four Creek, Tenas Creek, Goathorn Creek, and Telkwa River.
  - West Management Pond (WMP) – discharges to Tenas Creek, Goathorn Creek, and Telkwa River.

Groundwater recharge in the open pit is two orders of magnitude lower than the management and control ponds and as such is not considered in the analysis of Parameters of Potential Concern. Groundwater recharge from the Coal Processing Plant is four orders of magnitude lower than the management and control ponds and was not considered in this analysis Parameters of Potential Concern.

Parameters of Potential Concern (POPCs) and Parameters of Concern (POCs) were identified based on water quality model results as per BC ENV's general guidance on Parameters of Concern

(BC ENV 2024). A total of 12 POCs were identified for the anticipated future effluent sources with four of the POCs being identified for background (or baseline) waters in the Project Area.

Table E-1 POCs Identified for the Tenas Project BAT Assessment

	Surface Discharge			Groundwater Discharge (Post-Closure)				Background / Baseline
Parameter	**TCP Discharge (Operation)**	**NMP Discharge (Post-Closure)**	**RLO discharge – (Operation)**	**TCP Seepage**	**NMP Seepage**	**WMP Seepage**	**EMP Seepage**	**See Footnote**
Nitrogen Nutrients								
Nitrate	X			X		X		
Nitrite	X			X	X	X	X	
Sulphate								
Sulphate	X	X		X	X	X		
Metals								
Aluminum, total	X	X	X					X[A]
Cadmium, dissolved			X[D]					
Cobalt, total					X	X	X	
Copper, dissolved	X	X				X		X[B]
Iron, total	X	X	X					X[C]
Nickel, dissolved	X	X	X	X	X	X	X	
Zinc, dissolved	X			X	X	X		
Oxyanions								
Molybdenum, total	X			X				
Selenium, total	X	X		X	X	X	X	

Notes:
A - Background POC for Four, Goathorn, Tenas Creeks, Telkwa and Bulkley Rivers.
B - Background POC for Goathorn, Tenas Creeks, Telkwa and Bulkley Rivers.
C - Background POC for Four, Tenas Creeks, Telkwa and Bulkley Rivers.
D - Cd is POC for Rail Load Out only - it is therefore not considered in future screening

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20240925.xlsx]POC Condensed

Surface water discharges from the Project will be limited to the open water season and is expected to reach a maximum around freshet. Groundwater discharges, on the other hand, are expected to steadily increase over the duration of the Operation phase of the Project as the water management ponds are constructed and filled, but significant seasonal variability in groundwater flows are not expected.

Through the development and design of the Tenas Project, TML has made efforts to include as many source control measures and best management practices as is practically achievable to manage wager quality within and downstream of the Project Area. Such efforts include the inundation of potentially acid generating (PAG) rock in the management ponds on site to prevent potential Acid Rock Drainage, lining of the management and control ponds to reduce seepage and groundwater recharge, progressive reclamation and covering of non-potential acid generating rock (non-PAG) backfilled into the open pit, construction of dam/buttresses and backfills (any potential external piles) using a bottom up construction methodology, attenuation of effluent in Tenas Control Pond and pacing of discharge to the open water season, erosion prevention in collection and diversion channels, and sediment control in sedimentation/control ponds, clean water diversions to route water around Project activities, and the use of blasthole liners to reduce loss and dissolution of residual ammonium nitrate fuel oil (ANFO) explosives.

Updated water and load balance model results for the Project issued in 2024 indicated that surface and groundwater discharges from the Project are unlikely to cause concentrations in downstream receiving waters to approach or exceed BC water quality guidelines (WQGs) for protection of freshwater aquatic life at the modelled prediction nodes. Nonetheless, this BAT assessment was conducted to determine whether implementation of water treatment technologies to further reduce loadings in site effluent would be feasible and achievable.

Candidate BATs there were deemed to be potentially feasible included:

- Passive/Active flocculation.
- In-situ Active Gravel Bed Reactors (In-situ Active GBR).
- Active Tank Base Water Treatment Options listed below
  - Membrane Filtration + Anaerobic Biological Treatment.
  - Membrane Filtration + Anaerobic Biological Treatment + Lime Treatment.
  - Membrane Filtration + Anaerobic Biological Treatment + Sulphide Treatment.
  - Membrane Filtration + Anaerobic Biological Treatment + Ferric Co-precipitation.
  - Membrane Filtration + Anaerobic Biological Treatment + Ion Exchange.
  - Zero Liquid Discharge.
- Modified Management and Control Pond liners.

In addition to these, the base case option that includes a wide range of BMPs for managing water quality was also evaluated.

Candidate BATs were evaluated using a multiple accounts analysis (MAA). Evaluation criteria and weights were predefined by BC ENV but slightly modified by TML to account for the Yintah Management Directives provided by the Office of the Wet'suwet'en (OW) to recognize First Nation input into the process. The following was concluded based on the MAA for the Tenas Project:

- In-situ Active GBRs and the base case with BMPs were the highest ranked scenarios (78 points out of a possible 100) followed by passive/active flocculation (77 points).
- The option of modifying management pond liners to reduce seepage scored 73 points and was therefore less preferred than the In-situ Active GBR, the base case with BMPs, or flocculation.
- Active tank-based water treatment options, except for the zero liquid discharge treatment option, scored between 65 and 69 points, with an average of 67 points.
- Zero liquid discharge scored lowest at 55 points.

The active tank-based water treatment options generally scored higher for criteria related to control-effectiveness, but scored lower for environmental and socio-cultural criteria, and cost. Overall, the BAT assessment indicated that In-situ active GBR and the base case are about equally preferred with a slight preference for the In-situ active GBR option. Tank-based water treatment options,

GBRs, flocculation and the base case with BMPs scored similarly for the combined reliability criteria.

The following was concluded based on the outcome of the BAT assessment:

- The base case with BMPs is a highly rated and feasible option for protecting downstream water quality as is.

- In-situ Active GBRs and flocculation are highly rated and feasibility mitigation controls that should be retained as contingency options during permitting if water quality predictions for the Project differ substantially from actual conditions observed during the development of the mine. To improve on the technology readiness of the Active In-situ GBR technology TML should develop a pilot In-situ Active GBR with the Coal Processing Plan Sedimentation Pond.

- Active tank-based water treatment options are less suitable but feasible and should be retained as contingency options during permitting if water quality predictions for the Project differ substantially from actual conditions observed during the development of the mine and are trending towards exceedances of the WQGs.

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Appendix A –WQG and POPC Screening Summary Tables

1 Introduction

This report documents a Best Achievable Technology (BAT) assessment for the Tenas Project (the Project), which is a proposed open pit metallurgical coal mine near Telkwa, British Columbia. In 2022, Telkwa Mining Limited (TML) applied for an Environmental Assessment Certificate (EAC) for the Project, which is currently under review. The BAT assessment was prepared in response Information Requests (IR) 176,353,355, and 514 provided by the EAO in their Water IR letter in November of 2022 (SRK 2025).

The BAT assessment included key anticipated discharges from the proposed Tenas Project, including surface discharges (from Tenas Control Pond (operations), North Management Pond (post-closure), and from the Rail Infrastructure/Loadout) and seepage that would report to groundwater (seepage from Tenas Control Pond (TCP), North Management Pond (NMP), West Management Pond (WMP), and East Management Pond (EMP). Groundwater recharge in the open pit area is two orders of magnitude lower than management and control pond seepages and as such is too minor to be a controlled or managed discharge. Groundwater recharge from the Coal Processing Plant is four orders of magnitude lower than the management and control ponds and was not considered in this analysis Parameters of Potential Concern.

The BAT assessment aimed to adhere to the guidance issued by the BC Ministry of Environment and Climate Change Strategy (BC ENV), in November 2024 (BC ENV 2024a). TML consulted with BC ENV during the preparation of the BAT assessment to ensure that TML's interpretation of the BAT guidance aligned with the BC ENV's intent. On December 18, 2025 TML issued a presentation to BC ENV that summarized the methodology and preliminary results of the BAT assessment. TML subsequently received review comments from BC ENV on the summary presentation in January 2025. BC ENV's review comments and suggestions have been incorporated into this report, to the extent possible.

This report is organized as follows:

- **Section 2** describes the methodology used for the updated BAT assessment and highlights information and methods used as per BC ENV's direction.
- **Section 3** defines the BAT assessment setting, including Parameters of Potential Concern (POPCs), Parameters of Concern (POCs), the expected range of discharge flows, as well as other information that is relevant for informing the technology selection.
- **Section 4** summarizes the technology identification and technology feasibility screening step.
- **Section 5** documents the evaluation and ranking of candidate BAT technologies that were deemed to be potentially feasible in the technology screening step, and
- **Section 6** presents conclusions of the BAT assessment and identifies the preferred BAT(s).

2 BAT Assessment Methodology

This section describes the methodology used for the BAT assessment while figure Figure 2-1 below summarizes the overall assessment methodology

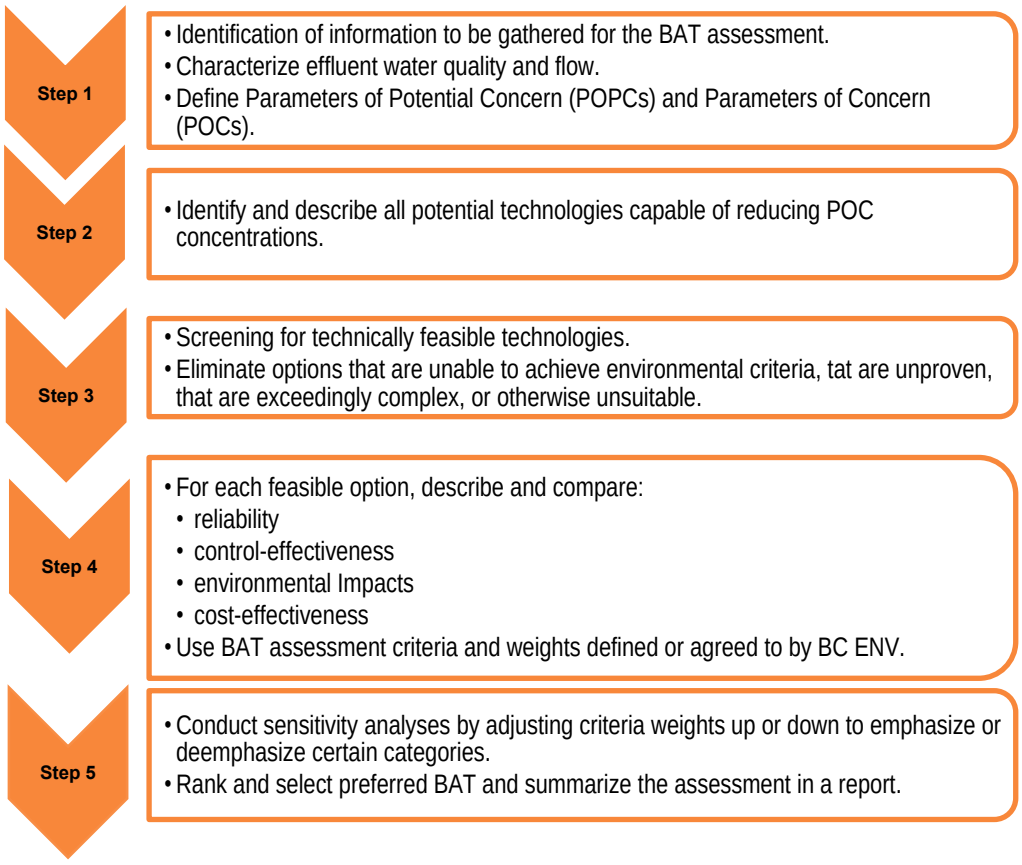


Figure 2-1 Overview of BAT Assessment Methodology

2.1 Step One: Identification of POPCs and POCs

This BAT assessment followed BC ENV's general guidance on Parameters of Concern (POCs) issued by BC ENV in January 2024 (BC ENV 2024). The purpose of the BAT assessment is to identify technologies that are best suited for managing or mitigating POCs in proposed discharges from the mine site. Step 1 of the assessment used the water quality model results from the water and load balance model developed for the Tenas Project (2024 revision) as a basis for identifying POPCs. POCs are identified by first defining Parameters of Potential Concern (POPCs) as follows:

- POPCs include all parameters with expected (untreated) discharge concentrations that are greater than 80% of applicable water quality guidelines (WQG). WQGs were chosen according to the following order of preference:
  - The lowest of approved or working BC water quality guideline for protection of freshwater aquatic life.

  - CCME water quality guidelines (Canadian Council of Ministers of the Environment) when BC guidelines are unavailable, or
  - ECCC water quality guidelines (Environment, and Climate change Canada) when 1) or 2) are unavailable.

  The only exception to the use of aquatic life guidelines was for molybdenum (total), for which BC's ruminant (wildlife) was chosen as the WQG as it was lower for wildlife receptors. While some parameters have lower guidelines for irrigation and drinking water these were not used for the selection of POCs because water from the Project is not used for irrigation or as a primary drinking water source. For guidelines that depend on toxicity-modifying factors, medium background values from baseline datasets within each creek were used.

- POPCs are automatically added to the list of POCs unless a clear scientifically based rationale is provided for excluding them. For this BAT assessment, all POPCs were conservatively assumed to be POCs.

The POC guidance stipulates that parameters with no WQG or other appropriate threshold should be identified as POPCs. However, this requirement is impractical because of the hundreds of thousands of inorganic and organic species without WQGs (or other thresholds) and was therefore not considered. In addition, certain "special case parameters" that can cause toxicity in unpredictable ways or that can bioaccumulate, bioconcentrate or biomagnify – such as selenium and mercury – should be considered POPCs irrespective of anticipated discharge concentrations. Selenium was identified as a POPC and a POC because effluent concentrations are expected to be higher than the BC WQG. However, mercury was not included as a POPC/POC because concentrations in the effluent from the site are modelled to be at or near the analytical detection limit.

2.2 Steps 2 and 3: Technology Identification and Screening

In Step 2 of the BAT assessment, technologies that potentially could be implemented are identified. BC ENV guidance specified specific information requirements to be included as part of the technology identification, including:

- a brief description of the treatment technology and its use in the mining industry.
- a description of any necessary ancillary technologies or infrastructure required, e.g., pre-treatment equalization, post-treatment solid/liquid separation, etc.
- a high-level process flow diagram, and
- a summary of advantages and disadvantages, including consideration for treatment by-products.

The requested information has been included in this report to the extent possible.

Identified technologies were then screened for feasibility in Step 3 of the assessment. BC ENV requested that the following criteria were used to screen for potential feasibility of each technology:

- Ability to achieve environmental criteria:

  - Evaluate each technology's capability to achieve the target effluent concentrations (in this case 80% of WQGs) for any identified POCs. Technologies that only address specific POCs rather than all of them may still be included for further evaluation.

- Proven commercial application:
  - Technologies considered as BAT, at a minimum, must have a demonstration system operating at near full-scale in the same industry and under similar site-specific conditions. For emerging technologies, technologies that have not been successfully implemented in a similar site condition, a Technology Readiness Assessment (TRA) must be conducted in accordance with the Technology Readiness Assessment Interim Technical Guidance (BC ENV 2022) and a TRA report should be submitted with the BAT assessment. Technologies that have been assessed at TRL-6, or below, are considered research and development technologies. Technologies considered for a BAT assessment prepared for an EAC application, must be assessed at a TRL level 7, 8, or 9.
- Operational Complexity:
  - This criterion considers several factors which may include, but are not limited to operator attendance requirement, chemical requirements, ease of process control, level of automation, level of expertise required to operate the system, maintenance requirements, and downtime expectations (for maintenance and part repairs and replacement).

BC ENV also stated that the cost of implementation are not to be considered at the screening stage. Technology screening often relies on professional judgement and operational experience. Therefore, the BAT assessment report has attempted to document rationales for screening out technologies as clearly as possible.

2.3 Step 4: Evaluation Criteria and Weights

BC ENV's guidance stipulates that a Multiple Accounts Analysis (MAA) should be used for assessing candidate BATs that pass the feasibility screening step. The following general criteria are to be used:

- Reliability.
- Control-effectiveness.
- Environmental impacts, and
- Cost effectiveness.

Each of the accounts have two or more sub-accounts (evaluation criteria) as illustrated in Table 2-1. Also indicated are the weights assigned by BC ENV to each account and criterion. Each criterion is scored on a scale of 1 to 5 with a score of 1 assigned to least favorable, and 5 to most favorable attributes.

TML proposed to add a criterion called "Adherence to Yintah Management Directives" to the "environmental impacts" account (Table 2-1). The criterion was added to acknowledge the

importance of considering the values of Wet'suwet'en First Nation on whose traditional territory the Project is located.

The following sections summarize SRK's understanding of the evaluation criteria to be used in the MAA.

Table 2-1 BAT Assessment Criteria and Weight Distribution

Assessment Criterion	BC ENV's Suggested Weights	TML's Proposed Weights
Reliability	**20**	**20**
Risk Assessment	5	5
Robustness	5	5
Scalability	5	5
Long-term Viability	5	5
Control-Effectiveness	**35**	**30**
Pollutant Reduction	20	20
Toxicity Reduction	15	10
Environmental Impacts	**20**	**25**
Energy Efficiency	5	5
Greenhouse Gas Emission	6	6
Footprint	4	4
Secondary Waste Production	5	5
Adherence to Yintah Management Directives	-	**5**
Cost-Effectiveness	**25**	**25**
Efficient Use of Existing Resources	3	3
Life Cycle Cost Analysis	22	22
Total	**100**	**100**

Note: **purple text** indicates SRK's proposed modifications to BC ENV's criteria and weights.

2.3.1 Reliability

2.3.1.1 Risk Assessment

BC ENV described the 'risk assessment' criterion as follows:

"Risk Assessment - Conduct a risk assessment for each technology to identify the potential risks associated with the implementation, operation, and maintenance of the technology. These risks may include but are not limited to the likelihood of process failure, environmental and human health risks resulting from process failure, as well as risks associated with secondary waste production (by-products) that may impact the environment and human health."

A general definition of "risk" is the combination of the probability that an adverse event will occur and the consequence of that event. For each candidate BAT considered, the predominant risks identified will be presented and assigned a risk category based on the associated probability and consequence. In the MAA table, technologies with high or extreme risks will be assigned lower scores than options with moderate or low risks. Note that certain extreme risks may cause a BAT to be eliminated from subsequent analysis.

2.3.1.2 Robustness

BC ENV describes the 'robustness' criterion as follows:

"Robustness - means consistent and reliable performance under various conditions over the technology operational life. Evaluate technologies based on their ability to maintain effectiveness and performance under the fluctuations in operating conditions such as effluent quality (physical and chemical characteristics) and quantity (flow)."

This assessment criterion was evaluated according to the definition provided.

2.3.1.3 Scalability

BC ENV describes the 'scalability' criterion as follows:

"Scalability - evaluate the scalability of each technology for future site expansions to manage the increased loads of POCs and additional effluent flows. Assess the systems performance under increased loads and flow conditions and identify potential system modifications that might be required to accommodate the changes effectively. Additionally, evaluate if the site condition such as available footprint, power, etc., can accommodate future expansions."

Since future discharge quality and flows are estimated based on the Project's water and load balance model, scalability is an important consideration. As such this assessment criterion was evaluated according to the definition provided.

2.3.1.4 Long-Term Viability

BC ENV describes the 'long-term viability' criterion as follows:

"Long Term Viability - long term viability involves evaluating the sustainability and performance effectiveness of each technology over an extended period. Discuss and compare longevity and expected lifespan for each technology."

This evaluation criterion is interpreted to be synonymous with effort required to maintain the BAT in a state where it can perform as designed for the duration it is required which is estimated at over one hundred years. As such there is overlap between long-term viability, operating costs/sustaining capital, and operational complexity.

2.4 Control Effectiveness

2.4.1 Pollutant Reduction

BC ENV describes the 'pollutant reduction' criterion as follows:

"Pollutant Reduction (achieving discharge limits) - discuss the efficacy of each technology in removing the POCs in terms of percent pollutant removal and achievable effluent concentrations. Pollutant reduction scores can be assigned to each POC individually, and an average of the allocated score for all POCs can be used to determine the final score of the

technology. The proposed scores shown in Table 2-2 should be used in your evaluation for control effectiveness."

Table 2-2 Proposed Scores for Pollutant Reduction (BC ENV)

Percent Pollutant Reduction (%)	Score (1-5)
0% to 20%	1
20% to 40%	2
40% to 60%	3
60% to 80%	4
80% to 100%	5

The intent and logic behind the pollutant reduction criterion is straight-forward. The pollutant reduction score for candidate BATs is evaluated for each POC individually. For example, if POCs include copper, selenium, molybdenum, and nitrate then each candidate technology is only assessed based on the parameter(s) that specific technology can address. Lime treatment for removal of copper would receive a high pollutant reduction score (4 or 5) even though the process does not remove any selenium, molybdenum, or nitrate. Similarly, anaerobic biological treatment would score high for removal of selenium and nitrate even though the process would not remove copper and molybdenum.

This approach ensures that each candidate BAT is evaluated according to its intended purpose and that none of the options are penalized for not addressing all POCs. It also ensures that preferred BATs can be selected for each parameter such that the final selection could include a combination/chain of options. However, before candidate BATs are combined, each must first be preferred for removal of a specific POC on its own merit. For example, combining a poor technology for removal of copper (as judged by the BAT assessment) with a suitable option for selenium removal does not improve the poor copper removal option since the capabilities of the two technologies do not overlap.

2.4.2 Toxicity Reduction

BC ENV describes the 'toxicity reduction' criterion as follows:

"Toxicity Reduction - mine effluent must not be acutely toxic to the most sensitive receptor present in the receiving environment. If applicable, discuss how each treatment technology addresses the acute toxicity characteristics of the effluent, by removing the POCs that are acutely toxic to the most sensitive receptor."

This assessment criterion is self-explanatory and was evaluated according to the definition provided.

2.5 Environmental Impacts

The assessment criteria of 'energy efficiency,' 'greenhouse gas emissions,' 'required footprint,' and 'secondary waste production' are self-explanatory and were evaluated according to the definitions provided.

As discussed above, TML added a fifth criterion that evaluates the extent to which the candidate BAT adheres to the Yintah Management Directives provided by OW. The score for this criterion is subjective and may have to be revised following further review of the BAT assessment by representatives from Wet'suwet'en First Nation.

2.6 Cost Effectiveness

The evaluation criterion of 'efficient use of existing' resources is straight-forward and was evaluated according to the definitions provided.

Similarly, capital, operating, maintenance, and sustaining capital costs were calculated according to the descriptions provided. Discount rates for NPV calculations will be based on guidance by the BC Ministry of Energy, Mines, and Low Carbon Innovation concerning calculation of reclamation liability cost estimates (EMLI 2024).

The effect of the cost-effectiveness account on the outcome of the BAT assessment is often of interest. Therefore, TML also included an evaluation of candidate BATs without the inclusion of the cost-effectiveness account (i.e., the subaccounts in the category were set to zero for all options considered).

3 BAT Assessment

3.1 Location of Discharges

Figure 3-1 shows the location of the planned surface discharges from the TCP during the Operation phase of the Project, and from the NMP during the Post-closure phase of the Project when the TCP has been decommissioned.

Seepages from the TCP, NMP, WMP, and EMP that would discharge to groundwater would flow through the pond liners within each of the pond footprints. Once the seepages report to the groundwater, they would follow the local and regional groundwater flow paths as illustrated in Figure 3-2. Details concerning the groundwater flows for the Project are available in SRK (2024).

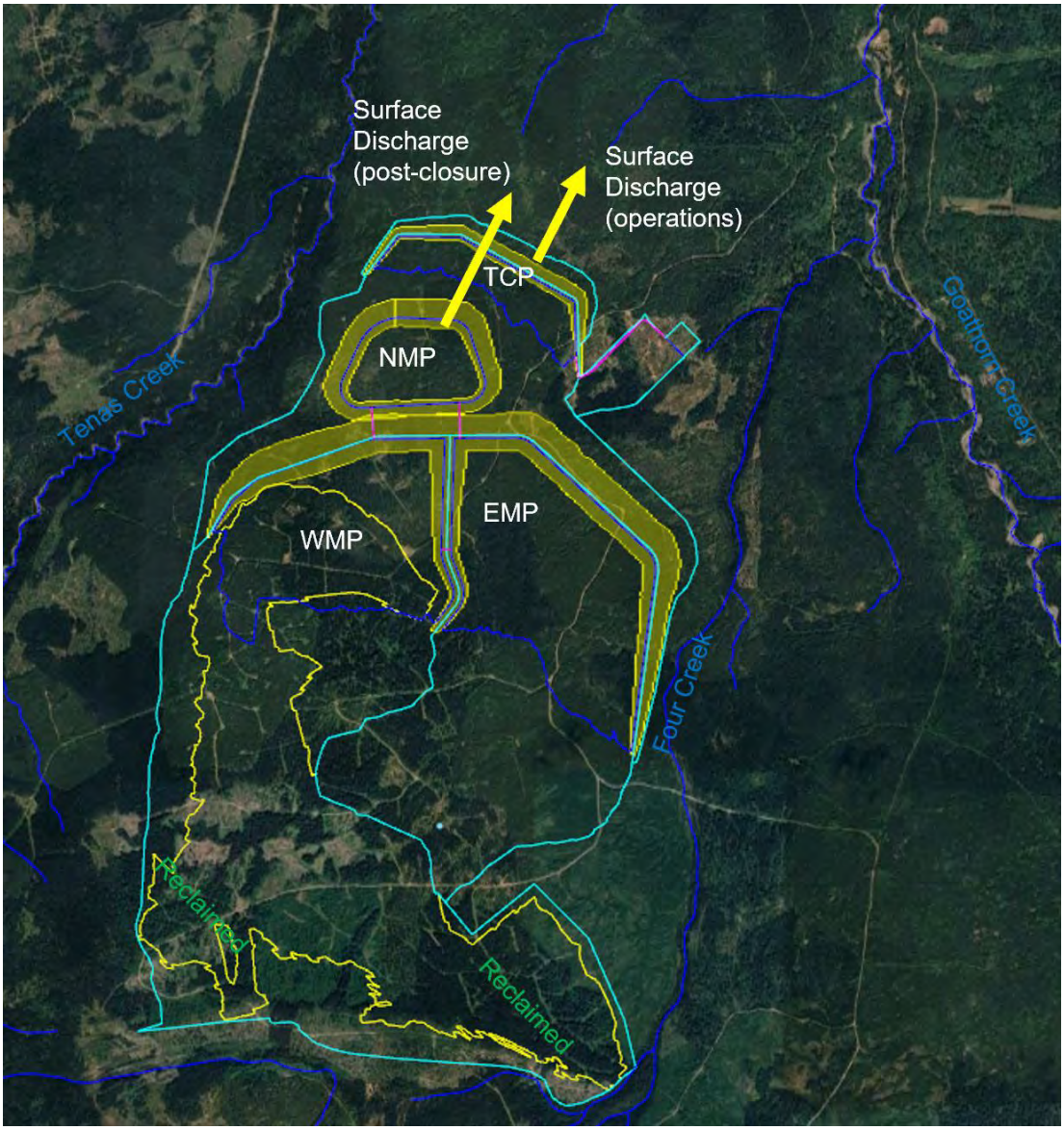


Figure 3-1 Location of Surface Discharges from the TCP (Operations) and NMP (Post-Closure)

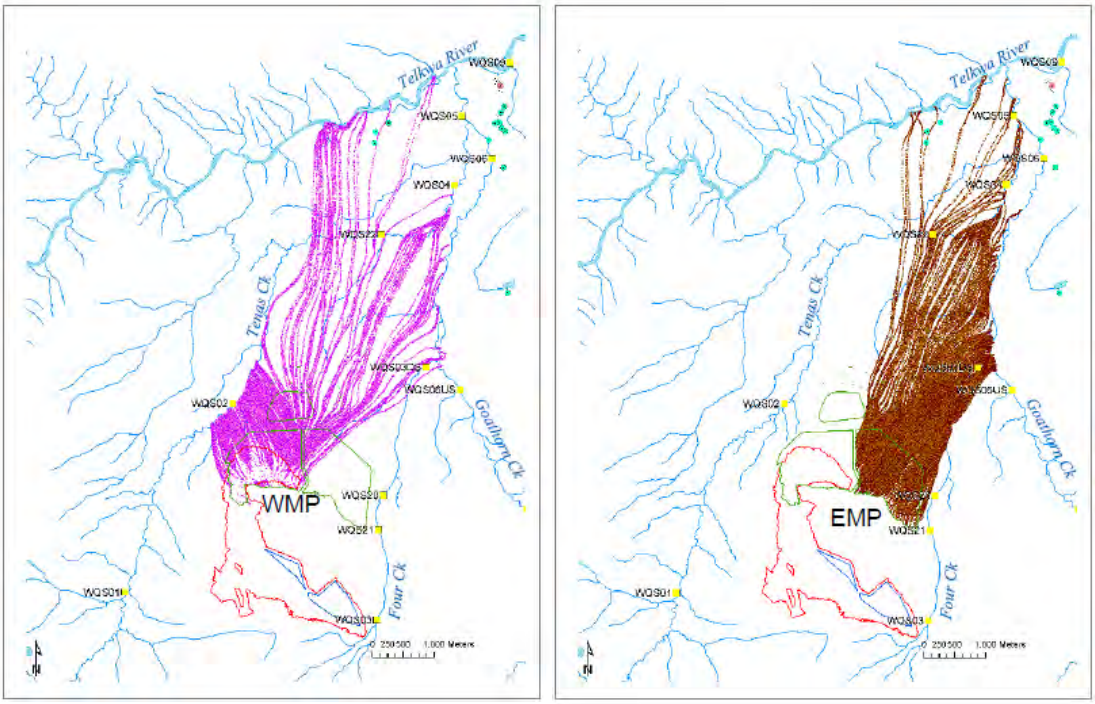


Figure 3-2 Modelled Groundwater Flow Paths from the WMP and EMP (SRK 2024)

3.2 Temporal Limit of BAT Assessment

This BAT assessment is focussed on technologies that can be implemented during the Construction, Operation, Decommissioning and Reclamation, and Post-closure phases of the Tenas Project.

3.3 Discharge Flows

Figure 3-3 shows modelled rates of discharge from the TCP during the Operation phase of the Project and NMP following the closure and decommissioning of the TCP. The modelled flows shown in the figure assumes that the TCP and management ponds have little or no capacity to attenuate peak freshet flows. However, assuming that storage capacity is available, the peak flows can be attenuated such that steady discharge rates of approximately 2,000 gpm over the open water season from May through October are possible during an average hydrological year (Figure 3-4). Accounting for a 1 in 200 wet year, the average open water discharge rate would be approximately 3,000 gpm.

Modelled seepage rates for the EMP, NMP, WMP, and TCP are illustrated in Figure 3-5. Seepage rages are expected to increase as the ponds a built up and as pond water levels increase. According to the closure plan for the Project, the TCP will be decommissioned in year 2048 and seepage therefore ceases at that time. However, seepage from the management ponds is expected to persist long-term.

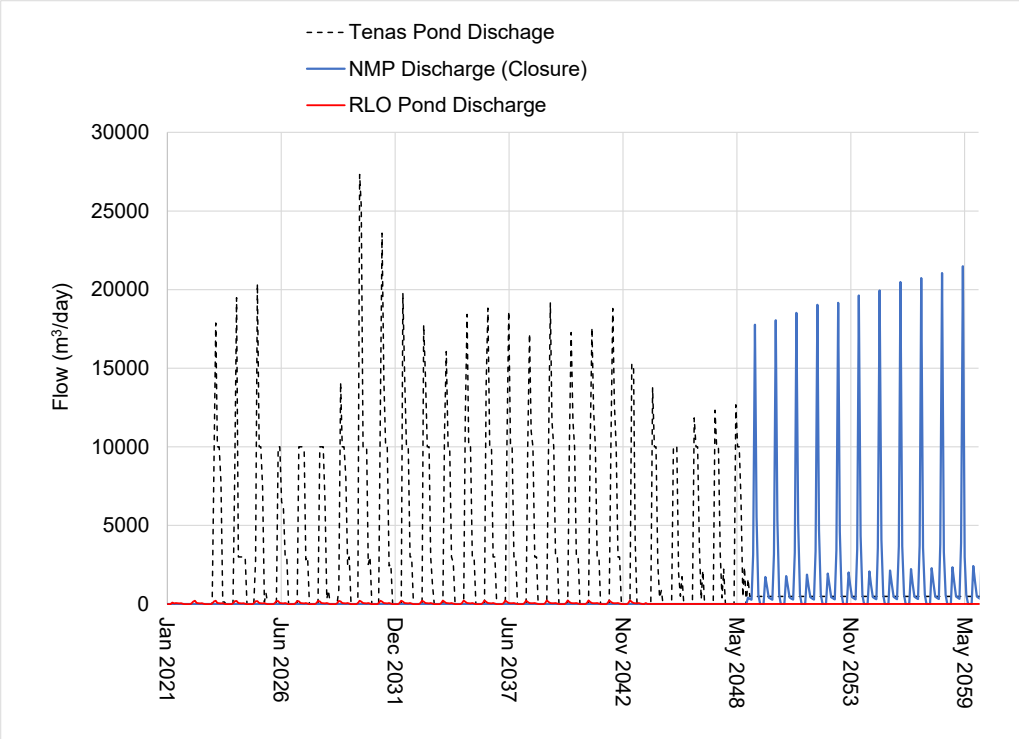


Figure 3-3 Modelled Surface Discharge Flows from TCP and WMP

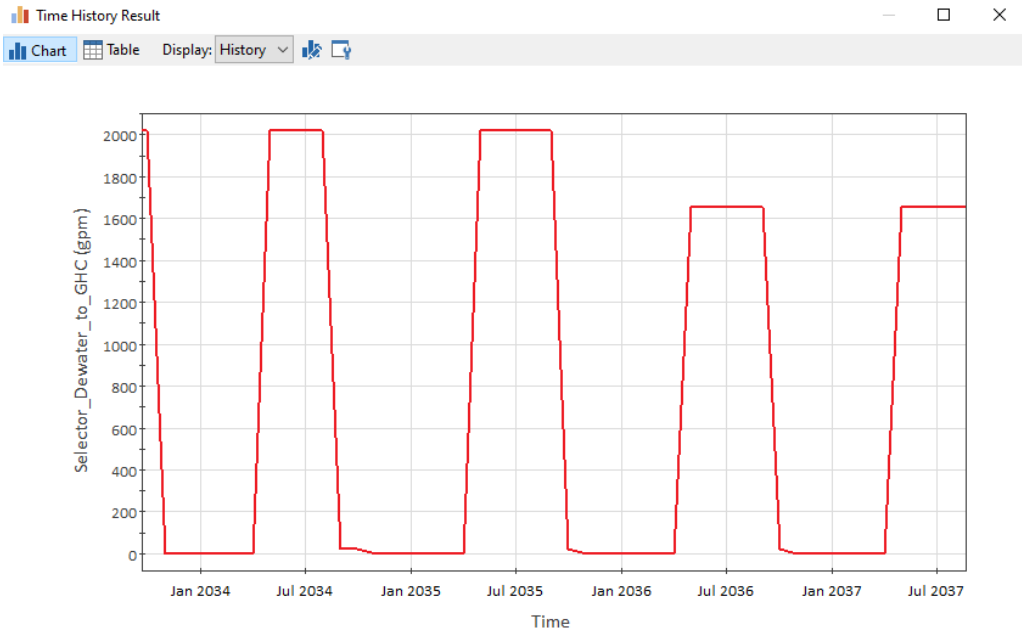


Figure 3-4 Surface Discharge Attenuated by the TCP and Management Ponds

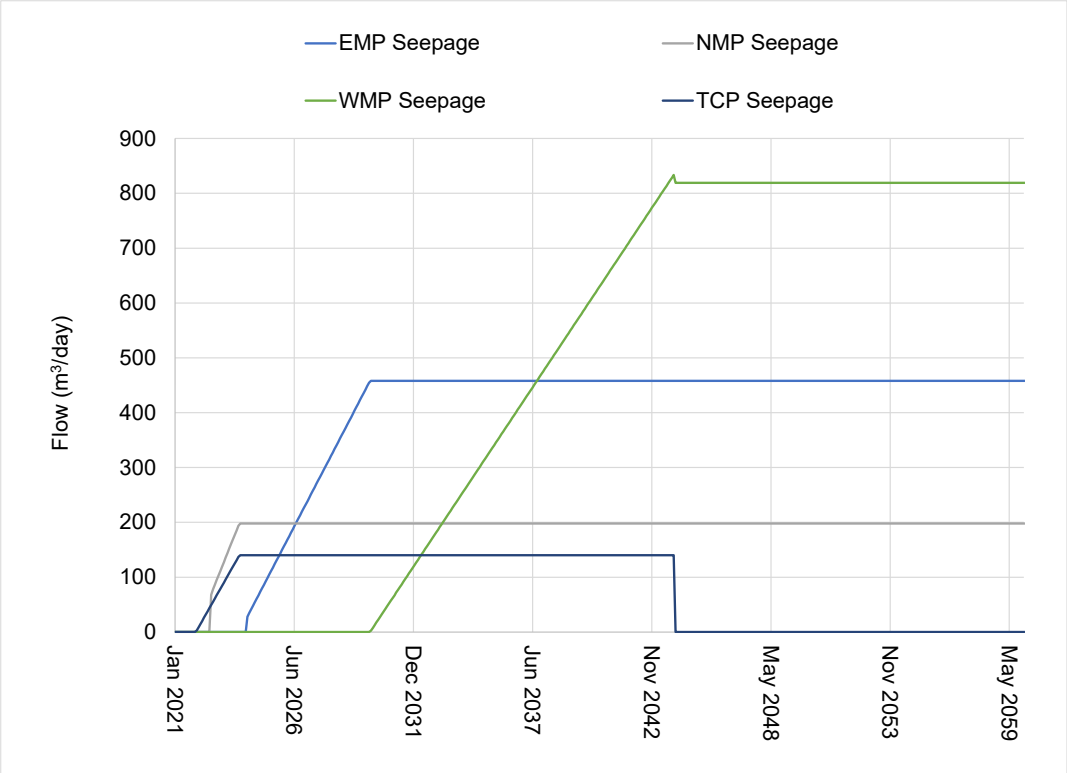


Figure 3-5 Modelled Seepage Rates for EMP, NMP, WMP, and TCP

3.4 Screening for POPCs and POCs

As discussed in Section 2.1, POPCs in discharges were identified by comparing the 2024 water quality model results to 80% of the applicable guidelines. Table 3-1 summarizes POCs identified for the Tenas Project.

Water quality guidelines used for POC screening and summary tables that compare water quality model results (maximum monthly discharge concentrations) to these WQGs are included in Appendix A.

Table 3-1 POCs Identified for the Tenas Project BAT Assessment

	Surface Discharge			Groundwater Discharge (Post-Closure)				Background / Baseline
Parameter	**TCP Discharge (Operation)**	**NMP Discharge (Post-Closure)**	**RLO discharge – (Operation)**	**TCP Seepage**	**NMP Seepage**	**WMP Seepage**	**EMP Seepage**	**See Footnote**
Nitrogen Nutrients								
Nitrate	X			X		X		
Nitrite	X			X	X	X	X	
Sulphate								
Sulphate	X	X		X	X	X		
Metals								
Aluminum, total	X	X	X					X[A]
Cadmium, dissolved			X[D]					
Cobalt, total					X	X	X	
Copper, dissolved	X	X				X		X[B]
Iron, total	X	X	X					X[C]
Nickel, dissolved	X	X	X	X	X	X	X	
Zinc, dissolved	X			X	X	X		
Oxyanions								
Molybdenum, total	X			X				
Selenium, total	X	X		X	X	X	X	

Notes:
A - Background POC for Four, Goathorn, Tenas Creeks, Telkwa and Bulkley Rivers.
B - Background POC for Goathorn, Tenas Creeks, Telkwa and Bulkley Rivers.
C - Background POC for Four, Tenas Creeks, Telkwa and Bulkley Rivers.
D - Cd is POC for Rail Load Out only - it is therefore not considered in future screening

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20240925.xlsx]POC Condensed

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/BAT Assessment/Telkwa BAT Tech Screening REV01.xlsx

3.5 Base Case with Best Management Practices

The base case for the BAT assessment is a model scenario that includes source control measures and other BMPs that TML has committed to implement as part of the Project development including:

- Inundation of potentially acid generating (PAG) rock in the management ponds on site.
- Lining of the management and control ponds to reduce seepage and groundwater recharge.
- Progressive reclamation and covering of non-acid generating rock backfilled into the open pit.
- Attenuation of water in TCP and in Management Ponds on site and pacing of discharge to open water season.
- Erosion prevention in diversion and collection channels and sediment control in sedimentation\control ponds.
- Clean water diversions to route water around Project activities, and
- Use of blasthole liners to reduce loss and dissolution of residual ammonium nitrate fuel oil (ANFO) explosives.

From a water and load balance modelling perspective, the base case scenario is referred to as the Updated EAC Project Case (2024, with blasthole liners added).

4 Technology Identification and Screening

Since both surface and groundwater discharges are evaluated by the BAT assessment, the technology screening and evaluation steps include two technology categories, namely groundwater-specific technologies (interception and containment technologies) and technologies applicable to surface discharges (treatment).

Table 4-1 lists technologies that could be implemented to manage groundwater discharges. Technologies that intercept and extract groundwater must be combined with a BAT for treating or managing surface discharge based on the assumption that groundwater with POCs would have to be treated prior to surface discharge once extracted. Table 4-2 lists in-situ treatment technologies and tank-based active treatment processes that could be used for treating surface water discharges. In-situ treatment technologies are applicable for improving the quality of both groundwater and surface water discharges. The two tables also indicates whether each of the identified technologies were deemed to be potentially feasible and therefore shortlisted for further assessment, or if some issue disqualified it from further assessment.

The following sections provide a brief description of the use of each of the identified technologies in the mining industry, a list of ancillary technologies or infrastructure required to implement each technology, a high-level process flow diagram, and a summary of advantages and disadvantages including considerations for management of treatment byproducts.

Table 4-1 Groundwater-Specific Mitigation Technologies

Technology	Notes	Shortlisted for Assessment
Containment/Interception		
Interception wells (+ surface discharge BAT)	Extraction of clean groundwater unavoidable. Requires a large number of wells. Not operationally or practically feasible.	No
Modified pond liner(s) (+ surface discharge BAT)	Potentially feasible	Yes
Pump from bottom of water management ponds (+surface discharge BAT)	Flushing pore water is inefficient and would take a long period of time. Performance is highly uncertain.	No
Construction of slurry walls downgradient of management ponds	Construction infeasible. Groundwater pathway too deep.	No

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/BAT Assessment/Telkwa BAT Tech Screening REV01.xlsx

Table 4-2 In-situ Treatment Technologies and Tank-Based Technologies Applicable for Treating Surface Discharges

	SO4	Nitrogen		Metals							Oxyanions			
POPC/POCs	Sulphate	Nitrite	Nitrate	Aluminum, Total	Cadmium, Dissolved	Cobalt, Total	Copper, Dissolved	Iron, Total	Nickel, Dissolved	Zinc, Dissolved	Molybdenum, Total	Selenium, Total	Notes	**Shortlisted for Assessment**
In-Situ or Semi-Passive Technologies														
In-situ anoxic gravel bed reactor (actively managed)	u	x	x	x	x	u	x	x	u	x	u	x	Potentially feasible.	Yes
In-situ anoxic biological treatment (passive with organic substrate)		x	x	x	u		u	x				x	Lack of control over the treatment process makes this option infeasible.	No
Engineered wetland		x	x	x	x	x	x	x		x	x	x	Not suitable for high freshet flows or winter operation. Also, required foot-print may be too large.	No
Passive/active flocculation				x				x					TSS will be managed according to erosion prevention and sediment management plan but passive flocculation (use of floc blocks) had not been considered as part of that plan.	Yes
Active Tank-Based Water Treatment Technologies														
Lime treatment and sedimentation/concentration				x	x	u	x	x	u				Unable to achieve effluent concentrations that are lower than WQG for several POPCs.	No
Sulphide precipitation, sedimentation/concentration				x	x	x	x	x					Unable to achieve effluent concentrations that are lower than WQG for several POPCs.	No
Ferric co-precipitation and sedimentation/concentration													Unable to achieve effluent concentrations that are lower than WQG for most POPCs.	No
RO + lime treatment	x			x	x	x	x	x	x	x			Potentially feasible for sulphate and metal removal.	Yes
RO + sulphide precipitation				x	x	x	x	x	x	x			Potentially feasible for metal removal.	Yes
RO + ferric co-precipitation											x		Potentially feasible for metal removal.	Yes
Ion exchange and regenerant treatment, selenium removal												x	Complex process. Se only POPC removed.	No
Ion exchange and regenerant treatment, metals				x	x	x	x	x	x	x			Potentially feasible for metal removal.	Yes
Ion exchange and regenerant treatment, sulphate removal	x			x	x	x	x	x	x	x			TRL 6. No full-scale processes currently operating anywhere.	No
Electrocoagulation				x				x					TRL 7 when applied to this project.	No
RO + electrocoagulation				x				x			x	u	TRL 7 when applied to this project.	No
Anaerobic biological treatment (MBBR, FBR, ABMet, SeHawk)		x	x	x				x				x	Unable to achieve effluent concentrations that are lower than WQG for several POPCs.	No
RO + anaerobic biological treatment (MBBR, FBR, ABMet, SeHawk)		x	x	x				x				x	Potentially feasible for NO_2/NO_3, Se, Cr, total Al, and Fe removal.	Yes
Zero Liquid Discharge (ZLD) process	x	x	x	x	x	x	x	x	x	x	x	x	ZLD processes are very complex, energy intensive, and produce soluble residuals that must be entombed on site or trucked to a hazardous waste facility. However, it is the only process that would remove all POCPs and it is therefore considered.	Yes
Ettringite precipitation	x			x	x	x	x	x	x	x			TRL 5 or 6 for this application.	No
Biological sulphate reduction	x	x	x		x	x	x	x		x	x	x	TRL 6 or 7. Produces toxic H_2S gas.	No

x - removes POC to a meaningful extent
u - may remove POC but efficacy is uncertain

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/BAT Assessment/Telkwa BAT Tech Screening REV01.xlsx

4.1 Groundwater Specific Technologies

4.1.1 Interception Wells (+ Surface Discharge BAT)

Interception wells are commonly used in the mining industry to intercept and recover seepage from tailings storage facilities or waste rock storage areas. Wells are drilled into aquifers downstream of where seepages report to the groundwater system. Interception wells require power to operate pumps and for heat tracing of well-heads and piping that conveys the intercepted water. Interception wells also require a network of pipes to convey the intercepted groundwater to a location where it can be used for processing, treated, or otherwise disposed of.

Interception wells must be in areas that are readily accessible to allow for regular inspection and maintenance. Disadvantages associated with interception wells is that they required ongoing operator attention and maintenance and a reliable source of power.

For the Tanas Project, the seepage rates from the management ponds and the TCP are expected to be minor and it would be virtually impossible to install wells that would specifically target discrete groundwater flow paths that contain seepage. Instead, many wells would be required, and these would likely extract predominantly clean background groundwater, which could reduce base flows in creeks downstream to an unsustainable level. Therefore, installation and operation of interception wells was considered to be **not technically feasible** for the Tenas Project.

4.1.2 Modified Liners in Management and Control Ponds (+ Surface Discharge BAT)

This option considers the possibility of modifying the design of the pond liners to further reduce the rates of seepage that enter the groundwater system. The liner systems considered for the Updated EAC Project Case (2024, with blasthole liners added) include:

- Soil-bentonite liner (0.3m) for EMP, NMP, and WMP (excluding WMP End Wall rock);
- Bituminous geomembrane liner for the Tenas Control Pond.

The modified liner design includes one of two options:

- Option 1:
  - Soil-bentonite liner (0.56m) for EMP, NMP, and WMP (excluding WMP End Wall rock);
  - Bituminous geomembrane liner on top of soil-bentonite liner (0.15m) for the Tenas Control Pond.
- Option 2:
  - Bituminous geomembrane liner on top of soil-bentonite liner (0.3m) for EMP;
  - Soil-bentonite liner (0.56m) for NMP, and WMP (excluding WMP End Wall rock);
  - Bituminous geomembrane liner on top of soil-bentonite liner (0.15m) for the Tenas Control Pond

Option 1 includes a thicker bentonite amended liner, covering the management pond bottoms, and upstream dam slopes, as well as the in-pit overburden portion of the West Management Pond.

Liner thicknesses are assumed to be 560 mm in management ponds. The Tenas Control Pond contains an added soil-bentonite liner of 150mm thickness compared to none in the base case.

Option 2 is that same as Option 1 for NMP, WMP, and TCP. The only change is the additional bituminous geomembrane liner on top of the soil-bentonite liner with a thickness of 300 mm for the East Management Pond.

The disadvantage associated with this option is primarily the high initial capital cost associated with the liner construction.

The performance of the modified liner designs were estimated as part of a mitigation modelling study completed in parallel with this BAT assessment (SRK 2025). Construction of modified and improved pond liners is clearly **feasible,** and the option was therefore advanced for further assessment.

4.1.3 Pump from Bottom of Water Management Ponds (+ Surface Discharge BAT)

Seepage from the management ponds is assumed to have the same water quality as the pore water contained in the PAG rock and processed rock (tailings) stored in the ponds. Most of the loadings associated with the pore water come from the initial wet-up of the material stored in the ponds (i.e., first flush loadings). Once loadings associated with this first flush have been eliminated the rock and tailings stored in the ponds is almost completely inert and is not expected to contribute any additional loadings to the pore water or seepage.

The option of pumping pore water from the bottom of the management ponds to surface (for treatment by a surface discharge BAT is predicated on the idea that the first flush pore water could be rinsed out of the PAG and processed rocks stored in the pond. Once the entire pore water volume has been displaced any seepage from the ponds would theoretically have lower constituent concentrations.

There are no known examples of this type of deliberate pore water flushing used at mines anywhere. The approach is highly theoretical and the performance of such a flushing operation is highly uncertain. Therefore, the approach was judged to be **not feasible** for implementation at the Tenas Project.

4.1.4 Construction of Slurry Cut-off Walls Downgradient of Management Ponds and TCP

Slurry cut-off walls can in some cases be used to contain contaminated groundwater plumes that are relatively shallow. The technology works by excavating a trench that is subsequently backfilled with bentonite-amended soil. When mixed with soil, bentonite clay forms a material that has extremely low hydraulic conductivity, which makes it suitable for use as a barrier for groundwater flow paths. Figure 4-1 shows a schematic of a slurry cut-off wall construction.

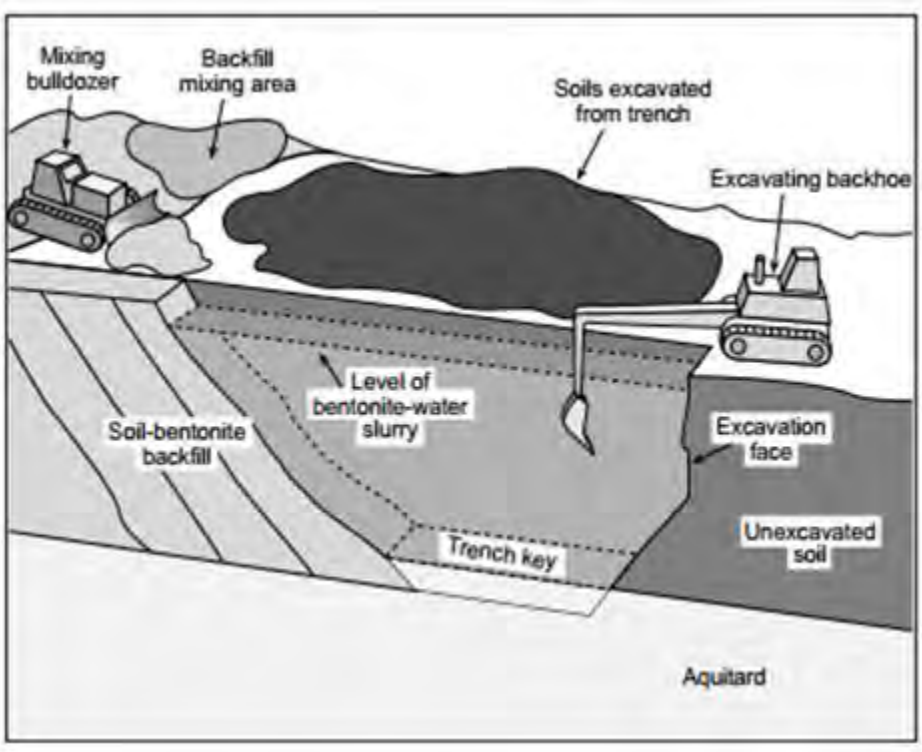


Figure 4-1 Schematic of a Slurry Wall Construction

Source: https://www.geoengineer.org/storage/wcp_assignment/135/editor_photos/4094/figure_5.jpg

Slurry cut-off walls are occasionally used in the mining industry, but most commonly to contain solutions in facilities that are constructed in relatively flat and homogenously stratified terrain such as on the Canadian prairies. The approach is less suitable in mountainous terrain with heterogenous and complex geology. Furthermore, because of the construction method, slurry walls are only applicable for containing relatively shallow groundwater flows. Also, sufficient footprint must be available to allow construction access and the slurry walls must not compromise the stability of embankment structures constructed upstream. Because the anticipated depth of the groundwater flow paths for the Tenas Project is outside of the depth range of conventional slurry walls, and because of the limited footprint downstream of the management pond embankments, this option was considered **not feasible** and was not assessed further.

4.2 In-situ Treatment Technologies

4.2.1 Actively Managed Gravel Bed Reactor (GBR)

A gravel bed reactor is a pond or reservoir that has been backfilled with coarse rock/gravel, covered by an insulating layer (soil and/or organics) and fitted with injection and extraction wells. The operation of a GBR is illustrated in Figure 4-2. Mine water flowing to the injection wells is dosed with a source of easily degradable organic carbon such as methanol or glucose and other nutrients as required. Inside the GBR, microorganisms degrade the organic carbon.

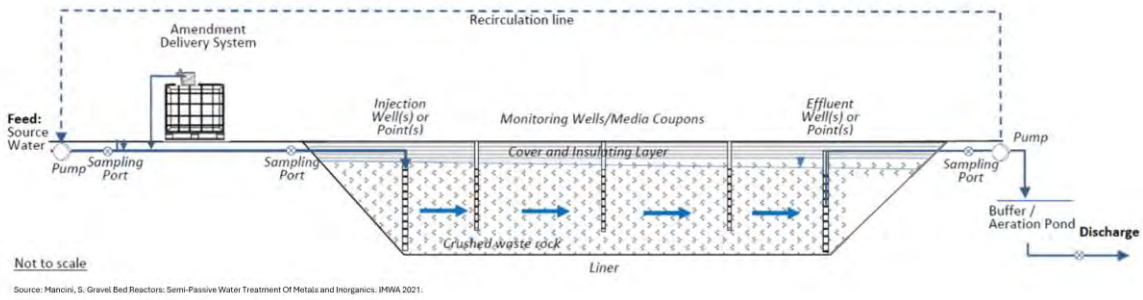


Figure 4-2 Schematic of a Gravel Bed Reactor

The degradation process of carbon consumes oxygen and oxidizes species such as nitrate, ferric iron (Fe^{3+}), selenate (SeO_4^{2-}), and sulphate (SO_4^{2-}) and produces reduced constituents such as ferrous iron (Fe^{2+}), selenite or elemental selenium (SeO_3^{2-}, Se^0) and sulphide (S^{2-}). Sulphide can form insoluble precipitates with dissolved metals such as copper, lead, cadmium, nickel, and zinc, which will be removed in the process.

The mining industry is in the early phase of adopting GBRs. A full-scale GBR with a treatment capacity of 20,000 m^3/day has been constructed at the Rainy River Mine in Ontario and currently operates as primary water treatment for the removal of copper. At two coal mines in the Elk Valley in BC, saturated rockfill reactors (SRFs) – a variant of GBRs – are currently used to remove selenium and nitrate from mine water.

GBRs are simpler and less costly to construct and operate than comparable active water treatment system. However, GBRs do not offer the same level of precise process control and post-treatment of effluent may be required.

The three management ponds planned for the Tenas Project are ideally suited to be used as actively managed GBRs. Hydraulic controls could be constructed as PAG rock is placed in the ponds such that water pumped to the pond would flow through the pond along a pre-determined flow path. This would allow for control of the hydraulic residence time, which would facilitate removal of POCs such as copper, selenium, nickel, and nitrate.

For this application, the technology readiness level (TRL) was judged to be an 8 for removal of copper and 7 for removal of other POCs such as nitrate, nickel, and selenium. Therefore, the technology was considered to be **potentially feasible** for implementation at the Tenas Project. However, a technology maturation plan must be developed, which would include pilot- and field-scale trials to evaluate the feasibility of the approach for this Project.

4.2.2 In-situ Anoxic Biological Treatment (Passive with Organic Substrate)

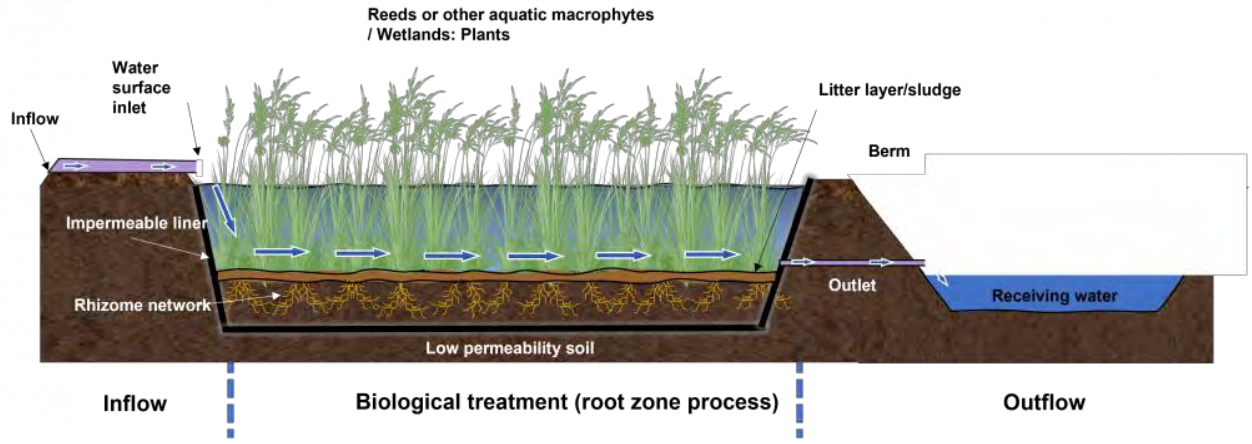
Passive bioreactors are like GBRs but are filled with a mixture of coarse rock, limestone, and organic material such as wood chips, manure, straw, biochar, or similar materials. The organic materials serve the same function as the degradable organic carbon added to the GBR influent, namely, to promote growth of anaerobic microorganisms.

Passive bioreactors have been used with limited success at mines in BC, including at the Brule and Quinsam coal mines. However, their use is not widespread. Although the reactors are operationally simple, the only means of controlling the process (and treatment performance) is to increase or decrease the inflow to the reactor. For this application, TRL is 6 or lower and the lack of process control makes it unsuitable for implementation at the Tenas Project. Therefore, the technology was considered to be **not feasible** and was not considered further.

4.2.3 Engineered Wetland

The use of engineered (or constructed) wetlands began in Germany in the 1950s and gained wider acceptance in the 1970s and 1980s (Seidel 1976). Engineered wetlands are most used to treat, or for polishing treatment of, municipal sewage or agricultural runoff but have also found use in the mining industry (Aurora 2018). Engineered wetlands tend to work best in applications where flows are low compared to the size of the wetland and when high-performance treatment is not required.

Figure 4-3 shows a schematic of a type of engineered wetland referred to as 'free-water surface flow wetland'[1]. The wetland works by mimicking the actions of a natural wetland. Vegetation filters out suspended solids, plant matter adsorbs or assimilate contaminants, and aerobic and anaerobic microorganisms transform or sequester various water quality constituents. An engineered wetland is constructed by placing an impermeable liner (clay or synthetic) within a pond or natural depression. A growth substrate placed on top of the liner is planted with wetland plants such as cattails, bulrushes, and canary grass. The outlet of the wetland either reports to a discharge pond or directly to the receiving environment.



Source: https://wiki.sustainabletechnologies.ca/wiki/Wetlands

Figure 4-3 Schematic Illustrating the Operation of an Engineered Wetland

An important consideration for implementation of an engineered wetland is the availability of a suitable location for construction of a lined pond. The area must be flat or gently sloped and relatively large. Although it may be possible to locate a suitable area for construction of an engineered wetland near the Tenas Project, a wetland would not be a candidate BAT because the TRL is less than 7 for this application due to the flows required and year-round treatment

[1] https://wiki.sustainabletechnologies.ca/wiki/Wetlands

requirements. Therefore, the technology was considered to be **not feasible** and was not considered further.

4.2.4 Passive/Active Flocculation

Passive flocculation refers to the practice of passively dosing flocculant polymers to turbid water by placing a “floc bloc” in the flow path of the stream (Figure 4-4) while active flocculation involves the addition of flocculants to contact water prior to it entering a pond to enhance the settlement of particulate matter in the water. Floc blocs have been used in the mining industry to facilitate removal of suspended sediment for many years (TRL 9). They are relatively low cost and is an operationally and environmentally safe method for improving removal of POCs associated with suspended sediment (total aluminum and total iron).

Active flocculation has been used in mining industry successfully over the past decades and is an operationally and environmentally safe method for improving removal of POCs associated with suspended sediment (total aluminum and total iron) and is TRL 9. Therefore, the use of passive\active flocculation was **potentially feasible** for the Tenas Project.

Figure 4-4 Examples of Floc Blocs in a Stream and Active Floc Dosing

4.3 Active Tank-Based Treatment Technologies

4.3.1 Lime Treatment

Lime treatment is one of the most common methods used for removing dissolved metals, suspended solids, and (in some cases) sulphate from mine water. The process works by increasing the mine water pH to between 9 and 10 by adding hydrated lime. At this pH, most dissolved metals such as copper, zinc, cadmium, lead, iron, and nickel precipitate as metal hydroxides solids and is then removed in a solid-liquid separation step. Lime treatment is TRL 9.

There are two general approaches for implementing lime treatment:

- Low Density Sludge (LDS): in this process, mine water is mixed with hydrated lime in one or more (typically two) lime reactor tanks (Figure 4-5). In the reactors, the pH setpoint (typically between pH 9 and 10) is controlled by adjusting lime addition. Reduced species such as ferrous

iron or manganese are oxidized by aeration. From the reactors, the process solution flows to a pond where precipitated metal hydroxides and calcite settle as sludge. The treated outflow from the pond may be filtered and in some cases the pH is lowered by adding carbon dioxide or acid. The settled sludge will periodically have to be removed from the pond by dredging.

- High Density Sludge (HDS): the first part of the HDS process is the same as the LDS process. However, instead of using a pond for settling of sludge, a mechanical clarifier is used (Figure 4-6). A portion of the sludge collected by the clarifier is pumped back to the lime reactor tanks via a rapid mix tank where the hydrated lime is added. The recycled sludge becomes coated by hydrated lime, which causes dissolved metals in the mine water to precipitate onto the sludge particles. This process increases the density of the sludge, improves the metal removal efficiency, and also improves the lime utilization. As in the LDS process, treated effluent flowing from the clarifier may be filtered and the pH may be adjusted.

Lime treatment plants require several ancillary services and facilities, including:

- A reliable source of power.
- Fresh water for reagent make-up (treated effluent can be used in some cases).
- Reagent storage and a laboratory for influent and effluent analysis.
- A pond for settling of sludge (LDS only),
- A mechanical clarifier for sludge (HDS only), and
- A facility for permanent disposal of sludge.

Advantages associated with lime treatment of include:

- High degree of process control and reliable performance

Disadvantages include:

- Lime treatment can remove metals but may not be able to achieve effluent concentrations that are less then 80% of the water quality guidelines. For example, the process can reduce dissolved copper concentrations from 0.01 mg/L to less than 0.0005 mg/L, but it may not be able to reduce cobalt, nickel, and zinc concentrations below 80% of the WQG concentrations.
- The process requires constant or frequent operator attention.
- Sludge must be managed on an ongoing basis.
- The use of lime, which is corrosive, involves the risk of operator exposure or spills.

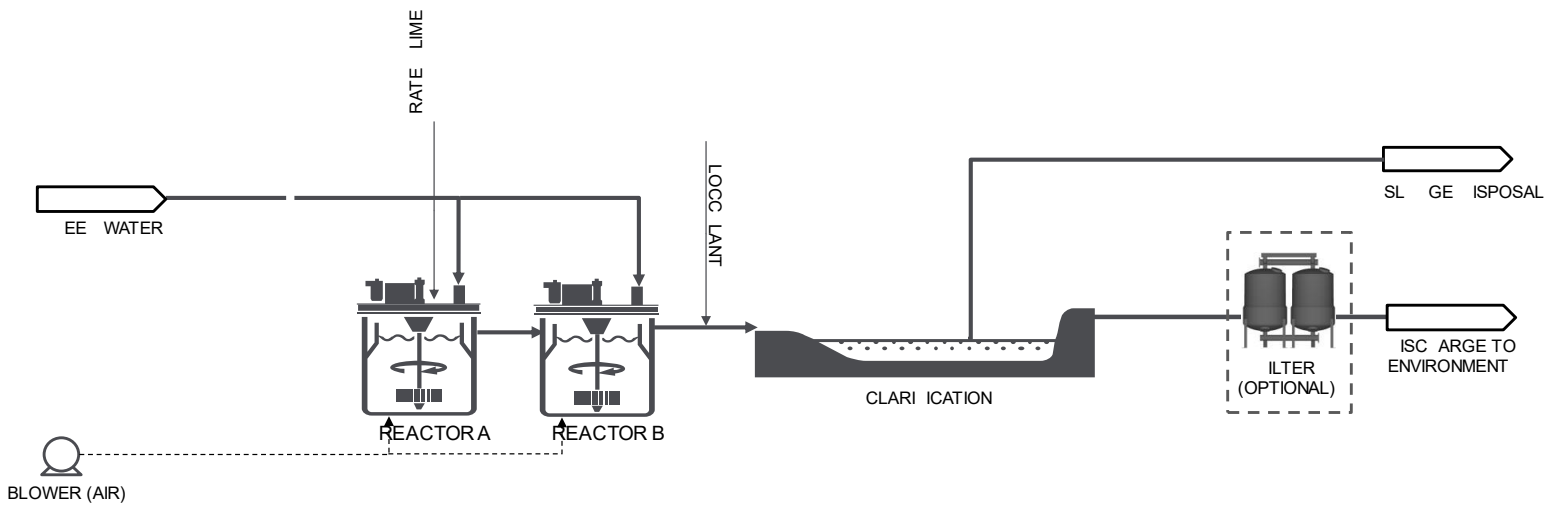


Figure 4-5 Schematic of a Low-Density Sludge (LDS) Lime Treatment Process

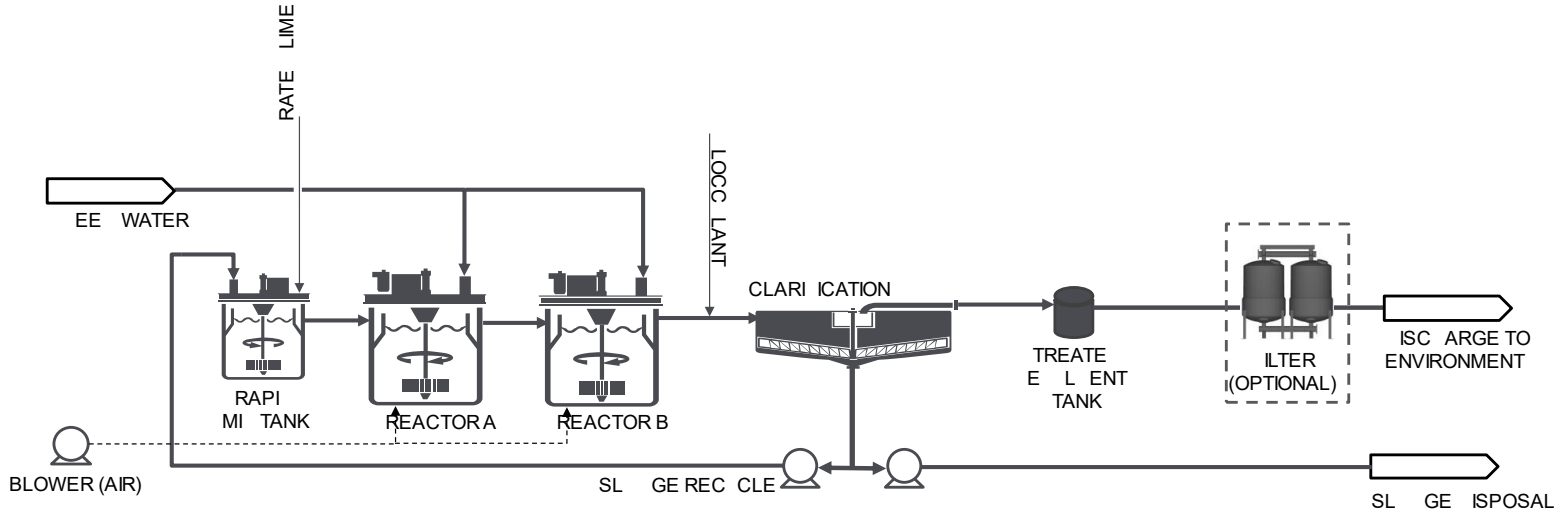


Figure 4-6 Schematic of a High-Density Sludge (HDS) Lime Treatment Process

- Capital and operating costs are relatively high compared to source control or semi-passive options.
- Energy requirements and greenhouse gas emissions are relatively high compared to source control or semi-passive options.

Implementation of lime treatment as a stand-alone process for treating surface discharge from the Tenas Project would realistically not be considered because it would not be able to reduce some of the already low POCs to levels below 80% of the WQG. A membrane or ion exchange pre-concentration step is required to achieve such low levels. Therefore, lime treatment as a stand-alone process was deemed to be **not feasible** for implementation at the Tenas Project.

4.3.2 Sulphide Precipitation

A sulphide precipitation water treatment process removes dissolved metals by precipitating them as insoluble metal sulphides. In the process, an inorganic sulphide reagent such as sodium hydrosulphide (NaHS) is added to metal-containing mine water in a reactor. Here, the dissolved metals are precipitated as sulphide solids (i.e., $Cu^{2+} + S^{2-} \rightarrow CuS$ (s)). The metal sulphide sludge is then removed by settling and filtration (Figure 4-7) or by microfiltration (Figure 4-8). Sulphide precipitation is TRL 9.

The sulphide precipitation process is relatively common in the mining industry because of its ability to target dissolved metals for removal in a manner that minimizes sludge production compared to lime treatment. This is possible because the process does not produce calcite, gypsum, or ferric hydroxide solids, which often account for most of the sludge produced by a lime treatment process.

Sulphide treatment plant require similar ancillary services and facilities as lime plants, including:

- A reliable source of power.
- Fresh water for reagent make-up.
- Reagent storage and a laboratory for influent and effluent analysis, and
- A facility for permanent disposal of sludge.

Although the sludge produced is relatively stable, it can oxidize over time and release the precipitated metals if exposed to atmospheric conditions. Therefore, it should be stored in a low oxygen environment or under a permanent water cover. Advantages associated with sulphide treatment include:

- High degree of process control and reliable performance.

Disadvantages include:

- Even though sulphide precipitation can achieve lower effluent concentrations than lime treatment for some POCs (i.e., copper, cobalt, and cadmium) the process cannot achieve extremely low concentrations of zinc and aluminum and is generally unable to remove nickel.
- The process requires constant or frequent operator attention.

- Sludge must be managed on an ongoing basis in a low oxygen environment or under a permanent water cover.
- The use of NaHS, which is toxic and can produce noxious hydrogen sulphide, involves the risk of operator exposure or spills.
- Capital and operating costs are relatively high compared to source control or semi-passive options.
- Energy requirements and greenhouse gas emissions are relatively high compared to source control or semi-passive options.

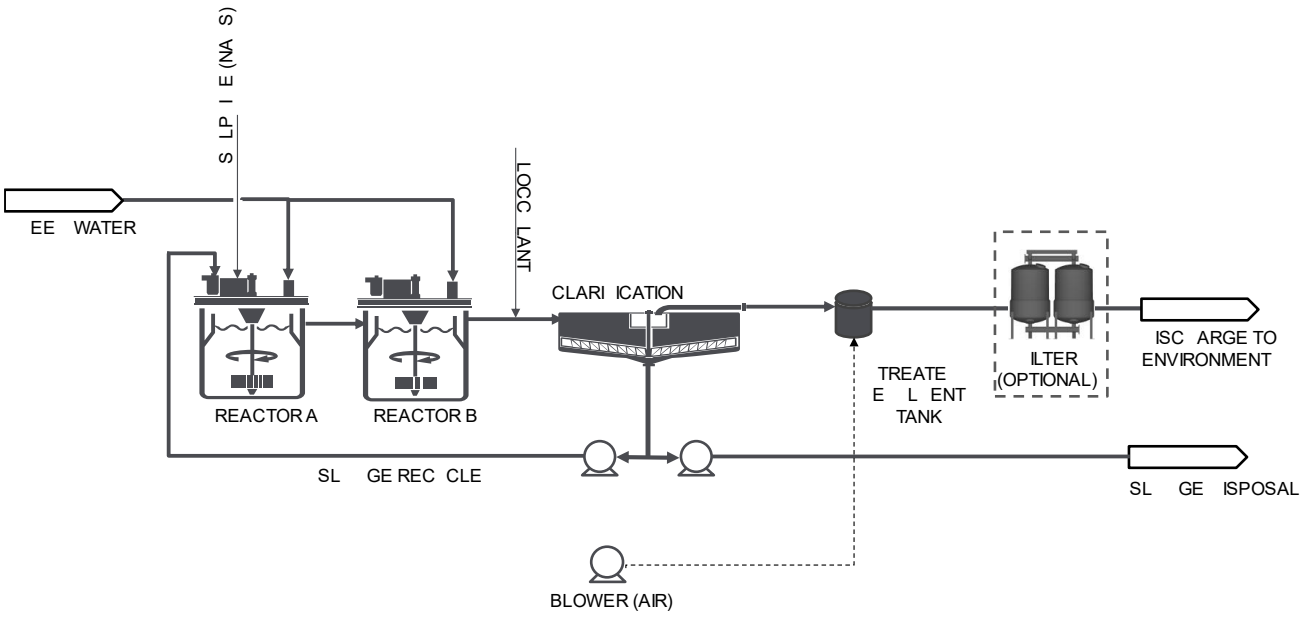


Figure 4-7 Schematic of a Conventional Sulphide Precipitation Process

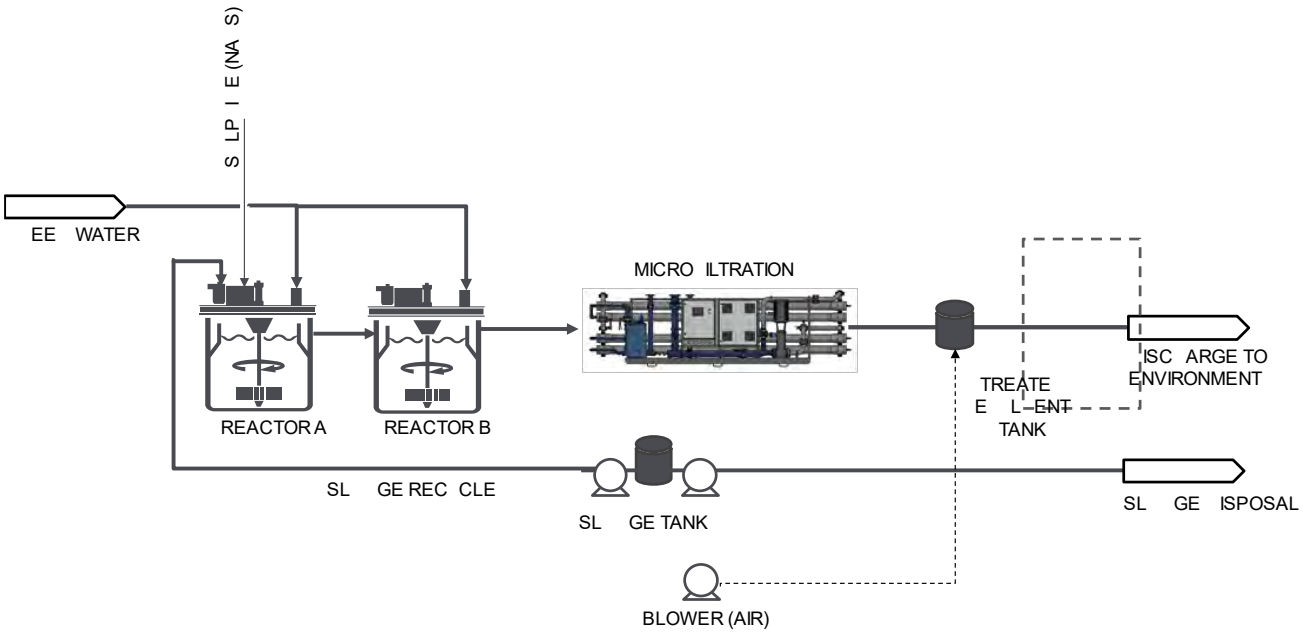


Figure 4-8 Schematic of a Sulphide Precipitation and Microfiltration Process

As with lime treatment, implementation of sulphide treatment as a stand-alone process for treating surface discharge from the Tenas Project would realistically not be considered because it would not be able to reduce some of the already low POCs to levels below 80% of the WQG. A membrane or ion exchange pre-concentration step is required to achieve such low levels. Therefore, sulphide treatment as a stand-alone process was deemed to be **not feasible** for implementation at the Tenas Project.

4.3.3 Ferric Co-precipitation and Sedimentation or Micro-filtration

Figure 4-9 shows a schematic of a ferric co-precipitation process. A ferric reagent (ferric sulphate or ferric chloride) is added to mine water in a reactor. Here, the ferric iron precipitates as ferric hydroxide solids/sludge. Some constituents, and in particular oxyanions of molybdenum adsorb to or become occluded with the precipitated iron hydroxide and can thereby be removed with the sludge. This technology is TRL 9.

Ferric co-precipitation is commonly used in the mining industry for removal of molybdenum. However, modelled molybdenum concentrations in effluents at the Tenas Project are relatively low and ferric co-precipitation as a stand-alone process would not be able to reduce concentrations to a meaningful extent. Therefore, iron co-precipitation as a stand-alone process was deemed to be **not feasible**.

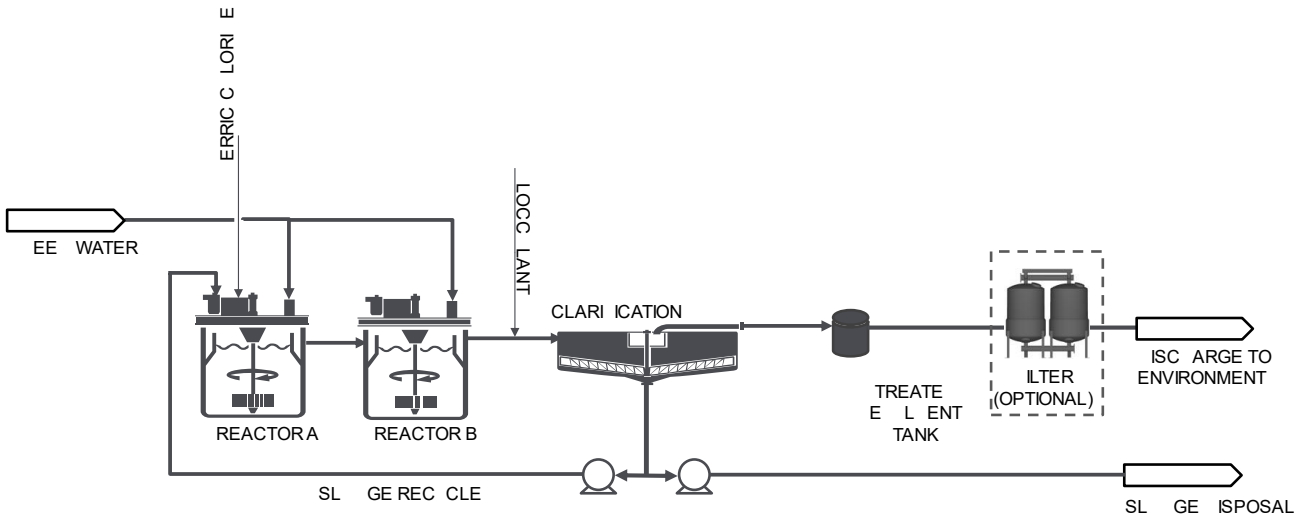


Figure 4-9 Schematic of a Ferric Co-precipitation Process

4.3.4 Membrane Filtration and HDS Lime Treatment

This treatment process is like the lime treatment process described in Section 4.3.1, but it includes a membrane filtration step ahead of the lime reactors. Membrane filtration works by forcing mine water through a synthetic membrane at high pressure. The process is commonly used and is TRL 9. The membrane rejects charged molecules (i.e., ions) such as sulfate and dissolved metals while it permits passage of non charged molecules, primarily (H_2O). RO membranes rejects virtually all molecules, while nano filtration membranes only rejects larger divalent molecules such as sulphate, calcium, and magnesium.

Membrane filtration produces two streams, namely a clean permeate (water that passes through the membrane) and a brine solution that contains the dissolved constituents that are rejected by the membrane. Typically, 70% to 85% of feed water is recovered as clean permeate, while 15% to 25% of the feed water volume and up is in the brine stream.

Figure 4-10 shows a schematic of a membrane filtration and HDS lime treatment process.

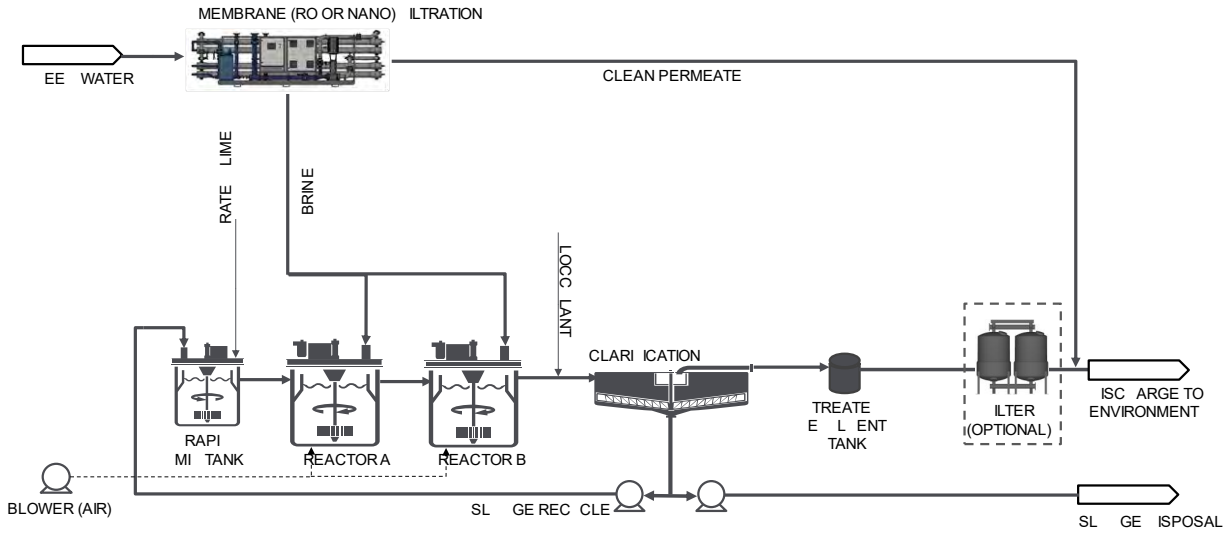


Figure 4-10 Schematic of a Membrane Filtration and HDS Lime Treatment Process

Feed water would be pumped to the membrane filtration unit, which would produce clean permeate and a brine stream. The feed water would likely require pretreatment such as multimedia and cartridge filtration before it can be processed by the membrane filter (pretreatment not shown on Figure 4-10). The brine solution would be pumped to the HDS lime treatment plant and treated as described above. The final plant discharge would be the combined effluent from the lime treatment process and the clean membrane permeate.

Membrane filtration ahead of HDS lime treatment is not commonly used to treat water at operating mines, but it is becoming more common as effluent quality limits are tightened to an extent where conventional treatment processes are inadequate. Advantages of the membrane and HDS process over an ‘ S only’ process include:

- Better performance in terms of copper removal (effluent with lower concentrations).
- An ability to remove some sulphate (a POC) because of the pre-concentration stage.

Disadvantages include:

- A more complex process that would be more prone to upsets and down-time.
- Higher capital and operating costs and greater energy demand and greenhouse gas emissions.

Since the membrane filtration and HDS process consists of two conventional technologies and since the process can remove all metal POCs it was considered to be potentially **feasible** and was advanced for further evaluation.

4.3.5 Membrane Filtration and Sulphide Precipitation

This process is identical to the process discussed in Section 4.3.2 but it includes a membrane pre-concentration process like the one discussed in the previous section (Section 4.3.4). Sulphide precipitation was rejected as a stand-alone process because of its inability to remove the already

low concentrations of metal POCs in untreated discharge from the Tenas Project. However, with the addition of a membrane pre-concentration step, POCs could be removed to levels below 80% of the WQG. Therefore, the process was considered to be **potentially feasible**.

4.3.6 Membrane Filtration and Ferric Co-precipitation

This process is identical to the process discussed in Section 4.3.3, but it includes a membrane pre-concentration process like the one discussed in Section 4.3.4. Iron co-precipitation was rejected as a stand-alone process because of its inability to remove the already low concentrations of molybdenum in untreated discharge from the Tenas Project. However, with the addition of a membrane pre-concentration step, molybdenum could be removed to levels below 80% of the WQG. Therefore, the process was considered to be **potentially feasible**.

4.3.7 Ion Exchange, Selenium Removal

Ion exchange (IX) is a process that removes dissolved ions from solution by adsorption onto a fixed media. The media is a synthetic resin made of polymers with functional groups that have specific affinity for certain ions (example in Figure 4-11). The process works by passing process water through columns with IX resin where the target constituent is adsorbed by displacing an inert ion such as sodium, chloride, or sulphate. IX resins are available in an anionic form that removes negatively charged molecules and in a cationic form that removed positively charged ions. It is a proven process with TRL 9.

Figure 4-11 Ion Exchange Resin

Selenium could be removed using an anionic ion exchange resin with affinity for selenate (SeO_4^{2}). Over time, the IX resin becomes saturated and is then regenerated using solutions with high concentrations of ions that can displace the adsorbed selenate. In the anionic IX process a solution of concentrated sodium sulphate can be used to displace the adsorbed selenate ions. The spent regenerant solution would subsequently be treated to remove the captured selenate or copper.

An approach to regenerating selenate-containing regenerant using electrochemical reduction has been commercialized in recent years[2] and is currently at a TRL of 8 (Figure 4-12).

IX plants require several ancillary services and facilities, including:

- A reliable source of power.
- Fresh water for reagent make-up.
- Reagent storage and a laboratory for influent and effluent analysis, and
- A facility or repository for permanent disposal of sludge.

Advantages associated with IX treatment of discharge include:

- High degree of process control and reliable performance.

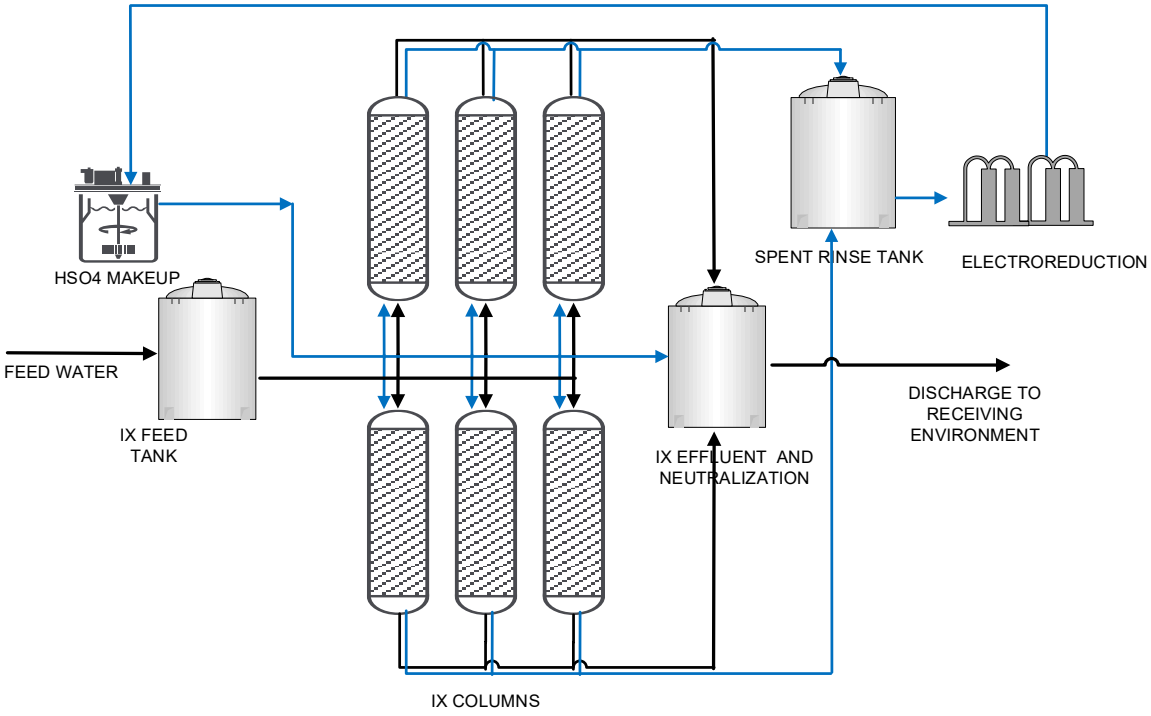


Figure 4-12 Simplified Schematic of an Ion Exchange Process for Removal of Selenium

Disadvantages include:

- The process requires constant or frequent operator attention.
- Sludge must be managed on an ongoing basis.
- The risk of operator exposure to, or spills of hazardous treatment reagents.

[2] https://www.bqewater.com/technology-solutions/selenium/

- The ion exchange process is more complex and more difficult to operate than other active water treatment processes such as sulphide or lime treatment.
- Capital and operating costs are relatively high compared to source control or semi-passive options.
- Energy requirements and greenhouse gas emissions are relatively high compared to source control or semi-passive options.

Because of the complexity of ion exchange for removal of selenium and because this would be the only POC that would be removed by the process, it was considered to be **not feasible** for the Tenas Project.

4.3.8 Ion Exchange, Metal Removal

Removal of metals using ion exchange is like the process described for removal of selenium in Section 4.3.7. However, instead of using an anionic exchange resin, a cationic resin is used, and the resin is regenerated using a dilute acid solution or a salt solution such as sodium chloride. Metals can be removed from the spent regenerant relatively easily by treating it with lime or sulphide. Ion exchange is not commonly used in the mining industry, but it is used in industrial treatment applications, particularly in cases where effluent with extremely low metal concentrations must be produced. Because the use of ion exchange for metal removal is a proven process and simpler than ion exchange for selenium removal it was considered **potentially feasible** for implementation for the Tenas Project. The technology is TRL 9.

4.3.9 Ion Exchange, Sulphate Removal

Removal of sulphate using ion exchange is but the process is inefficient and complex and there are no full-scale plant in operations at mines anywhere in the world. Therefore, the process was considered to be **not feasible** for the Tenas Project.

4.3.10 Electrocoagulation

Electrocoagulation is implemented by passing process water through electrochemical cells where an electrical current is applied across immersed anodes and cathodes. At the anode, which typically consists of iron or aluminum metal, metals are oxidized to soluble ions. At the cathode, water is hydrolyzed to hydroxide ions and hydrogen gas.

In the overall process, the oxidized iron or aluminum precipitate as hydroxides and can therefore be removed in subsequent solid-liquid separation step that usually involves settling or clarification and filtration. When iron is used as anode material, the process is similar to ferric co-precipitation process described in Section 4.3.3.

Electrocoagulation can be a useful process for removing suspended solids and some metals but is it unable to produce effluent with POC concentrations that are lower than 80% of the WQGs. Since most POCs in untreated effluent for the Tenas Project are already low, electrocoagulation would not be able to improve the quality of the effluent and was therefore considered to be **not feasible**.

4.3.11 Membrane Filtration and Electrocoagulation

The addition of a membrane filtration stage upstream of the electrocoagulation is also considered to be a **not feasible** since electrocoagulation is poorly suited for removing POC to low concentrations.

4.3.12 Anaerobic Biological Treatment (with or without Membrane Filtration)

Anaerobic biological treatment works by dosing a source of degradable organic carbon to the mine water as it is pumped to a bioreactor filled with a solid but porous media. The organic carbon stimulates growth of microorganisms, which consume dissolved oxygen and begin to reduce oxygen-containing constituents. The dose of organic carbon determine the extent to which oxidized constituents are reduced. Mildly to moderately reducing conditions will convert nitrate (NO_3^-) to nitrogen gas and selenate (SeO_4^{2-}) to selenite (SeO_3^{2-}) or elemental selenium, while strongly reducing conditions will also reduce sulphate (SO_4^{2-}) to sulphide (S^{2-}). The technology is TRL 9.

Figure 4-13 shows a simplified schematic of an anaerobic biological treatment process. Feed water is pumped to the anaerobic bioreactor where organic carbon and nutrients are added. The bioreactor provide sufficient residence time for anaerobic microbes to degrade the organic carbon and complete the reduction process. A post treatment stage consisting of an aerobic bioreactor that removes residual organic carbon and reduced species produced by the anaerobic bioreactor (such as sulphides) treats the effluent from the anaerobic bioreactor. A solid-liquid separation step such as a clarifier, pond and/or filter may be required to remove residual biosolids. From the post treatment stage, the treated water flows to an effluent tank and from there it is discharged to the receiving environment.

Anaerobic bioreactors require a number of ancillary services and facilities, including:

- A reliable source of power and fresh water.
- Reagent storage and a laboratory for influent and effluent analysis, and
- A facility or repository for permanent disposal of spent reactor media and sludge.

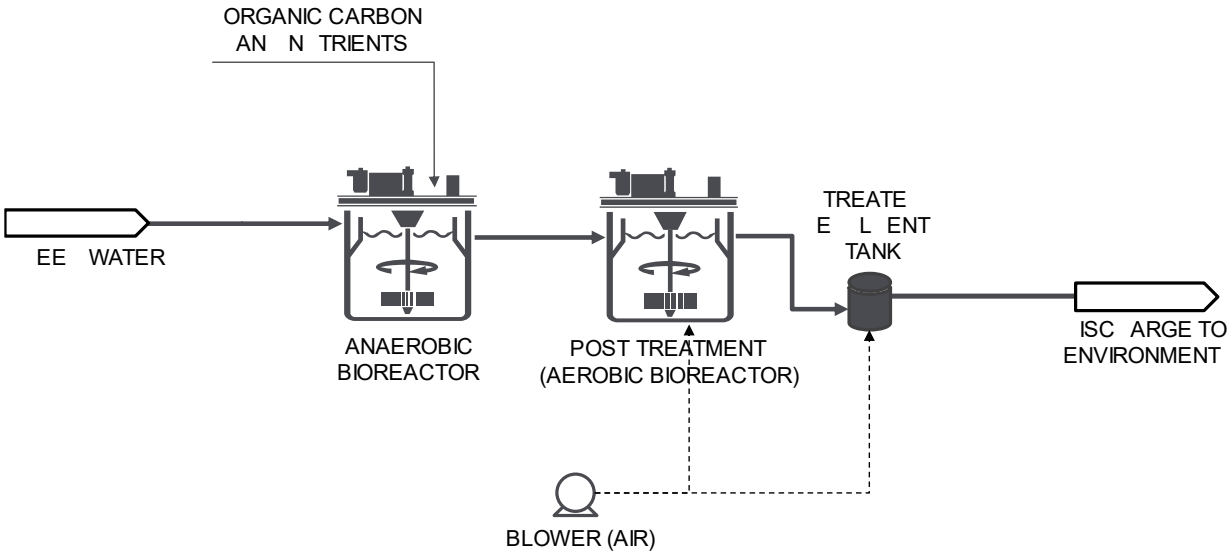


Figure 4-13 Simplified Schematic of an Anaerobic Biological Treatment Process

Advantages associated with anaerobic biological treatment of discharge from SW38/SW63 include:

- High degree of process control and reliable performance.

Disadvantages include:

- The process requires constant or frequent operator attention.
- Sludge must be managed on an ongoing basis.
- The risk of operator exposure to, or spills of hazardous treatment reagents.
- Capital and operating costs are relatively high compared to source control or semi-passive options.
- Energy requirements and greenhouse gas emissions are relatively high compared to source control or semi-passive options.

Anaerobic bioreactor processes are both common and conventional processes for removal or selenium and nitrate from mine water. For nitrate removal, it is only process in common use. If anaerobic biological treatment were to be implemented for the Tenas Project both nitrate and selenium would be targeted by the process. However, conventional anaerobic biological treatment would likely not be able to remove the selenium concentrations in untreated effluent that are generally projected to be less than 0.020 mg/L and often less than 0.010 mg/L. Anaerobic biological treatment can generally only be relied upon to achieve a selenium concentration of 0.010 mg/L. Therefore, a membrane filtration stage would be required to pre-concentrate the untreated discharge before it is treated by the anaerobic biological.

Accordingly, implementation of an anaerobic biological process was considered to be **not feasible** as a standalone process but potentially **feasible** if combined with a membrane filtration process.

4.3.13 Zero Liquid Discharge (ZLD) process

The zero liquid discharge process uses mechanical and thermal energy to concentrate POCs in successive stages until a dry salt is produced. Figure 4-14 shows a schematic of the process.

First, mine water is pre-treated before it is pumped to a membrane filtration unit (RO or Electrodialysis Reversal (EDR)). Brine produced by the membrane filtration is pumped to an evaporator that produces a saline slurry, which in turn is passed on to a crystallizer that evaporates remaining water and produces a dry salt. The salt is highly soluble and must therefore be disposed in a facility that can maintain it dry (i.e., it must be entombed by synthetic liners, buried in barrels, cast in cement, or similar disposal methods). Disposal of the soluble salt by-product produced by the process is a major draw-back. ZLD is considered to be a mature technology and is therefore TRL 9.

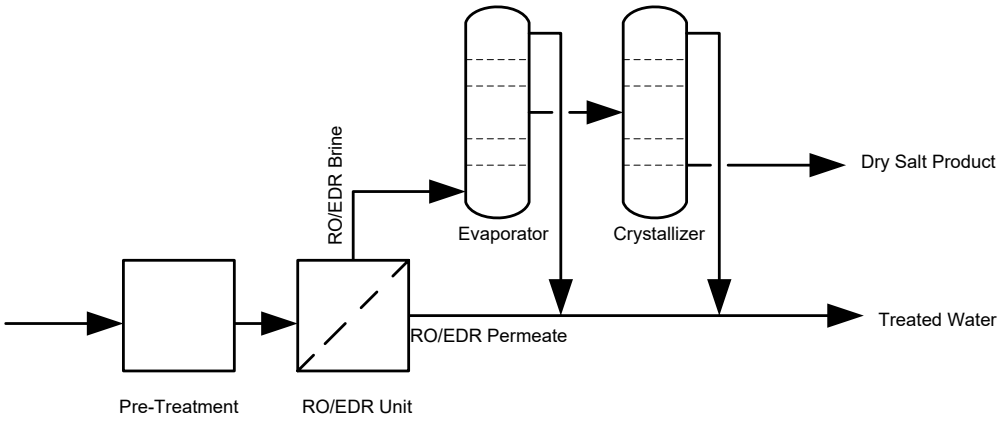


Figure 4-14: Schematic of Membrane Concentration followed by Mechanical Evaporation

The process is rarely used in the mining industry because of the high capital and operating costs and because of the very high power demand. However, it can be the only option available if a POC such as chloride has to be removed.

In spite of the disadvantages, the ZLD process was deemed to be **potentially feasible** for treating discharges from the Tenas Project since it theoretically could reduce all POCs to levels well below the WQGs.

4.3.14 Ettringite Precipitation

In the ettringite precipitation process, sulphate ions are precipitated as $Ca_6Al_2(SO_4)_3(OH)_{12}\cdot 26H_2O$ by adding calcium hydroxide and aluminum hydroxide to the process water. The process reliably removes sulphate and also dissolved metals because of the high pH used in the precipitation process. However, the process has never been implemented at an industrial scale. One reason for the lack of commercialization is the prohibitively high cost of the aluminum reagent required for the precipitation process. Efforts at recovering and recycling the aluminum have been made by various water treatment companies over the years but none have succeeded. The process was judged to be **not feasible** principally because of the fact that it has never been commercialized and is considered to be TRL 6 or 7.

4.3.15 Biological Sulphate Reduction

Biological sulphate reduction removes sulphate by converting it into hydrogen sulphide gas, which can subsequently be converted to elemental sulphur. In addition, the process is likely to remove most other POCs. The process has been implemented at full scale and is therefore TRL 8 or 9.

The anaerobic bioreactor process involves the following steps: first, the intake water undergoes settling and/or filtration to remove suspended solids. Next, the water is heated to a temperature between 20 to 30 degrees C. The anaerobic processes do occur at lower temperature, but the rates are slower, which means that reactors have to be much larger. After heating, the water is passed to the anaerobic reactors where a source of organic carbon (or electron donor) such as acetate or methanol is added. The sulphate reducing bacteria in the reactor feed on the carbon and converts sulphate to hydrogen sulphide gas (H_2S) as follows:

SO_4^{2-} + 8 e- (organic carbon) + 10 H^+ → H_2S (gas) + 4 H_2O

Hydrogen sulphide gas is highly reactive and toxic, so it must be converted to elemental sulphur, a grey or yellow solid, using an oxidation reactor. In addition, the water treated in the anaerobic bioreactor must subsequently be treated in an aerobic bioreactor that removes residual organic carbon not consumed in the anaerobic reactor.

Ordinarily, selenium is also removed in an anaerobic bioreactor. However, when a reactor is operated at conditions that reduces sulphate, selenium can form soluble selenide (Se^{2-}) ions or organo-selenium compounds. Such compounds can be more toxic and bioaccumulate more readily than selenate (SeO_4^{2-}), which is the species typically found in normal surface water. Therefore, an additional treatment step may be required to remove residual reduced selenium species.

Worldwide, there are very few examples of anaerobic bioreactors specifically designed to remove sulphate. The best (and perhaps only) known example is a plant constructed at the Budel zinc refinery in the Netherlands. Built in 1992, the plant has a capacity of about 300 m^3/hour. The feed for the plant is a contaminated groundwater plume containing about 1,000 mg/L of sulphate and about 100 mg/L of zinc. As such, the plant was constructed to deal with both sulphate and metals contamination.

Because the sulphate reducing biological treatment process is complex and produces hazardous hydrogen sulphide gas it was considered to be **not feasible** for implementation at the Tenas Project.

5 BAT Evaluation and Ranking

5.1 Candidate BAT Scenarios

The technology identification and screening described in Section 4 looked at specific technologies that are capable of targeting specific POCs. Therefore, in order to address most (if not all) POCs, it is necessary to combine candidate BATs into scenarios that can be implemented as comprehensive water treatment solutions.

Table 5-1 lists BAT scenario considered for the Tenas Project. The table indicates which POCs would be addressed by the BATs that were deemed to be potentially feasible and which POCs would not be addressed by each scenario. Scenarios that include active tank-based treatment technologies also require the use of the TCP as a buffer pond for attenuating freshet flows so that the active water treatment processes can operate at a steady rate throughout the open water treatment and discharge season.

Implementation of complete BAT scenarios requires more infrastructure than the stand-alone technologies discussed in Section 4. Figure 5-1 and Figure 5-2 show example flow sheets for implementation of Scenario 3 (Active GBR) and Scenario 5 (Membrane Filtration + Anaerobic Bioreactor + Lime Treatment). In the MAA, it is important that all requirements for implementation of the complete operational scenarios are fairly evaluated.

Table 5-1 Candidate BAT Scenarios for the Tenas Project

Groundwater Discharge

Interception	Description	NO_2/NO_3	Se/Mo	Metals	SO4	POCs Addressed	POCs Not Addressed
Additional Liner	Add additional liner material to further reduce groundwater seepage from ponds.	Go to Surface BAT →					
None	In-situ Active GBR	In-situ Active GBR: NO2, NO3, Al, Fe, Cu, (Se polishing) (not Mo, Co, Ni, Zn)			none	NO2, NO3, Al, Fe, Cu, (Se - polishing)	Mo, Co, Ni, Zn, SO4

Surface Discharge

Scenario	Description	Flow Attenuation	NO_2/NO_3	Se/Mo	Metals	SO4	POCs Addressed	POCs Not Addressed
1	BMPs already planned	None	**No additional source control or water treatment measures beyond BATs already incorporated into the Project design.**				All	No additional removal of POCs.
2	Passive/active flocculation (only)	None	**none**		none except TSS removal (Al and Fe)	none	TSS, Fe, Al	NO2, NO3, Se, Co, Cu, Ni, Zn, Mo, SO4
3	In-situ Active GBR	None	In-situ Active GBR: NO2, NO3, Al, Fe, Cu, (Se polishing) (not Mo, Co, Ni, Zn)			none	NO2, NO3, Al, Fe, Cu, (Se - polishing)	Mo, Co, Ni, Zn, SO4
4	RO + Anaerobic Biological Treatment	**Tenas Control Pond**	RO + anaerobic biological treatment (MBBR, FBR, ABMet, SeHawk): NO2, NO3, Se. (not Cu, Mo)		none except TSS removal (Al and Fe)	none	NO_2, NO_3, Se, Al, Fe	Mo, Co, Cu, Ni, Zn, SO4
5	RO + Anaerobic Biological Treatment + Lime Treatment	**Tenas Control Pond**	RO + anaerobic biological treatment (MBBR, FBR, ABMet, SeHawk): NO2, NO3, Se. (not Mo)		**Lime Treatment:** Al, Co, Cu, Fe, Ni, Zn, SO4		NO_2, NO_3, Se, Al, Co, Cu, Fe, Ni, Zn, SO_4	Mo
6	RO + Anaerobic Biological Treatment + Sulphide Treatment	**Tenas Control Pond**	RO + anaerobic biological treatment (MBBR, FBR, ABMet, SeHawk): NO2, NO3, Se. (not Mo)		**Sulphide Treatment:** Co, Cu, Ni, Zn + TSS removal (Al, Fe)	none	NO_2, NO_3, Se, Al, Co, Cu, Ni, Zn	Mo, SO4
7	RO + Anaerobic Biological Treatment + Ferric Co-precipitation	**Tenas Control Pond**	**RO + anaerobic biological treatment (MBBR, FBR, ABMet, SeHawk):** NO_2, NO_3, Se.		**Ferric Co-precipitation:** Mo + TSS removal (Al, Fe)	none	NO_2, NO_3, Se, Al, Fe, Mo	Co, Cu, Ni, Zn, SO4
8	RO + Anaerobic Biological Treatment + Ion Exchange	**Tenas Control Pond**	**RO + anaerobic biological treatment (MBBR, FBR, ABMet, SeHawk):** NO_2, NO_3, Se.		**Ion Exchange:** Al, Co, Cu, Fe, Ni, Zn.	none	NO2, NO3, Se, Al, Co, Cu, Mo, Fe, Ni, Zn	SO_4
9	Zero Liquid Discharge	**Tenas Control Pond**	Zero Liquid Discharge (ZLD): All POCs				NO2, NO3, Se, Al, Co, Cu, Fe, Ni, Zn, Mo, SO4	none
10	Additional Liner in Water Management Ponds	**Tenas Control Pond**	This options reduces seepage from the water management ponds but increases surface dsicharge by the same volume. Therefore, there is not net POC removal if additional liners are added as a stand-alone BAT				none	NO2, NO3, Se, Al, Co, Cu, Fe, Ni, Zn, Mo, SO4

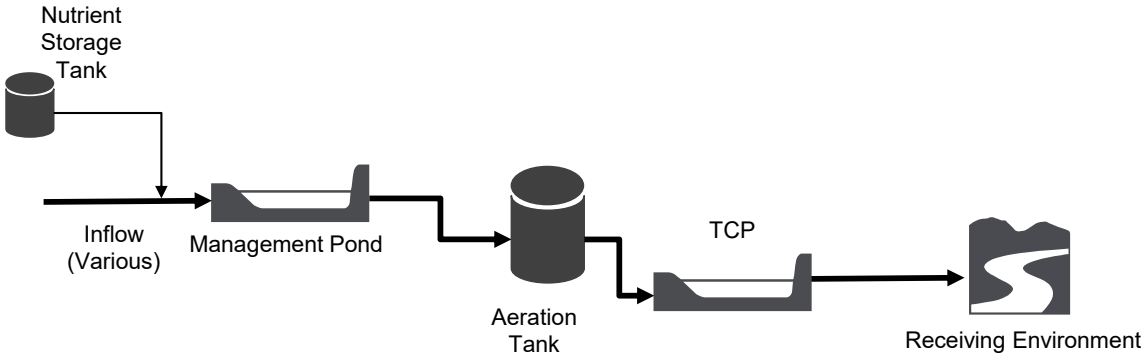


Figure 5-1 Scenario 3: Gravel Bed Reactor

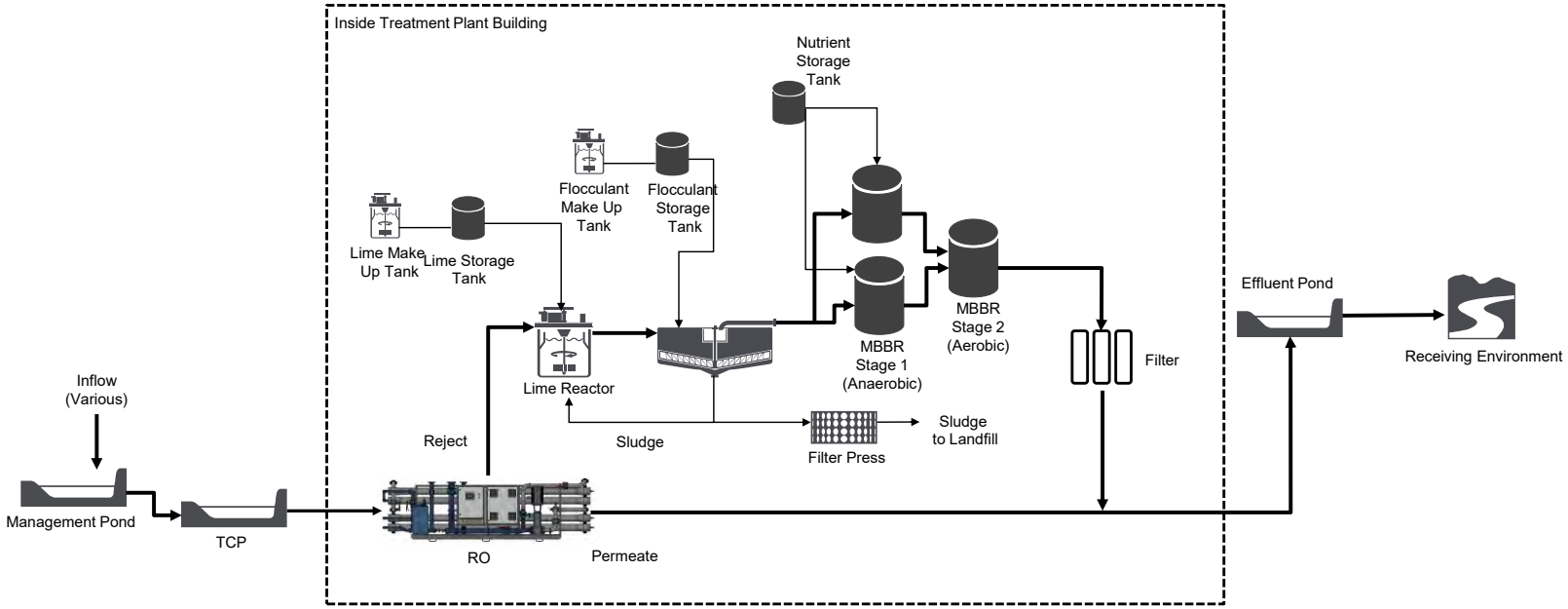


Figure 5-2 Scenario 5: Membrane Filtration + Anaerobic Bioreactor + Lime Treatment

In summary, the following candidate BATs scenarios were advanced for the MAA:

- Modified Liners in Water Management Ponds.
- Passive/Active Flocculation.
- In-situ Active GBR.
- Membrane Filtration + MBBR
- Membrane Filtration + MBBR + HDS Lime
- Membrane Filtration + MBBR + Sulphide
- Membrane Filtration + MBBR + Ferric
- Membrane Filtration + MBBR + Ion Exchange
- Zero Liquid Discharge.

In addition to these, the base case options of that includes the BMPs developed for the Project was also considered in the MAA. Each of the candidate BATs were evaluated according to the criteria provided by BC ENV. The rationales behind the criteria scores are documented in Section 5.2. Ranking of the candidate BATs and selection of the preferred BAT are discussed in Section 5.3.

5.2 Criteria Scoring

5.2.1 Reliability Scores

The reliability account consists of the following criteria: risk, robustness, scalability, and long-term viability. These were scored as follows:

- **Risk**: risks associated with the Base Case that includes all BMPs are likely limited because of the relatively clean untreated water and lack of projected exceedances in the receiving environment.
  - The risk account was scored as follows: a score of 3 due to potentially higher constituent concentrations in the receiving environment (Base Case, Flocculation), hazards associated with sulphide (RP + MMBR + sulphide), and performance uncertainty (Modified Liners)
  - A score of 4 for remaining active water treatment options.
- **Robustness:** refers to consistent and reliable performance under various conditions.
  - Planned source control measures are expected to be robust and were therefore assigned a score of 5, as was Option 10 (additional liners in water management ponds).
  - Passive/active flocculation and in-situ GBR are expected to work well at normal operating conditions but may perform less well at high flow or upset conditions (Score 3).

  - Active water treatment is generally robust, but any mechanical system can potentially fail or malfunction. More complex processes are generally more prone to malfunctions (Score 4 for all except the more complex RO + MMBR + Ion Exchange)).

- **Scalability:** the ability to accommodate increases in flow or loadings.
  - Mechanical treatment plants are generally difficult to scale since all equipment, piping and pumps are designed to accommodate a certain design flow. The more complex a process is the more difficult it is to scale up (Score 3, or 2 for ZLD).
  - Passive/active flocculation can readily be scaled by adding floc stations in more locations and additional liners could be installed in any new pond (Score 5).
  - In-situ GBRs can be scaled by constructing additional ponds (Score 4).
  - Planned source control measures are likely scalable to an expanded operation (Score 4).
- **Long-term viability**: refers to sustainability and performance effectiveness over an extended period.
  - Planned source control measures such as inundating PAG waste rock and construction of low-permeability liners are sustainable and expected to perform well for many decades or centuries with minimal maintenance (Score 5).
  - Likewise, additional liners are expected to perform well long-term (Score 5).
  - Mechanical equipment can be made to operate indefinitely if it is well maintained and replaced at the end of its operating life. However, ongoing maintenance is less sustainable (Score 4).
  - ZLD is less sustainable because it produces a soluble salt that must be entombed in barrels or liners and stored in perpetuity (Score 2).

5.2.2 Control-Effectiveness Scores

Pollutant Reduction was calculated and scored as follows:

- Percent loadings removed of each POC over and above planned source control measures was calculated and weighed by total volume discharged for each candidate BAT option.
- Percent loadings removed was averaged across all POCs to get an overall score.
- Percent loading removal was based on MAXIMUM POC concentrations. Therefore, actual loadings removal percentages are likely to be substantially lower.
- Passive/Active flocculation was assigned an overall loading removal of zero because the extent of TSS removal cannot be quantified reliably (i.e., passive flocculation will remove some TSS, but a definitive removal factor cannot be assigned).

Table nn shows a summary of the pollutant reduction evaluation.

Table 5-2 Pollutant Reduction Calculation Result

POC	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10
Nitrate	0%	0%	78%	89%	89%	89%	89%	89%	89%	0%
Nitrite	0%	0%	81%	91%	91%	91%	91%	91%	91%	0%
Sulphate	0%	0%	0%	0%	40%	0%	0%	0%	70%	0%
Aluminum, total	0%	0%	56%	65%	65%	65%	65%	65%	86%	0%
Cobalt, total	0%	0%	0%	0%	14%	14%	0%	14%	71%	0%
Copper, dissolved	0%	0%	0%	0%	94%	94%	0%	94%	94%	0%
Iron, total	0%	0%	60%	70%	80%	80%	80%	80%	96%	0%
Molybdenum, total	0%	0%	0%	0%	0%	0%	0%	75%	75%	0%
Nickel, dissolved	0%	0%	0%	0%	13%	13%	0%	65%	65%	0%
Selenium, total	0%	0%	78%	93%	93%	93%	93%	93%	93%	0%
Zinc, dissolved	0%	0%	0%	0%	0%	0%	0%	77%	77%	0%
Overall Maximum POC Load Reduction*	0%	0%	29%	34%	48%	45%	35%	66%	80%	0%
Score	**1**	**1**	**2.5**	**2.5**	**3**	**3**	**2.5**	**4**	**4.5**	**1**

Untreated discharge is not expected to be acutely toxic. However, water quality model results indicates that when TSS in untreated effluent is at the maximum proposed concentration (35 mg/L) the total iron concentration could marginally exceed the acute guideline of 1.0 mg/L total iron. Similarly, model results indicates that nitrite concentrations could marginally exceed the acute guideline of 0.06 mg/L nitrite-N.

Both of these acute guideline exceedances are unlikely to occur, but option 1 and 2 were nonetheless given a score of 4.5, while the other options, which all remove iron and nitrite, was given a score of 5.

5.2.3 Environmental Impacts and Socio-Cultural Scores

Sub-accounts were scored as follows:

- **Energy Efficiency**:
  - The base case option (Option 1) that includes various source control measures do not include construction of additional facilities and was therefore given an energy efficiency score of 5. Once installed, additional liners (Option 10) do not consume energy (Score 5).
  - Zero Liquid Discharge process is very energy intensive (~15 kW-hr/m3) and was therefore assigned a score of 1.
  - In-situ active GBR only require energy for aerating the effluent after treatment (Score 4.5)
  - Other active water treatment measures are moderately energy efficient (~4 kW-hr/m3) compared to ZLD and were therefore given a score of 3.5.

- **Greenhouse Gas (GHG) Emission**s:
  - GHG emissions generally follow energy emissions, but emissions associated with treatment reagents must also be taken into account. Option 4 received a slightly better score of 4 because of the lower reagent demand.
  - Installation of additional liners was scored 3.5 because a large volume of bentonite would have to be shipped to site from Kamloops.
- **Foot-print:**
  - Source control (Option 1, base case), passive/active flocculation (Option 2), and additional liners (Option 10) do not require additional foot-print and therefore scored 5.
  - In-situ GBR requires minimal foot-print for installation of aeration equipment (Score 4.5).
  - Most active water treatment options require a sizable foot-print (Score 3).
  - Option 4 is smaller because a clarifier is not required (Score 4).
- **Secondary Waste Production:**
  - Base case, passive/active flocculation, and additional liners scored 5 because of no or negligible secondary waste production.
  - In-situ GBR has nearly no waste production, but the post-treatment aeration could produce some total iron that would settle in the TCP (Score 4.5)
  - RO + MBBR (Option 4) produces biomass and TSS sludge (Score 4)
  - Other active water treatment options score 3, 2.5 or 1 depending on the volume or stability of the secondary waste produced. ZLD produces large volumes of soluble salts that must be disposed of in a hazardous landfill off site and was therefore assigned a score of 1.
- Adherence to Yintah Management Directives:
  - The Office of Wet'suwet'en has provided a document that lays out a series best management practices that should be followed when developing a Project within Yintah.
  - The following is the directive that was deemed most relevant after discussion with the OW and house groups

  “Maintain surface water quantity and quality within the natural range of variability in perpetuity across the Yintah for future generations of Wet’suwet’en people.”
  - Using this information the same scoring use used as pollutant reduction as the technologies that were most effective for pollutant reduction also achieved water quality values closer to the natural baseline conditions

5.2.4 Cost-Effectiveness Scores

The cost effectiveness criteria were scored as follows:

- **Efficient Use of Existing Resources**:
  - The base case (Option 1) and passive/active flocculation uses only existing infrastructure and resources and therefore scored 5.

- Additional liners make use of the planned water management ponds but cannot be constructed from materials on site (bentonite will have to be sourced in Kamloops) (Score 3).
- The in-situ GBR will be imbedded in the design of the water management ponds and require only little equipment in addition to that (i.e., aeration tank). Score 4.
- All active water treatment options require construction of new infrastructure that will consume additional resources (Score 2 or Score 1.5 for ZLD).

Life Cycle Cost Analysis scores were based on 100-year Net Present Value (NPV) discounted at 4%. Table 5-3 lists order-of-magnitude (Class V) NPVs for the options considered along with the associated scores.

Table 5-3 Order-of-Magnitude Cost Estimates and Scores for Candidate BAT Scenarios

		NPV (M$)	Score
Base Case	Option 1	$ -	5
Passive Flocculation	Option 2	$ 1	5
In-situ Active (GBR)	Option 3	$ 12	4.5
RO + MBBR	Option 4	$ 66	3.5
RO + MBBR + HDS Lime	Option 5	$ 100	3
RO + MBBR + Sulphide	Option 6	$ 100	3
RO + MBBR + Ferric	Option 7	$ 100	3
RO + MBBR + Ion Exchange	Option 8	$ 123	2.5
Zero Liquid Discharge	Option 9	$ 285	1
Additional WMP Liners	Option 10	$ 45	4

5.3 MAA Ranking and Preferred BAT

Table 5-4 shows the scoring of short-listed BAT scenarios for the Tenas Project:

- In-situ active GBRs and the base case with BMPs were the highest ranked scenarios (78 points out of a possible 100) followed by passive/active flocculation (77 points).
- The option of modifying management pond liners to reduce seepage scored 73 points and was therefore less preferred than GBR, the base case with BMPs or flocculation.
- All active tank-based water treatment options, with the exception of zero liquid discharge treatment, ranged between 65 and 69 points, with an average of 67 points.
- Zero liquid discharge scored lowest (55 points).

The active tank-based water treatment options generally scored higher for criteria related to control-effectiveness, but scored lower for environmental and socio-cultural criteria, and cost. Overall, the BAT assessment indicated that pump-back of drainages and the base case are about equally preferred with a slight preference for the pump-back option. Tank-based water treatment options, GBRs, flocculation and the base case with BMPs scored similarly for the combined reliability criteria.

5.4 MAA without Cost-Effectiveness Account

Table 5-5 shows the MAA table for the candidate BATs without the Cost-Effectiveness account included (i.e., cost is not considered to be a factor). When the cost-effectiveness account is eliminated from the MAA, all options achieves scores in a similar range with Option 3 (In-situ GBR) and Option 8 (RO + MBBR + Ion Exchange) slightly preferred.

Table 5-4 MAA Assessment of Candidate BAT Scenarios

		Base Case with BMPs	Passive/Active Flocculation	In-situ Active (GBR)	RO + MBBR	RO + MBBR + HDS Lime	RO + MBBR + Sulphide	RO + MBBR + Ferric	RO + MBBR + Ion Exchange	Zero Liquid Discaherge	Modified Liners in Water Management Ponds
Assessment Criterion	**Weight**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Option 6**	**Option 7**	**Option 8**	**Option 9**	**Option 10**
Reliability	**20**	**17**	**16**	**14**	**15**	**15**	**14**	**15**	**14**	**12**	**18**
Risk Assessment	5	3	3	3	4	4	3	4	4	4	3
Robustness	5	5	3	3	4	4	4	4	3	4	5
Scalability	5	4	5	4	3	3	3	3	3	2	5
Long-term Viability	5	5	5	4	4	4	4	4	4	2	5
Control-Effectiveness	**30**	**13**	**13**	**20**	**20**	**22**	**22**	**20**	**26**	**28**	**13**
Pollutant Reduction	20	1	1	2.5	2.5	3	3	2.5	4	4.5	1
Toxicity Reduction	10	4.5	4.5	5	5	5	5	5	5	5	4.5
Environmental & Socio-Cultural Impacts	**25**	**23**	**23**	**22**	**20**	**17**	**17**	**17**	**17**	**10**	**22**
Energy Efficiency	5	5	5	4.5	3.5	3.5	3.5	3.5	3.5	1	5
Greenhouse Gas Emission	6	5	5	4.5	4	3.5	3.5	3.5	3.5	1	3.5
Footprint	4	5	5	4.5	4	3	3	3	3	3	5
Secondary Waste Production	5	5	5	4.5	4	3	3	3	2.5	1	5
Adherence to Yintah Management Directives	5	3	3	4	4	4	4	4	4	4	4
Cost-Effectiveness	**25**	**25**	**25**	**22**	**14**	**12**	**12**	**12**	**12**	**5**	**19**
Efficient Use of Existing Resources	3	5	5	4	2	2	2	2	2	1.5	3
Life Cycle Cost Analysis	22	5	5	4.5	3	2.5	2.5	2.5	2.5	1	4
Total	**100**	**78**	**77**	**78**	**69**	**66**	**65**	**64**	**69**	**55**	**73**

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/BAT Assessment/ Telkwa BAT Tech Screening REV01.xlsx

Table 5-5 MAA Assessment of Candidate BAT Scenarios with Cost-Effectiveness Account Eliminated

		Base Case with BMPs	Passive/Active Flocculation	In-situ Active (GBR)	RO + MBBR	RO + MBBR + HDS Lime	RO + MBBR + Sulphide	RO + MBBR + Ferric	RO + MBBR + Ion Exchange	Zero Liquid Discaherge	Modified Liners in Water Management Ponds
Assessment Criterion	**Weight**	**Option 1**	**Option 2**	**Option 3**	**Option 4**	**Option 5**	**Option 6**	**Option 7**	**Option 8**	**Option 9**	**Option 10**
Reliability	**20**	**17**	**16**	**14**	**15**	**15**	**14**	**15**	**14**	**12**	**18**
Risk Assessment	5	3	3	3	4	4	3	4	4	4	3
Robustness	5	5	3	3	4	4	4	4	3	4	5
Scalability	5	4	5	4	3	3	3	3	3	2	5
Long-term Viability	5	5	5	4	4	4	4	4	4	2	5
Control-Effectiveness	**30**	**13**	**13**	**20**	**20**	**22**	**22**	**20**	**26**	**28**	**13**
Pollutant Reduction	20	1	1	2.5	2.5	3	3	2.5	4	4.5	1
Toxicity Reduction	10	4.5	4.5	5	5	5	5	5	5	5	4.5
Environmental & Socio-Cultural Impacts	**25**	**23**	**23**	**22**	**20**	**17**	**17**	**17**	**17**	**10**	**22**
Energy Efficiency	5	5	5	4.5	3.5	3.5	3.5	3.5	3.5	1	5
Greenhouse Gas Emission	6	5	5	4.5	4	3.5	3.5	3.5	3.5	1	3.5
Footprint	4	5	5	4.5	4	3	3	3	3	3	5
Secondary Waste Production	5	5	5	4.5	4	3	3	3	2.5	1	5
Adherence to Yintah Management Directives	5	3	3	4	4	4	4	4	4	4	4
Cost-Effectiveness	**25**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Efficient Use of Existing Resources	3										
Life Cycle Cost Analysis	22										
Total	**100**	**53**	**52**	**56**	**55**	**54**	**53**	**52**	**57**	**50**	**53**

Source: https://srk.sharepoint.com/sites/NACAPR002055/Internal/BAT Assessment/ Telkwa BAT Tech Screening REV01.xlsx

6 Conclusions

The following was concluded based on the assessment of Best Achievable Technologies for the Tenas Project:

- The base case with BMPs is a highly rated and feasible option for protecting downstream water quality as is.
- TML should consider supplementing the base case BMPs with active in-situ GBRs and flocculation.
- Active tank-based water treatment options are less suitable but feasible and should be retained as contingency options in the event that water quality predictions for the Project differ substantially from actual conditions observed during the development of the mine.
- When the cost-effectiveness account is eliminated from the MAA, all options achieves scores in a similar range with Option 3 (In-situ GBR) and Option 8 (RO + MBBR + Ion Exchange) slightly preferred.

As per the MAA methodology, the preferred BAT is the highest ranked (highest score) scenario. However, the BAT assessment is a conceptual evaluation of technologies based on information and data currently available. If subsequent studies or engineering design identifies limitations or issues that had not been identified as part of the conceptual evaluation, the rank order may change such that the second or third highest ranked BAT becomes the preferred BAT. Alternatively, unexpected benefits of one or more of the ranked BATs that may be discovered as part of subsequent investigations, may cause lower ranked BATs to become preferred BATs.

This report, Tenas Project Best Achievable Technology (BAT) Assessment, was prepared by SRK Consulting (Canada) Inc.,

3 March 2025

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EGBC Permit to Practice: 1003655

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The opinions expressed in this report have been based on the information available to SRK at the time of preparation. SRK has exercised all due care in reviewing information supplied by others for use on this project. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information, except to the extent that SRK was hired to verify the data.

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Appendix A Water Quality Guidelines

Table A-1.1 Water Quality Guidelines for Receiving Water Nodes

Receiving Environment		Tenas Creek		Four Creek		Goathorn Creek		Telkwa River		Bulkley River	
Parameter	**Units**	**Selected for FEAC**	**Rationale**	**Selected for FEAC**	**Rationale**	**Selected for FEAC**	**Rationale**	**Selected for FEAC**	**Rationale**	**Selected for FEAC**	**Rationale**
Alkalinity	mg CaCO3/L										
Ammonia, total	mg-N/L	1.3	Used BC AWQG	0.992	Used BC AWQG	1.56	Used BC AWQG	1.66	Used BC AWQG	1.6	Used BC AWQG
Chloride	mg/L	150	Used BC AWQG	150	Used BC AWQG	150	Used BC AWQG	150	Used BC AWQG	150	Used BC AWQG
Fluoride	mg/L	1.22	Used BC AWQG	1.37	Used BC AWQG	1.19	Used BC AWQG	0.99	Used BC AWQG	0.84	Used BC AWQG
Nitrate	mg-N/L	3	Used BC AWQG	3	Used BC AWQG	3	Used BC AWQG	3	Used BC AWQG	3	Used BC AWQG
Nitrite	mg-N/L	0.02	Used BC AWQG	0.02	Used BC AWQG	0.02	Used BC AWQG	0.02	Used BC AWQG	0.02	Used BC AWQG
Sulphate	mg/L	218	Used BC AWQG	309	Used BC AWQG	218	Used BC AWQG	218	Used BC AWQG	128	Used BC AWQG
Aluminum, total	mg/L	0.35	Used BC AWQG	0.69	Used BC AWQG	0.27	Used BC AWQG	0.19	Used BC AWQG	0.18	Used BC AWQG
Antimony, total	mg/L	0.072	Used BC AWQG	0.072	Used BC AWQG	0.072	Used BC AWQG	0.072	Used BC AWQG	0.072	Used BC AWQG
Arsenic, total	mg/L	0.005	Used BC AWQG	0.005	Used BC AWQG	0.005	Used BC AWQG	0.005	Used BC AWQG	0.005	Used BC AWQG
Barium, total	mg/L	1	No AWQG, Used WWQG	1	No AWQG, Used WWQG	1	No AWQG, Used WWQG	1	No AWQG, Used WWQG	1	No AWQG, Used WWQG
Beryllium, total	mg/L	0.00013	No AWQG, Used WWQG	0.00013	No AWQG, Used WWQG	0.00013	No AWQG, Used WWQG	0.00013	No AWQG, Used WWQG	0.00013	No AWQG, Used WWQG
Boron, total	mg/L	1.2	Used BC AWQG	1.2	Used BC AWQG	1.2	Used BC AWQG	1.2	Used BC AWQG	1.2	Used BC AWQG
Cadmium, dissolved	mg/L	0.00017	Used BC AWQG	0.00023	Used BC AWQG	0.00016	Used BC AWQG	0.00011	Used BC AWQG	0.00009	Used BC AWQG
Chromium (Cr(VI)), total	mg/L	0.0025	No AWQG, Used WWQG	0.0025	No AWQG, Used WWQG	0.0025	No AWQG, Used WWQG	0.0025	No AWQG, Used WWQG	0.0025	No AWQG, Used WWQG
Cobalt, total	mg/L	0.004	Used BC AWQG	0.004	Used BC AWQG	0.004	Used BC AWQG	0.004	Used BC AWQG	0.004	Used BC AWQG
Copper, dissolved	mg/L	0.0026	Used BC AWQG	0.0047	Used BC AWQG	0.0013	Used BC AWQG	0.0008	Used BC AWQG	0.0011	Used BC AWQG
Iron, total	mg/L	1	Used BC Acute WQG	1	Used BC Acute WQG	1	Used BC Acute WQG	1	Used BC Acute WQG	1	Used BC Acute WQG
Iron, dissolved	mg/L	0.35	Used BC Acute WQG	0.35	Used BC Acute WQG	0.35	Used BC Acute WQG	0.35	Used BC Acute WQG	0.35	Used BC Acute WQG
Lead, total	mg/L	0.0055	Used BC AWQG	0.0069	Used BC AWQG	0.0053	Used BC AWQG	0.0044	Used BC AWQG	0.0040	Used BC AWQG
Manganese, total	mg/L	0.94	Used BC AWQG	1.09	Used BC AWQG	0.91	Used BC AWQG	0.79	Used BC AWQG	0.73	Used BC AWQG
Mercury, total	mg/L	0.00002	Used BC AWQG	0.00002	Used BC AWQG	0.00002	Used BC AWQG	0.00002	Used BC AWQG	0.00002	Used BC AWQG
Molybdenum, total	mg/L	0.034	Used BC ruminant wildlife guideline	0.034	Used BC ruminant wildlife guideline	0.034	Used BC ruminant wildlife guideline	0.034	Used BC ruminant wildlife guideline	0.034	Used BC ruminant wildlife guideline
Nickel, dissolved	mg/L	0.003	Used BC AWQG	0.005	Used BC AWQG	0.002	Used BC AWQG	0.001	Used BC AWQG	0.001	Used BC AWQG
Selenium, total	mg/L	0.002	Used BC AWQG	0.002	Used BC AWQG	0.002	Used BC AWQG	0.002	Used BC AWQG	0.002	Used BC AWQG
Silver, total	mg/L	0.00005	Used BC AWQG	0.0015	Used BC AWQG	0.00005	Used BC AWQG	0.00005	Used BC AWQG	0.00005	Used BC AWQG
Strontium, dissolved	mg/L	2.5	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life	2.5	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life	2.5	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life	2.5	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life	2.5	No BC AWQG or WWQG, Used ECCC FEQG for Aquatic Life
Thallium, total	mg/L	0.0008	No AWQG, Used WWQG	0.0008	No AWQG, Used WWQG	0.0008	No AWQG, Used WWQG	0.001	No AWQG, Used WWQG	0.001	No AWQG, Used WWQG
Uranium, total	mg/L	0.0085	No AWQG, Used WWQG	0.0085	No AWQG, Used WWQG	0.0085	No AWQG, Used WWQG	0.0085	No AWQG, Used WWQG	0.0085	No AWQG, Used WWQG
Zinc, dissolved	mg/L	0.0071	Used BC AWQG	0.0139	Used BC AWQG	0.0074	Used BC AWQG	0.0042	Used BC AWQG	0.0039	Used BC AWQG

Notes: BC AWQG = Approved BC Water Quality Guidelines for Aquatic Life; BC WWQG = WORKING BC Water Quality Guidelines for Aquatic Life; ECCC FEQG = Environment Canada Federal Environmental Quality Guidelines

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[Telkwa_BAT_assessment_BCWQGused_26062024.xlsx]WQG_table

Table A-1.2 Parameters to calculate Water Quality Guidelines for Receiving Water

Receiving Environment		Tenas Creek	Four Creek	Goathorn Creek	Telkwa River	Bulkley River
Parameter	**Units**	**P50**	**P50**	**P50**	**P50**	**P50**
Temperature	degC	3	3	5	5	9
pH	pH unit	8.1	8.3	7.9	7.8	7.7
Hardness	mg-$CaCO_3$/L	73	110	69	37	27
Chloride	mg/L	0.25	0.25	0.25	0.25	0.25
Dissolved Organic Carbon		2.5	8	2	1.6	2.2

Table A-2.1 TCP surface discharge (operations), NMP surface discharge (closure) - POCs

		TCP surface discharge (operations), NMP surface discharge (closure) - POCs						
		Goathorn creek (WQSEA1)				POCs selection		
Parameter	Units	Baseline P50	Baseline P95	WQG	80% WQG	Max TCP discharge - Normal ST	Max NMP discharge -Normal ST	Exceeds at EA1? - Normal ST
Ammonia, total	mg-N/L	0.0025	0.0070	1.6	1.3	1.1	0.093	0.020
Chloride	mg/L	0.25	0.50	150	120	6.6	3.1	0.86
Fluoride	mg/L	0.032	0.041	1.2	0.96	0.15	0.031	0.050
Nitrate	mg-N/L	0.041	0.076	3.0	2.4	8.1	0.66	0.17
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.016	0.19	0.015	0.0041
Sulphate	mg/L	24	37	220	180	420	230	62
Aluminum, total	mg/L	0.092	0.75	0.27	0.22	0.39	0.39	0.19
Antimony, total	mg/L	0.000073	0.00014	0.074	0.059	0.00079	0.00043	0.00013
Arsenic, total	mg/L	0.00023	0.00068	0.0050	0.0040	0.0018	0.00090	0.00044
Barium, total	mg/L	0.058	0.072	1.0	0.80	0.080	0.025	0.076
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0.000061	0.000015	0.000060
Boron, total	mg/L	0.0050	0.050	1.2	0.96	0.13	0.14	0.029
Cadmium, dissolved	mg/L	0.0000081	0.000036	0.00016	0.00013	0.000032	0.0000054	0.000016
Chromium (Cr(VI)), total	mg/L	0.00020	0.00091	0.0025	0.0020	0.0020	0.0013	0.00053
Cobalt, total	mg/L	0.000050	0.00055	0.0040	0.0032	0.0035	0.0013	0.00039
Copper, dissolved	mg/L	0.0014	0.0039	0.0013	0.0010	0.0017	0.0022	0.0021
Iron, total	mg/L	0.085	0.78	1.0	0.80	1.5	1.5	0.43
Iron, dissolved	mg/L	0.015	0.13	0.35	0.28	0.036	0.0080	0.025
Lead, total	mg/L	0.000025	0.00023	0.0053	0.0042	0.0016	0.0010	0.00021
Manganese, total	mg/L	0.0059	0.033	0.91	0.73	0.061	0.030	0.012
Mercury, total	mg/L	0.0000025	0.0000064	0.000020	0.000016	0.0000085	0.0000046	0.0000040
Molybdenum, total	mg/L	0.00047	0.00062	0.034	0.027	0.035	0.0077	0.0022
Nickel, dissolved	mg/L	0.00025	0.0011	0.0022	0.0018	0.0060	0.0023	0.00065
Selenium, total	mg/L	0.000086	0.00020	0.0020	0.0016	0.024	0.0082	0.0015
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000040	0.000027	0.0000084	0.000012
Strontium, dissolved	mg/L	0.076	0.11	2.5	2.0	0.28	0.25	0.14
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.000076	0.000017	0.000014
Uranium, total	mg/L	0.000054	0.00014	0.0085	0.0068	0.0047	0.0025	0.00049
Zinc, dissolved	mg/L	0.0015	0.0021	0.0074	0.0059	0.0098	0.0019	0.0021

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20241210.xlsx]COCs selection

Table A-2.2 MP seepage - POCs

		MP seepage - POCs					
		Four creek (WQS03_DS)				POCs selection	
Parameter	**Units**	**Baseline P50**	**Baseline P95**	**WQG**	**80% WQG**	**Max EMP - Normal ST**	**Exceeds at WQS03_DS? - Normal ST**
Ammonia, total	mg-N/L	0.0025	0.0092	0.99	0.79	0.28	0.050
Chloride	mg/L	0.25	0.50	150	120	1.6	0.47
Fluoride	mg/L	0.059	0.068	1.4	1.1	0.027	0.10
Nitrate	mg-N/L	0.013	0.058	3.0	2.4	2.2	0.38
Nitrite	mg-N/L	0.00050	0.0010	0.020	0.016	0.050	0.0095
Sulphate	mg/L	1.9	28	310	250	200	33
Aluminum, total	mg/L	0.099	1.2	0.69	0.55	0.018	0.26
Antimony, total	mg/L	0.000050	0.00012	0.074	0.059	0.00018	0.000087
Arsenic, total	mg/L	0.00074	0.0011	0.0050	0.0040	0.00037	0.0013
Barium, total	mg/L	0.071	0.13	1.0	0.80	0.032	0.16
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0.000027	0.000086
Boron, total	mg/L	0.012	0.020	1.2	0.96	0.032	0.019
Cadmium, dissolved	mg/L	0.0000052	0.000012	0.00023	0.00018	0.000059	0.000013
Chromium (Cr(VI)), total	mg/L	0.00026	0.0016	0.0025	0.0020	0.00023	0.00052
Cobalt, total	mg/L	0.000050	0.00047	0.0040	0.0032	0.0035	0.00068
Copper, dissolved	mg/L	0.0014	0.0034	0.0047	0.0038	0.00098	0.0024
Iron, total	mg/L	0.095	1.1	1.0	0.80	0.080	0.24
Iron, dissolved	mg/L	0.015	0.41	0.35	0.28	0.080	0.052
Lead, total	mg/L	0.000025	0.00028	0.0069	0.0055	0.00027	0.000065
Manganese, total	mg/L	0.0025	0.024	1.1	0.88	0.064	0.013
Mercury, total	mg/L	0.0000025	0.000013	0.000020	0.000016	0.0000030	0.0000052
Molybdenum, total	mg/L	0.00023	0.00038	0.034	0.027	0.0075	0.0012
Nickel, dissolved	mg/L	0.00025	0.0018	0.0047	0.0038	0.0053	0.0011
Selenium, total	mg/L	0.000025	0.000095	0.0020	0.0016	0.0051	0.00081
Silver, total	mg/L	0.0000050	0.000022	0.0015	0.0012	0.000010	0.0000087
Strontium, dissolved	mg/L	0.17	0.24	2.5	2.0	0.17	0.32
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.000074	0.000020
Uranium, total	mg/L	0.000078	0.00025	0.0085	0.0068	0.00096	0.00019
Zinc, dissolved	mg/L	0.0015	0.0025	0.014	0.011	0.0073	0.0026

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20241210.xlsx]COCs selection

Table A-2.3 MP seepage - POCs

		MP seepage - POCs							
		Tenas Creek (WQS04)				POCs selection			
Parameter	Units	Baseline P50	Baseline P95	WQG	80% WQG	Max NMP - Normal ST	Max WMP - Normal ST	Max TCP - Normal ST	Exceeds at WQS04? Normal ST
Ammonia, total	mg-N/L	0.0025	0.0074	1.3	1.0	0.19	0.37	1.1	0.031
Chloride	mg/L	0.25	0.50	150	120	2.3	3.2	6.6	0.52
Fluoride	mg/L	0.031	0.045	1.2	0.96	0.043	0.033	0.15	0.055
Nitrate	mg-N/L	0.0050	0.060	3.0	2.4	1.5	2.9	8.1	0.24
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.016	0.034	0.066	0.19	0.0060
Sulphate	mg/L	2.6	7.4	220	180	240	250	420	24
Aluminum, total	mg/L	0.056	1.8	0.35	0.28	0.022	0.021	0.018	0.11
Antimony, total	mg/L	0.00013	0.00024	0.074	0.059	0.00033	0.00046	0.00079	0.00022
Arsenic, total	mg/L	0.00048	0.00090	0.0050	0.0040	0.00065	0.00042	0.0013	0.00068
Barium, total	mg/L	0.034	0.047	1.0	0.80	0.059	0.024	0.074	0.054
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0.000058	0.000018	0.000061	0.000068
Boron, total	mg/L	0.015	0.050	1.2	0.96	0.10	0.14	0.13	0.028
Cadmium, dissolved	mg/L	0.0000025	0.0000058	0.00017	0.00014	0.000082	0.000055	0.000032	0.0000069
Chromium (Cr(VI)), total	mg/L	0.00032	0.0018	0.0025	0.0020	0.00035	0.00020	0.00077	0.00054
Cobalt, total	mg/L	0.000050	0.00099	0.0040	0.0032	0.0040	0.0042	0.0028	0.00034
Copper, dissolved	mg/L	0.0011	0.0030	0.0026	0.0021	0.0017	0.0023	0.0017	0.0015
Iron, total	mg/L	0.048	1.2	1.0	0.80	0.11	0.063	0.036	0.068
Iron, dissolved	mg/L	0.015	0.14	0.35	0.28	0.11	0.063	0.036	0.028
Lead, total	mg/L	0.000025	0.00039	0.0055	0.0044	0.00045	0.00060	0.0012	0.000070
Manganese, total	mg/L	0.0050	0.058	0.94	0.75	0.079	0.074	0.036	0.0084
Mercury, total	mg/L	0.0000025	0.0000089	0.000020	0.000016	0.0000046	0.0000023	0.0000054	0.0000041
Molybdenum, total	mg/L	0.00012	0.00019	0.034	0.027	0.0100	0.0084	0.035	0.00084
Nickel, dissolved	mg/L	0.00025	0.0017	0.0025	0.0020	0.0065	0.0056	0.0060	0.00068
Selenium, total	mg/L	0.000051	0.00020	0.0020	0.0016	0.0069	0.0082	0.024	0.00078
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000040	0.000017	0.0000094	0.000027	0.000014
Strontium, dissolved	mg/L	0.11	0.13	2.5	2.0	0.24	0.27	0.28	0.14
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.00010	0.000067	0.000076	0.000016
Uranium, total	mg/L	0.00011	0.00025	0.0085	0.0068	0.0019	0.0026	0.0047	0.00034
Zinc, dissolved	mg/L	0.0015	0.0015	0.0071	0.0057	0.0092	0.0071	0.0098	0.0019

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20241210.xlsx]COCs selection

Table A-2.4 Rail Load Out - POCs

		Rail Load Out - POCs							
		Bulkley River (WQS11)				POCs selection			
Parameter	Units	Baseline P50	Baseline P95	WQG	80% WQG	Max RLO discharge - Normal ST	Exceeds at WQS11? - Normal ST	Max RLO discharge - High ST	Exceeds at WQS11? - High ST
Ammonia, total	mg-N/L	0.0025	0.0074	1.6	1.3	0	0.0052	0	0.0052
Chloride	mg/L	0.25	0.50	150	120	0.080	0.26	2.3	0.26
Fluoride	mg/L	0.031	0.045	0.84	0.67	0	0.031	0	0.031
Nitrate	mg-N/L	0.0050	0.060	3.0	2.4	0	0.014	0	0.014
Nitrite	mg-N/L	0.00050	0.0020	0.020	0.016	0	0.0052	0	0.0052
Sulphate	mg/L	2.6	7.4	130	100	68	4.8	1600	4.8
Aluminum, total	mg/L	0.056	1.8	0.18	0.14	0.37	0.15	0.37	0.15
Antimony, total	mg/L	0.00013	0.00024	0.074	0.059	0.0000054	0.000052	0.00012	0.000052
Arsenic, total	mg/L	0.00048	0.00090	0.0050	0.0040	0.00051	0.00031	0.00062	0.00031
Barium, total	mg/L	0.034	0.047	1.0	0.80	0.012	0.031	0.14	0.031
Beryllium, total	mg/L	0.000050	0.00010	0.00013	0.00010	0	0.000052	0	0.000052
Boron, total	mg/L	0.015	0.050	1.2	0.96	0.0083	0.0052	0.18	0.0052
Cadmium, dissolved	mg/L	0.0000025	0.0000058	0.000085	0.000068	0.000091	0.0000031	0.0021	0.0000031
Chromium (Cr(VI)), total	mg/L	0.00032	0.0018	0.0025	0.0020	0.0012	0.00031	0.0016	0.00031
Cobalt, total	mg/L	0.000050	0.00099	0.0040	0.0032	0.0014	0.00010	0.021	0.00010
Copper, dissolved	mg/L	0.0011	0.0030	0.0011	0.00088	0.00023	0.00073	0.0062	0.00073
Iron, total	mg/L	0.048	1.2	1.0	0.80	1.5	0.19	1.8	0.19
Iron, dissolved	mg/L	0.015	0.14	0.35	0.28	0.076	0.052	0.30	0.052
Lead, total	mg/L	0.000025	0.00039	0.0040	0.0032	0.00044	0.00016	0.0014	0.00016
Manganese, total	mg/L	0.0050	0.058	0.73	0.58	0.071	0.018	1.2	0.018
Mercury, total	mg/L	0.0000025	0.0000089	0.000020	0.000016	0.0000047	0.0000031	0.000040	0.0000031
Molybdenum, total	mg/L	0.00012	0.00019	0.034	0.027	0.00018	0.00042	0.0035	0.00042
Nickel, dissolved	mg/L	0.00025	0.0017	0.0013	0.0010	0.0023	0.00031	0.048	0.00031
Selenium, total	mg/L	0.000051	0.00020	0.0020	0.0016	0.00035	0.000031	0.0080	0.000031
Silver, total	mg/L	0.0000050	0.000020	0.000050	0.000040	0	0.000010	0	0.000010
Strontium, dissolved	mg/L	0.11	0.13	2.5	2.0	0.068	0.0000023	1.5	0.000051
Thallium, total	mg/L	0.0000050	0.000010	0.00080	0.00064	0.00010	0.000010	0.0025	0.000010
Uranium, total	mg/L	0.00011	0.00025	0.0085	0.0068	0.000031	0.000042	0.00047	0.000042
Zinc, dissolved	mg/L	0.0015	0.0015	0.0039	0.00312	0.0034	0.0016	0.094	0.0016

https://srk.sharepoint.com/sites/NACAPR002055/Internal/Water Balance Modelling/Results/20240516_UEA_to BAT Team/New Results to BAT Team/BAT_Calcs_05042024/[BAT_effluenttarget_CCM_20241210.xlsx]COCs selection

APPENDIX 13: TENAS PROJECT, INITIAL DILUTION ZONE ASSESSMENT, SRK

APPENDIX 14: TENAS COAL MINE INFORMATION REQUEST # 498, 500-504, AND 520 - EXPERT ADVICE REGARDING FISH AND FISH HABITAT WITHIN THE PROJECT AREA, PALMER ENVIRONMENTAL

APPENDIX 15: TENAS PROJECT, MINE MATERIAL MANAGEMENT BASED ON AN NPR CUT-OFF OF 2.0, 1.80, 1.60, AND 1.20, TELKWA MINING

APPENDIX 16: TELKWA COAL TENAS PROJECT ENVIRONMENTAL ASSESSMENT APPLICATION – RESPONSES TO 2022 SUPPLEMENTAL GEOCHEMISTRY INFORMATION REQUESTS FROM THE MINISTRY OF ENERGY, MINES AND LOW CARBON INNOVATION, SRK

APPENDIX 17: METAL LEACHING/ACID ROCK DRAINAGE MANAGEMENT PLAN, SRK

APPENDIX 18: TENAS PROJECT INFORMATION REQUEST RESPONSES RELATED TO GEOTECHNICAL ASPECTS, SRK

APPENDIX 19: TENAS PROJECT DAM BREACH ASSESSMENT REPORT, SRK

APPENDIX 20: PAG MANAGEMENT ALTERNATIVES ASSESSMENT, SRK

APPENDIX 21: TENAS PROJECT POTENTIAL ACID GENERATING MATERIAL STORAGE ALTERNATIVES ASSESSMENT, SRK

APPENDIX 22: TENAS PROJECT INFORMATION REQUEST RESPONSES FROM OFFICE OF THE WET'SUWET'EN – FINAL, SRK

Attachment B: Telkwa Mining Response to the follow up information requests from MENV on April 15, 2026

Attachment C: Telkwa Mining Response to the follow up information requests from MCMM on May 15, 2026

Attachment D: Telkwa Mining Response to the follow up information requests 8 and 9 from MENV on May 22, 2026

Attachment E: Telkwa Mining Response to the follow up information request 8 from MENV and MCMM on June 25, 2026