BC EAO EAC Application – Tenas Project

Section 13.0 Management Plans
Chapter 5 Discharge Management Plan

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VERSION 1.0

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Submitted by:	Telkwa Coal Limited Suite 1410 – 409 Granville Street Vancouver, BC V6C 1T2

Tenas Project

Section 13.0 Management Plans
Chapter 5 Discharge Management Plan

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ABBREVIATIONS AND ACRONYMS

Abbreviation or Acronym	Long Form of Abbreviation or Acronym
BC	British Columbia
BC AWQG	British Columbia Approved Water Quality Guidelines
BC MECCS	British Columbia Ministry of Environment and Climate Change Strategy
BC WWQG	British Columbia Working Water Quality Guidelines
BC SDWQG	British Columbia Source Drinking Water Quality Guidelines
BMPs	best management practices
C	Chapter
CCME	Canadian Council of Ministers of the Environment
COC	Contaminants of Concern
COPC	Contaminants of Potential Concern
CPP	Coal Processing Plant
CSM	Conceptual Site Model
DMP	Discharge Management Plan
EA	Environmental Assessment
EAC	Environmental Assessment Certificate
ECCC	Environment and Climate Change Canada
EMS	Environmental Management System
GovBC	Government of British Columbia
GovCan	Government of Canada
IDZ	Initial Dilution Zone
LOM	life-of-mine
MA/EMA	*Mines Act,* RSBC 1996, c 293, and *Environmental Management Act*, SBC 2003, c 53
MOC	Management of Change
MWMP	Minesite Water Management Plan (S13.0-C11)
PAG	potentially acid generating
POC	Parameters of Concern
POPC	Parameters of Potential Concern
Project	Tenas Project
QA/QC	Quality Assurance/Quality Control
S	Section
SEMP	Socio-economic Management Plan (S13.0-C16)
SPO	Site Performance Objectives
SPP	Standard Practices and Procedures

Abbreviation or Acronym	Long Form of Abbreviation or Acronym
TARP	Trigger Action Response Plan
TCL	Telkwa Coal Limited
TOC	total organic carbon
TSS	total suspended solids
WQG	water quality guidelines
WSC	Water Survey of Canada

UNITS OF MEASURE

Abbreviation or Acronym	Long Form of Abbreviation or Acronym
7Q10	lowest 7-day average flow that occurs (on average) once every 10 years
>	greater than
%	percent
km	kilometres
m	metre
m^3/s	cubic metres per second
m^3/d	cubic metres per day
mg/L	milligrams per litre

EXECUTIVE SUMMARY

This Discharge Management Plan (DMP) provides details pertaining to the operational plans for discharges to surface water for the Tenas Project (Project). The DMP contains information on the following: expected Project discharge water quality limits, expected Project surface water discharge rates, Project discharge locations, emergency procedures for discharge system upsets, and adaptive management and contingency plans.

The purpose of this DMP is to mitigate risks to the public and the environment. The DMP will be reviewed and revised, as required. This document should be read in conjunction with **Appendix 13.11-E Minesite Water Monitoring Program** of the **Minesite Water Management Plan (Section [S] 13.0-Chapter [C] 11) (MWMP**).

The DMP proposes effluent quality objectives and trigger levels/conditions describing when action is to be taken and potential mitigation measures to remedy unexpected or deteriorating effluent quality. A Trigger Action Response Plan (TARP) will be in place to proactively ensure that limits specified during the regulatory process are being complied with, and discharges are not having any adverse effects on the receiving environment. In addition, the DMP describes results of the initial dilution zone (IDZ) modelling **(Appendix 13.5-A).**

Management of Project discharges and meeting compliance objectives will require diligent operation, planning and adaptive management. Through implementation of this DMP and relevant Standard Practices and Procedures (SPPs), TCL will ensure that discharge objectives are met.

1. INTRODUCTION

This Discharge Management Plan (DMP) provides details on the operational plans for discharges from the Project to surface water. The DMP contains information on discharge water quality objectives, water discharge rates, locations, emergency procedures for system upsets and adaptive management and contingency plans.

The purpose of this plan is to mitigate risks to the public and the environment. As the DMP is a living document, this plan will be reviewed and revised as required. This document should be read in conjunction with the **Appendix 13.11-E Minesite Water Monitoring Program** in the **Minesite Water Management Plan (Section [S] 13.0-Chapter [C] 11) (MWMP)**.

2. PURPOSE AND OBJECTIVES

The objectives of this DMP are to:

- Minimize effects on surface water and groundwater quality in reference to BC water quality guidelines and/or Site Performance Objectives (SPOs) downstream that could affect its use;
- Incorporate the Conceptual Site Model (CSM) into discharge planning, which describes the pathways of Parameters of Potential Concern (POPCs) and Parameters of Concern (POCs) from Project sources through environmental media and to environmental receptors in the system;
- Describe emergency procedures for effluent control system malfunctions/upsets and include contingency plans (i.e., contingency storage for water prior to discharge); and
- Propose effluent quality objectives and trigger levels/conditions describing when action is to be taken and propose potential mitigation measures to remedy unexpected or deteriorating effluent quality. A Trigger Action Response Plan (TARP) will be developed to proactively ensure that permit limits are being met and that discharges are not affecting the receiving environment.

In addition, this DMP summarizes the results of the initial dilution zone (IDZ) modelling **(Appendix 13.5-A).**

3. SCOPE AND SCALE

The scope of this DMP is defined within the Surface Water Local Study Area (LSA), and includes activities, as well as any operation and/or construction activities that are directly associated with the Project and exist outside of the Project Area. The DMP is in effect during Construction, Operation, Decommissioning and Reclamation, and Post-closure phases and ceases to be in force at the final closure of the Project as approved by the regulatory authorities.

4. COMPLIANCE OBLIGATIONS

Several legislative requirements are applicable to discharge from the site. A short list of these and their major applicable components are provided in **Table 4-1** below.

Table 4-1: Legislation, Regulations, and Guidelines Relevant to the Discharge Management Plan (DMP)

Legislation, Regulations, and Guidelines	Applicable Information
A User Guide for Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining. (British Columbia Ministry of Environment [BC MOE] 2015)	Provincial guidelines design and operation of sediment ponds in mining
A User Guide to Annual Reporting under the Environmental Management Act. Environmental Protection Division. (BC MOE 2016)	Provincial guidelines for annual reporting under the environmental management act
Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture Summary Report. (British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2021)	Provincial approved guidelines for water quality protection
Coal Mining Effluent Regulations - pending	Proposed to come into force 2023; will not apply to the Tenas Mine until 2026.
Development and Use of Initial Dilution Zones in Effluent Discharge Authorizations. Environmental Protection Division (BC MOE 2019)	Provincial guidelines for developing an IDZ for discharge authorizations
Environmental Management Act, SBC 2003, c 53 (Government of British Columbia [GovBC] 2003) *(EMA)*	Rules regarding environmental management for industry, including effluent permitting
Fisheries Act, 1985, c F-14 (Government of Canada [GovCan] 1985)	Prohibits serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, including the permanent destruction of habitat
Joint Application Information Requirements for *Mines Act* and *Environmental Management Act* Permits (British Columbia Ministry of Energy, Mines and Petroleum Resources [BC MEMPR] and BC MECCS 2019).	Provides guidance on *Mines Act/Environmental Management Act* permit applications and management plans.
Waste Discharge Regulation, BC Reg 320/2004 (GovBC 2004)	Provides details on effluent permitting
Water Protection Act, RSBC 1996, c 484 (GovBC 1996)	Provides guidelines for the issuance of approvals to make changes in or about a stream
Water Quality Guidelines for the Protection of Aquatic Life (Canadian Council of Ministers of the Environment. [CCME] 2021)	National guidance for water quality protection of aquatic life
Water Sustainability Act, BC Reg. 36/2016 (GovBC 2016)	Principal provincial *Act* for managing the diversion and use of water resources

Legislation, Regulations, and Guidelines	Applicable Information
Water Sustainability Regulation, BC Reg 36/2016 (GovBC 2016)	Details the requirements in applications for licences and industrial use approvals
Working Water Quality Guidelines for British Columbia. (BC MECCS 2021)	Provincial working guidelines for water quality protection

The Joint Application Information Requirements for *Mines Act,* RSBC 1996, c 293 and *Environmental Management Act*, SBC 2003, c 53 permits (British Columbia Ministry of Energy, Mines and Petroleum Resources [BC MEMPR] and British Columbia Ministry of Environment and Climate Change Strategy [BC MECCS] 2019) (JAIR) also provides requirements for a Mine Discharge Management Plan in Section 9.7, which are adhered to in this Plan.

> *"Provide operational plans for all discharges to surface water or groundwater. Include the following information:*
> *• discharge limits (volumes and concentrations) that ensure no acute toxicity to aquatic organisms at the point of discharge and no chronic toxicity beyond the edge of the IDZ. Achieve this by back-calculating discharge concentration and volume limits using contaminant-specific WQGs, WQOs, or SBEBs as values in the mass balance model;*
> *• ensure groundwater use downstream is not compromised and no chronic toxicity occurs in surface waters as surface water recharge occurs. Note: This information may form the basis for terms or conditions incorporated into the EMA effluent discharge permit;*
> *• incorporation of the Conceptual Site Model (CSM);*
> *• describe emergency procedures for pollution control system malfunctions/upsets, and include contingency plans (e.g., contingency storage for water requiring treatment) for chemical and fuel storage areas; and*
> *• propose effluent quality limits (or other appropriate limits) and trigger levels/conditions (as per the TRP100) that will trigger an action to address and mitigate unexpected or deteriorating effluent quality. This TRP should be in place to proactively ensure permit limits are being met and discharges are not negatively impacting the receiving environment."*

4.1 Standard Practices and Procedures (SPPs)

TCL Standard Practices and Procedures (SPPs) will conform to the Code. In addition to regulatory requirements, the Project will implement SPPs that meet or exceed the required legislation, regulations, and guidelines.

5. RELATIONSHIP TO OTHER MANAGEMENT PLANS

The Project is governed by an **Environmental Management System (C13.0-C1) (EMS)**, an overarching management plan strategy comprising a set of processes and practices which enable TCL to manage its environmental and safety performance in a holistic way, within an integrated framework. While the management plans are part of the **EMS**, the **EMS** is not just a collection of management plans.

In addition to the overall guidance of the **EMS**, this DMP has a relationship with other management plans that also present mitigation measures. Those management plans and their relationship to this DMP are listed in **Table 5-1**.

Table 5-1: Management Plans with Relationship to the Discharge Management Plan (DMP)

Management Plan	Nature of Relationship
Environmental Management System (S13.0-C1) (EMS)	All management plans are part of the EMS.
Construction Environmental Management Plan (S13.0-C4) (CEMP)	The CEMP describes activities that will control water management during construction and will follow this plan for any discharges.
Explosives Management Plan (S13.0-C6) (EMP)	Discharges from water management structures at the Explosives Facility and Explosives Magazine are governed by this Discharge Management Plan (S13.0-C5) (DMP).
Fuel Management and Spill Control Plan (S13.0-C7) (FMSCP)	Details fuel and spill controls such that fuel storage and/or spills won't adversely affect mine discharges
Mine Emergency Response Plan (S13.0-C9) (MERP)	Details mine emergency response when problems arise from discharges from the site
Minesite Water Management Plan (S13.0-C11) (MWMP)	Provides site water management and surface and groundwater quality and quantity monitoring programs of site discharges
Metal Leaching (ML)/Acid Rock Drainage (ARD) Management Plan (S13.0-C12) (ML/ARDMP)	Details management of constituent leaching which could affect discharge water quality, including metals.
Reclamation and Closure Plan (S13.0-C15) (RCP)	Site discharge will continue into the Post-closure Phase and the RCP details final reclamation of water management facilities
Surface Erosion Prevention and Sediment Control Plan (S13.0-C17) (SEPSCP)	Surface runoff will discharge from the site and the SEPSCP provides control measures to alleviate sediment in runoff into discharges.

6. DETAILS OF THE DISCHARGE MANAGEMENT PLAN

The Project CSM describes the source, migration, and exposure pathways to receptors for the Project's POPC. Elements of the CSM include: sources of POPCs, controls on sources, migration and exposure pathways, transport mechanisms, receiving environment, water quality and quantity controls, closure remediation processes, among others. These are detailed in the CSM memo provided in **Appendix 1.0-T** of **S1.0 Overview of Project Proponent Description**.

In the Project Area, there are two (2) potential discharge pathways to the downstream receiving environment:

- mine-affected groundwater discharge through infiltration and seepage from the open pit, Tenas Control Pond, sedimentation ponds, water storage ponds, and management ponds; and
- surface water discharge from the Tenas Control Pond, sedimentation ponds associated with the Coal Processing Plant (CPP), Explosive Facility, Explosive Magazine, rock, and gravel quarries, Rail Infrastructure areas, Tenas Access Corridor (TAC), and the management ponds.

Travel time for mine-affected groundwater to reach nearby receivers exceeds project life span in most instances, and this DMP focuses on controlled surface water effluent releases.

6.1 Groundwater Discharge

There are two (2) major groundwater systems at the Minesite: a shallow overburden system, which is a local unconfined system with relatively high groundwater velocities, and a deep bedrock system, characterised by a large lateral extent and relatively low groundwater velocities.

The analysis of the Project's residual effects on groundwater quantity and quality were performed using a groundwater flow model (**Appendix 1.0-U SRK, Groundwater Technical Report for the Tenas Coal Project, Telkwa** of **S1.0 Overview of Project Proponent Description of the EAC Application).** Reduction of baseflows is predicted to occur due to changes in catchments and increases to baseflows are predicted to occur from elevated water levels in water storage facilities such as the management ponds. Infiltration from the management ponds (i.e., East, West, and North management ponds) and the Tenas Control Pond is projected to create a groundwater mound under the ponds, elevating local groundwater levels. This infiltration will increase baseflows in nearby creeks. At the end of the Operation Phase, baseflow increases by about 3.2 percent (%) for the Tenas Creek, 0.8% for Goathorn Creek and 0.7% for the Telkwa River, while a reduction of baseflow of 0.2% was predicted at Four Creek. Modelling results suggest that baseflows will either remain unchanged or slightly increase during the Post-closure Phase, with about a 3% increase for Tenas Creek, 4% for Four Creek, 2% for the Goathorn Creek, and 1% for the Telkwa River (**Appendix 1.0-U**). The increased groundwater discharge will have the largest effect on streamflow and streamflow quality during the winter months.

Based on groundwater flow modeling, 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 (Operation Phase) into Four Creek, Goathorn Creek, Telkwa River, or the nearest private wells. Considering long-term contributions, the model predicted particles could take more than 400 years to reach the private wells located north of the Project. The average time predicted for 50% of particles to reach the nearby creeks varies from (**Appendix 1.0-U**):

- 65 years for Tenas Creek;
- 95 years for Four Creek;

- 320 years for Goathorn Creek; and
- over 400 years for the Telkwa River.

Water quantity and quality modeling conservatively assumed seepage would reach streams after 25-years (**Appendix 13.5-B Water and Load Balance Modeling Report**). The Bulkley River is not predicted to receive measurable quantities of mine-affected groundwater considering the size of this watercourse related to activity at the Rail Infrastructure. Predicted estimates of constituent concentrations do not exceed drinking water quality guidelines in the private wells located north of the Project during any phase of the Project.

Further information on the groundwater pathway and various modelling cases are summarized in **S4.0-Chapter (C) 4 Groundwater Valued Component (VC)**.

6.2 Surface Water Discharge

Surface water discharge from the Project area into the receiving environment includes discharge from the following infrastructure:

- Tenas Control Pond;
- Wastewater Storage Pond
- Rail Infrastructure Sedimentation Pond;
- Explosive Facility Sedimentation Pond;
- Explosive Magazine Sedimentation Pond;
- Rock Quarry Sedimentation Pond;
- Gravel Quarry Sedimentation Ponds 1 and 2;
- East and West TAC Sedimentation Ponds;
- Potable Water Storage Pond;
- CPP Sedimentation Pond;
- Non-point discharges from the powerline and TAC; and
- North Management Pond.

The Soil Treatment Facility is an additional water storage facility onsite, which will discharge into the CPP Sedimentation Pond under extreme flood events. Since this facility will not discharge to the environment, it has not been discussed in this DMP.

Discharge will occur throughout the mine life during the Construction, Operation, Decommissioning and Reclamation phases, and into the Post-closure Phase. All ponds, except for the North, East, and West management ponds, will be decommissioned during the Decommissioning and Reclamation Phase. Pond details and pumping rates are presented in **Table 6.2-1**. The CPP Sedimentation Pond is excluded from the summaries in **Table 6.2-1** since it does not discharge directly to the environment under normal operating conditions.

Table 6.2-1: Summary of Project Discharge Facilities

Project Discharge Facility	Project Phase	Means of Discharge	Receiving Environment	Maximum Discharge – Project Case[(1)]
Tenas Control Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Tributary of Goathorn Creek	12,000 m^3/day
Explosive Magazine Sedimentation Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Tributary of Goathorn Creek	2,600 m^3/day
Explosive Facility Sedimentation Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Tributary of Tenas Creek	2,600 m^3/day
Wastewater Storage Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Tributary of Goathorn Creek	41.5 m^3/day
Rail Infrastructure Sedimentation Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Tributary of Bulkley River	210 m^3/day
North Management Pond	Post-Closure after Tenas Control Pond is decommissioned	Spillway	Tributary of Goathorn Creek	17,600 m^3/day
Potable Water Storage Pond	Construction, Operation, Decommissioning and Reclamation	Culvert and channel	Four Creek	8,200 m^3/day
East TAC Sedimentation Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Goathorn Creek	2,600 m^3/day
West TAC Sedimentation Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Goathorn Creek	2,600 m^3/day
Gravel Quarry Sedimentation Pond for Pit 1	Construction and Operation (Gravel Quarry is reclaimed prior to end of the Operation Phase)	Pump or spillway	Tributary of Goathorn Creek	2,600 m^3/day
Gravel Quarry Sedimentation Pond for Pit 2	Construction and Operation (Gravel Quarry is reclaimed prior to end of the Operation Phase)	Pump or spillway	Tributary of Goathorn Creek	2,600 m^3/day
Rock Quarry Sedimentation Pond	Construction, Operation, Decommissioning and Reclamation	Pump or spillway	Tributary of Helps Creek	2,600 m^3/day

Notes: *m^3/day=cubic metres per day;* 1. *Maximum Discharge – Project Case represents normal operating conditions and does not include emergency spillway discharge or flood events*

Surface runoff from portions of the Tenas Creek and Four Creek watersheds that contacts Project infrastructure is collected in the East, West, North management ponds, and the Tenas Control Pond , where it is recycled for use in the Coal Processing Plant (CPP) and other infrastructure, and/or used to maintain the water cover over potentially acid-generating (PAG) materials in management ponds. The Tenas Control Pond will be constructed downstream to collect water from the management ponds and provide settling time for suspended solids removal. Excess water will be released from the Tenas Control Pond to a tributary of Goathorn Creek, which will include a minimum discharge rate during open water months to mix with treated sewage effluent from the Sewage Treatment Plant. The Tenas Control Pond will be decommissioned during the Post-closure Phase, and excess water will be released from the North Management Pond through the same tributary channel to Goathorn Creek.

The Rail Infrastructure Sedimentation Pond intercepts surface runoff from the Rail Infrastructure area. Suspended sediments are settled in the pond prior to discharge to the Bulkley River via pump and spillway. The pond will be decommissioned during the Post-closure Phase.

The Explosive Magazine and Explosive Facility sedimentation ponds collect runoff from local working areas associated with the Explosive Magazine pad and the Explosive Facility, respectively. Both ponds will provide retention time to collect suspended sediments from pad runoff and will discharge via pump and spillway into tributaries of Tenas Creek and Goathorn Creek. They will be reclaimed during the Decommissioning and Reclamation Phase

The TAC sedimentation ponds (East and West), the Rock Quarry Sedimentation Pond and the Gravel Quarry sedimentation ponds for Pits 1 and 2 collect runoff from local working areas associated with the TAC within the Goathorn Creek Valley and rock and gravel quarry pits 1 and 2, respectively. The ponds will provide retention time to collect suspended sediments from pad runoff and will discharge via pump and spillway into tributaries of Goathorn Creek or Goathorn Creek Directly. They will be decommissioned and reclaimed during the Decommissioning and Reclamation Phase.

The Wastewater Storage Pond will operate onsite until the Passive Post-closure Phase and will store wastewater (treated sewage effluent from the Sewage Treatment Plant). Discharge from the Wastewater Storage Pond will occur during the open-water season with discharge from the Tenas Control Pond (refer to **6.2.2**) to a tributary of Goathorn Creek .

The Potable Water Storage Pond will collect non-contact water upstream of the East Management Pond to supply potable water onsite. Excess water will discharge via a twinned 400 mm diameter culvert into Four Creek, and high flows will discharge to the East Management Pond via an engineered spillway.

The CPP Sedimentation Pond will collect runoff from the CPP pad and is designed to settle suspended particles prior to discharge. Unlike the other sedimentation ponds, the CPP Sedimentation Pond will be pumped to the Tenas Control Pond, controlling runoff for flood events up to the 10-year storm. For this reason, maximum discharge, and monthly average discharge rates from the CPP Sedimentation Pond to the environment are not presented in this DMP but are discussed in the **Appendix 1.0-F SRK, Tenas Project Water Management Design Technical Report** of **S1.0 Overview of Project Proponent Description.** An emergency spillway will convey larger flood events to a tributary of Goathorn Creek.

More information regarding surface water discharges from the Project is available in **S4.0-C3 Surface Water VC.**

6.2.1 Discharge Rate from Control, Management and Sedimentation Ponds

Monthly average discharge rates from the Tenas Control Pond, the Rail Infrastructure Sedimentation Pond, the North Management Pond, and the Potable Water Storage Pond were estimated from water and load balance modelling for pre-mining conditions and throughout the life-of-mine (LOM) through to the Year 2100 **(Appendix 13.5-B).** Long-term discharge estimates were obtained using Project-specific hydrology and considering Project Case conditions (i.e., expected groundwater seepage, and average hydrology).

Monthly average discharge rates from the sedimentation ponds, including the Explosive Magazine Sedimentation Pond, the Explosive Facility Sedimentation Pond, Rock Quarry Sedimentation Pond, East TAC Sedimentation Pond, West TAC Sedimentation Pond, Gravel Quarry Sedimentation Pond for Pit 1, and the Gravel Quarry Sedimentation Pond for Pit 2 were estimated based on monthly average runoff rates for Goathorn Creek, as presented in **Appendix 1.0-R SRK, Tenas Project Hydrometeorological Report of S1.0 Overview of Project Proponent Description**, and the associated pond catchment areas.

Table 6.2 2 outlines the monthly average Project discharge rates from the discharging facilities. Sewage Treatment Plant discharge rates are discussed further in **6.2.2.** Surface water discharge rates are variable over the Operation and Post-closure phases; but are generally consistent with pre-development patterns (i.e., higher discharge during freshet periods and lower discharge during winter), so the shape of the annual hydrograph in the receiving environment is generally unchanged.

Table 6.2-2: Monthly Average Project Discharge (cubic metres per day [m^3/day]) from Discharging Facilities

Project Facility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tenas Control Pond	-	-	-	-	8,055	6,623	3,786	1,675	2,613	2,805	-	-
North Management Pond	39	34	29	11,970	9,811	361	900	101	207	1,655	95	43
Rail Infrastructure Sedimentation Pond	-	-	-	150	177	26	61	42	67	58	-	-
Potable Water Storage Pond	-	-	-	2,191	8,180	2,535	2,130	907	1934	1475	-	-
Explosive Facility Sedimentation Pond	-	-	-	8	31	32	20	11	9	9	-	-
Explosive Magazine Sedimentation Pond	-	-	-	4	16	16	10	6	4	5	-	-
Rock Quarry Sedimentation Pond	-	-	-	-	-	40	156	160	102	55	43	46
Gravel Quarry Sedimentation Pond for Pit 1	-	-	-	-	-	12	47	48	30	17	13	14
Gravel Quarry Sedimentation Pond for Pit 2	-	-	-	-	-	64	250	255	16	89	69	74
East Tenas Access Corridor Sedimentation Pond	-	-	-	-	-	16	63	64	41	22	17	18
West Tenas Access Corridor Sedimentation Pond	-	-	-	-	-	8	31	32	20	11	9	9

The Tenas Control Pond discharges surface water from May to October during the open water season via pump and spillway. The pumping rate from the Tenas Control Pond to the tributary of Goathorn Creek is 9,000 cubic metres per day (m^3/day). Discharge is maximized in the early Operation Phase of the Project (i.e., Years 0 to 2) when operational storage is minimized. The maximum discharge in the Project Case is 12,000 m^3/day (0.14 cubic metres per second [m^3/s]), which exceeds the pumping rate (9,000 m^3/day). The

spillway may be utilized during this period of operation. Discharge rates are comparatively higher in May, with an average rate of 8,055 m^3/day (0.093 m^3/s) during the Operation Phase.

The Rail Infrastructure Sedimentation Pond discharges to the Bulkley River up to a maximum monthly average rate of 210 m^3/day during mining operations. The pump was sized based on storm events and sedimentation controls and can operate up to a maximum rate of 2,600 m^3/day (0.03 m^3/s) during the Operation Phase. Discharge occurs from April to October, with higher monthly average discharge in May. The average discharge in May is 177 m^3/day.

The Explosive Facility Sedimentation Pond discharges to a tributary of Tenas Creek and the Explosive Magazine Sedimentation Pond discharges to a tributary of Goathorn Creek. Pumps were sized based on storm events and sedimentation controls and can operate up to a maximum rate of 2,600 m^3/day (0.03 m^3/s) during mining operations. Monthly average discharge is expected to be lower, with highest monthly average discharges occurring in June at a rate of 16 m^3/day (0.0002 m^3/s) from the Explosive Magazine Sedimentation Pond and 32 m^3/day (0.0004 m^3/s) from the Explosive Facility Sedimentation Pond with discharges occurring from April to October.

The Rock Quarry Sedimentation Pond discharges to a tributary of Helps Creek, while the East and West TAC sedimentation ponds, and Gravel Quarry sedimentation ponds for Pits 1 and 2 discharge to Goathorn Creek directly or via an existing tributary. Pumps were sized based on storm events and sedimentation controls and can operate up to a maximum rate of 2,600 m^3/day (0.03 m^3/s) during the Operation Phase. Monthly average discharge is expected to be lower, with highest discharges occurring in June of any given year. The following provides a summary of highest monthly average discharges:

- East TAC Sedimentation Pond = 64 m^3/day;
- West TAC Sedimentation Pond = 32 m^3/day;
- Rock Quarry Sedimentation Pond = 160 m^3/day;
- Gravel Quarry Sedimentation Pond for Pit 1 = 48 m^3/day; and
- Gravel Quarry Sedimentation Pond for Pit 2 = 255 m^3/day

The North Management Pond begins discharging to the tributary of Goathorn Creek during the Post-closure Phase once the Tenas Control Pond has been decommissioned. Discharge occurs via the closure spillway. The North Management Pond discharge is maximized near the end of the Post-closure Phase at 17,600 m^3/day (0.20 m^3/s) with the highest average monthly discharges of 11,970 m^3/day and 9,811 m^3/day occurring in April and May, respectively.

The monthly average and monthly maximum Project discharge rates from the management ponds, Tenas Control Pond, and Rail Infrastructure Sedimentation Pond are also detailed in **Appendix 13.5-A IDZ Assessment Memo** and **Appendix 13.5-B Water and Load Balance Modeling Report** of **S1.0 Overview of Project Proponent Description**. Maximum discharge rates from other sedimentation ponds, including the Explosive Magazine and Explosive Facility sedimentation ponds, the Rock Quarry and Gravel Quarry sedimentation ponds, and the TAC sedimentation ponds are provided in **Appendix 1.0-F SRK, Tenas Project Water Management Design Technical Report** of **S1.0 Overview of Project Proponent Description.**

6.2.2 Sewage Treatment Plant Effluent and Wastewater Storage Pond

The Wastewater Storage Pond will discharge treated effluent into a tributary of Goathorn Creek. The treated effluent is held in a storage pond over winter and discharged during the open-water season from May through September, mixing with the Tenas Control Pond discharge before entering Goathorn Creek. The

average discharge rate from the Sewage Treatment Plant is expected to be 41.5 m^3/day (0.0005 m^3/s). The effluent water quality was obtained from the expected performance of the secondary sewage treatment plant that is planned for the Project (**Appendix 13.5-B**) and is summarized in **Table 6.2-3.**

Table 6.2-3: Sewage Treatment Plant Expected Effluent Water Quality

Parameter	Units	Value
Nitrate-nitrogen	mg-N/L	36.9
Nitrite-nitrogen	mg-N/L	0.1
Total ammonia (as nitrogen)	mg-N/L	1.9

According to the Municipal Wastewater Regulation, BC Reg 87/2012 (Government of British Columbia [GovBC] 2012), a dilution ratio of 10:1 is required for sewage effluent (see **Appendix 1.0-R Potable Water and Sewage Treatment Plant**), which will be supplied by the discharge from the Tenas Control Pond during the Operation Phase, and Decommissioning and Reclamation Phase of the Project. Dilution is higher (greater than [>] 100) considering various discharge conditions from the Tenas Control Pond and Wastewater Storage Pond and water flows in Goathorn Creek (**Appendix 13.5-B**), and water demand to dilute the Sewage Treatment Plant effluent will be met throughout operation based on available water in the Tenas Control Pond.

6.3 Receiving Environment

Goathorn Creek is the receiving environment for Project discharge from the Tenas Control Pond and Wastewater Storage Pond during the Operation, and Decommissioning and Reclamation phases and the North Management Pond during the Post-closure Phase once the Tenas Control Pond is decommissioned. The ponds discharge to an unnamed tributary of Goathorn Creek. The tributary is not fish bearing due to its gradient and water flows, and erosion protection will be installed up until the confluence with Goathorn Creek **(Appendix 1.0-F SRK, Tenas Project Water Management Design Technical Report** of **S1.0 Overview of Project Proponent Description)** to allow for the expected discharge flows.

The Bulkley River receives Project discharge from the Rail Infrastructure Sedimentation Pond during the Operation, and Decommissioning and Reclamation phases of the Project.

Discharge from sedimentation ponds will be through vegetation and into nearby tributaries. The receiving environment for each sedimentation pond is summarized below:

- The Explosive Facility Sedimentation Pond will discharge into an unnamed tributary of Tenas Creek;
- The Explosive Magazine Sedimentation Pond will discharge into an unnamed tributary of Goathorn Creek;
- The Gravel Quarry Sedimentation Ponds (for Pit 1 and Pit 2) will both discharge into a tributary of Goathorn Creek;
- The Rock Quarry Sedimentation Pond will discharge into a tributary of Helps Creek; and
- The TAC sedimentation ponds (East and West) will discharge directly into Goathorn Creek.

As stated previously, these seven (7) sedimentation pond discharges are not expected to have a measurable change in quality and/or quantity in the receiving environment.

The Potable Water Storage Pond discharges into Four Creek via two (2) 400 mm diameter culverts. Water collected in the Potable Water Storage Pond is non-contact water from a natural catchment and is therefore not expected to produce a change in Four Creek water quality. The discharge rate is controlled by the culvert capacity, which was selected to control the 1 in 10-year flood event to limit erosion in Four Creek **(Appendix 1.0-F SRK, Tenas Project Water Management Design Technical Report).** Flows greater than the culvert capacity will discharge via a spillway to the East Management Pond.

6.3.1 In-stream Water Quality Guidelines

The water quality guidelines (WQGs) used to evaluate effects to the receiving environment were established based on the long-term average BC Approved Water Quality Guidelines (BC AWQG) (BC MECCS 2021) and the BC Working Water Quality Guidelines (BC WWQG) (BC MECCS 2015) for freshwater aquatic life and the BC Source Drinking Water Quality Guidelines (BC SDWQG) (BC MECCS 2020). Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME WQG) were applied for parameters for which BC provincial guidelines are not available, and other provincial guidelines were used for parameters that don't have either a BC and/or Canadian water quality guideline. The most stringent value for each parameter from the available sources was selected as the in-stream target threshold concentration, except for selenium, where the BC AWQG was used. This is consistent with Environment and Climate Change Canada (ECCC) recommendations (ECCC 2021). Some WQGs are also dependent on toxicity-modifying factors in the receiving environment and are adjusted for temperature, pH, hardness and/or total organic carbon (TOC), based on average background concentrations (i.e., pre-mining conditions).

Effects on surface water quality were evaluated based on screening against WQGs as well as variability within the historical monitoring record. Where model results exceeded the guidelines, SPOs were considered. SPOs were developed for six (6) parameters: total aluminum **(Appendix 13.5-C),** dissolved cadmium **(Appendix 13.5-D),** total cobalt **(Appendix 13.5-E),** nitrite **(Appendix 13.5-F)**, total selenium **(Appendix 13.5-G),** and total thallium **(Appendix 13.5-H).** For total selenium, a Tier 1 SPO of 0.0080 milligrams per litre (mg/L) and a sulphate-dependent Tier 2 SPO were developed **(Appendix 13.5-I).**

Goathorn and Bulkley watercourses will be discussed in more detail below as these are the only two (2) streams that may have a measurable effect from Project discharges.

6.3.2 Goathorn Creek Flow

Goathorn Creek flow is closely related to the seasonal distribution of precipitation and temperature. Hydrologic estimates for the creek were obtained from the monitored flow at Goathorn Hydrologic Station and the synthetic record 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 **Appendix 1.0-R SRK, Tenas Project Hydrometeorological Report** of **S1.0 Overview of Project Proponent Description.**

Goathorn Creek is predominantly fed by spring snowmelt (freshet) and rainfall in the summer. High discharges occur from May through July. The mean annual discharge is 1.7 m^3/s at the Goathorn Hydrologic Station. During the open water season (i.e., May to October), the monthly mean flow ranges between 1.2 m^3/s and 4.6 m^3/s, averaging 2.68 m^3/s **(Table 6.3-1).** Low flows typically occur in late fall and winter when air temperatures remain below freezing and precipitation is stored in the snowpack. During this period, streamflow is from groundwater discharge. The annual 7-day consecutive low flow during a 10-year return period (7Q10) is expected to be 0.22 m^3/s at the Goathorn Hydrologic Station. Monthly 7Q10 low-flow estimates range from 0.23 – 1.9 m^3/s.

Table 6.3-1: Mean and Annual 7-day Consecutive Low Flow During a 10-year Return Period (7Q10) Flow (cubic metres per second [m^3/s]) at Goathorn Hydrologic Station in Goathorn Creek

Flow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	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
7Q10	0.24	0.24	0.23	0.26	0.99	1.9	1.2	0.7	0.51	0.49	0.32	0.27	0.22

Source: *Appendix 1.0-R SRK, Tenas Project Hydrometeorological Report of Section (S) 1.0 Overview of Project Proponent Description*

6.3.3 Goathorn Creek Water Quality

The background water quality data for Goathorn Creek has been described in the **Appendix 13.5-B Water and Load Balance Modeling Report.** Baseline water quality monitoring was initiated in 2017 (ERM 2019). Available water quality data were reviewed in support of the Environmental Assessment Certificate (EAC) Application, and statistics were developed to support Goathorn Creek water quality characterisation.

Baseline water quality monitoring indicated that exceedances of water quality guidelines have been recorded historically in Goathorn Creek for: total and dissolved aluminum, total copper, and total iron. Based on grab samples, there were exceedances for dissolved and total aluminium compared to BC AWQG and CCME WQG, respectively. BC AWQG and CCME WQG were also exceeded for total copper and total iron, respectively, typically occurring during spring freshet. The 95th percentile concentrations for dissolved aluminum, total aluminum, total copper, and total iron are 0.13 mg/L, 0.75 mg/L, 0.0054 mg/L and 0.78 mg/L respectively, all of which exceed their respective water quality guidelines.

For Project discharges from the Tenas Control Pond (during Operation, Decommissioning and Reclamation phase) and the North Management Pond (during Post-closure Phase), temporary exceedances of water quality guidelines and SPOs may occur in Goathorn Creek, particularly during the low-flow summer months. This is discussed in more detail in the IDZ assessment (see **6.4**). Long-term water quality at the end of modelled period (i.e., 2100) is expected to be below both the WQG and the SPO benchmarks.

Table 6.3-2 outlines 50th and 95th percentile background concentration of water quality parameters in Goathorn Creek with the respective long-term average WQGs, as benchmarks. SPOs are also presented, where applicable. The 50th percentile concentration of each parameter was considered in the IDZ modelling, while the 95th percentile was used for POPCs screening and end-of-pipe discharge criteria assessment.

Table 6.3-2: Background Parameter Concentrations (50th and 95th percentiles) in Comparison With Long-term Water Quality Guidelines and Site Performance Objectives for Goathorn Creek

Parameter	Water Quality Guidelines		SPO (mg/L)	Goathorn Creek Background Concentration (mg/L)	
	Value (mg/L)	Source		50th Percentile	95th Percentile
Chloride	150	BC AWQG		0.25	0.5
Fluoride **	0.12	CCME WQG		0.032	0.041
Ammonia, total †	1.5	BC AWQG		0.0025	0.007
Nitrate-nitrogen	3	BC AWQG		0.041	0.076

Parameter	Water Quality Guidelines		SPO (mg/L)	Goathorn Creek Background Concentration (mg/L)	
	Value (mg/L)	Source		50th Percentile	95th Percentile
Nitrite-nitrogen	0.02	BC AWQG	0.0524	0.0005	0.002
Sulfate *	218	BC AWQG		24	37
Aluminum, total #	0.1	CCME WQG	0.236	0.092	0.75
Aluminum, dissolved #	0.05	BC AWQG		0.014	0.13
Antimony, total	0.009	BC WWQG		0.00005	0.00011
Arsenic, total	0.005	BC AWQG		0.00023	0.00068
Barium, total	1	BC WWQG		0.058	0.072
Beryllium, total	0.00013	BC WWQG		0.00005	0.0001
Boron, total	1.2	BC AWQG		0.005	0.05
Cadmium, dissolved *	0.00016	BC AWQG	0.00019	0.0000081	0.000036
Chromium, total	0.0089	CCME WQG		0.0002	0.00091
Cobalt, total	0.004	BC AWQG	0.0174	0.00005	0.00055
Copper, total ‡	0.0028	BC AWQG		0.0015	0.0054
Iron, total **	0.3	CCME WQG		0.085	0.78
Iron, dissolved **	0.3	BC SDWQG		0.015	0.13
Lead, total	0.005	BC AWQG		0.000025	0.00023
Manganese, total *	0.12	BC SDWQG		0.0059	0.033
Mercury, total	0.00001	BC AWQG		0.0000025	0.0000064
Molybdenum, total	0.073	BC AWQG		0.00047	0.00062
Nickel, total *	0.08	BC WWQG		0.00025	0.0011
Selenium, total	0.002	BC AWQG	0.008	0.000086	0.0002
Strontium, total	7	BC SDWQG		0.076	0.11
Silver, total *	0.00005	BC AWQG		0.000005	0.00002
Thallium, total	0.0008	BC WWQG	0.0022	0.000005	0.000010
Uranium, total	0.0085	BC WWQG		0.000054	0.00014
Zinc, total *	0.0075	BC AWQG		0.0015	0.0061

Notes: *mg/L=milligram per litre; BC AWQG=British Columbia Approved Water Quality Guidelines; BC SDWQG=British Columbia Source Drinking Water Quality Guidelines; BC WWQG=British Columbia Working Water Quality Guidelines; CCME=Canadian Council of Ministers of the Environment; SPO=Site Performance Objectives;-WQG=Water Quality Guidelines*
*Guideline dependent on: * hardness; # pH; † pH and temperature; and ‡ pH, dissolved oxygen (DO) and hardness. Calculated based on the 50th percentile concentration of parameters from Goathorn Creek baseline monitoring.*
*** Short-term maximum BC AWQG are provided for fluoride and total and dissolved iron*

6.3.4 Bulkley River Flow

The Bulkley River flow analysis is based on extended records from WSC Bulkley River at Quick hydrometric station (WSC 08EE004), which captures conditions upstream of the Rail Infrastructure Area. The hydrology and detailed flow estimates for the river are described in the Hydrometeorological Baseline Report (**Appendix 1.0-R**).

Monthly mean flow of the Bulkley River at Quick varies between 29.2 to 365.1 m^3/s, with high discharge occurring from May to July (**Table 6-3**). The mean annual discharge is 139.2 m^3/s. Low flows typically occur in late fall and winter. Based on the low flow analysis of Bulkley River at Quick, the annual 7Q10 low-flow is expected to be 15.1 m^3/s (**Appendix 1.0-R**).

The Bulkley River streamflow experiences less than 0.1% change relative to baseline conditions due to Project discharge from Rail Infrastructure Pond (**Appendix 13.5-B**).

Table 6-3: Mean Flow (cubic metres per second [m^3/s]) of Bulkley River at Quick (Water Survey of Canada [WSC] Station 08EE004)

Flow	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	38.3	31.1	29.2	87.6	315.5	365.1	230.2	142.4	101.4	110	102.7	59.3	139.2

6.3.5 Bulkley River Water Quality

Background water quality characterization of Bulkley River was carried out based on baseline water quality monitoring initiated in 2017 (ERM 2019). This has been detailed in **Appendix 13.5-B Water and Load Balance Modeling Report**.

Baseline water quality monitoring indicates that parameter exceedances of WQGs have occurred in the Bulkley River for: dissolved and total aluminum, total copper, and total iron. Based on grab samples, the river exceeded BC AWQG for dissolved aluminium and total copper, and CCME WQG for total aluminium and total iron. These exceedances typically occur during the spring freshet. The 95th percentile concentrations for dissolved aluminum, total aluminum, total copper, and total iron exceed their respective water quality guidelines (**Table 6.3-4**). The CCME WQG has also been exceeded based on the 50th percentile concentration of total aluminium.

The Bulkley River receives Project discharge from the Rail Infrastructure Sedimentation Pond. Due to its large dilution capacity, WQG exceedances are not expected beyond what has been experienced historically for this river. This is consistent for Rail Infrastructure Sedimentation pond water quality corresponding to expected source terms (Project Case), as well as the case using high source terms (Alternative Assessment Case 2).

Table 6.3-4: Background Parameter Concentrations (50th and 95th percentiles) in Comparison with Long-term Water Quality Guidelines and Site Performance Objectives (SPOs) for Bulkley River

Parameter	Water Quality Guidelines		SPO (mg/L)	Goathorn Creek Background Concentration (mg/L)	
	Value (mg/L)	Source		50th Percentile	95th Percentile
Chloride	150	BC AWQG		0.25	0.86
Fluoride **	0.12	CCME WQG		0.023	0.035
Ammonia, total †	1.7	BC AWQG		0.005	0.017
Nitrate-nitrogen	3	BC AWQG		0.013	0.041
Nitrite-nitrogen	0.02	BC AWQG	0.0524	0.002	0.005
Sulfate *	128	BC AWQG		4	5

Parameter	Water Quality Guidelines		SPO (mg/L)	Goathorn Creek Background Concentration (mg/L)	
	Value (mg/L)	Source		50th Percentile	95th Percentile
Aluminum, total #	0.1	CCME WQG	0.236	0.13	1.3
Aluminum, dissolved #	0.05	BC AWQG		0.017	0.13
Antimony, total	0.009	BC WWQG		0.00005	0.00011
Arsenic, total	0.005	BC AWQG		0.00024	0.0007
Barium, total	1	BC WWQG		0.026	0.038
Beryllium, total	0.00013	BC WWQG		0.00005	0.0001
Boron, total	1.2	BC AWQG		0.005	0.01
Cadmium, dissolved *	0.00008	BC AWQG	0.00009	0.0000025	0.0000065
Chromium, total	0.0089	CCME WQG		0.00025	0.0012
Cobalt, total	0.004	BC AWQG	0.0174	0.00005	0.00068
Copper, total ‡	0.002	BC AWQG		0.0009	0.0029
Iron, total **	0.3	CCME WQG		0.18	1.3
Iron, dissolved **	0.3	BC SDWQG		0.024	0.16
Lead, total	0.004	BC AWQG		0.000095	0.00051
Manganese, total *	0.12	BC SDWQG		0.016	0.059
Mercury, total	0.00001	BC AWQG		0.0000025	0.0000055
Molybdenum, total	0.073	BC AWQG		0.00037	0.00055
Nickel, total *	0.025	BC WWQG		0.00025	0.0014
Selenium, total	0.002	BC AWQG	0.008	0.000025	0.0002
Strontium, total	7	BC SDWQG		0.04	0.061
Silver, total *	0.00005	BC AWQG		0.000005	0.00002
Thallium, total	0.0008	BC WWQG	0.0022	0.000005	0.000014
Uranium, total	0.0085	BC WWQG		0.000036	0.000094
Zinc, total *	0.0075	BC AWQG		0.0015	0.0055

Notes: *mg/L=milligram per litre; BC AWQG=British Columbia Approved Water Quality Guidelines; BC SDWQG=British Columbia Source Drinking Water Quality Guidelines; BC WWQG=British Columbia Working Water Quality Guidelines; CCME=Canadian Council of Ministers of the Environment; SPO=Site Performance Objectives; WQG=Water Quality Guidelines*
*Guideline dependent on: * hardness; # pH; † pH and temperature; and ‡ pH, dissolved oxygen (DO) and hardness. Calculated based on the 50th percentile concentration of parameters from Goathorn Creek baseline monitoring.*
*** Short-term maximum BC AWQG are provided for fluoride and total and dissolved iron*
*Guideline dependent on: * hardness; # pH; † pH and temperature; and ‡ pH, dissolved oxygen (DO), and hardness. Calculated based on the 50th percentile concentration of parameters from Goathorn Creek baseline monitoring.*

6.4 Initial Dilution Zone (IDZ)

6.4.1 Description of Initial Dilution Zone (IDZ)

The East, West, and North management ponds will collect surface water from the Minesite area. Excess water from these ponds flows to the Tenas Control Pond with discharge to a tributary of Goathorn Creek. This tributary flows into the left bank of Goathorn Creek. During operation, the Tenas Control Pond only discharges in open water season and mixes with treated sewage effluent from the Sewage Treatment Plant from the Wastewater Storage Pond in the tributary of Goathorn Creek. It will be decommissioned during the Post-closure Phase, and excess water will be released from the North Management Pond to the same tributary as Tenas Control Pond that flows into Goathorn Creek.

The IDZ is in Goathorn Creek, below the confluence of the tributary and the mainstem of Goathorn Creek. It extends downstream to where parameters meet relevant WQGs in the receiving environment.

Details on the Goathorn Creek IDZ assessment can be found in **Appendix 13.5-A IDZ Assessment Memo**.

The Rail Infrastructure Sedimentation Pond discharges into the Bulkley River via an unnamed tributary. An IDZ analysis was not completed for this discharge due to the small volume of discharge versus the average flow of the Bulkley River. Similarly, the discharge rates from Explosive Magazine and Explosive Facility sedimentation ponds are very small in relation to the receiving environments in Tenas and Goathorn Creek and therefore no additional IDZ analyses were developed.

The TAC sedimentation ponds 1 East and 2 West, and the Gravel Quarry sedimentation ponds 1 and 2 discharge into the Goathorn Creek directly and through an unnamed channel. An IDZ analysis was not completed for these discharges due to the small volume of discharge versus the average flow of the Goathorn Creek. Furthermore, these discharges are only expected to have TSS effected due to the nature of the materials being handled, which is controlled through pond engineering.

The Rock Quarry Sedimentation Pond discharges into Helps Creek via an unnamed channel. An IDZ analysis was not completed for this discharge due to the small volume of discharge versus the average flow of the Goathorn Creek. Furthermore, this discharge is only expected to have TSS affected due to the nature of the materials being handled, which is controlled through pond engineering.

The Potable Water Storage Pond discharges into Four Creek. Since this water is non-contact water without any influence from mining, an IDZ analysis was not required.

6.4.2 Initial Dilution Zone (IDZ) Evaluation Cases

The Goathorn Creek IDZ assessment characterised and delineated the extent of IDZ for effluent discharged from the Project under a range of discharge and mixing conditions. The IDZ Assessment was developed according to Technical Guidance 11 (TG11) produced by the British Columbia Ministry of Environment and Climate Change Strategy (BC MECCS) (2019).

As described in TG11, the IDZ delineation was evaluated for three credible and conservative cases, based on site-specific information. The cases presented include a worst case (very worst case), a reasonable worst case (worst case that typically occurs), and 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 (**Table 6.4-1**). These IDZ cases were evaluated for both Operation, and Post closure phases (i.e., discharge from the Tenas Control Pond and the North Management Pond, respectively).

Table 6.4-1: Definition of Initial Dilution Zone (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 (2)	50th percentile background concentration	Maximum discharge for the lowest dilution month	95th percentile concentration with high source terms
Reasonable worst case	7Q10 low-flow relative to stream freshet	50th percentile background concentration	Average discharge for the freshet month	50th percentile concentration with high source terms
Expected case	Mean flow during critical period (3)	50th percentile background concentration	Average discharge during critical period	50th percentile concentration with expected source terms

Notes:
(1) 7Q10 low-flow: 7-day minimum flow that is expected to occur once every 10 years
(2) Considering maximum monthly discharge, the creek has lowest dilution in September during operation and April after closure
(3) Open water season (i.e., May-Oct) is the critical period for operation, while April-May is critical during post-closure

6.4.3 Summary of Initial Dilution Zone (IDZ) Assessment

POPCs in the effluent were identified by screening the Project discharge water quality results relative to WQGs (refer to **6.3.1**) for Goathorn Creek. The in-stream SPOs–developed for the Project environmental assessment (EA)–were considered for evaluation purposes. For IDZ modelling, the following parameters were identified as POPCs: dissolved and total aluminum, arsenic, dissolved cadmium, chromium, cobalt, copper, iron, manganese, nitrate-nitrogen, nitrite-nitrogen, selenium, sulphate, thallium, uranium, and zinc.

Considering the discharge rate and water quality in the Tenas Control Pond and the Wastewater Storage Pond during the Operation Phase, concentrations in the tributary of Goathorn Creek were obtained for the IDZ cases based on a fully-mixed mass balance approach. After mixing with Goathorn Creek flows, the total ammonia concentration in the tributary was below the WQG and therefore not included in the list of POPC's. The fully-mixed concentration of nitrate-nitrogen and nitrite-nitrogen in the tributary were carried forward in the IDZ evaluation for Goathorn Creek.

To characterise 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 to estimate stream hydraulic properties. These govern the dispersion characteristics in the receiving environment and were incorporated in the mixing and dilution model. The mixing model was developed considering the dilution required for each POPC to meet WQGs.

The extent of the IDZ and corresponding plume features were evaluated for the worst-case, reasonable-worst case and expected cases and compared against TG11 guidance. For the worst-case scenario, exceedances of WQGs occurred for: dissolved and total aluminum, dissolved cadmium, copper, iron, nitrite-nitrogen, selenium, sulfate, thallium, and zinc during operation, and total aluminum, copper, iron, selenium, sulfate, and zinc during Post-closure. This case is very conservative, as it considers the 7Q10 low flow combined with maximum Project discharge and 95th percentile concentration corresponding to high source terms. Emphasis was placed upon the reasonable-worst case and the expected case, which are conservative, but provide realistic evaluation scenarios.

The results of the IDZ assessment are summarized for the Phases below.

- Operation Phase:
  - Reasonable-worst case: Modelling results indicated WQG exceedances of total aluminum, dissolved cadmium, and selenium. These parameters meet the TG11 guidance, when the SPO is considered for in-stream water quality conditions;
  - Expected case: Parameters meet TG11 guidance, except for total aluminum. The recommended guidelines are satisfied for total aluminum when the SPO is applied;
- Post-closure Phase:
  - Reasonable-worst case: WQG exceedances of total aluminum and iron are predicted; however, the iron IDZ plume features are within 5% of the TG11 recommendation. The corresponding concentration is less than the 95th percentile baseline water quality. Total aluminum meets TG11 guidance for the SPO, representing in-stream water quality; and
  - Expected case: Exceedance only occurs for total aluminum, but TG11 guidance is met when applying the SPO.

In summary, only aluminium would be classified as a POPC beyond the IDZ zone under the expected case; however, aluminum is naturally elevated under baseline conditions, and the post-mixing results are within the natural variability of Goathorn Creek (i.e. less than 95th percentile of baseline water quality).

For the reasonable worst case, total aluminum, dissolved cadmium, and selenium would be classified as a POPC beyond the IDZ zone. These parameters meet in-stream SPO's within the IDZ.

6.5 Effluent End-of-pipe Discharge Criteria

6.5.1 Water Quality at Control, Management, and Sedimentation Ponds

Project discharge water quality corresponds to the expected water quality in the management ponds, control, and sedimentation ponds. Long-term estimates of water quality in the Tenas Control Pond, North Management Pond and Rail Infrastructure Sedimentation Pond were developed from water and load balance modeling for pre-mining, Construction, Operation, and Post-closure phases **(Appendix 13.5-B**). These predictions incorporate variability in hydrologic and groundwater conditions, climate change, and geochemical source terms. Long term estimates of water quality from other sedimentation ponds were not developed as these areas are very small and constructed using existing material so no change in water quality beyond elevated suspended solids concentrations are expected. Total suspended solids (TSS) concentrations would be controlled through the design of each pond.

The load balance component incorporates background loading developed from baseline surface and groundwater quality measurements. It considers multiple scenarios of source-term combinations, based on alternative rock and material management strategies and ranges of geochemical testing results. The base case source term, which is most likely to occur, incorporates Project design mitigation measures, expected inputs for geochemical source terms and average hydrology. Among different alternative assessment cases, a case with high geochemical source terms (Alternative Assessment Case 2) was also evaluated. From long-term monthly predictions, statistics on constituent concentrations were obtained for summer (i.e., May through October) and winter periods (i.e., November through April).

Table 6.5-1 outlines the expected monthly average concentration of nitrate-nitrogen and total selenium at the Tenas Control Pond and the Rail Infrastructure Sedimentation Pond during operation, and the North Management Pond during the Post-closure Phase once the Tenas Control Pond is decommissioned. These parameters were considered for the end-of-pipe discharge criteria (refer to **6.5**), based on the current understanding by TCL of what may become regulated by the federal government. Parameter concentrations are presented for the summer and winter periods with expected and conservative high source terms.

The maximum, average, 50th and 95th percentile concentrations of various water quality parameters are detailed in **Water and Load Balance Modeling Report** in **Appendix 13.5-A** and the **IDZ Assessment Memo** in **Appendix 13.5-B**. Most parameter concentrations are projected to decrease over the Post-closure Phase. Other sedimentation ponds are expected to have no exceedances of nitrate-nitrogen or total selenium due to nature of the materials being handled and only TSS is a concern for which the ponds have been designed to manage.

Table 6.5-1: Modelled Monthly Average Concentration of Nitrate-Nitrogen and Total Selenium at the Discharging Facilities

Discharging Facility	Modelled Concentrations (mg/L)							
	Nitrate-Nitrogen				Total Selenium			
Source Term	Expected	Expected	High	High	Expected	Expected	High	High
Season	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Tenas Control Pond (Operation Phase)	2.4	3.7	2.4	3.7	0.0072	0.0075	0.017	0.016
Rail Infrastructure Sedimentation Pond (Operation Phase)	0.0	0.0	0.0	0.0	0.0099	0.0092	0.010	0.0096
North Management Pond (Post-closure Phase)	0.032	0.046	0.032	0.046	0.0031	0.0036	0.0061	0.0071

Note: *mg/L=milligrams per litre*

In Canadian federal jurisdiction, end-of-pipe limits for discharge of mine effluent to the environment are not currently specified for the coal mining sector. The Coal Mining Effluent Regulations, pending under the *Fisheries Act,* RSC 1985, c F-14 (Government of Canada [GovCan] 1985), are currently in development and are expected to come into effect in the future. The Coal Mining Effluent Regulations are expected to specify end-of-pipe limits for pH, TSS, nitrate and total selenium for both existing and new coal mines.

Proposed end-of-pipe discharge concentration targets for nitrate-nitrogen and total selenium were developed considering in-stream water quality concentrations in Goathorn Creek, corresponding to BC AWQG and SPO, respectively. The end-of-pipe concentrations were back-calculated based on IDZ modeling conditions **(Appendix 13.5-A)** to meet TG11 guidance for flow criteria based on the reasonable-worst case during post-closure (**Table 6.4-1**), since it represents a conservative and realistic scenario. The in-stream 95th percentile concentrations in Goathorn Creek was used to conservatively represent lower dilution capacity conditions.

In the case of total selenium, end-of-pipe targets were developed using the Tier 1 SPO, which is higher than the Tier 2 SPO during open-water season in Goathorn Creek due to lower sulphate concentrations experienced during these months (**Appendix 13.5-A**). The Tier 1 end-of-pipe target was back-calculated to be 0.050 mg/L to reach the in-stream concentration of 0.008 mg/L, as presented in **Table 6.5-2**. TCL has developed a **Selenium Management Plan (Appendix 13.5-J).** This provides further information and activities that TCL will be undertaking to meet the selenium model predictions provided and to provide further responses if monitored Selenium levels are trending to be above the SPO Tier 1 and Tier II levels developed for this Project. Further information on nitrate mitigation items are in **S13.0-C6 Explosives**

Management Plan (EMP). Some the activities that are suggested for attenuated Selenium levels will also reduce nitrate levels such Biochemical Reactors and some of the active water treatment flowsheets.

Based on the BC AWQG for nitrate-nitrogen of 3 mg/L, the end-of-pipe target for nitrate-nitrogen was calculated to be 18.8 mg/L (**Table 6.5-2**). Derivation of the end-of-pipe targets are described in **Appendix 13.5-B IDZ Assessment Memo.**

Table 6.5-2: Calculated End-of-pipe Discharge Concentration for Nitrate-Nitrogen and Total Selenium

Parameter	Goathorn Creek Background Concentration, 95th percentile (mg/L)	In-stream Water Quality Requirement (mg/L)		Calculated End-of-pipe Targets (mg/L)
		Source	Value	
Nitrate-nitrogen	0.0760	BC AWQG	3.0	18.80
Total selenium	0.0002	SPO (Tier 1)	0.0080	0.050

Note: *mg/L=milligrams per litre*

6.6 Calcite Considerations

As part of the overall assessment of potential water quality effects from the Project a review was completed for potential calcite precipitation as observed in the Elk Valley. SRK completed an analysis on potential calcite precipitation in the immediate downstream environment below the end-of-pipe discharge location in Goathorn Creek. Please see **Appendix 13.5-K Calcite Precipitation Evaluation Technical Memorandum.**

Based on the analysis conducted SRK concluded that the Project is not expected to cause calcite precipitation in Goathorn Creek as calcite concentrations will not change measurable from current baseline conditions and there is not visual signs of calcite precipitation based field monitoring activities. This parameter will be monitored as part the water monitoring program for the Project and regular visual observations of creek bed substrate conditions will be carried out as part of the ongoing monitoring program. If monitoring observes calcite precipitation at levels that are harmful to aquatic life and fish and fish habitat, a treatment system will be implemented for the effluent being discharged from the Tenas Control Pond.

6.7 Trigger Action Response Plan (TARP)

For discharge management, routine water monitoring will be conducted according to **Appendix 13.11-E Water Monitoring Plan** in **MWMP.** The TARP is based on the active monitoring plan; action plans will be implemented to address and mitigate unexpected (i.e. deviating from expected conditions from modelling) or deteriorating effluent quality (i.e. change relative to ongoing monitoring datasets). Goathorn Creek flow, pond volume, Project discharge and water quality monitoring data will be reviewed, based on water and load balance modelling (**Appendix 13.5-B**), to assess if water quality benchmarks and TG11 guidance are met.

Potential triggers for the Project discharge were evaluated, and the corresponding actions, are outlined below:

- Exceedance of WQGs can occur for the worst case scenarios reviewed, which is very conservative, considering the 7Q10 low flow combined with maximum Project discharge and high source-term

concentrations is not expected to occur routinely. Such a condition may only occur for a week maximum. Such potential short-term exceedances are expected to be prevented by operational controls, based on metered discharge from the ponds and active monitoring of downstream flow and pond water quality;

- The TG11 guidance is met for POPCs during the reasonable-worst case and expected case based on SPOs. Adaptive management will need to be incorporated if concentrations exceed the water quality benchmarks for this case which may involve staged threshold discharge from the ponds;
- Based on water and load balance modeling, nitrate-nitrogen concentration in the Tenas Control Pond is high in the first 10 years of operations after the construction of management pond dams and buttresses. The maximum concentration exceeds calculated end-of-pipe concentration of 18.8 mg/L (refer to **Table 6.5-2**). However, this exceedance only occurs during winter, when there is no discharge from the Tenas Control Pond (**Appendix 13.5-A**) so this exceedance is not material. During active discharge, there are no expected exceedances of the calculated end-of-pipe targets for nitrate-nitrogen (see **6.5**). Actions to reduce nitrate levels are outlined in the **EMP**; and
- Under expected conditions, the water and load balance modeling shows that the end-of-pipe target for total selenium **(Table 6.5-2**) will not be exceeded. If concentrations of selenium in the Tenas Control Pond are measured near the end-of-pipe target, alternative mitigation measures, such as staged threshold discharge from the ponds, could be implemented to ensure that downstream water quality does not exceed the SPO. The **Selenium Management Plan (Appendix 13.5-J)** outlines further responses if there is any exceedance of the water quality SPO thresholds.

Response to the potential WQG exceedance triggers and corresponding actions are to be verified through active monitoring. The following actions could be implemented to limit WQG exceedance in the receiving environment:

- In the event of an extreme low-flow (i.e., 7Q10 low-flow), if WQG/SPO is exceeded in a weekly sampling event, a duplicate sampling and flow measurement as well as measurements in the receiving water will be collected. No action is required if the duplicate event and the subsequent event are below WQG/SPO. If WQG/SPO is exceeded for three consecutive weeks, additional monitoring will be implemented at the edge of IDZ. In this case, storage volume in the control and management and sedimentation ponds can be utilized to limit/minimize discharge to the receiving environment. Target volumes in the management, sedimentation, and control ponds are used to trigger actions including discharge to environment and/or storage in ponds. Discharge during winter months is minimized where possible due to the reduced dilution capacity in Goathorn Creek at that time and the likelihood of low flows during this period;
- When WQG/SPO is exceeded for two (2) consecutive weeks during typical low and average flow conditions, a staged discharge approach with frequent sampling will be implemented. This involves reducing the discharge and increased subsequent sampling, followed by gradual increase of discharge volumes with monitoring until discharge objectives are met. Additional storage capacity in the control and management ponds can be utilized for this case, and contingency pumping may be enabled to balance the storage capacity among the ponds so that they do not overflow;
- If the pond water quality being discharged offsite exceeds end-of-pipe targets for a period of two (2) weeks over a period of three (3) years, offsite discharge may be stopped immediately. Mitigation could include not discharging and transferring the water between management, sedimentation, and control ponds until water quality meets end-of-pipe targets. Detailed sampling and follow-up lab analytics will be carried out. If results are consistently above the end-of-pipe target, CPP operations and maintenance procedures are to be reviewed to investigate operations affecting water quality. Further contingency actions can also be implemented such as:
  - submerging potentially acid generating (PAG) rock underwater quicker;

- covering non-PAG material during the Operation Phase with geomembranes to prevent infiltration;
- allowing additional non-contact water to enter the Minesite prior to discharge offsite;
- pumping water from Goathorn Creek into the Minesite water management system; and
- implementation of passive and active water treatment.

6.8 Water Monitoring

The **Minesite Water Monitoring Program** in **Appendix 13.11-E** of the **MWMP** includes flow and water quality monitoring at Goathorn, Tenas and Four Creeks, in addition to the Telkwa and Bulkley Rivers. The monitoring will be conducted to evaluate potential exceedances for the identified POPCs in any of the case conditions, and the degree and frequency of such occurrences.

The monitoring plan includes:

- Streamflow and surface water quality monitoring will continue at stations used in the environmental baseline program. Water quality samples will be collected using a grab sample. Water level data will continue to be collected using *in situ* pressure transducers and rating curves will be reviewed annually and updated to convert levels to streamflow;
- Groundwater monitoring will be conducted at existing and proposed monitoring wells. The monitored parameters will include groundwater levels and the groundwater quality; and
- Water quality sampling and flow measuring system will be installed in management ponds to enable monitoring of the pond inflows and associated discharges.

The **MWMP** also includes monitoring POPC concentrations downstream of the Project discharge in Goathorn, Tenas and Four Creeks in addition to the Telkwa and Bulkley rivers, to ensure water quality benchmarks are met. Monitoring will continue into the Post-closure Phase.

7. MONITORING

TCL will conduct regular inspections of the water management system to ensure that structures are in good condition. TCL will also conduct regular audits to ensure that the DMP is being followed and gather input from users.

Monitoring of POPC/Contaminants of Potential Concern (COPC) and POC/Contaminants of Concern (COC) identified for aquatic life, wildlife, terrestrial vegetation, human health, and land uses will be conducted for soils, vegetation, sediment, and surface and groundwater.

7.1 Performance Objectives

Performance objectives to ensure the proper implementation of this DMP are detailed in **Table 7.1-1**.

Table 7.1-1: Performance Objectives

Objective	Target
Total suspended solid (TSS) levels in discharge from sedimentation and Tenas Control Pond meet regulatory requirements	Meet regulatory requirements for discharges from structures and if needed, assess flocculant and/or coagulant effectiveness and quantities used.
No measurable effects on fish from flocculant and/or coagulant use	Target zero, no measurable effects on fish and/or fish habitat due to the use of flocculants and/or coagulants
Water levels in the management ponds meet cover requirement	Meet minimum cover requirement of 0.5 meter (m) and target 1 m if practical
Water levels in the management ponds meet minimum cover requirement	Meet minimum cover requirement of 2 m in Post closure
Staged discharge is implemented when needed	When WQG is exceeded for two (2) consecutive weeks during typical low and average flow conditions, a staged discharge approach with frequent sampling was implemented. This involves reducing the discharge and increased subsequent sampling, followed by gradual increase of discharge volumes with monitoring until discharge objectives are met.
Parameters of Potential Concern/Parameters of Concern (POPC/POC) or Contaminants of Potential Concern/Contaminants of Concern (COPC/COC) are monitored	Monitoring of these elemental concentrations downstream of the Project discharge in Goathorn, Tenas and Four creeks and in the Telkwa and Bulkley rivers to ensure do not exceed benchmarks.
Management and control ponds meet end-of-pipe target	Water quality monitoring at control and management ponds to meet nitrate-nitrogen and selenium end-of-pipe concentration.
Repeated water quality sampling and flow monitoring at the Initial Dilution Zone (IDZ)	When WQG is exceeded during low-flow conditions, a duplicate sample and flow measurement will be collected. Additional monitoring will be implemented and reported to meet in-stream benchmarks.
Minimize Tenas Project (Project) discharge during winter months	Meet water quality benchmarks in the receiving environment during low flows with reduced dilution capacity.
As-built report is available for channels including discharge	Complete an as built report for channels and any modifications completed

Objective	Target
Channels including discharge are regularly inspected	Complete annual inspections for channels, to check effectiveness of erosion and sediment control features are in good working order
Channels including discharge are subject to regular maintenance	Complete annual maintenance requirements and documentation for structures
Flows are tracked in channels including discharge	Track flows in structures to confirm effectiveness and seepage losses
As-built reports are available for sedimentation ponds, management ponds, and Tenas Control Pond	Complete an as built report for structures and any modifications completed
Sedimentation ponds, management ponds, and Tenas Control Pond are subject to geotechnical inspection	Complete geotechnical inspections annually by the Engineer of Record for structures that require this type of inspection and complete repairs noted
Sedimentation ponds, management ponds, and Tenas Control Pond are subject to regular maintenance	Complete annual maintenance requirements and documentation for structures
Flows are tracked in sedimentation ponds, management ponds, and Tenas Control Pond	Track flows through structures and water levels
Sedimentation ponds, management ponds, and Tenas Control Pond are monitored for water quality	Complete water quality and quantity monitoring for structures
Sedimentation ponds, management ponds, and Tenas Control Pond are subject to a geotechnical review	Complete a third-party geotechnical review of embankments every three (3) years or as required based on regulatory requirements and/or inspections performed by TCL personnel.
Sedimentation ponds, management ponds, and Tenas Control Pond are subject to monitoring for seepage	Complete seepage monitoring and compare to target levels and make any changes in future management pond liner construction requirements
Pumping systems are inspected regularly	Complete two (2) annual inspections for structures
Spare parts are available onsite for pumping systems	Ensure systems have critical spares onsite to ensure sufficient redundancy
Utilize storage capacity in control and management ponds	In the event of an extreme low-flow period, storage volume in the control and management ponds can be utilized to limit/minimize discharge to the receiving environment. Target volumes in ponds are used to trigger actions including discharge to environment and/or storage.
Contingency pumping to minimize Project discharge	Contingency pumping may be enabled to balance the storage capacity among the management and control ponds to avoid overflow and control Project discharge.
An as-built report is available for pumping systems	Complete as built report for pumping systems
Pumping systems used throughout the Project are similar	Ensure systems are as similar as possible

8. REPORTING

8.1 General Reporting

Reporting completed by TCL will ensure consistent implementation of the DMP. Summary reports of monitoring activities and results will be compiled and reviewed annually, per **7. Monitoring**.

8.2 Compliance Reporting

Compliance reporting will be subject to the specifications and conditions of the EAC, and *Mines Act,* RSBC 1996, c 293, and *Environmental Management Act,* SBC 2003, c 53 (*MA/EMA)* permit conditions. The information gathered during monitoring practices will be summarized with information from other management plans into an Annual Environmental Management Summary Report and, upon permit completion, the Annual Environmental Reports as required by *MA/EMA* permits. Community engagement activities will be an aspect of the **Socio-economic Management Plan (S13.0-C16) (SEMP)**. The **SEMP** will have requirements related to reporting on community engagement programs**.**

8.3 Internal Reporting

Details of the inspection of the discharge infrastructure and water quality monitoring will be reported internally on an annual basis according to the adaptive management framework of the **EMS**. The report will provide results of monitoring, assessment of performance objectives in **7.1** and including any other pertinent information.

TCL staff or contractors will be strongly encouraged to report any inefficiencies to management for evaluation consideration.

8.4 Annual Reporting Requirements

In accordance with the **Minesite Water Monitoring Program (Appendix 13.11-E)** of **MWMP**, TCL will prepare an annual report to the British Columbia Ministry of Environment (BC MOE) summarizing the results of monitoring required under the *EMA* permits.

Key information requirements outlined in the annual report will include:

- Compliance: effluent and process monitoring results are compared to the applicable permit requirements and limits. Non-compliance events are highlighted;
- Spills and other incidents: include dates, times, descriptions, and a chronology of measures taken for incidents over the year that resulted in the release of unauthorized effluent emissions;
- Management plan summaries: summary of activities that occurred during the year related to applicable management plans in place onsite;
- Environmental effects: monitoring results are summarized, and effects assessed; and
- Recommendations: about how existing effects are resolved or minimized, how non-compliance or effects will be avoided in the future, whether the monitoring programs are still sufficient and effective, and how to enhance the monitoring program, if required.

A proposed outline of the annual report is listed below:

- executive summary;
- description of Minesite operation and discharges;
- chemical reagents and waste storage;
- incidents;
- monitoring:
  - summarize, interpret, and discuss the results of environmental monitoring as required in the associated discharge permit, including:
    - monitoring program description;
    - sampling methodology and equipment used, noting any variations in data collection;
    - description of quality assurance/quality control (QA/QC) measures and procedures used;
    - hydrological and flow monitoring results;
    - water quality monitoring results;
    - data interpretation;
    - summary and conclusion; and
    - appendices.

9. ROLES AND RESPONSIBILITIES

Primary responsibilities have been assigned to the following groups:

9.1 Mine Manager

The Mine Manager bears overall responsibility for all phases of the Project, and responsibility for management ponds, onsite environmental monitoring and compliance relating to Construction, Operation, Decommissioning and Reclamation, and Post-Closure phase activities. The Mine Manager reports to the executive steering committee for TCL and will coordinate with this group to ensure that Project objectives are being met.

Specifically, the Mine Manager will:

- implement the DMP;
- provide the necessary budget and resources to allocate sufficient resources to carry out the DMP and monitoring of discharges;
- complete an annual inspection of water management infrastructure;
- participate in periodic risk assessments associated with DMP; and
- facilitate the annual review of the DMP.

9.2 Mine Superintendent

The Mine Superintendent will:

- complete an annual review of the DMP;
- complete quarterly inspections of water management infrastructure; and,
- provide equipment and personnel to carry out maintenance of water management infrastructure, when requested.

9.3 Environmental Coordinator

The Environmental Coordinator will:

- complete an annual review of the DMP;
- complete monitoring of discharges and receiving environment in Goathorn, Tenas and Four creeks, and the Telkwa and Bulkley rivers and *EMA* data reporting to regulatory agencies;
- complete the Annual Environmental Management Summary Report related to the DMP and submit to regulators and Indigenous groups; and
- complete quarterly inspections of environmental aspects water management infrastructure.

9.4 Environmental Technician

The Environmental Technician will:

- provide vacation cover for the Environmental Coordinator;

- assist Environmental Coordinator, as required, with the Annual Environmental Management Summary Report; and,
- assist the Environmental Coordinator with inspection and monitoring related to the DMP.

9.5 Quality Control/Quality Assurance (QA/QC) Technician

The Quality Assurance/Quality Control (QA/QC) Technician will:

- assist with water, sediment, surface soil, overburden, dust samples and ML/ARD samples of mine rock, processed rock, ROM coal, and open pit surfaces, using standard industry best management practices (BMPs) and QA/QC methodologies;
- assist the Environmental Coordinator as required with the Annual Environmental Management Summary Report;
- assist the Environmental Coordinator with monitoring related to the DMP;
- provide vacation coverage for the Environmental Technician; and
- complete monthly inspections of water management infrastructure.

9.6 Employees and Contractors

Employees and contractors will:

- complete a site-specific environmental induction and training appropriate to their role; and
- understand and implement the DMP, as appropriate to their role.

10. COMMUNICATION

Communication of the DMP at TCL will be based on internal requirements and will primarily take place through this DMP and relevant SPPs. Any significant change to the DMP will be communicated to the Project's employees and contractors through a site-wide email, announcements over radio channels by Minesite supervision and bulletins posted around the Project Minesite. When effective to do so, maps will be marked with changes. Change management is detailed in **12**.

10.1 Training and Awareness

Employees and contractors will have training and awareness of the Project responsibilities to meet the objectives of the DMP for Project phases. Training will include an overview of the objectives, mitigation measures, monitoring, and reporting requirements to meet DMP targets.

Employees and contractors will receive training on the DMP during a general site safety orientation. DMP training will occur before individuals begin work on the Project and for new personnel arriving onsite.

Additional training will be provided to employees and contractors delegated to specific work tasks (e.g., clearing, reclamation or herbicide application) and will occur through site-specific orientation and/or in-person communication with the Environmental Coordinator.

10.2 Communication Policy

Personnel and contractors operating and/or inspecting any part of the DMP system shall follow the site's communication policy.

10.3 Visual

Personnel and contractors operating, maintaining, or monitoring the site discharge system must be knowledgeable of the **MWMP**. Any visual abnormalities such as high sediment levels and/or hydrocarbon sheens are to be reported to the Environmental Coordinator.

10.4 Verbal

Non-operating personnel must contact water management system operators and obtain permission before entering an active work area. Only persons needing to perform work in an active work area are authorized to enter this work area and only for the time required to perform the task at hand.

11. EVALUATION AND ADAPTIVE MANAGEMENT

11.1 Evaluation

A review of the DMP will be completed by the Environmental Coordinator on an annual basis to compare data, trends, and implementation of the management plans and their objectives. This process will include a review of DMP deliverables and input received from Indigenous groups through the **SEMP.**

11.2 Adaptive Management

Adaptive management will be adopted to verify that management plans and mitigation measures are consistently meeting or exceeding performance objectives and targets. This will be achieved through periodic reviews of the DMP and the results of monitoring programs in comparison with expected outcomes from the model **(Appendix 13.5-B**). The DMP is a living document that will be reviewed and improved as site conditions change and following the evaluation of monitoring and sampling data collected through the life of the Project.

11.3 Continuous Improvement

TCL will work towards continuous improvement throughout the Project. The Mine Manager (or designate) will investigate improvements in any trend and assess whether the practices responsible for the improvements can be applied to other areas of the Project. Deteriorating trends will be studied to determine root causes.

When the cause is identified, the Mine Manager (or designate) will implement a suitable corrective action. Examples of corrective actions could include (but are not limited to):

- Update the water and load balance model;
- finding alternate flocculant and addition rates to improve TSS;
- additional training of employees and contractors on procedures;
- enhancement of maintenance or monitoring measures;
- construction of additional water management infrastructure; and/or,
- additional supervisory oversight.

TCL will amend the DMP, as required, based on annual evaluations, monitoring, and feedback from stakeholders and the Indigenous groups. Any proposed changes will be sent out for review by regulators, selected stakeholders, and Indigenous groups, as required before being finalized and implemented into the DMP.

12. CHANGE MANAGEMENT

Changing any part of the DMP requires a formalized process. If significant changes are being planned to objectives, management plan structure, operational milestones, communication and/or information management, it is required that the Management of Change (MOC) procedure in the **EMS** be followed. Minor edits and/or updates to this DMP will be facilitated through version control and content approval functions.

13. CONCLUSION

Management of the Project discharge and meeting compliance objectives requires diligent operation and planning. Through implementation of this plan and relevant SPPs, TCL will ensure that discharge objectives are met.

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Appendix 13.5-A Initial Dilution Zone (IDZ) Assessment Memo

TELKWA COAL
LIMITED

Appendix 13.5-B Water and Load Balance Modeling Report

TELKWA COAL
LIMITED

Appendix 13.5-C Aluminum SPO Recommendation Memo

TELKWA COAL
LIMITED

Appendix 13.5-D Cadmium SPO Recommendation Memo

TELKWA COAL
LIMITED

Appendix 13.5-E Cobalt SPO Recommendation Memo

TELKWA COAL
LIMITED

Appendix 13.5-F Nitrite SPO Recommendation Memo

TELKWA COAL
LIMITED

Appendix 13.5-G Selenium SPO Recommendation Memo

TELKWA COAL
LIMITED

Appendix 13.5-H Thallium SPO Recommendation Memo

TELKWA COAL
LIMITED

Appendix 13.5-I Sulphate SPO Recommendation Memo

TELKWA COAL
LIMITED

Appendix 13.5-J Selenium Management Plan

TELKWA COAL
LIMITED

Appendix 13.5-K Calcite Precipitation Evaluation Technical Memorandum

TELKWA COAL
LIMITED