

A First Aid Room will be set up in the Administration Building and will be fully stocked to deal with all anticipated emergency situations at the Minesite. There is additional support and equipment located in the Mine Rescue Building that is discussed in the following subsection.

There are also emergency response facilities located in Telkwa and Smithers consisting of a volunteer Fire Department that can assist in responding to any emergencies at the Minesite with the following equipment:

- ▶ fire truck; and
- ▶ ambulance.

1.16.2 Light Vehicle Maintenance and Mine Rescue Buildings

The Light Vehicle Maintenance Building is constructed in Year 1 and will consist of a 40 foot (ft) by 60 ft fabric structure with a sea container foundation and concrete floor for servicing light vehicles onsite. This building will be equipped with a four-point hoist and air extraction systems to allow for the efficient and safe maintenance of light vehicles.

The Mine Rescue Building is also constructed in Year 1 of the Project and will be an identical building in size and construction as the Light Vehicle Maintenance Building. An ambulance will be onsite to respond to emergency calls to convey people to the hospital located in Smithers. The ambulance will be stored inside this building. Furthermore, a heavy rescue truck will be stored in this building to assist the Emergency Response Team (ERT) in responding to emergencies onsite. The Mine Rescue Building will be equipped with a concrete floor, storage facilities for mine rescue equipment and clothing, plug ins for the ambulance and heavy rescue truck and air extraction systems.

An example of the building that will be used for light vehicle maintenance and mine rescue is shown in **Figure 1.16-2** below.



Figure 1.16-2: Photo of typical building that will be used for Light Vehicle Maintenance and Mine Rescue buildings

1.16.3 Maintenance Facility

The Maintenance Facility will be constructed in Year 0 with the foundations being established in Year -0.5 and will be a pre-engineered steel building used for mine equipment maintenance, heavy and light vehicle washing, warehouse storage, and lubricant storage.

The facility will be designed to accommodate the 90-tonne rigid frame haul trucks (Caterpillar 777G or equivalent). The Maintenance Facility will include the following:

- ▶ two (2)-bay heavy vehicle maintenance bays for preventative and break down maintenance activities with common overhead travelling crane;
- ▶ one (1) heavy vehicle wash bay that has facilities for both heavy and light vehicles;
- ▶ one (1) outdoor heavy vehicle welding pad;
- ▶ warehouse with shipping and receiving ramp;
- ▶ lubricant storage, and distribution;
- ▶ cold storage warehouse for equipment parts and supplies; and
- ▶ mechanical and electrical services, i.e., compressors, switchboard, etc.

The two (2) maintenance bays and heavy vehicle wash bay will have a heated concrete floor slab while the remaining of the warehouse and cold storage areas will only have concrete floors with heating provided by the HVAC system. Lubricant dispensing reels will be in the mid-point of the two (2) heavy vehicle maintenance bays and will be interconnected to the lubricants stored in the Maintenance Lubricant Storage Facility. The workshop will include a forced air HVAC system with enough make-up air capacity to allow trucks to run within the building connected to dedicated systems for required running tests. The Maintenance Facility will be designed to allow for additional maintenance bays to be added to the non wash bay end of the structure. A feasibility level design was obtained from Seko Construction which is a company that supplies and assembles pre-engineered steel buildings for various industrial users. **Figures 1.16-3** and **1.16-4** below illustrates the Maintenance Facility which will include space for equipment maintenance, warehousing, and cold storage.

Additional details on the Maintenance Facility can be found in **Appendix 1.0-P Seko Construction, Tenas Project Maintenance Facility Additional Background Technical Information** attached.



Figure 1.16-3: Isometric view of Maintenance Facility

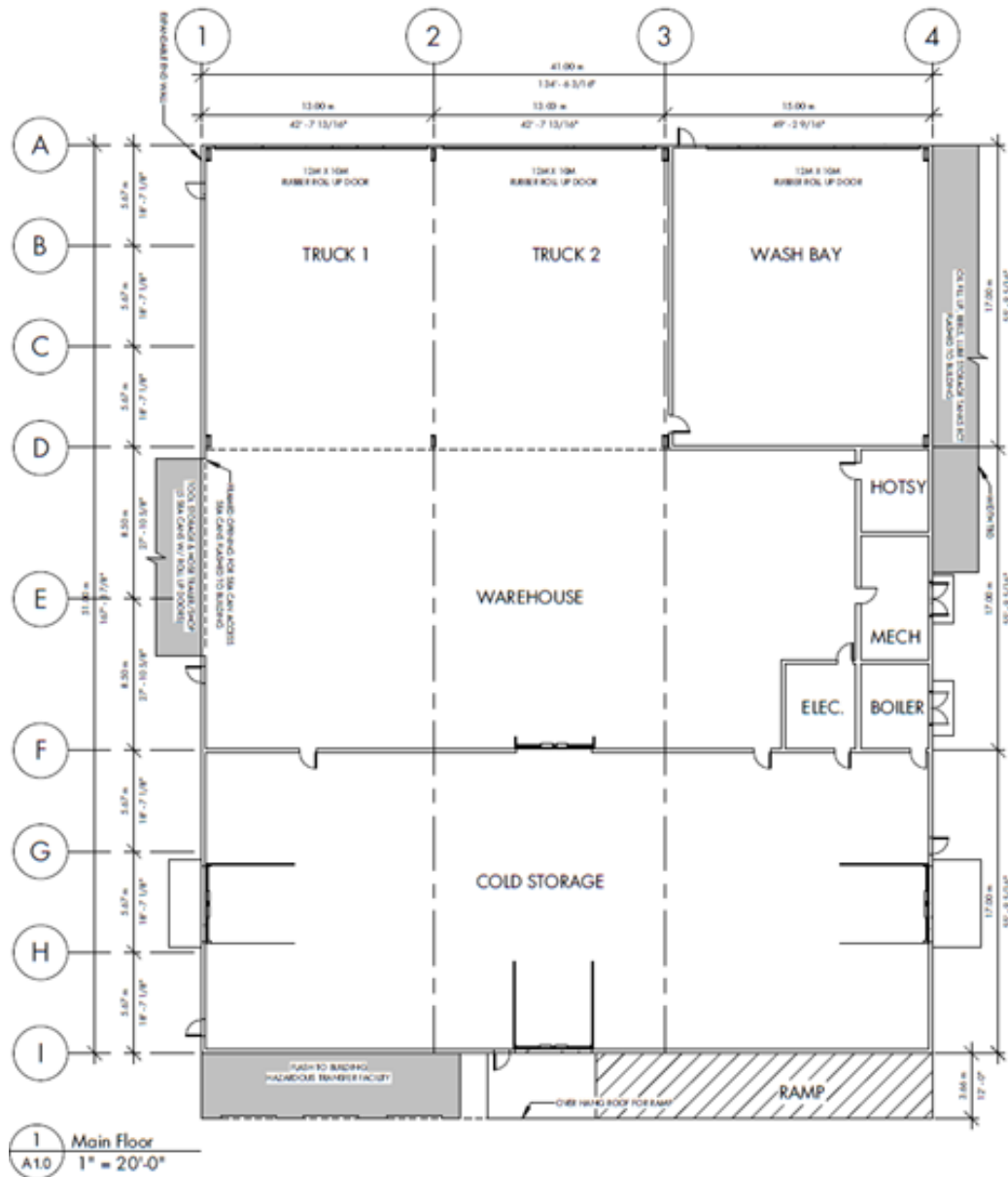


Figure 1.16-4: Maintenance Facility plan view

1.16.4 Tire Shop

In Year 1 a fabric pre-engineered heated building will be constructed in the vicinity of the Maintenance Facility and used as a tire repair facility for both mining equipment and light vehicles. Ground preparation will be compacted gravel and the fabric structure will be anchored by sea containers. The contractor selected for tire repair services will be responsible for this building and it will be covered by the tire services contract of the mine. This facility will look almost identical to the Light Vehicle Maintenance and Mine Rescue buildings shown by **Figure 1.16-2** previously. This building and associated equipment will be provided by a third-party contractor such as Kal Tire or Fountain Tire.

A concrete jacking pad will be constructed externally to the Maintenance Facility and will be sized to accommodate one (1) 90-tonne rigid frame haul truck (example Caterpillar 777G). **Figure 1.16-5** below illustrates the design for the 90-tonne jacking pad.

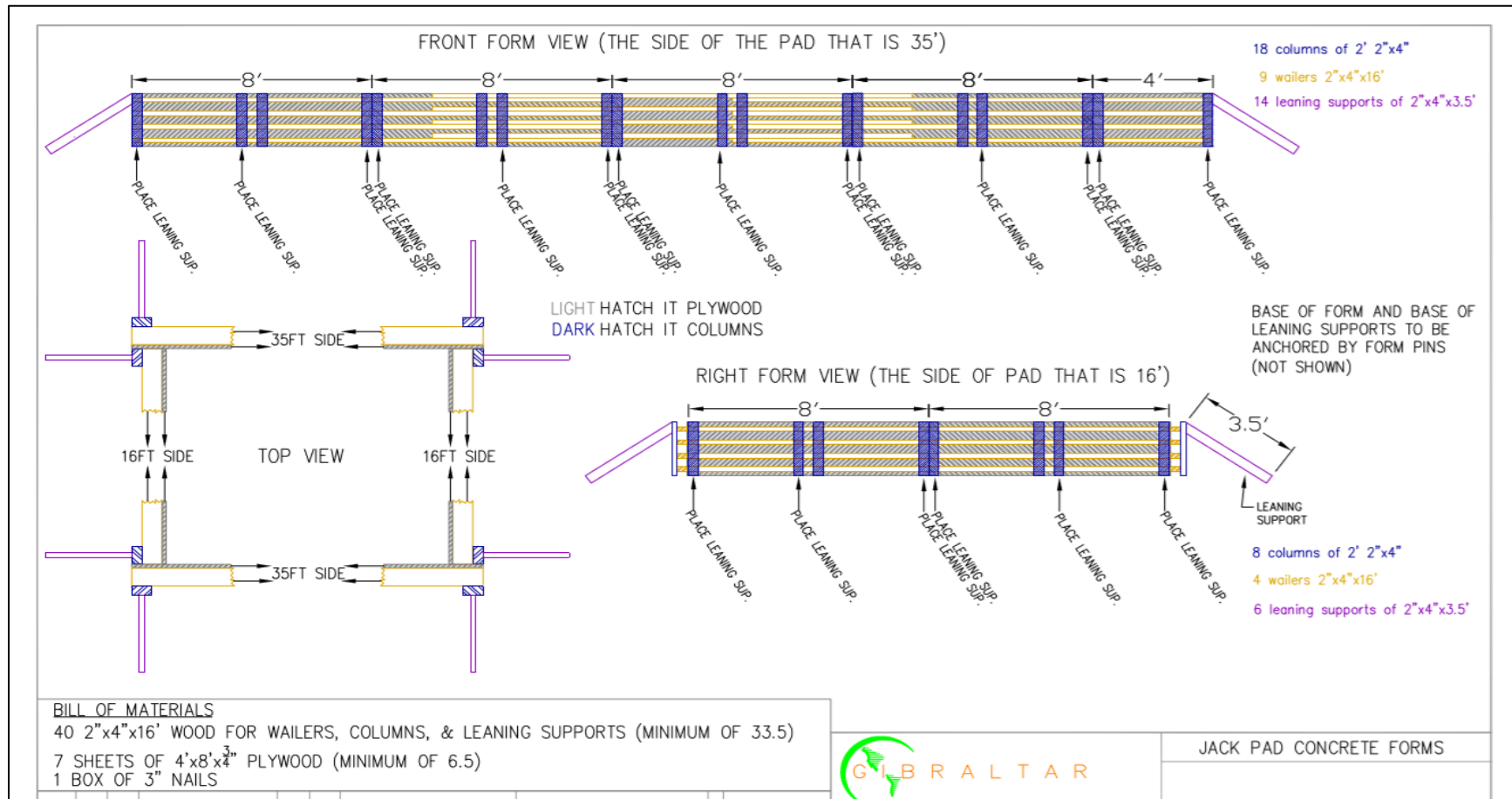


Figure 1.16-5: 90-tonne rigid frame truck jacking pad

1.16.5 Containerized Storage and Hydraulic Hose Shop

In Year 1 several 40-ft sea containers will be purchased, installed, and outfitted to supplement the Maintenance Facility. The containers will be located close to the Maintenance Facility and will be used for:

- ▶ tools;
- ▶ hydraulic hose shop; and
- ▶ equipment consumable storage.

A further sea container outfitted to be a fully functional hydraulic hose shop will be purchased to allow the repair of hydraulic hoses onsite and storage for all hydraulic hoses and fittings required for the shop.

In Year 2 with the construction of the Maintenance Facility complete, several more 40-ft sea containers will be purchased with lighting and electrical connections for:

- ▶ tool storage for each maintenance shift;
- ▶ tool storage for the plant; and
- ▶ specialized tools for site.

1.16.6 Welding Pad

All welding will occur outside the Maintenance Facility on the Welding Pad side of the Maintenance Facility. Plugs will be provided on the outside of the building to connect welders to and to run portable heaters. The Welding Pad will be equipped with tarp system holders and such to allow the equipment to be partially protected from the elements if required.

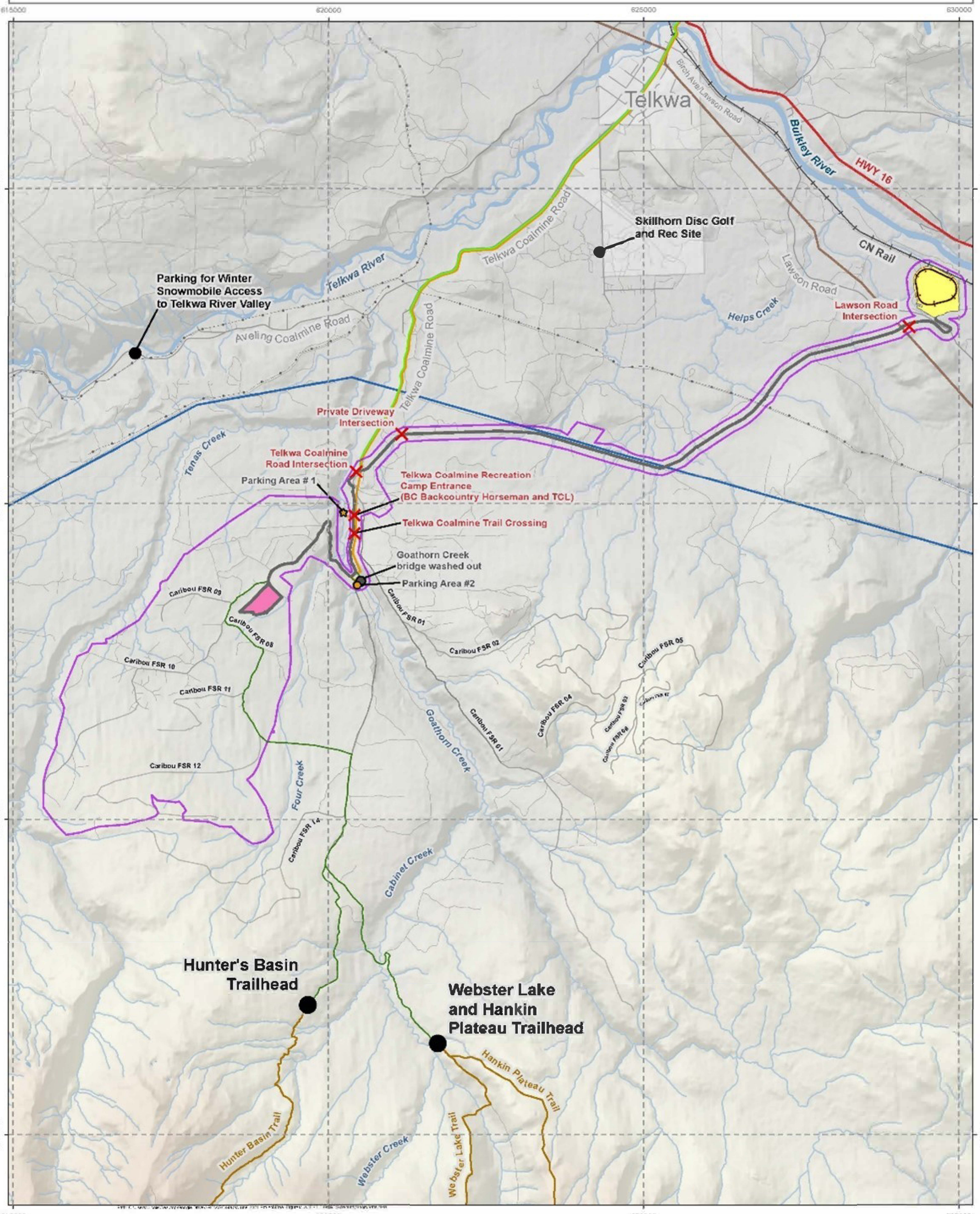
1.16.7 Site Security

Entry to the site will be via boom gates with cameras, controlled via radio frequency clickers like a garage door opener. Six (6) gates will be located on the TAC where it intersects the Telkwa Coalmine Road, on a private driveway, entrance to the TCRC, Telkwa Coalmine Trail Crossing and two (2) more gates will be located where the Lawson Road intersects the TAC. A camera will also be placed at these locations to help secured access to the site and reduce unwanted access. The location of the boom gates will ensure no uncontrolled site access to the Minesite and/or Rail Infrastructure. The location of the boom gates is shown on **Figure 1.16-6** below.

Tenas Project

Security Boom Gate Locations

- | | | | | | |
|--|--------------------------------|---|------------------------------|---|-------------------------|
|  | Project Area |  | 138 kV Transmission Line |  | Hiking Trail |
|  | Mine Infrastructure Complex |  | 500 kV Transmission Line |  | Watercourse |
|  | Rail Loop |  | Rail Line |  | Highway |
|  | Rail Infrastructure |  | Pacific Natural Gas Pipeline |  | Telkwa Village Boundary |
|  | Under TCL Escort |  | Current Access Route |  | Waterbody |
|  | Tenas Access Corridor |  | 25 kV Powerline |  | Parking Area 1 |
|  | Intersections and Access Gates |  | Secondary Roads and Trails |  | Parking Area 2 |



1.16.8 Site Communications

The mine will be serviced with a radio communication system for all people onsite to communicate with other people. The site will also be serviced by an internet and voice-over internet protocol (VOIP) system which is connected and runs off the system currently in place at TCL's office located in the office in Telkwa.

1.16.9 Fire Protection and Detection Systems

During the Construction Phase, the Project's fire suppression system will consist of fire extinguishers located appropriately around the Project Minesite. At end of the Construction Phase a fire detection system will be installed as part of the CPP and Maintenance Facility construction projects. Furthermore, a fire prevention system encompassing a distribution system to two (2) dedicated fire hydrants located strategically around the MIC will be installed. The fire prevention system will comprise a diesel-powered fire pump installed at the same location as the process water supply pump that is used for process water supply. Fire water will be supplied from the Tenas Control Pond for the CPP, and Maintenance Facility wash bay. The Tenas Control Pond has a capacity of approximately 850,000 m³ of water with a minimum storage value of 150,000 m³ which is sufficient to support fire fighting activity. Furthermore, additional water can be sourced from open pit dewatering activities and the management ponds if required. Fire water distribution lines will be installed within the MIC pad and two (2) fire hydrants will be installed at designated locations to allow for onsite fire fighting for all fixed infrastructure components. The CPP and MIC will have a dedicated fire pump system, with dedicated hydrants with sufficient hose lengths to quickly respond to any fires at the CPP and MIC pad area. The fire protection system will be designed and installed in accordance with National Fire Code of Canada 2015 (NRCAN 2015) and BC Fire Code 2018 (Government of British Columbia [GovBC] 2018) and will consist of the following:

- ▶ hand activated manual alarms and fire protection activation subpanels located throughout the following buildings (CPP, Maintenance Facility, Mine Rescue, Light Vehicle Maintenance, Tire Shop, Administration and Mine Dry);
- ▶ fire hose reels and dry chemical powder (DCP) portable fire extinguishers with polyvinyl chloride (PVC) clear cover;
- ▶ carbon dioxide (CO₂) portable fire extinguishers located adjacent to electrical service facilities;
- ▶ point type smoke and heat detection buildings as required;
- ▶ carbon monoxide detection in buildings as required;
- ▶ fire water supplied from the Tenas Control Pond and pumps;
- ▶ a maximum system operating pressure, not less than 1,035 kPa for a period of 12 hours;
- ▶ fire water ring main servicing hydrants near the MIC and CPP facilities;
- ▶ sounder and beacons installed throughout the site;
- ▶ Class II hose station complete with foam depot boxes for hazard areas; and
- ▶ sufficient water storage to sustain one (1) full hour of both hydrants being activated

A fire alarm system will be installed within the motor control centre (MCC) of the CPP, the Administration Building, Maintenance Facility, Potable Water Treatment Plant, Mine Rescue Building, Light Vehicle

Maintenance Building, Explosive Facility, and Tire Shop for early smoke and/or heat detection which will provide immediate alarm to the CPP control room.

Fire extinguishers will be strategically placed and sized within the Project's footprint and will also be mounted in all Supervisor, Superintendent, and Manager vehicles. The emergency response vehicle will also be equipped with portable fire extinguishers.

The wash bay in the Maintenance Facility and Explosive Facility will also be equipped with hose reels which will allow water from these facilities to be used for small fires if they do occur near these facilities.

Finally, the water tanks mounted on the 90-tonne mine water truck will be equipped with a supplementary water cannon for assisting with fires during the period of April 1 through October 1 annually.

1.16.10 Geohazards for Mine Infrastructure Complex (MIC)

All ancillary infrastructure for the Project is located on a shallow sloping plateau located between the Tenas and Goathorn creeks and is not subject to any hazards due to adverse terrain. Furthermore, there are no large watercourses at the upslope end of ancillary infrastructure that would cause mudflows and/or debris flows. Lastly with the shallow slope present the area is not at risk from avalanches. The only hazards the ancillary infrastructure face are the ones induced by the construction of upstream management ponds which are addressed through the geotechnical analysis conducted by SRK.

1.17 Water Management

The water management strategy for the Project is to collect and control all surface runoff from mine disturbed areas (contact water) in a series of engineered channels, ponds, and spillways while diverting run-off from undisturbed areas if practical and identified in the water and load balance completed by SRK (non-contact water) around the Project. Details on the water management designs are described in **Appendix 1.0-F SRK, Water Management Design Technical Report**, and in the **MWMP**.

Due to the presence of PAG material, three (3) management ponds will be constructed and filled with PAG material and processed rock during the life of the mine. These management ponds require a minimum of 1 m of water cover to prevent oxidation and acid rock generation. The PAG management strategy is discussed in detail in **Appendix 1.0-Q SRK, Tenas Project PAG Management Alternatives Assessment Memo**. Channel alignments were chosen to optimize the volume of water directed to each management pond while minimizing impacts on flows in the receiving environment, and to prevent the release of potentially high-sediment water to the environment.

Water collected within the Project footprint is stored and pumped to meet various water demands, including various process water demands and potable water demand.

The mean annual precipitation for the Project was estimated to be 608 mm, which typically falls as snow from November through, with approximately 50% falling as snowfall and 50% as rainfall. Detailed hydrometeorological characterisation for the Project, including temperature, evaporation, and streamflow rates are presented in **Appendix 1.0-R SRK, Tenas Project Hydrometeorological Report**.

The objectives of the Project water management system include:

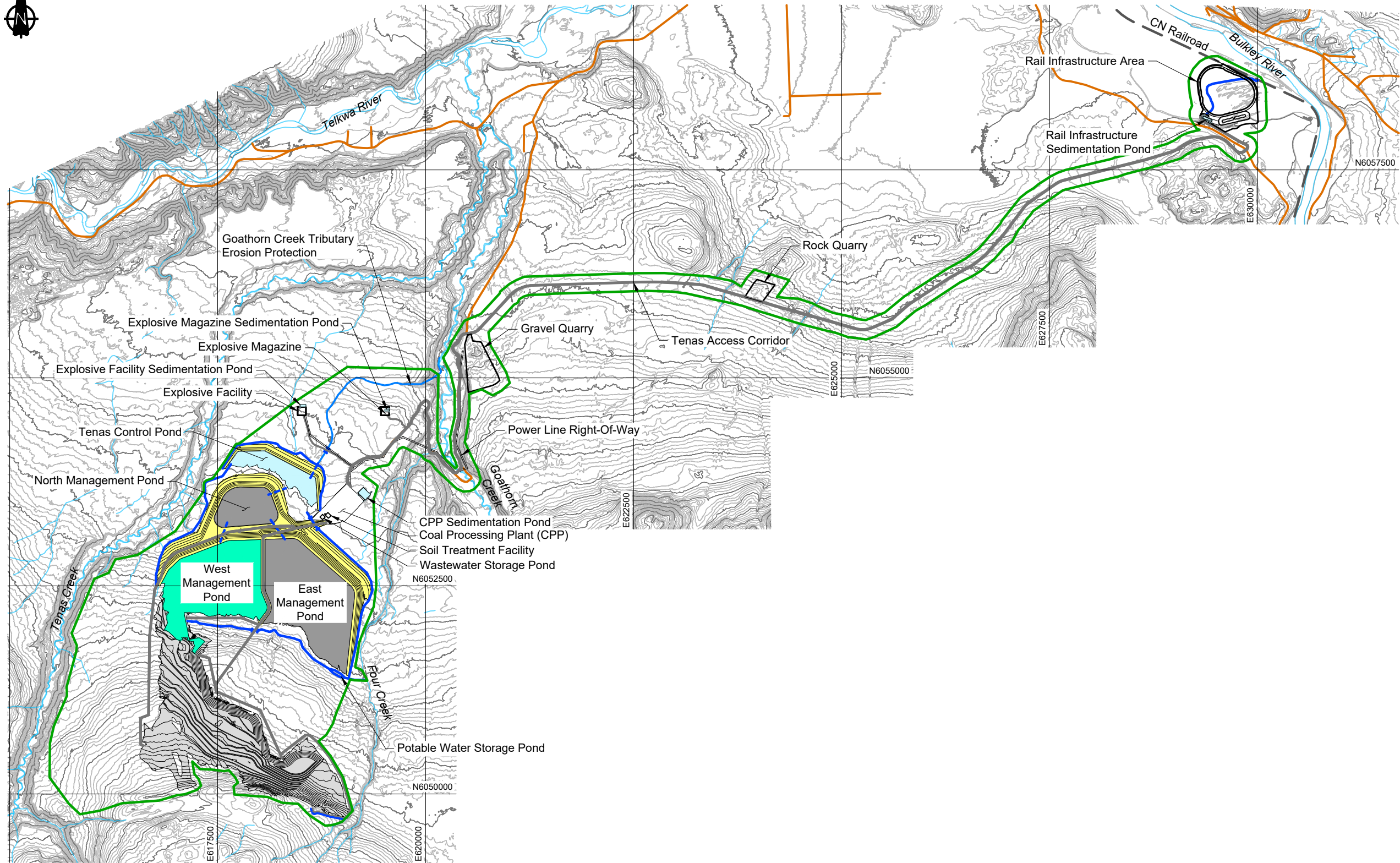
- ▶ Reduce Project water requirements by incorporating water recycling and material dewatering processes into the mining process (e.g. processed rock);

- ▶ Reduce impacts to streams downstream and adjacent to the Project by maintaining as small of footprints as practical and incorporating clean water diversions, maintaining pre-mining drainage patterns where feasible;
- ▶ Reduce sourcing water from rivers for water cover or potable water use;
- ▶ Manage seasonal discharge to maintain natural flow conditions;
- ▶ Maintain minimum water cover requirements to reduce risk of ML/ARD from PAG rock;
- ▶ Minimize water flowing into the open pit and active excavation areas to keep the construction and mining areas as dry as possible;
- ▶ Reduce water quality impacts by collecting potentially high sediment water (i.e., surface water runoff from overburden, and non-PAG piles) that has the potential to impair water quality of the receiving streams;
- ▶ ensure that all discharges meet regulatory requirements specified in approvals granted to the Project;
- ▶ continuously monitor surface water quality and quantity to assess plan effectiveness;
- ▶ regularly update and adapt the water management strategy to changes throughout the LOM and in response to monitoring results; and
- ▶ minimize the erosion of natural soils and mine infrastructure areas to reduce the suspended solid loading in surface runoff discharge.

The following subsections describe water management activities for the Project.

1.17.1 Surface Water Management Infrastructure

Proposed water management infrastructure consists of engineered channels, management ponds and associated spillways, sedimentation ponds, culvert road crossings, and pumping systems. Engineering details are described in the Tenas Project Water Management Design Technical Report (**Appendix 1.0-F; SRK, Tenas Project Water Management Design Technical Report**). **Figure 1.17-1** below presents an overview of water management systems at the end of the Operation Phase, and **Table 1.17-1** provides additional details.



LEGEND

- Water Management Feature
- Spillway
- Existing Watercourse
- Existing Road
- Proposed Road
- Project Area
- Dam and Buttress
- Sedimentation and Control Pond
- Active Management Pond
- Backfill / NAG Pile
- Covered Inactive Management Pond

NOTES

- Contours shown at 5.0m intervals.
- All dimensions shown in meters unless otherwise stated.
- Mine Infrastructure designs by Telkwa Coal Limited (TCL).

REFERENCE

NAD83 UTM Zone 9.



SRK JOB NO.: 1CT027.003
FILE NAME: 1CT027.003 Overview.dwg



Telkwa Coal

Environmental Assessment

Water Management overview
at the end of Operation Phase

DATE:
2022/04/05

APPROVED:
SAB

FIGURE:
1.17-1

Table 1.17-1: Surface Water Management Infrastructure

Structure Type	Structure Name / Description	Summary of Design
Management Ponds	North Management Pond (NMP)	- Store PAG rock, processed rock and water cover behind rock embankments. - Equipped with emergency spillways and associated minimum freeboard criteria based on CDA dam classification (CDA 2013) and BC Dam Safety Regulations, BC Reg 40/2016. Supported by dam breach inundation modelling (Appendix 1.0-M; SRK, Tenas Project Dam Breach Assessment Report). Pumping infrastructure included for routing water movement between facilities.
	East Management Pond (EMP)	
	West Management Pond (WMP)	
Sedimentation Ponds	Tenas Control Pond	- Designed in accordance with BC MOE Technical Guidance 7 Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining Version 1.0 (BC MOE 2015) up to the 1 in 10-year flood event. - Equipped with emergency spillways to convey up to the 1 in 200-year flood event, except for Tenas Control Pond which is equipped to convey the flood event 2/3 between the 1,000-year flood and the PMF and the Gravel Quarry Sedimentation Ponds which do not have spillway - Equipped with pumping systems for routine discharge.
	CPP Sedimentation Pond	
	Rail Infrastructure Sedimentation Pond	
	Explosives Magazine Sedimentation Pond	
	Explosives Facility Sedimentation Pond	
	Gravel Quarry Sedimentation Ponds for Pits 1 and 2	
	East TAC Sedimentation Pond on the East Side of Goathorn Creek	
	West TAC Sedimentation Pond on the West Side of Goathorn Creek	
	Rock Quarry Sedimentation Pond	
Other Water Storage	Potable Water Storage Pond	Intake to the Potable Water Treatment Plant, storing a minimum of 1

Structure Type	Structure Name / Description	Summary of Design
Ponds		year of potable water supply (6,000 m ³) at full-supply level and a minimum of eight (8) months of supply beneath a potential 1.0 m ice thickness in winter. Equipped with spillway to convey up to the 1 in 200-year flood event.
	Wastewater Storage Pond	Store 5,000 m³ of treated effluent from the Sewage Treatment Plant. Discharged via pipeline to the Goathorn Creek tributary.
	Soil Treatment Facility Pond	Store up to the 1 in 10-year flood event.
Collection and Diversion Channels	C-01: Collect potentially high-sediment runoff and seepage from EMP dam and buttress, with optional contributions of water from C-02 and the Potable Water Pond	- Convey peak flow from 1 in 10-year flood event without destabilizing erosion protection. - Contain peak flow from 1 in 25-year flood event while maintaining minimum freeboard of 0.3 m. - Contain peak flow from 1 in 100-year flood event without overtopping for structures that are decommissioned after operation phase, or 1 in 200-year flood for structures that remain in-place in post-closure. - Erosion protection selected based on expected velocities and structure's lifetime, using turf reinforcement mat where feasible and riprap for structures with steep gradients or that will remain in-place in post-closure. - All channels to be built with an access road for regular inspection and maintenance. - Erosion protection included along Goathorn Creek tributary downstream of Tenas Control Pond and in hillslopes towards Four Creek downstream of channel C-02 discharge.
	C-02: Collect undisturbed runoff upstream of EMP and pond locally in the Potable Water Pond. Discharge direction controlled by a flow control valve to connect to C-01 or to discharge into Four Creek	
	C-03: Collect potentially high-sediment runoff from WMP and NMP dam and buttress	
	C-04: Collect high-sediment runoff along the toe of the Tenas Control Pond dam. Discharge back into the Tenas Control Pond or to the tributary of Goathorn Creek	
	C-05: Divert undisturbed runoff around southern extents of open pit to Four Creek.	
	Goathorn Creek Tributary erosion protection	
	Four Creek erosion protection	
Pumping Systems	Pump System 1 (PMP_SYS-01): Tenas Control Pond to Goathorn tributary	Sized to convey annual average inflow to the Tenas Control Pond minus the CPP water demand (facilitated in a separate pumping network) over

Structure Type	Structure Name / Description	Summary of Design
	Pump System 2 (PMP_SYS-02): Tenas Control Pond to management ponds	a five (5)-month open-water period.
	Pump System 3 (PMP_SYS-03): management ponds to Tenas Control Pond	Mobile system between management ponds. Sized based on water and load balance modeling attached in Appendix 1.0-E SRK, Tenas Project Water and Load Balance Modeling Report.
	Pump System 4 (PMP_SYS-04): CPP Sedimentation Pond to Tenas Control Pond	Sized to provide sufficient retention time to settle 10-micron particle given available pond storage capacity.
	Pump System 5 (PMP_SYS-05): Sedimentation Pond to environment	
	Pump System 6 (PMP_SYS-06): Open pit to management ponds	Sized to convey open pit inflows during the 1 in 2-year flood event, dewatered over a 2-day period.
Road Crossings	CU-01: Convey flows from channel C-01 through the North Management Pond haul ramp into Tenas Control Pond	Convey peak flow from 1 in 100-year flood event. Removed during decommissioning phase
	CU-02: Convey flows from channel C-02 through service road	Convey peak flow from 1 in 25-year flood event.
	CU-03: Convey flows from West Management Pond to North Management Pond	
	CU-04: Convey flows from East Management Pond to North Management Pond	
	CU-05: Convey flows discharged from Tenas Control Pond into Goathorn Creek Tributary beneath the Explosives Magazine access road	Convey 1 in 100-year flood event. Removed during Decommissioning and Reclamation Phase

Notes: BC=British Columbia; BC MOE=British Columbia Ministry of Education; CDA=Canadian Dam Association; CPP=Coal Processing Plant; m=metre; m³=cubic metre; PAG=potentially acid generating; PMF=Probable Maximum Flood

1.17.1.1 *Sedimentation, Water Storage Pond Construction and Operations*

Construction and operation details of water management ponds are described in the following subsections. Details for the Tenas Control Pond and the management ponds construction, maintenance and monitoring are described in **1.22.2, 1.22.1, 1.22.7 and 1.22.8** respectively.

1.17.1.1.1 *Sedimentation Ponds*

The following provides a summary of salient aspects of the sedimentation ponds for the Tenas Project.

1.17.1.1.1.1 Construction

No embankments are planned for the sedimentation ponds as stated previously.

All organic matter and growth materials needs to be removed from the proposed sedimentation pond location to at least 2 m past the proposed crest of the excavation.

The methodology for constructing the sedimentation ponds will involve using a backhoe excavator to excavate the required pond shape into the existing ground surface. Overburden excavated from the sedimentation will be placed into the embankments for the management ponds if available or stockpiled until they are available.

A rock liner or turf mat liner is planned for all sedimentation ponds to reduce erosion generated from these excavations. A 0.20-m-thick layer of rip rap with a D50 size of 0.10 m has been specified to reduce erosion of side slopes in the sedimentation ponds. Liner will be placed using an excavator and the thickness will be verified by survey control prior to flooding.

As there are no embankments and the sedimentation ponds are less than 5 m in depth, no stability assessment was completed for these structures. If these structures are changed in the future to an embankment structure, a stability assessment will be performed.

1.17.1.1.1.2 Maintenance and Monitoring

The maintenance and monitoring activities for the sedimentation ponds is very similar to the management and control ponds provided in **1.22.7**. Water levels in the pond will be monitored and regular inspections will be performed for spillway integrity.

Piezometers are installed near all sedimentation ponds to understand groundwater seepage from these structures and if the seepage is higher than the water balance has provided for, the sedimentation pond will be pumped out and benthonic liner will be installed to reduce water seepage from the pond.

1.17.1.1.1.3 Contingencies for Sediment Control

The current sedimentation ponds have been designed for the following specifications:

- ▶ total suspended solids (TSS) of 35 milligrams per litre (mg/L) which is below provincial guideline of 50 mg/L; and
- ▶ With a retention time greater than what is required for 35 mg/L.

As part of the control and sedimentation ponds at site, there will be prefabricated flocculation buildings to allow for the efficient delivery of flocculant in response to flows and TSS amounts being received by the

pond and discharged by the pond. These have been provided to add an additional layer of protection to deal with TSS concentrations in the effluent from these ponds. The current design basis does not require these facilities as the ponds have been designed according to BC MOE sedimentation guidance, however, based on experience at other operating mines these facilities were included as additional contingency for the Project.

Figure 1.17-2 below illustrates a typical flocculant building installation. It is envisioned there will be a flocculation building at each of the control and management ponds required for this site.

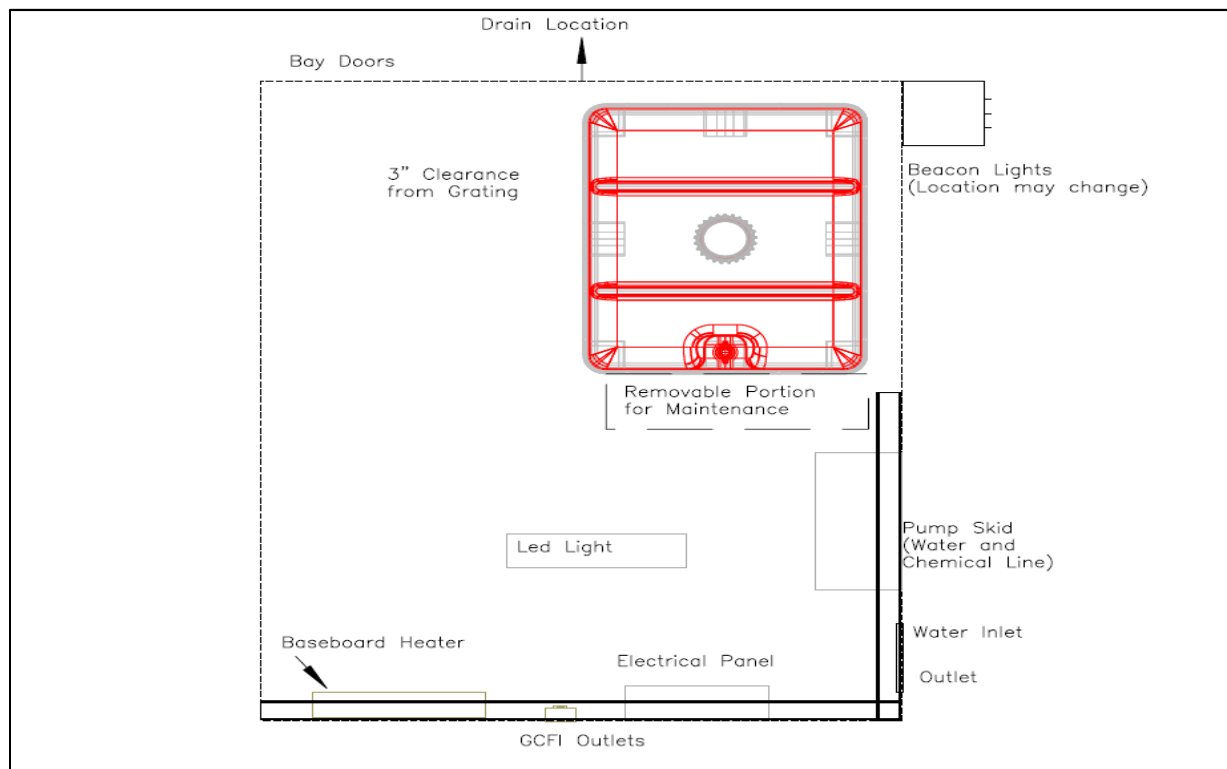


Figure 1.17-2: Flocculation building general arrangement drawing

Furthermore, the Tenas Control Pond is also used for both sediment control and water storage and has been sized to provide a backstop for all sediment control for the Project.

1.17.1.1.1.4 Additional Mitigations for Sediment Control

If during the Operation Phase of any sedimentation pond if it is found that a sedimentation pond is not achieving the regulatory guideline of 50 mg/L the following mitigations can be incorporated within 12 months:

- ▶ The existing sedimentation pond can be increased in height to provide even further retention time;

- ▶ A small polishing sedimentation pond can be constructed downstream of the main sedimentation ponds;
- ▶ Silt curtains can be added to sedimentation ponds to increase flow paths; and
- ▶ A small pre-settlement pond can be added upstream of the main sedimentation ponds.

1.17.1.1.2 Summary of Sedimentation Pond Design Details

The following tables summarize the sedimentation pond design details for the entire Project.

The hydrologic analysis, pond geometry and sedimentation calculations and results are summarized in **Table 1.17-2**, **Table 1.17-3**, and **Table 1.17-4**, respectively.

Table 1.17-2: Sedimentation Pond Hydrologic Analysis Summary

Pond	CPP Sedimentation Pond	Rail Infrastructure Sedimentation Pond	Explosive Facility Sedimentation Pond	Explosive Magazine Sedimentation Pond	Rock Quarry Sedimentation Pond	Gravel Quarry 1 Sedimentation Pond	Gravel Quarry 2 Sedimentation Pond	East TAC Sedimentation Pond	West TAC Sedimentation Pond
Maximum Catchment Area (m ²)	203,500	77,900	10,000	5,000	50,000	15,000	80,000	20,000	10,000
1 in 10-year Peak Inflow (m ³ /s)	1.8	0.5	0.1	0.1	0.7	0.2	1.1	0.3	0.1
1 in 10-year 24-hour Storm Volume (m ³)	19,550	7,440	960	480	4,820	1,450	7,720	1,930	960
1 in 10-year Max water level (m)	2.5	2.6	2.5	2.4	2.5	1.2	2.4	1.6	0.9
1 in 10-year Peak Outflow (m ³ /s)	0.090	0.030	0.008	0.006	0.010	0.010	0.010	0.010	0.010
1 in 200-year Peak Inflow (m ³ /s)	2.9	0.8	0.2	0.1	1.2	0.4	2.0	0.5	0.2
1 in 200-year 24-hour Storm Volume (m ³)	29,000	10,960	1,440	720	7,190	2,160	11,510	2,880	1,440
1 in 200-year Max water level (m)	2.8	2.7	2.6	2.5	2.7	2.5	2.6	2.5	2.5
1 in 200-year Peak Outflow (m ³ /s)	2.6	0.8	0.2	0.1	1.0	0.2	1.9	0.4	0.0

Notes: CPP=Coal Processing Plant; m=metre; m²=square metre; m³/s=cubic metre per second; TAC=Tenas Access Corridor

Table 1.17-3: Sediment Control Pond Geometry and Design Summary

Pond	CPP Sedimentation Pond	Rail Infrastructure Sedimentation Pond	Explosive Facility Sedimentation Pond	Explosive Magazine Sedimentation Pond	Rock Quarry Sedimentation Pond	Gravel Quarry 1 Sedimentation Pond	Gravel Quarry 2 Sedimentation Pond	East TAC Sedimentation Pond	West TAC Sedimentation Pond
Base length (m)	43	100	50	30	80	50	115	50	50
Number of baffles	2	0	0	0	0	0	0	0	0
Base width (m)	78	20	10	6	16	10	23	10	10
Depth from base of pond to pump intake (m)	0.5	0.5	2	2	0.5	0.5	0.5	0.5	0.5
Depth from base of pond to spillway (m)	2.6	2.7	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Depth from base of pond to top of excavation(m)	3.3	3.3	3.1	3.1	3.3	3.0	3.1	3.0	3.0
Spillway base width (m)	10	10	2	2	2	10	10	10	10
Spillway side slopes (H:V)	2	2	2	2	2	2	2	2	2
Pumping rate (m³/s)	0.090	0.030	0.008	0.006	0.010	0.010	0.010	0.010	0.010
Pond volume below pump intake (m³)	2,570	870	1,510	680	690	280	1,390	280	280
Pond volume below spillway (m³)	16,780	6,550	2,060	970	4,460	2,060	8,390	2,060	2,060

Pond	CPP Sedimentation Pond	Rail Infrastructure Sedimentation Pond	Explosive Facility Sedimentation Pond	Explosive Magazine Sedimentation Pond	Rock Quarry Sedimentation Pond	Gravel Quarry 1 Sedimentation Pond	Gravel Quarry 2 Sedimentation Pond	East TAC Sedimentation Pond	West TAC Sedimentation Pond
Total pond volume (m³)	22,290	8,400	2,800	1,330	6,310	2,690	10,910	2,690	2,690

Notes: CPP=Coal Processing Plant; m=metre; m²=square metre; m³/s=cubic metre per second; TAC=Tenas Access Corridor

Table 1.17-4: Sediment Control Pond Sedimentation Calculation Summary

Pond	CPP Sedimentation Pond	Rail Infrastructure Sedimentation Pond	Explosive Facility Sedimentation Pond	Explosive Magazine Sedimentation Pond	Rock Quarry Sedimentation Pond	Gravel Quarry 1 Sedimentation Pond	Gravel Quarry 2 Sedimentation Pond	East TAC Sedimentation Pond	West TAC Sedimentation Pond
Minimum pond surface area for settling (m²)	5,400	1,800	480	360	600	600	600	600	600
Design pond surface area at orifice level (m²)	5,450	1,940	1,040	530	1,480	620	2,930	620	620
Minimum retention time (hr)	7	7	28	28	7	7	7	7	7
Design retention time during 1 in 10-year event (hr)	8	8	52	32	19	8	39	8	8

Notes: CPP=Coal Processing Plant; hr=hour; m²=square metre; TAC=Tenas Access Corridor

Sedimentation pond operation and monitoring requirements are described in **Appendix 13.11-E Minesite Water Monitoring Plan** of the **MWMP** and include:

- ▶ Daily water level readings should be taken in all ponds;
- ▶ Pumping rates should be measured and recorded with a totalizer. Pump controls may be manual or automatic, depending on the selected configuration and pump design;
- ▶ Monthly water quality sampling should be done in all ponds for full suite of water quality parameters, with more frequent measurements of TSS concentrations proceeding storm events to ensure ponds are working as intended; and
- ▶ Annual sediment accumulation measurements should be taken.

1.17.1.1.3 Wastewater (Sanitary), and Potable Water Storage Ponds

1.17.1.1.3.1 Construction

These ponds will be excavated structures with 2.0H to 1V wall slopes.

As there are no embankments and the ponds are only 5 m in depth and no consequence of any potential failures, no stability assessment was completed for these structures.

All organic matter and growth materials needs to be removed from the proposed sedimentation pond location to at least 2 m past the proposed crest of the excavation.

The methodology for constructing the ponds will involve using a backhoe excavator to excavate the required pond shape into the existing ground. Overburden will be placed into the embankments for the management ponds if available or stockpiled until they are available.

A bituminous liner or other appropriate liner is planned for the Wastewater and Potable Water Storage ponds identical to the one (1) proposed for the Tenas Control Pond.

1.17.1.1.3.2 Maintenance and Monitoring

As these structures are excavations, very little maintenance activities are required for these two (2) facilities. It is expected local piezometers will need to be installed around these facilities to confirm groundwater seepage rates. The excavated slopes will be inspected weekly to document any cracks forming and the ponds need to be kept clear of any debris. Flows through the ponds and pond water levels will be monitored on an ongoing basis to provide feedback on consumption amounts.

1.17.1.2 Water Management Discussion for Other Features

Water management for specific features such as the Gravel Quarry, Rock Quarry, Rail Infrastructure, and TAC are provided in the following locations:

- ▶ Gravel Quarry water management is further discussed in **1.23**;
- ▶ Rock Quarry water management is further discussed in **1.24**;
- ▶ Powerline water management is further discussed in **1.19.5**; and
- ▶ Rail Infrastructure water management is further discussed in **1.21.5**.

1.17.2 Water Demand

1.17.2.1 Process Water

Process water for site services, including CPP water make-up and wash-down and utility requirements, will be sourced from water collected onsite from precipitation and melting snow that is directed to the Tenas Control Pond. Process make-up water for the CPP, site wash-down and human requirements is estimated at approximately 15,000 m³ per month. Process water will be pumped from the Tenas Control Pond located approximately 400 m northwest of the CPP and MIC pad. A pipe will be placed around the Tenas Control Pond's embankment and buried underground into the process water pump station building. Two (2) process water pumps (one (1) duty and one (1) standby, both of which will be able to meet fire water pressure and volume requirements) will transfer water approximately 650 m through a buried high-density polyethylene (HDPE) pipe to the CPP clarified water sump, fire water tank, Explosive Facility process water tank, and to the Maintenance Facility process water tank. The pipe will be buried at a sufficient depth, which is estimated to be 3 m, to avoid the effects of frost heave and prevent the pipe from freezing in the winter months. A high-level diagram of the process water distribution for the mine operation is shown by **Figure 1.17-3** below.

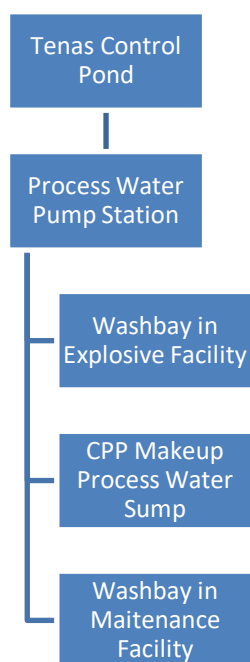


Figure 1.17-3: Process water distribution schematic

The process water pumps will be housed in a fully enclosed heated and insulated sea container building.

Process water required at the Rail Infrastructure will be sourced from either the existing groundwater wells in the area and/or from new ones installed during construction. The expected monthly process water requirements at the Rail Infrastructure is estimated at 1,000 m³ which will primarily be used for dust control and blending with chemical agents used for topping rail cars and/or for side release agents for the rail cars and trucks.

Furthermore, approximately 0.75 million m³ of water will be sourced from Goathorn Creek annually via groundwater wells along the western edge of Goathorn Creek to deal with any upset conditions and to provide additional contingency to the site water balance that may occur during the operation of the mine. This volume only represents 2.5% of Goathorn Creek's annual flow and less than 0.5% of the Telkwa River's annual flow. While detailed hydrology studies completed by SRK show this additional make up water is not required, subsequent environmental effects assessments have assumed this water is used by the Project to provide additional robustness to the water balance and effects assessment for the Project. The proposed contingency water supply pipeline from Goathorn Creek near the TAC's Goathorn Creek Bridge will be routed along the 25 kV powerline route from the Goathorn Creek Bridge up to the control and management ponds.

1.17.2.1.1 Process Water Supply Contingencies

The Project has used the highest consumption for the CPP including a contingency of 30% so that actual process water demand will be lower than this in the Operation Phase. The water and load balance has included a 500,000 m³ annual water withdrawal contingency from Goathorn Creek in addition to the above. Lastly, grey water from the maintenance shop is being diverted to the CPP and this has not been accounted for in the water balance to provide additional conservatism in the process water demands. Covers are constructed earlier in the Operation Phase versus what was used in the water and load balance which will reduce actual process water requirements. See **Appendix 1.0-E SRK, Tenas Project Water and Load Balance Modeling Report**.

1.17.2.1.2 Process Water Supply Additional Mitigations

There is further water reduction equipment that will be investigated and that could be purchased for the CPP during the Operation Phase to further reduce water requirements of the Project by approximately 10%.

1.17.2.2 Potable Water

Potable water will be sourced from the Potable Water Storage Pond, located within the collection channel C-02, collecting non-contact runoff south of the open pit. A Potable Water Treatment Plant (with heating, lighting, and controls) delivering an average flow rate of 17.3 m³/day will be installed as part of the Administration and Mine Dry Building assuming 100 people onsite during a 24-hour period. The treatment plant will consist of cartridge filtration, chlorine disinfection and ultraviolet (UV) sterilization and includes a 5,000 L storage tank to deal with peak demand requirements for the two (2) daily shift changes. The Potable Water Treatment Plant will be a self-contained sea container which will be fully constructed and fitted out offsite and delivered fully functional to the Project. Please see **Appendix 1.0-S Radloff and Associates, Potable Water and Sewage Treatment Plant** for further information on the potable and sewage treatment plans.

The Potable Water Storage Pond will be constructed to contain the annual requirements for potable water onsite which is estimated at 6,000 m³ based on a full complement of 100 people onsite starting on Day 1 of the Operation Phase. Potable water at the site will be used for domestic facilities such as showers, sinks, and for the safety showers located in the Potable Water Treatment Plant. Potable water will only be provided to the Administration and Mine Dry Building. All other buildings will be supplied potable water via mobile potable water stations. See **Appendix 1.0-F SRK, Tenas Project Minesite Water Management Plan Technical Report** for details on the Potable Water Storage Pond which will be incorporated into the diversion Channel 02 above the East Management Pond.

The Potable Water Treatment Plant output water quality will be in accordance with relevant BC and Canadian regulations and standards for potable water. The Potable Water Treatment Plant will be containerized and supplied fully automated (as far as possible) and will be integrated into the overall CPP Supervisory Control and Data Acquisition (SCADA) system to allow remote monitoring and control. Both the Potable Water Storage Pond and Potable Water Treatment Plant for the Project will have the facility to fill and/or receive water from a mobile potable water tanker from 3rd party suppliers in the region if required. An example of a potable water plant suggested for the site is shown by **Figure 1.17-4** below.



Figure 1.17-4: Example of Potable Water Treatment Plant

At the Rail Infrastructure, an existing potable water system is in place which provides potable water from an established groundwater well as this water already meets potable water requirements without additional treatment. This groundwater well has sufficient capacity for both potable water and make up water requirements at the Rail Infrastructure.

1.17.2.2.1 Potable Water Supply Contingencies

The Potable Water Plant has been sized for maximum workforce on site of 100 people onsite with a 24-hour period which is approximately 15% above current workforce projections for the Project. The current Potable Water Plant has been sized to produce enough water for all sinks, showers, toilets and drinking fountains while potable water is not required for the toilets or sinks which is the current plumbing plan which provides a built-in contingency of 10%.

1.17.2.2.2 Potable Water Supply Additional Mitigations

The ultimate backstop mitigation to potable water supply is to source water from current 3rd party providers in the region which have sufficient capacity to provide the potable requirements for the Project. TCL may construct another potable water treatment plant if required.

1.17.3 Sewage, Wastewater, and Washwater Management

A Sewage Treatment Plant (containerized complete with power, heating, communications, treatment systems and lighting) will be located on the MIC pad. The treatment plant capacity is based on an estimated sewage water treatment requirement of 12.5 m³/day assuming 100 people onsite during a single 24-hour period. The treatment plant will have primary, and advanced secondary sewage treatment systems prior to effluent discharge. The treatment plant treated effluent will be pumped to the Wastewater Storage Pond for eventual disposal via the discharge channel for the Tenas Control Pond to Goathorn Creek. Concentrated settled sludge will be collected for periodic removal from the treatment plant by trucks for disposal on site. The Sewage Treatment Plant will be supplied fully automated (as far as possible) and will be integrated into the overall CPP SCADA system to allow remote monitoring and control. An example of a Sewage Treatment Plant suggested for this Project is shown by **Figure 1.17-5** below. Please see attached **Appendix 1.0-S Radloff and Associates, Potable Water and Sewage Treatment Plant** for additional information on the Sewage Treatment Plant.



Figure 1.17-5: Example of a Sewage Treatment Plant

At the Rail Infrastructure there is an existing sewage septic system in place which will be utilized for sewage treatment prior to release into the environment and is deemed sufficient for the personnel use envisioned at this location by the Project.

Grey water is generated and distributed as follows:

- ▶ Grey water generated from wash bay in the Maintenance Facility will be pump to thickener located in the CPP;

- ▶ Grey water generated from the sinks in the Administration and Mine Dry Building will be combined with sewage water discharges from the toilets and showers in this building and directed to the Sewage Treatment Plant; and
- ▶ Grey water generated from the wash bay at the Explosive Facility will be directed to an evaporator at this location to leave behind ammonium nitrate material to be disposed of appropriately.

1.17.3.1 Sewage Water Treatment Capacity Contingencies

The current Sewage Treatment Plant has been designed for a workforce of 100 people onsite in a 24-hour period which is 15% above the current workforce projections.

1.17.3.2 Sewage Water Treatment Capacity Mitigations

If it is found during the Operation Phase that the designed Sewage Treatment Plant cannot achieve target volumes and/or quantity the following can be undertaken:

- ▶ upgrade the existing Sewage Treatment Plant to a tertiary system to provide for a superior quality effluent and increase capacity of the Sewage Treatment Plant by 15%. The secondary Sewage Treatment Plant has been designed to allow for this contingency which would require approximately 12 months to put in place from the time of equipment order;
- ▶ employ an evaporator like the one (1) installed at the Explosive Facility to reduce effluent quantity from this facility; and
- ▶ Construct another Sewage Treatment Plant or further expand existing one.

1.17.4 Water Distribution

1.17.4.1 Contact Water Pumping Systems

Figure 1.17-6 illustrates the pumping strategy required during the Operation Phase. The **MWMP** provides additional detail on the design criteria and operation of surface water pumping systems.

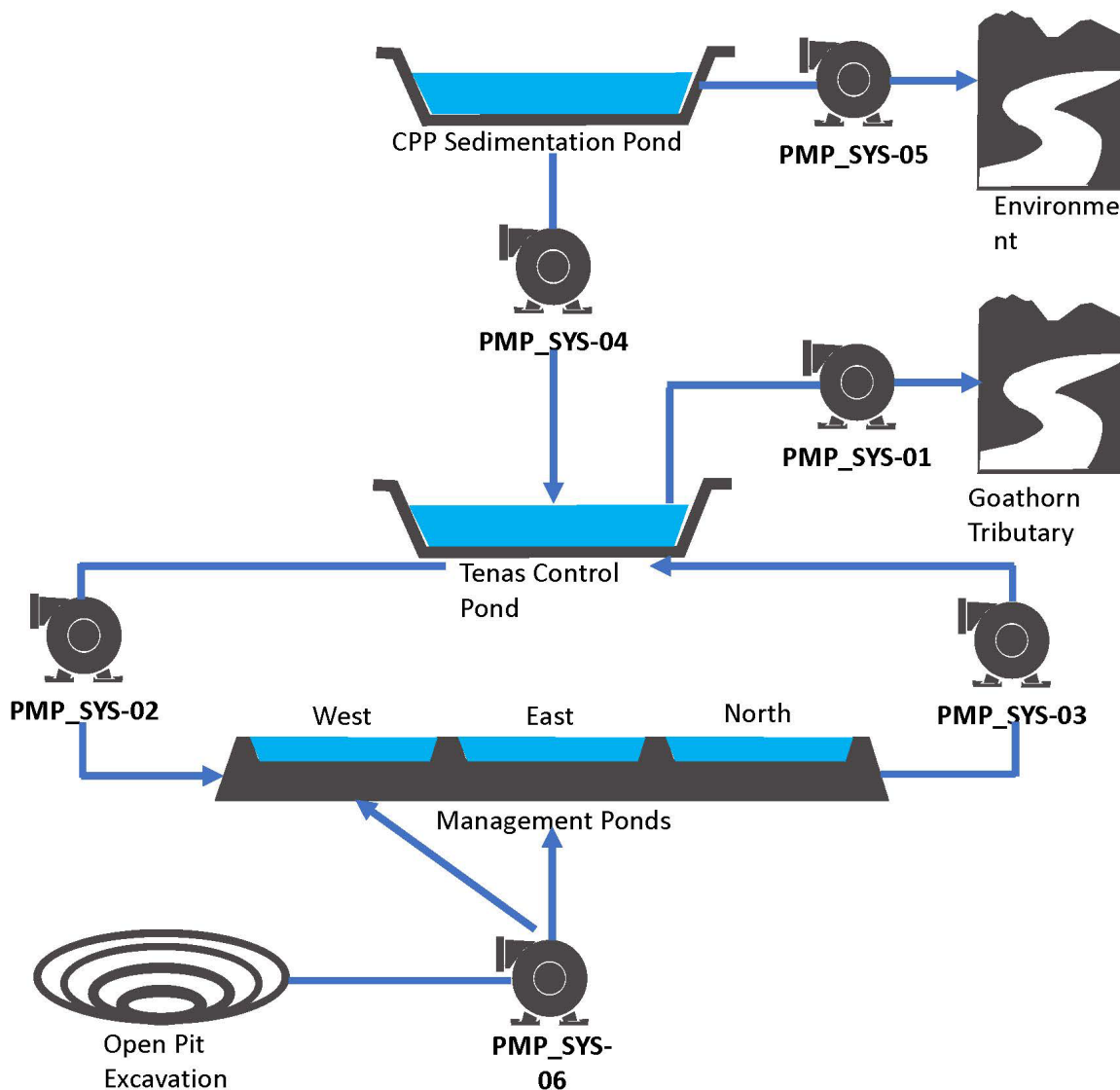


Figure 1.17-6: Summary of pumping strategy for management, sedimentation, and control ponds during the Operation, and Decommissioning and Post-closure Phases

In Post-closure Phase the open pit will be allowed to fill up with water which will flow in two (2) directions;

- ▶ majority of the contact water will flow north into the West Management and then north Management ponds; and
- ▶ the remainder will be directed to Four Creek to the East unless monitoring during the Operation phase indicates that water should be directed to the North.

Figure 1.17-7 provides the contact water flow paths during the Post-closure Phase

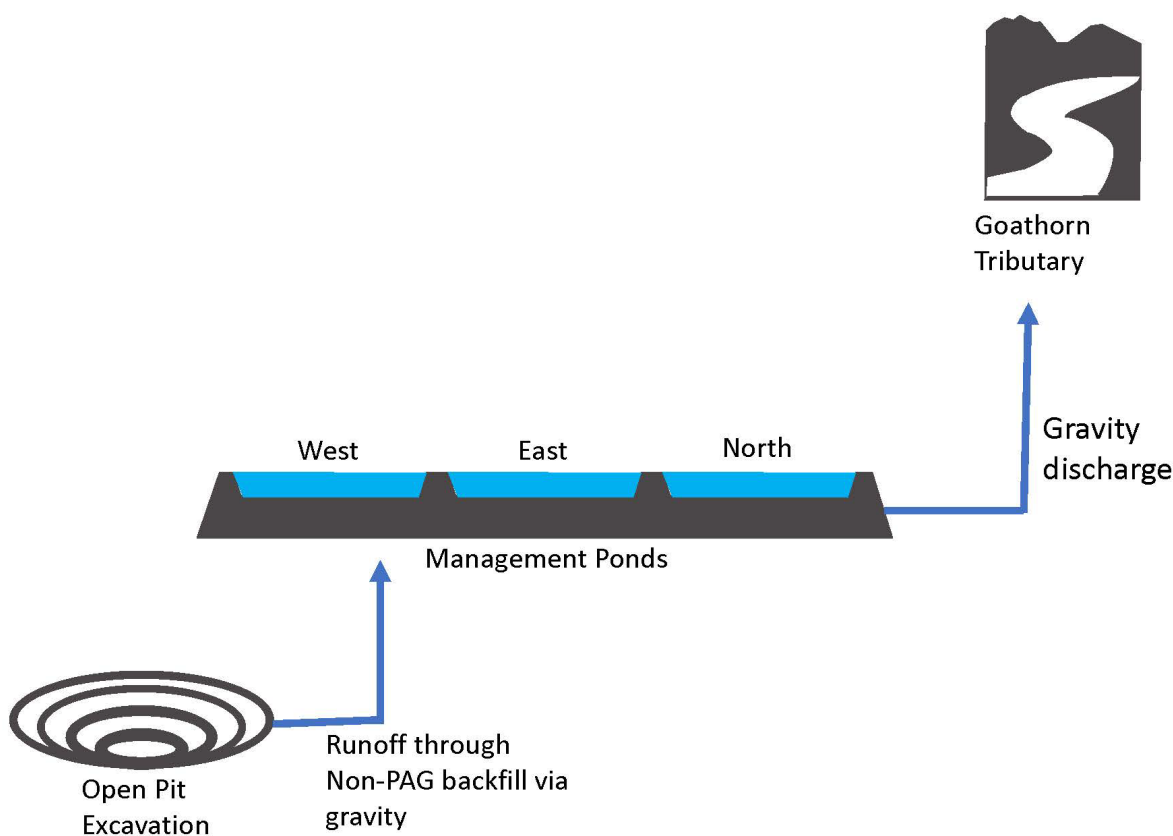
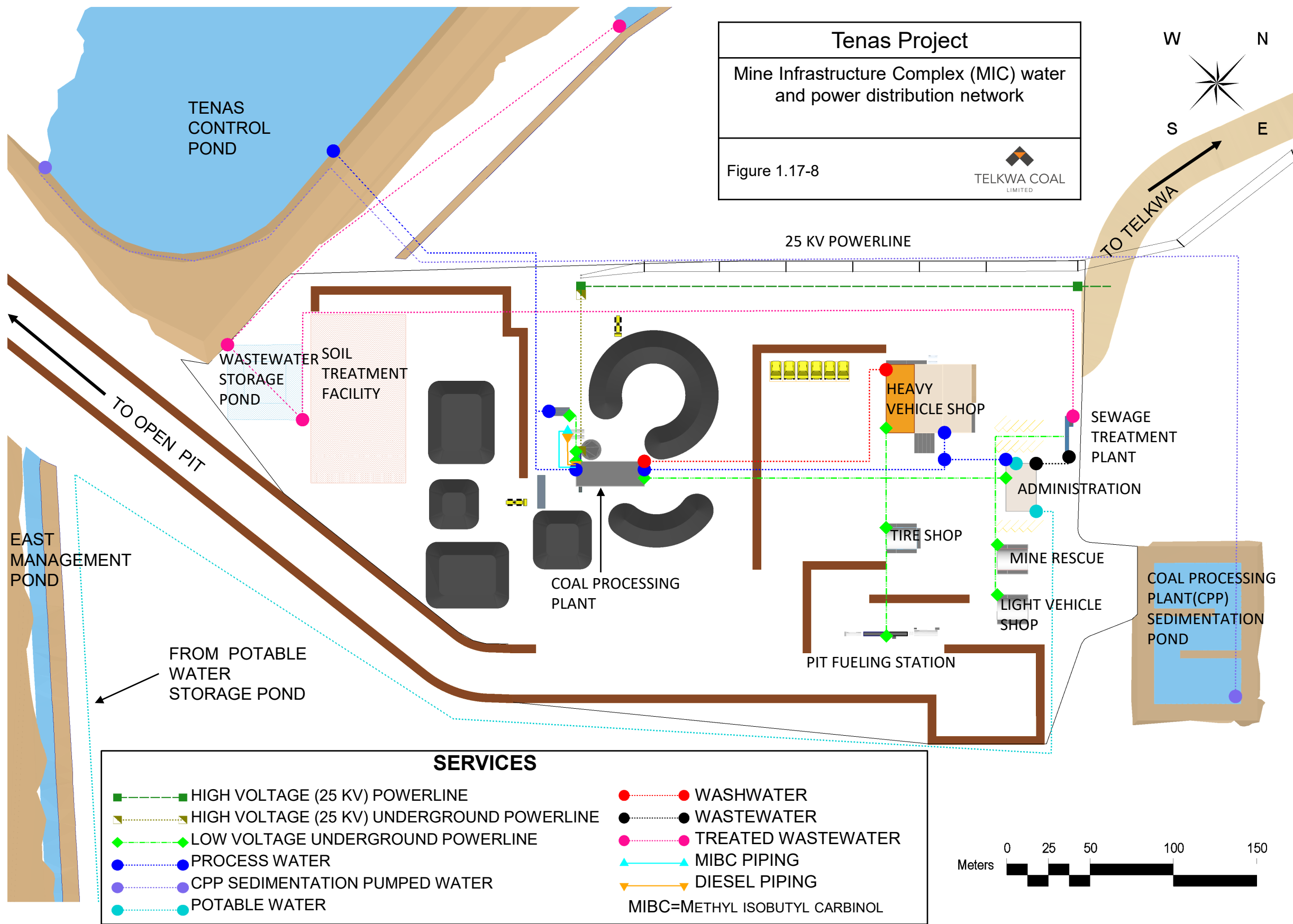
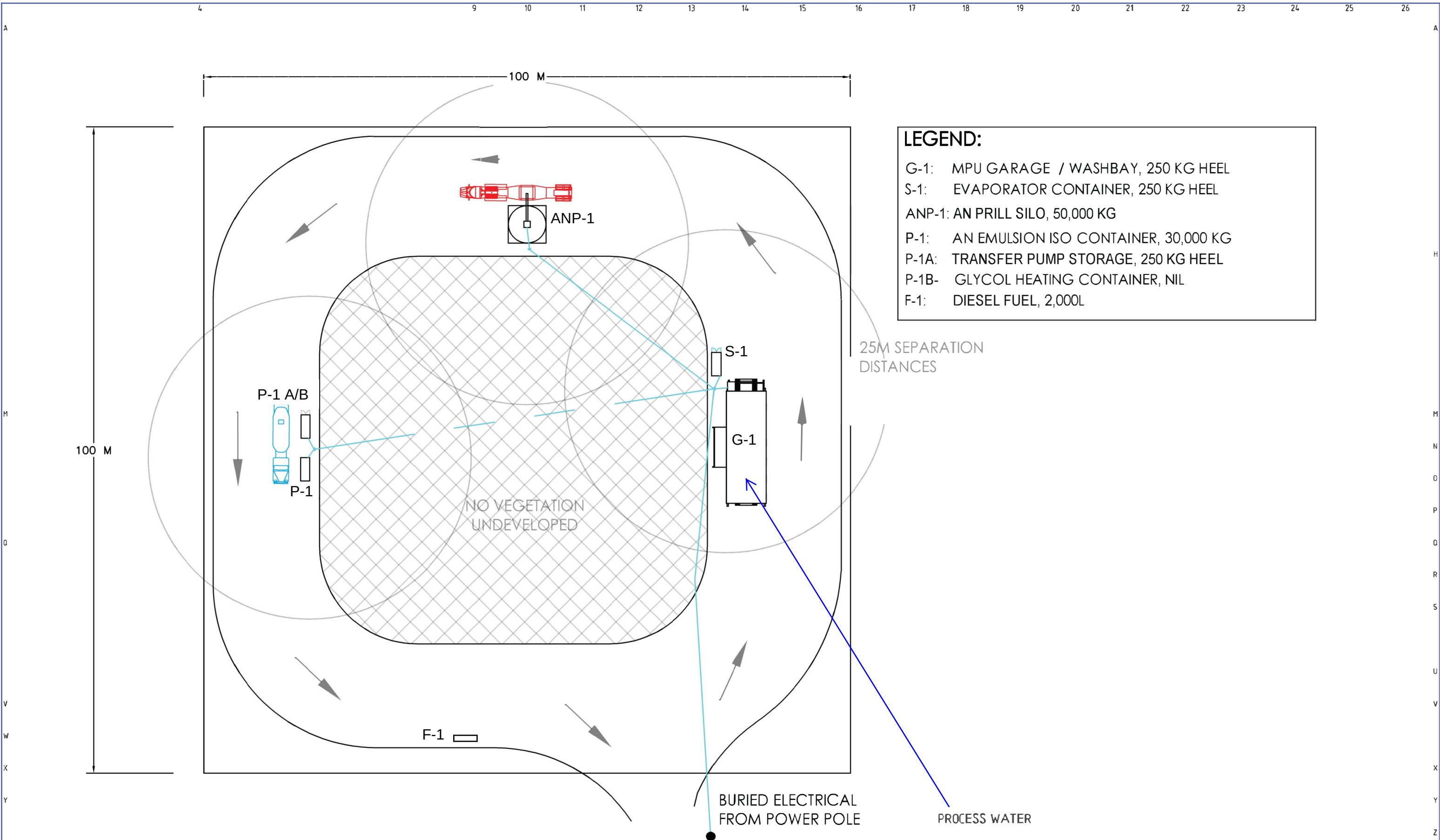


Figure 1.17-7: Summary of water flows in Post-closure Phase

1.17.4.2 Process, Potable Water and Sewage Water Distribution Systems

Figures 1.17-8 and 1.17-9 below provide the anticipated distribution network for potable, process and sewage water at the MIC and Explosive Facility Pad.





- LEGEND:**
- G-1: MPU GARAGE / WASHBAY, 250 KG HEEL
 - S-1: EVAPORATOR CONTAINER, 250 KG HEEL
 - ANP-1: AN PRILL SILO, 50,000 KG
 - P-1: AN EMULSION ISO CONTAINER, 30,000 KG
 - P-1A: TRANSFER PUMP STORAGE, 250 KG HEEL
 - P-1B- GLYCOL HEATING CONTAINER, NIL
 - F-1: DIESEL FUEL, 2,000L

1.17.5 Water and Load Balance Modelling

A water and load balance model was developed for the purpose of:

- ▶ estimating the flow and quality of excess water derived from water management infrastructure (i.e., ponds);
- ▶ 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);
- ▶ estimating the quality of excess water to be discharged to the receiving environment; and
- ▶ estimating the quality of water in the receiving environments at the discharge points and downstream prediction nodes.

Modeling was supported by a Conceptual Site Model (CSM), presented in **Appendix 1.0-T SRK, Tenas Project Conceptual Site Model**. **Figure 1.17-10** presents the conceptual water and load balance model during the Operation Phase while **Figure 1.17-11** presents the conceptual water and load balance model during the Post-closure Phase. Detailed water modelling methods and results are presented in **Appendix 1.0-E SRK, Tenas Project Water and Load Balance Modeling Report**.

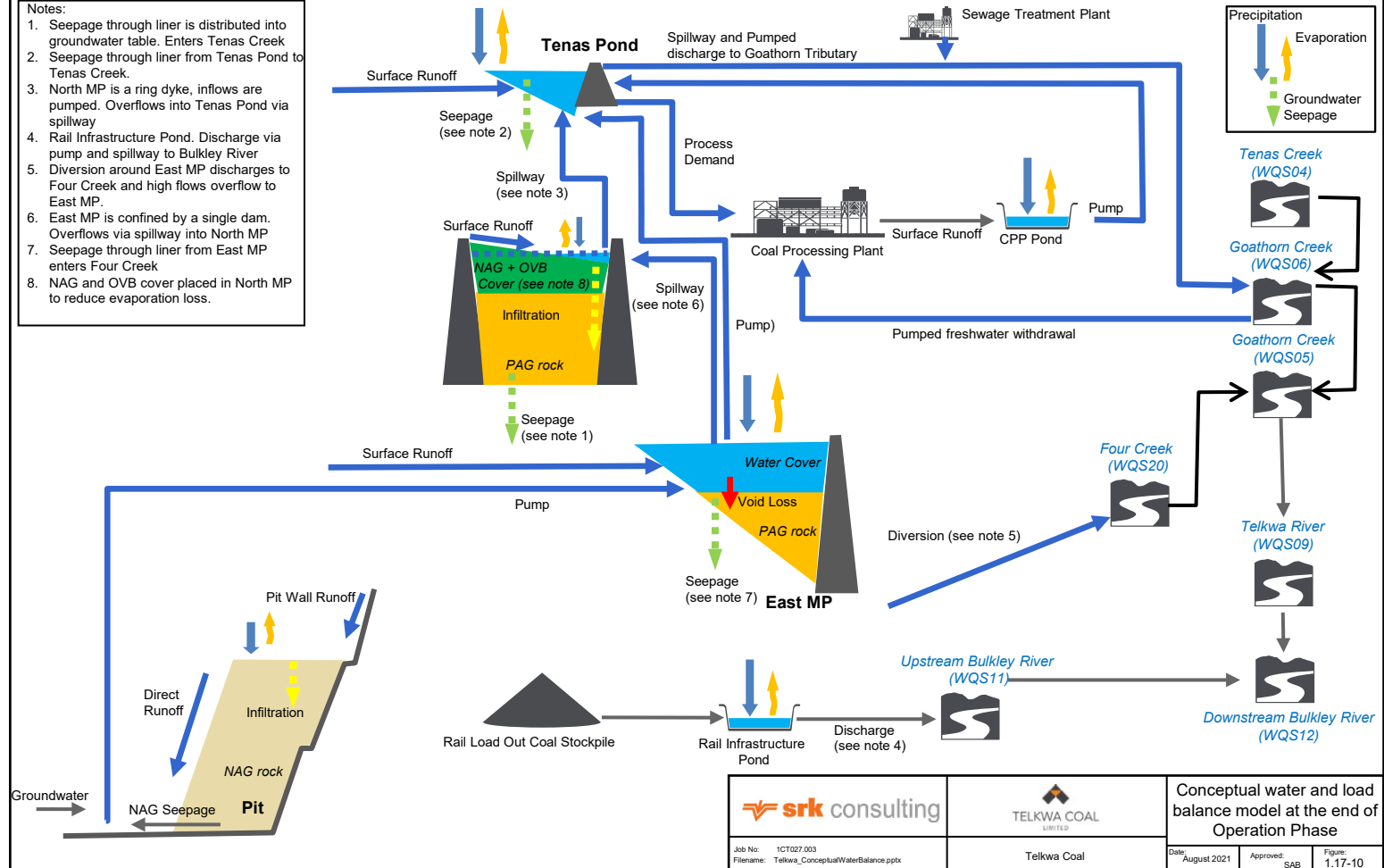
The following inputs, assumptions, and exclusions were applied as a basis for the model:

- ▶ estimating the quality of water in the receiving environments at the discharge points and downstream prediction nodes;
- ▶ mine plan summarizing tonnages and/or volumes of overburden, reclamation materials (surface soils), and mine rock, including the classification of mine rock as: non-PAG or PAG, and placed internally to the open pit or management ponds as backfill or placed into an external stockpile;
- ▶ stage-storage curves for management ponds and open pit, as well as corresponding spillway levels;
- ▶ Project schedule including production volumes of mine rock, ROM coal, processed rock, processed coal, and overburden;
- ▶ Plan of areas for reclamation materials (surface soils), and mine rock placement locations, as well as the development of the open pit;
- ▶ Management, storage, sedimentation, and control pond areas and capacities;
- ▶ pumping networks, as described in above;
- ▶ process water demand;
- ▶ meteorologic, hydrologic, and hydrogeologic inputs as further described below; and
- ▶ source term inputs as further described in subsections below.

Modelling results include estimating Project discharge rates, discharge water quality and in-stream water quantity and quality prior to, during and post-mining are presented in **Appendix 1.0-E SRK, Tenas Project Water and Load Balance Modeling Report**.

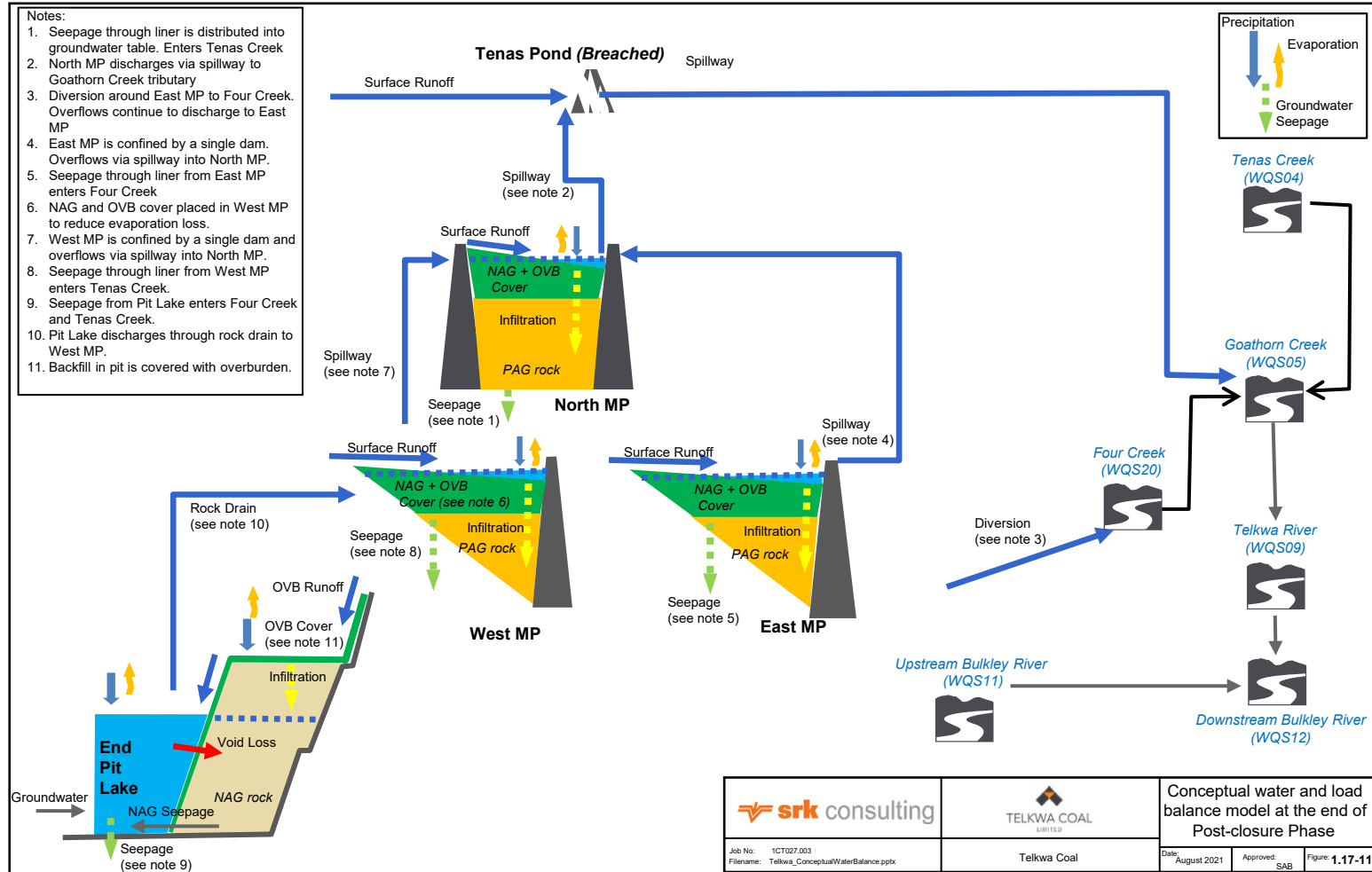
Notes:

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 Infrastructure Pond. Discharge via pump and spillway to Bulkley River
5. Diversion around East 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.



Notes:

1. Seepage through liner is distributed into groundwater table. Enters Tenas Creek
2. North MP discharges via spillway to Goathorn Creek tributary
3. Diversion around East 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. Seepage through liner from West MP enters Tenas Creek.
9. Seepage from Pit Lake enters Four Creek and Tenas Creek.
10. Pit Lake discharges through rock drain to West MP.
11. Backfill in pit is covered with overburden.



1.17.5.1 Inputs to Water and Load Balance Modeling

The following provides a summary of the relevant inputs required to complete the water and load balance.

1.17.5.1.1 Project's Climate and Hydrologic Setting

As part of the water and load balance for the Project, an understanding of climate and hydrology and their associated inputs are required. See **Appendix 1.0-R SRK, Tenas Project Hydrometeorological Baseline and Model Development Report**.

The BC MECCS has published hydrological zones that represent areas of homogeneous hydrologic and geomorphic characteristics. The Project is within Zone 8 – Nechako Plateau hydrologic zone and is within the Interior Plateau physiographic region to the east of the Coast Mountains. This zone is characterised by a continental climate with cold winters, warm summers, and relatively low precipitation. The Project footprint elevation ranges from 750 to 1,050 meters above sea level (masl) with a median elevation of 800 masl.

The Project footprint located downgradient of the Telkwa mountain range, a subset of the Bulkley Ranges, 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, BC, 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.

1.17.5.1.2 Mean Annual Precipitation (MAP)

A Project-specific record was generated and the MAP was determined to be 608 mm/year. Precipitation typically falls as snow during the months of November to March, with approximately 50% of the annual precipitation being snowfall, and 50% being rainfall. **Figure 1.17-12** shows the monthly average precipitation conditions.

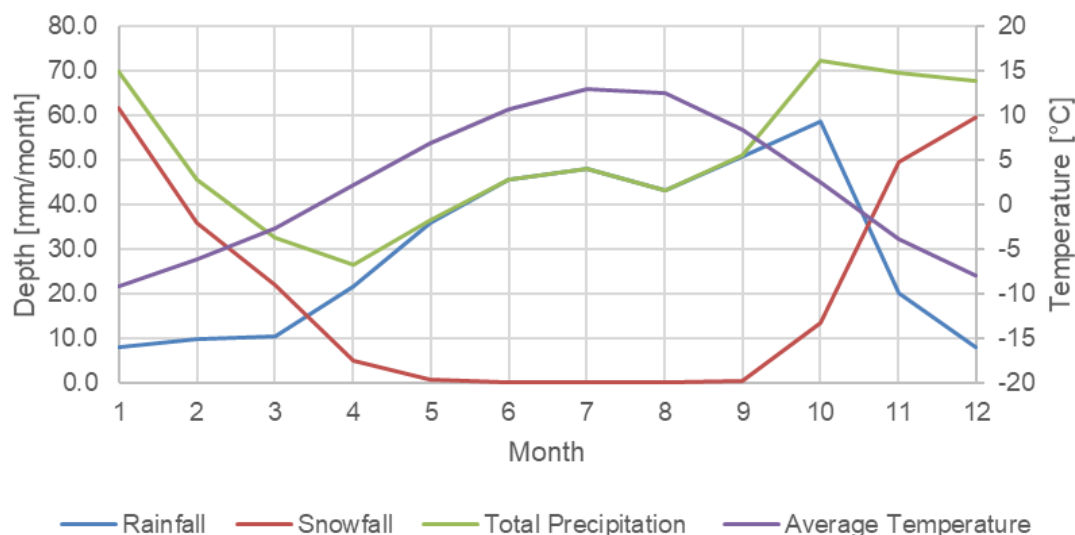


Figure 1.17-12: Monthly average precipitation conditions

1.17.5.1.3 Depth Duration Frequency Curves

Depth duration frequency (DDF) values were developed for the Project to define storm events. **Table 1.17-2** summarizes the corrected climate change DDF values for the Project.

Table 1.17-5: Project Depth Duration Frequency Data with Climate Change (Precipitation Depth in millimetres [mm])

Storm Duration (min)	Return Period (years)							
	2	5	10	25	50	100	200	1000
5	4.7	7.3	8.9	10.5	11.8	12.7	15.7	19.7
10	6.7	10.4	12.8	15.3	17.3	18.8	23.4	29.2
15	8.1	12.3	14.9	17.4	19.5	20.9	25.8	32.2
30	11.3	16.5	19.5	22.4	24.7	26.1	32.0	40.0
60	15.4	22.7	26.9	30.9	33.9	35.7	43.6	54.6
120	20.1	29.0	33.9	38.2	41.6	43.3	52.3	65.8
360	32.8	45.9	52.2	56.7	59.8	61.6	72.3	91.5
720	40.4	57.7	67.0	75.0	81.2	84.3	101.4	127.5
1,440	49.2	70.6	84.2	98.4	110.6	119.7	150.7	187.0

Note: minimum

1.17.5.1.4 Extreme Precipitation Events

A **Table 1.17-3** summarizes the annual precipitation for return periods ranging from the 1 in-1,000 wet year to the 1 in-1,000 dry year.

Table 1.17-6: Annual Precipitation Frequency Analysis (in millimetres [mm])

Hydrological Condition	Return Period (years)	Annual Precipitation (mm)
Wet	1000	997
	500	964
	200	918
	100	882
	50	843
	25	803
	20	789
	10	743

Hydrological Condition	Return Period (years)	Annual Precipitation (mm)
	5	690
Dry	5	517
	10	479
	20	448
	25	440
	50	416
	100	396
	200	378
	500	357
	1000	343

Note: mm=millimetre

Table 1.17-4 presents the PMPs for the Project where summer/autumn was defined as being from July 1 to October 31.

Table 1.17-7: Project Probable Maximum Precipitation

Season	PMP (mm)
Spring	250
Summer/Autumn	277

Note: mm=millimetre

For all designs requiring the PMP a value of 277 was used.

1.17.5.1.5 Snowmelt

A snowmelt model was developed for the Project and validated using regional snow pillow data. Snowmelt at the Project was determined to typically start in April and peak in May. **Table 1.17-5** summarizes maximum daily snowmelt for a range of return periods.

Table 1.17-8: Project Daily Snowmelt Depth Frequency Analysis

Return Period (years)	1-day Snowmelt Depth (mm)
2	23
5	27
10	29
25	32

Return Period (years)	1-day Snowmelt Depth (mm)
50	33
100	35
200	36
500	38
1000	39

Note: mm=millimetre

1.17.5.1.6 Mean Monthly Evaporation

Monthly evaporation was calculated using local and regional parameters as inputs to open water potential evaporation equations and was determined to be 529 mm/year, and the monthly average rates are provided in **Table 1.17-6**.

Table 1.17-9: Monthly Average Project Evaporation Summary (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

1.17.5.1.7 Mean Annual Runoff (MAR)

The mean annual runoff (MAR) for the Project was determined to be 219 mm/year where highest flows tend to occur in May due to freshet, and continuously regress thereafter. The distribution of runoff across the months of an average year are provided in **Table 1.17-7**.

Table 1.17-10: Monthly Average Project Runoff Distribution (%)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Runoff Distribution	2%	2%	3%	15%	34%	11%	7%	5%	6%	8%	6%	2%	100%

1.17.5.1.8 Hydrogeology

An understanding of hydrogeology and its inputs is required to complete a design for the water management infrastructure. A copy of SRK's Groundwater Technical Report is provided in **Appendix 1.0-U SRK, Groundwater Technical Report for the Tenas Coal Project, Telkwa**.

The hydrogeology of the Project Area was studied extensively in the 1990s to support feasibility studies and environmental assessments (Piteau 1998), and 2017-2018 (SRK) to provide further information on the hydrogeological system. As of January 2019, hydrogeology baseline information included:

- ▶ 18 historical wells and 11 new wells constructed in 2019;
- ▶ 28 hydraulic conductivity tests in bedrock and 26 in overburden;
- ▶ groundwater level observations measured between 1989 and 2018 from 29 wells;
- ▶ five wells with water level dataloggers to observe seasonal changes;
- ▶ groundwater quality data collected between 1995 and 2018; and
- ▶ seep survey conducted along Tenas Creek and Four Creek.

Appendix 1.0-U SRK, Groundwater Technical Report for the Tenas Coal Project, Telkwa provides a description of the groundwater conceptual and numerical model properties, scenarios, and results. Results from the numerical models were used as inputs to the **Water and Load Balance Modeling Report** provided in **Appendix 1.0-E** and for design of the Project's **MWMP** and for water quality and quantity predictions in the Project water and load balance models. Predictions of open pit inflows and seepages from the management ponds are estimated in **Table 1.17-8** below for the base, and high seepage case scenarios.

Table 1.17-11: Predicated Open Pit Inflows and Seepages from the Management and Tenas Control Ponds

Inflows and Seepages (m ³)	Feature					
	Excavation of Open Pit and North Management and Tenas Control Ponds Full		Excavation of Open Pit, North, East Management and Tenas Control Ponds Full		Excavation of Open Pit, North, East and West Management and Tenas Control Ponds Full	
	Base Case	High Case	Base Case	High Case	Base Case	High Case
Open Pit Inflows	317	408	888	1144	550	671
NMP Seepage	198	210	198	210	198	210
EMP Seepage	n/a	n/a	458	535	458	535
WMP Seepage	n/a	n/a	n/a	n/a	836	2073
Tenas Control Pond	140	290	140	290	140	290

Notes: EMP=East Management Pond; m³=cubic metre; n/a=not applicable; NMP=North Management Pond; WMP=West Management Pond
Flows in **green** are into the structure or inflows.
Flows in **red** are out of the structure or seepage.

Interception ditches are not required at the overburden/bedrock contact for the Project as the field work completed to date does not indicate a material flow of groundwater from this contact. The contributions of groundwater flows from overburden is predicted to be localized and negligible compared to groundwater flows from the bedrock.

Model results suggest no drawdown will occur at the nearest domestic wells, situated approximately 4 km north from the northern limit of the North Management Pond, and 1.6 km west from where Tenas Creek flows into Goathorn Creek.

Based on the full load and water balance conducted for the Project and is provided in **Appendix 1.0-E SRK Tenas Project Water and Load Balance Modeling Report** no measurable parameter concentrations above British Columbia Water Quality Guidelines (BCWQG) are expected to occur at the nearest domestic wells.

1.17.5.1.9 Conceptual Hydrogeologic Model

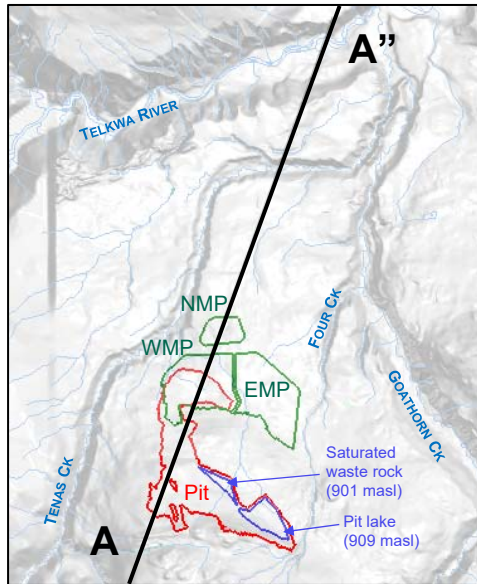
Conceptually, the groundwater system is divided into two (2) sub-systems: deep bedrock and shallow overburden (**Figure 1.17-13**). The deep bedrock is composed of the Skeena sedimentary rock group, the volcanic group, fractures, and faults. At the scale of the Telkwa Watershed, the fractured rock is assumed to act as an equivalent porous medium. 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 do 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 private well located down valley of the Project. 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 (**Figure 1.17-14**).

Shallow overburden is composed of two (2) 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 shallow overburden is characterised 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.

The bedrock is characterised by a low to moderate hydraulic conductivity (i.e., K geomean of 2×10^{-7} m/s). K geomean values sorted by lithological types, from the least permeable to the most permeable, are conglomerate (2×10^{-8} m/s), mudstone/siltstone (7×10^{-8} m/s), volcanic rock (1×10^{-7} m/s), sandstone (2×10^{-7} m/s), and coal (5×10^{-7} m/s). For the overburden, K in the clay-silt-rich till is relatively low (9×10^{-9} m/s), and in the sand-gravel-rich till moderately high (1×10^{-6} m/s). There is no site measurement for specific storage or specific yield.

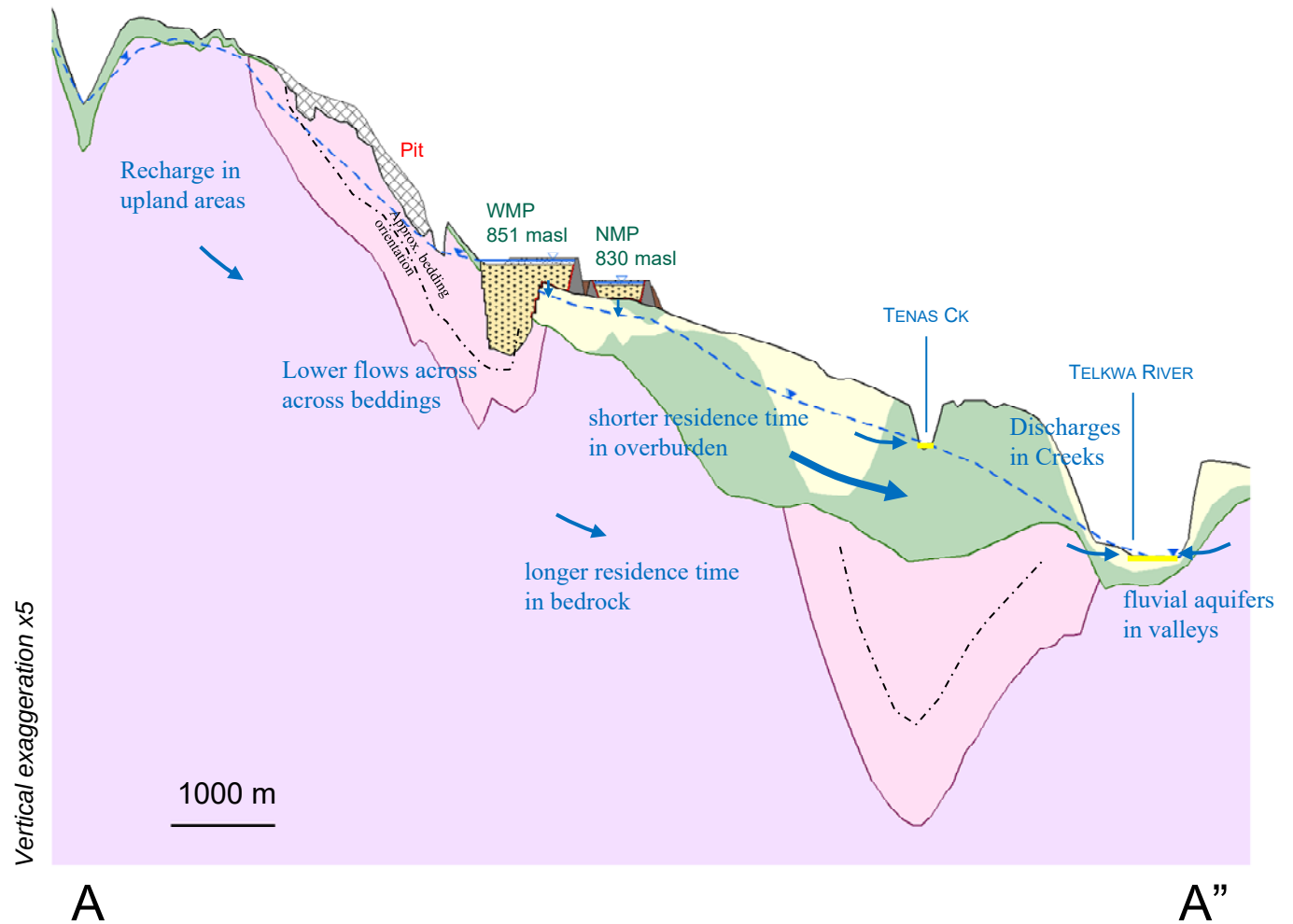
Potential groundwater related effects from the Project include:

- ▶ Groundwater Quantity:
 - ▶ water table drawdown from Mine dewatering and management pond seepage;
 - ▶ changes to creek baseflows and groundwater level at down valley private wells;
- ▶ Groundwater Quality:
 - ▶ seepage from management ponds and end pit lakes; and
 - ▶ changes to groundwater quality discharging to surface water pumped by private wells.



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

**Tenas Project Groundwater
Conceptual Model Section View**

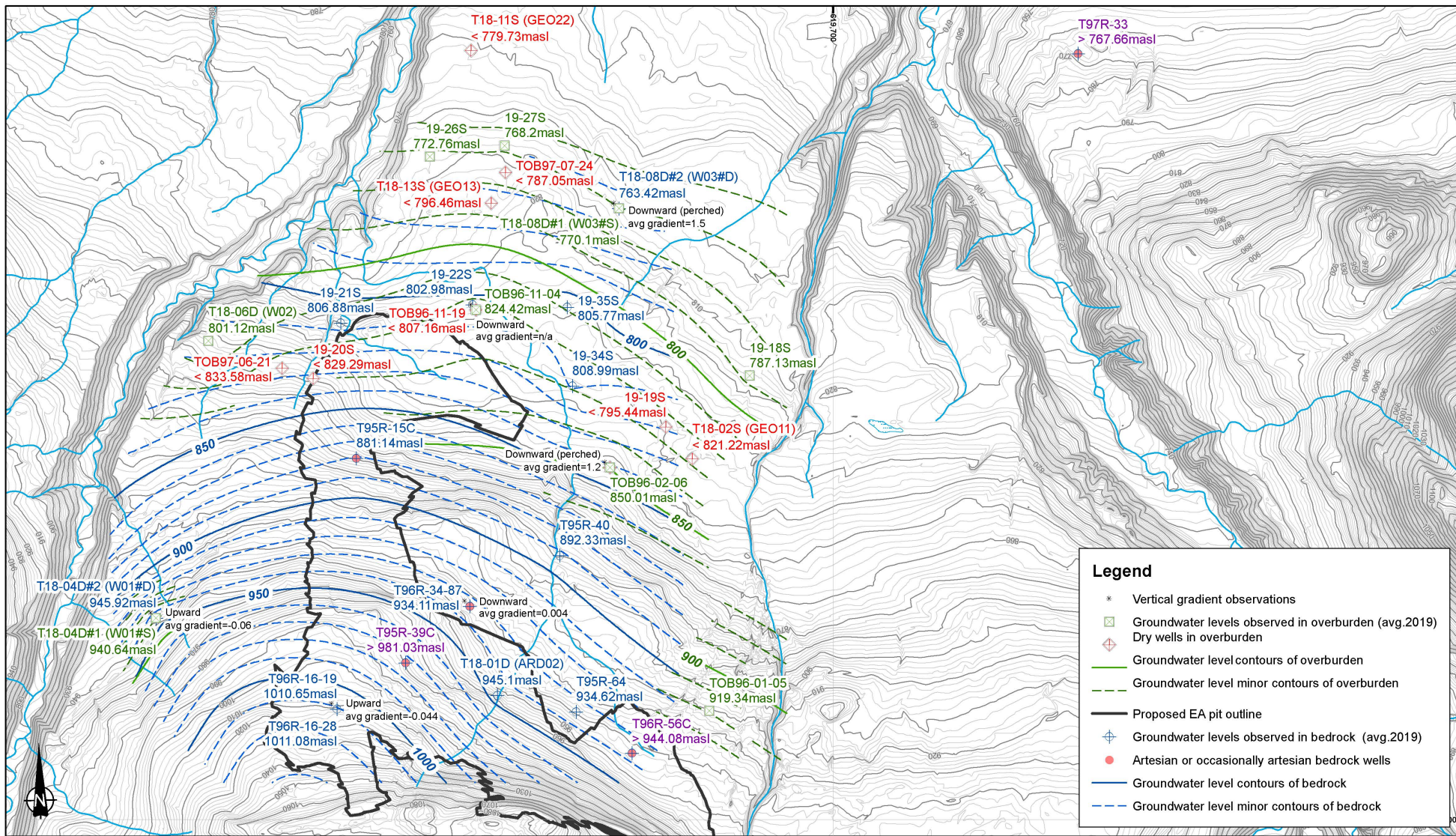
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Tenas Project

Date:
Dec.2020

Approved:
GF

Figure: **1.17-13**



0 0.325 0.65 1.3 Kilometers

Coordinate System: NAD 1983 UTM Zone 9N
Projection: Transverse Mercator
Datum: North American 1983



Job No: 1CT027.004
Filename: Fig30_Groundwater Tenas 2019.pptx



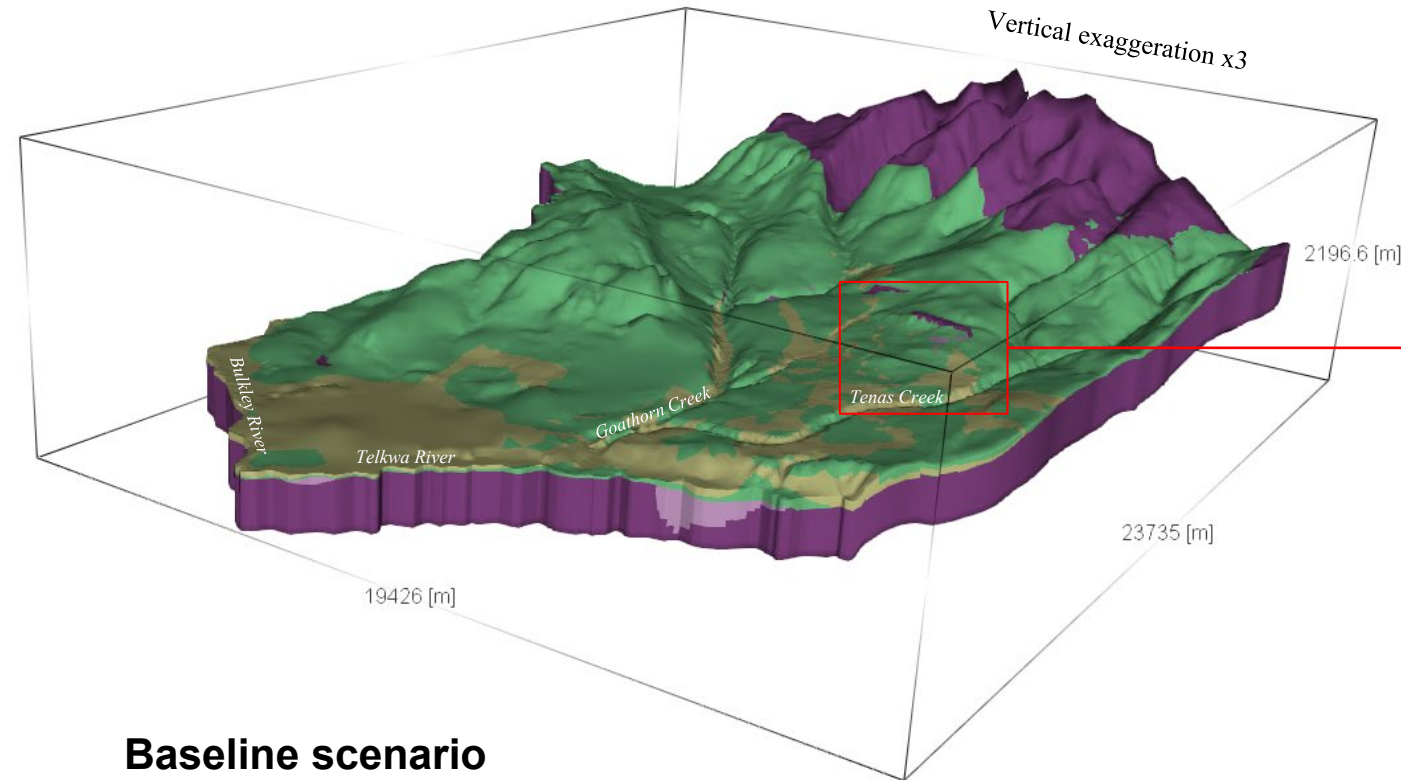
Tenas Project

Groundwater tables in overburden and bedrock with the Environmental Assessment (EA) open pit shown

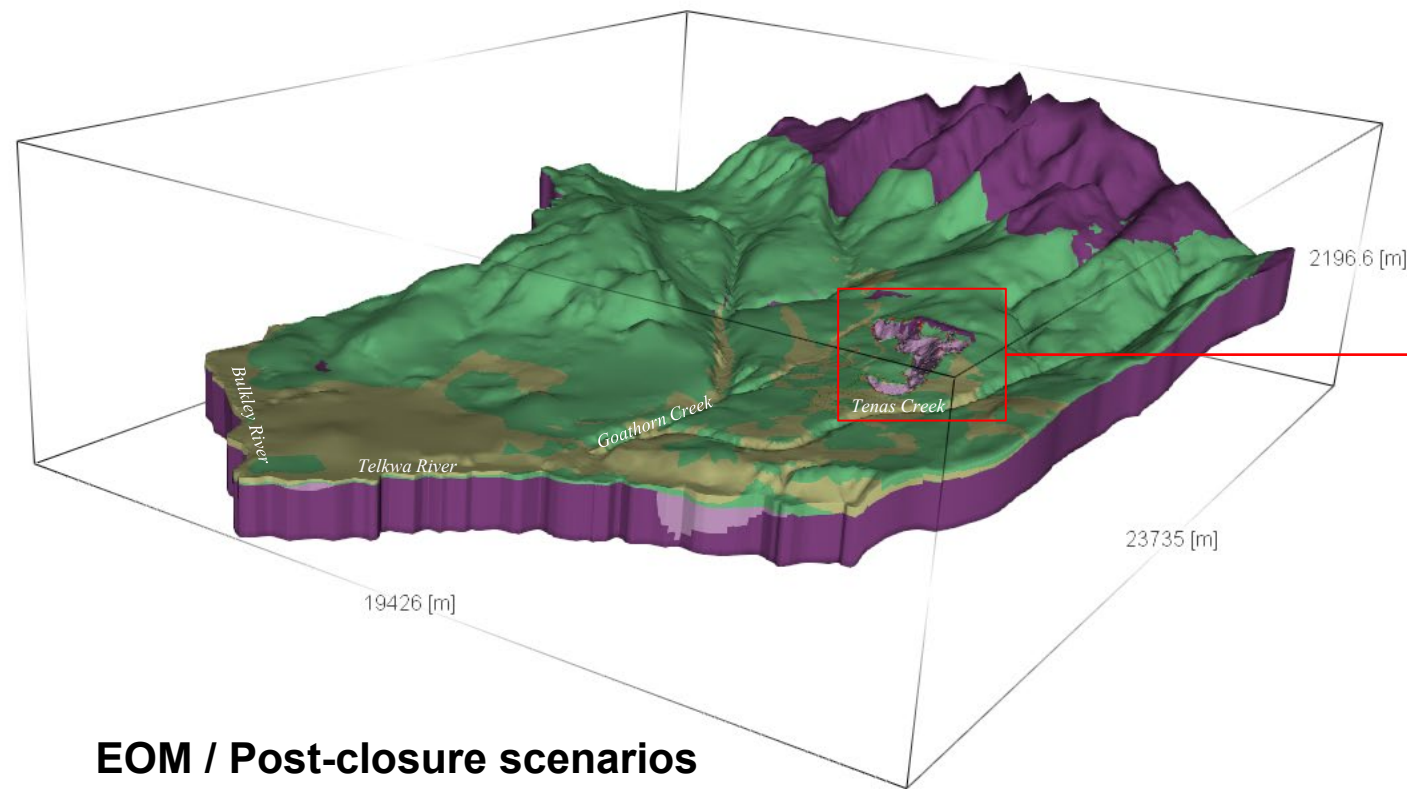
Date: Nov 2020
Approved: GF
Figure: 1.17-14

1.17.5.1.10 Numerical Hydrogeologic Model

3D numerical groundwater flow modelling was completed to evaluate potential Project effects to groundwater (**Figure 1.17-15**). Effects to surface water were evaluated in partnership with a site wide water and load balance model. Groundwater modeling was based on 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 **Appendix 1.0-U SRK, Groundwater Technical Report for the Tenas Coal Project, Telkwa**.

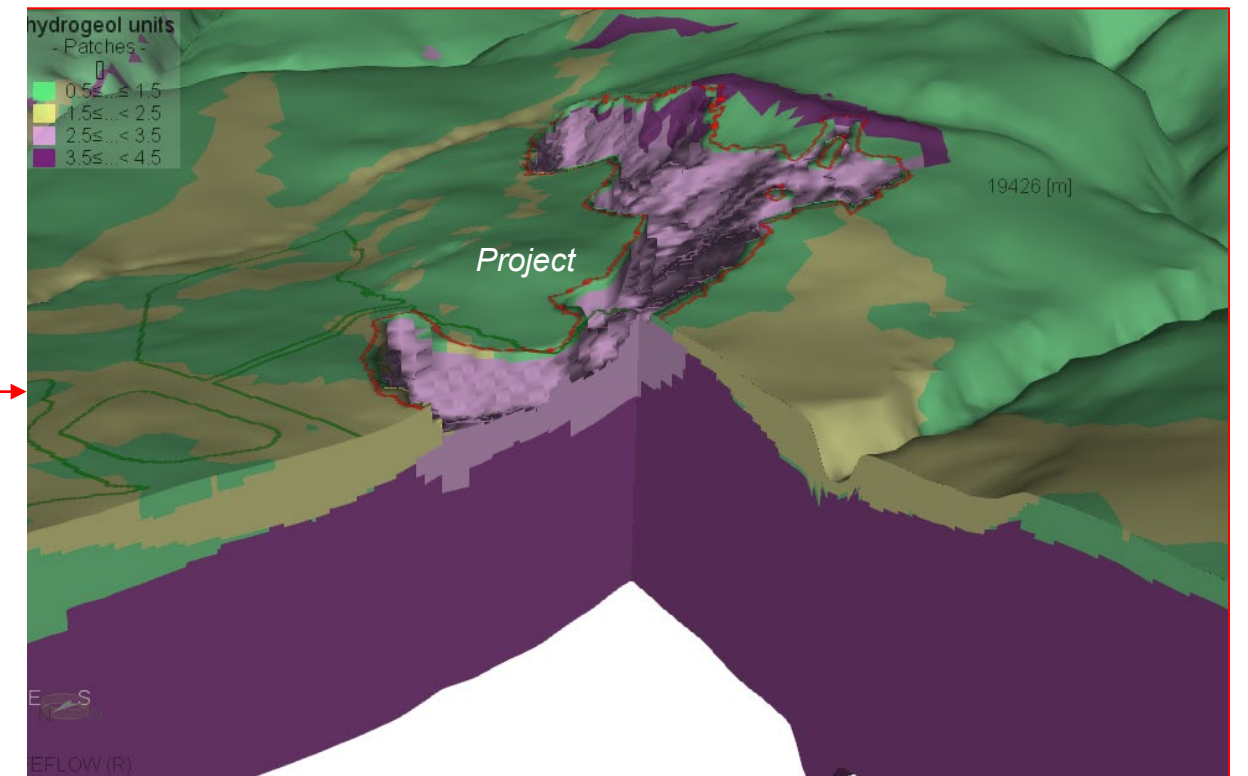
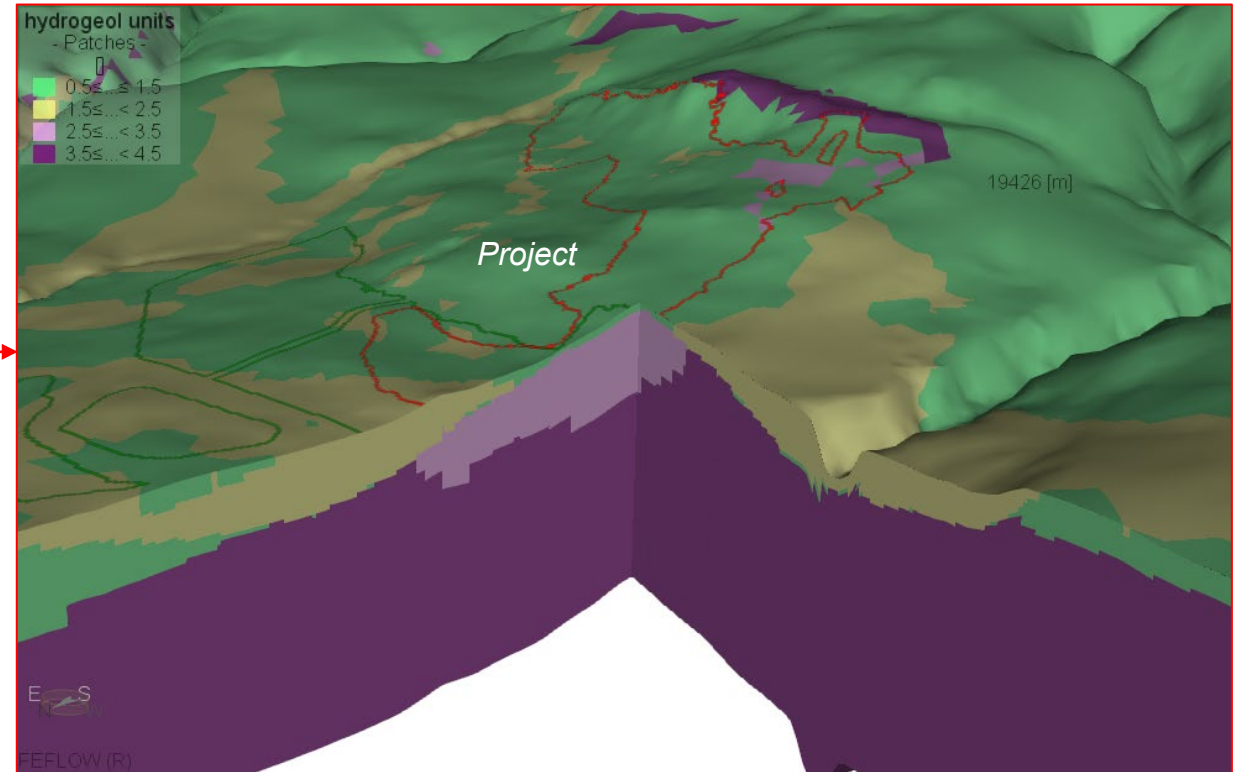


Baseline scenario



EOM / Post-closure scenarios

- | | |
|---|---|
|  Silt-clay-rich till |  Sedimentary rocks |
|  Sand-gravel-rich till |  Volcanic rocks |



 Job No: 1CT027.004 Filename: Fig54_3D view HydrostatGwModel_rev1.pptx	 Tenas Project	Tenas Project groundwater numerical model isometric views		
		Date: Nov 2020	Approved: GF	Figure: 1.17-15

1.17.5.2 *Project Discharges*

There are eight (8) controlled external water discharge locations for the Project. They include a control pond, and eight (8) sedimentation ponds. They are listed below:

1. Tenas Control Pond: This control pond is downstream of the Project Area and discharges via gravity using an existing surface channel to Goathorn Creek;
2. CPP Sedimentation Pond: This sedimentation pond is downstream of the CPP and discharges into Four Creek in the Post-closure Phase once the MIC pad and Project is reclaimed. During the Construction, Operation, and Decommissioning and Reclamation phases the discharge from this pond is pumped to the Tenas Control Pond. In a 1 in 25-year storm event this sedimentation pond would discharge into Four Creek;
3. Rail Infrastructure Sedimentation Pond: This sedimentation pond is downstream of the Rail Infrastructure and discharges into Bulkley River via gravity using an existing surface channel;
4. Explosive Facility Sedimentation Pond: The sedimentation pond for the Explosives Facility discharges into Tenas Creek via gravity using overland flow;
5. Explosive Magazine Sedimentation Pond: The sedimentation pond for the Explosives Magazine discharges into Goathorn Creek via gravity using overland flow;
6. Gravel Quarry Sedimentation Pond: The sedimentation pond for the Gravel Quarry discharges to Goathorn Creek via pumping to the Goathorn Creek Bridge;
7. Rock Quarry Sedimentation Pond: The sedimentation pond for the Rock Quarry discharges to Helps Creek via existing forested ephemeral channel; and
8. Goathorn Creek Sedimentation Pond 1 on the east side of Goathorn Creek and Pond 2 on the west side of Goathorn Creek discharge through basal gravels into Goathorn Creek.

The uncontrolled sheet discharges from the powerline adjacent to the TAC and not within the Tenas Control Pond's catchment area, and TAC outside of Goathorn Creek as these components incorporate adequate erosion and sediment control measures to be addressed by natural environmental attenuation of TSS.

Discharge rates and quality are described further in **2.2.2** as well as in **Appendix 1.0-E SRK, Tenas Project Water and Load Balance Modeling Report, WMP**, and the **DMP**.

1.17.6 **Geohazards for Water Management Structures**

The facilities (collection and diversion channels, management, and sedimentation ponds) constructed for water management for the Project are located on a shallow sloping plateau located between the Tenas and Goathorn creeks and are not subject to any hazards due to adverse terrain. Furthermore, there are no large watercourses at the upslope end of the facilities that store hazardous materials that would cause mudflows and/or debris flows. Lastly with the shallow slope present the area is not at risk from avalanches. The only hazards the water management facilities face are the ones induced by the construction of upstream management ponds which are addressed through the geotechnical analysis conducted by SRK.

1.18 Fuel and Lubricant Storage Facilities and Distribution Network

1.18.1 Hydrocarbon Storage and Dispensing

Diesel fuel for primary and ancillary mining equipment and light vehicles will be transported to site via the TAC by a licensed third-party vendor such as Imperial Oil in super B-train tanker trucks. Lubricants will be transported to site in single tank tanker trucks, flat beds or cube van trucks hauling 1,000 L tote tanks.

The following **Table 1.18-1** summarizes fuel and hydrocarbon storage onsite.

Table 1.18-1: Hydrocarbons Used and Stored at the Tenas Project

Material	Site Category	Location	Stored Amount
Diesel	Hydrocarbons	Pit Fueling Station	1 * 100,000 L
		Rail Infrastructure Fueling Station	1 * 20,000 L
Gasoline	Hydrocarbons	Light Vehicle Fueling Station	1 * 20,000 L
DEF	Hydrocarbons	Pit Fueling Station	4 * 5,000 L
		Rail Infrastructure	1 * 1,000 L
Lubricants and Used Oil	Hydrocarbons	Pit Fueling Station	5 * 3,000 L, 1 * 2,200 L
		Maintenance Lubricant Storage Facility	4 * 8,000 L, 4 * 3,000 L
		Rail Infrastructure Fueling Station	3 * 3,000 L, 1 * 2,200 L
Glycol and Used Glycol	Hydrocarbons	Pit Fueling Station	1 * 3,000 L; 1 * 2,200 L
		Maintenance Lubricant Storage Facility	1 * 8,000 L, 1 * 8,000 L
		Rail Infrastructure Fueling Station	1 * 1,000 L, 1 * 2,200 L
Grease	Hydrocarbons	Pit Fueling Station	1 * 1,000 L
		Maintenance Lubricant Storage Facility	1 * 1,000 L
		Rail Infrastructure	1 * 1,000 L
Diesel (Process Reagent)	Hydrocarbons	Process Reagent Storage Facility	1 * 20,000 L

Notes: DEF=diesel exhaust fluid; L=litres; MIBC= methyl isobutyl carbinol

Additional information can be found in the **Fuel Management and Spill Control Plan (S13.0-C7) (FMSCP)** and **Chemicals and Materials, Storage, Transfer, and Handling Plan (S13.0-C3) (CMSTHP)**.

Additional information on fuel storage and dispensing will be provided in the subsequent sections.

1.18.1.1 Pit Fueling Station – Fuel/Diesel Exhaust Fluid (DEF) Storage and Dispensing

The Pit Fueling Station will consist of one (1) 100,000 L double-walled skid-mounted steel tank for diesel fuel, which is for refueling both Minesite vehicles and light vehicles for the Minesite operation. The diesel tank will be installed in the Construction Phase.

The Pit Fueling Station will also have four (4) x 5,000 L polymer plastic tanks for diesel exhaust fluid (DEF) housed inside a skid-mounted sea container to provide a heated and insulated housing to prevent this material from freezing. All tanks will be compliant with the National Fire Code of Canada 2015 (NRCAN 2015) and BC Fire Code 2018 (GovCan 2018), and manufactured and labelled in accordance with CAN ULC S-601-07.

The tanks will be installed above ground and will be skid-mounted with both high volume and low volume dispensing equipment included, with high volume pumps being used for mine equipment and low volume pumps being used for light vehicles. The tanks will have a submersible turbine pump, filtering and metering equipment, tank safety valve, loading arm and refueling nozzle. The tanks will be equipped with a non-pressure overfill detection system which will prevent tanks from being overfilled. Furthermore, the tanks will be equipped with a measuring system which will automatically shut fuel off when the tank reaches a point where only 2.5% of the tank's capacity has fuel left.

The Pit Fueling Station has been designed to be temporary in nature at its initial location and is envisioned to move several times over the Project's life to minimize time equipment spends getting to and from this facility daily.

This fueling station will be purchased as a turn-key contract including supply, transport, installation, and commissioning from Fireball Equipment, who have provided similar facilities to other mines in the region. This unit will be constructed during the Construction Phase. As described later, lubricants will be stored near this facility to assist with the servicing of equipment. An example of a fueling station like what will be constructed for the Project is shown by **Figure 1.18-1** below.



Figure 1.18-1: Example of Pit Fueling Station

The tanks and fueling station will have concrete lock blocks and bollards installed to protect the facilities from unintentional contact from mining equipment. Furthermore, a set refueling area that is lined with a geomembrane will be provided adjacent to the diesel tanks where mining equipment is fueled so that any

spills in this area are directed back to the center of the lined area to prevent spills from escaping the area into the surrounding environment via ground and/or surface water routes.

The Pit Fueling Station will be able to dispense fuel to at least two (2) pieces of mining equipment simultaneously and will be able to be refueled from super B-train tanker trucks coming to site. The system will have separate fueling areas for light vehicles and heavy mine vehicles to avoid any unnecessary interactions. The light vehicle refueling area and the filling area for diesel deliveries will not be lined as the likelihood of a large spill is rare due to the low volume pumps used in this process

Figure 1.18-2 below provides a plan view drawing of the Pit Fueling Station.

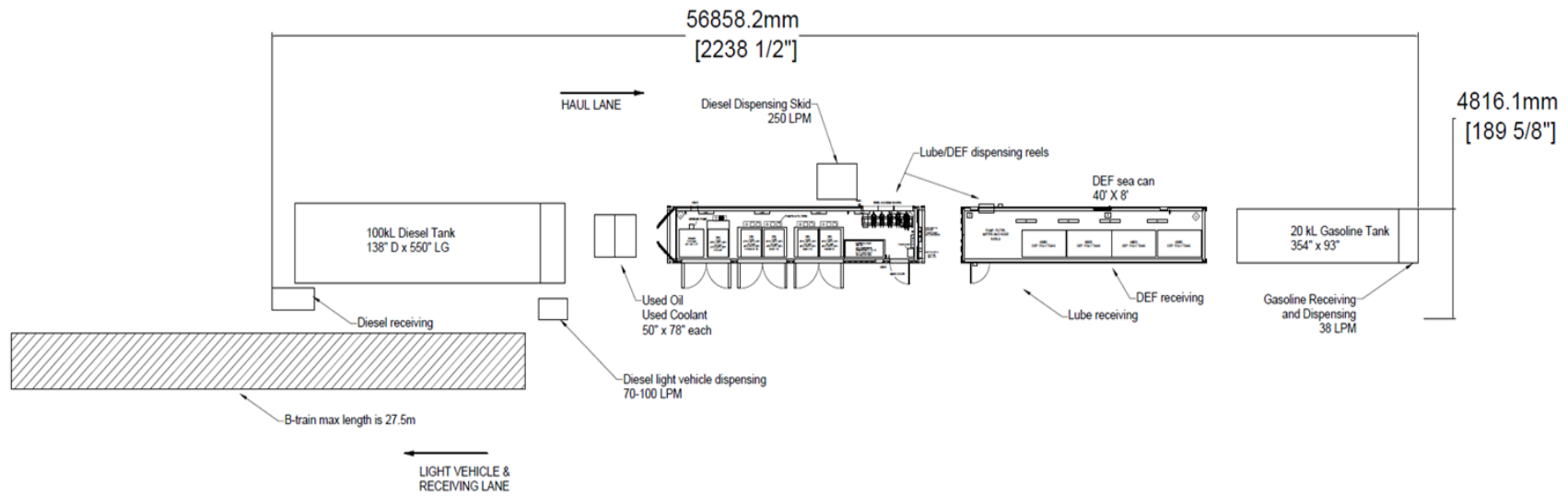


Figure 1.18-2: Plan view of Pit Fueling Station

1.18.1.2 Light Vehicle Fueling Station

While most of the equipment at the Project will be fueled with diesel fuel, some equipment will require gasoline, especially the smaller-sized ancillary equipment and light duty vehicles. The Light Vehicle Fueling Station will be part of the overall Pit Fueling Station and will consist of a 15,000 L double-walled steel gasoline tank and dispensing station. **Figure 1.18-3** below provides the design for the proposed gasoline fueling station. No membrane lined area is provided for the refueling of light vehicles or for refilling of the tank by delivery trucks, due to the low volume of hydrocarbons that the pumps can deliver.



Figure 1.18-3: Example of Light Vehicle Fueling Station

1.18.1.3 Rail Infrastructure Fueling Station

While most mobile equipment will be located at the Minesite, two (2) to three (3) FELs will be operational at the Rail Infrastructure area to allow for the loading of processed coal onto rail cars. A trade-off analysis was reviewed of using a stationary station at the Rail Infrastructure versus using a mobile fuel/lubricant truck for this function, and it was determined that a stationary station was the preferred option from a cost and risk perspective.

At the Rail Infrastructure Fueling Station, a 20,000 L double-walled skid mounted steel tank will be used to store diesel fuel, which will be used to fuel the FELs and trucks hauling processed coal.

In addition, the Rail Infrastructure Fueling Station comprised inside a sea container will be installed that has basic lubricant and used product storage for the following:

- ▶ engine lubricant;
- ▶ coolant;
- ▶ gear lubricant;
- ▶ transmission and hydraulic lubricant;
- ▶ used lubricants;
- ▶ DEF; and
- ▶ used coolant.

This system will be like the Pit Fueling Station described earlier in **1.18.1.1**. A geomembrane lined refueling area is provided for the FELs and processed coal trucks and the same area will be used for fuel deliveries. While the amount of fueling done at this location is minor, the groundwater level is located only 3 to 4 m below the existing ground surface so to mitigate spills getting into the groundwater it was felt prudent to have a more robust spill containment system at this location.

The Rail Infrastructure Fueling Station will provide storage, pumping, and filtering and metering instruments for the lubricants, coolant, grease, used coolant and used lubricant products stored in the sea container. Only Intermediate Bulk Container (IBC) totes with a capacity of 1,000 L will be used for this station. This system will be constructed in the first year of the Operation Phase. The Rail Infrastructure Fueling Station will provide an integral storage system in the floor of the sea container housing the lubricants will be designed at 110% of the largest tank in the facility with its purpose to capture any spills and or leaks from the tanks within the Rail Infrastructure Fueling Station. A third-party licensed vendor such as Imperial Oil will be responsible for providing the required IBC totes to the Project as they run out and are removed from the sea container. **Figure 1.18-4** below presents the Rail Infrastructure Fueling Station, including diesel fueling and lubricant dispensing.

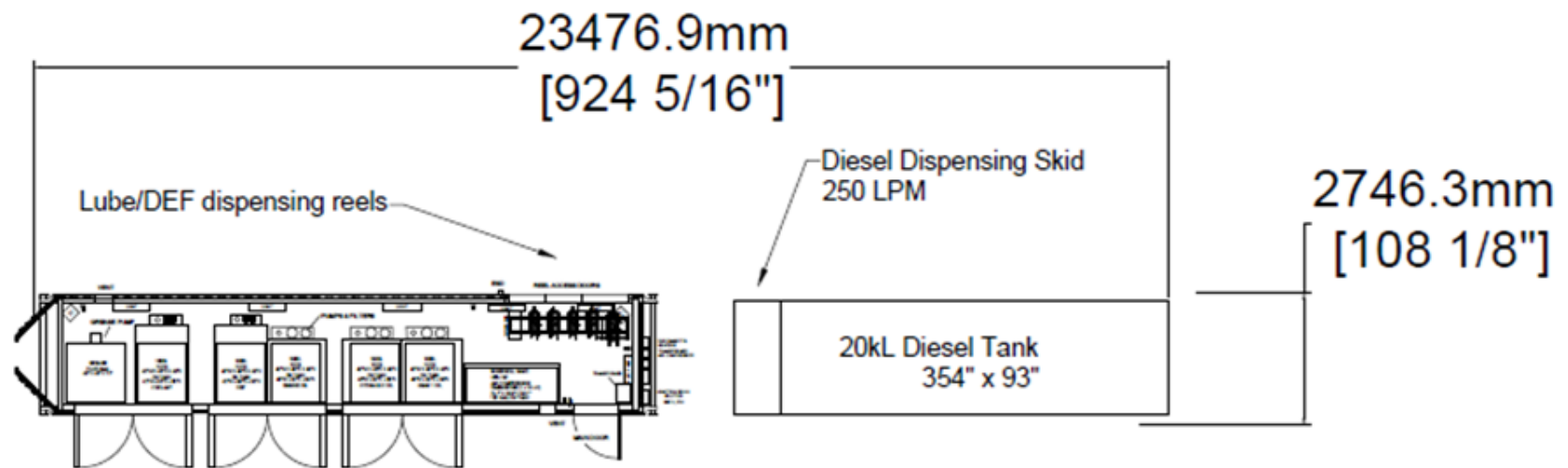


Figure 1.18-4: Diesel fueling and lubricant dispensing station at Rail Infrastructure Fueling Station

1.18.1.4 Pit Fueling Station - Lubricant Storage and Dispensing

Lubricants for primary and ancillary mining equipment and light vehicles will be stored in a dedicated sea container located at the Pit Fueling Station, and this is identified as the Pit Fueling Lubricant Storage Facility. A set of lubricant reels are in the Pit Fueling Lubricant Storage Facility that can be used to service equipment and/or fill up lubricant delivery vehicles to provide lubricants to tracked equipment in the field. The lubricant reels will be interconnected with the lubricants and fluids from the Pit Fueling Lubricant Storage Facility.

The Pit Fueling Lubricant Storage Facility will provide storage, pumping, and filtering and metering instruments for the lubricants, coolant, grease, used coolant and used lubricant products stored within. Permanent storage tanks within the Pit Fueling Lubricant Storage Facility will be between 1,500 and 2,000 L in capacity and will be refilled from Intermediate Bulk Containers (IBC) totes with a capacity of 1,000 L mounted above the permanent tanks. This system will be constructed in the first year of the Operation Phase. The Pit Fueling Lubricant Storage Facility will provide an integral storage system in the floor designed at 110% of the largest tank in the facility with its purpose to capture any spills and or leaks from the tanks within the sea container. A third-party licensed vendor such as Imperial Oil will be responsible for providing the required IBC totes to the Project as they run out and are removed from the sea container. **Figure 1.18-5** below provides a drawing for the Pit Fueling Lubricant Storage Facility.

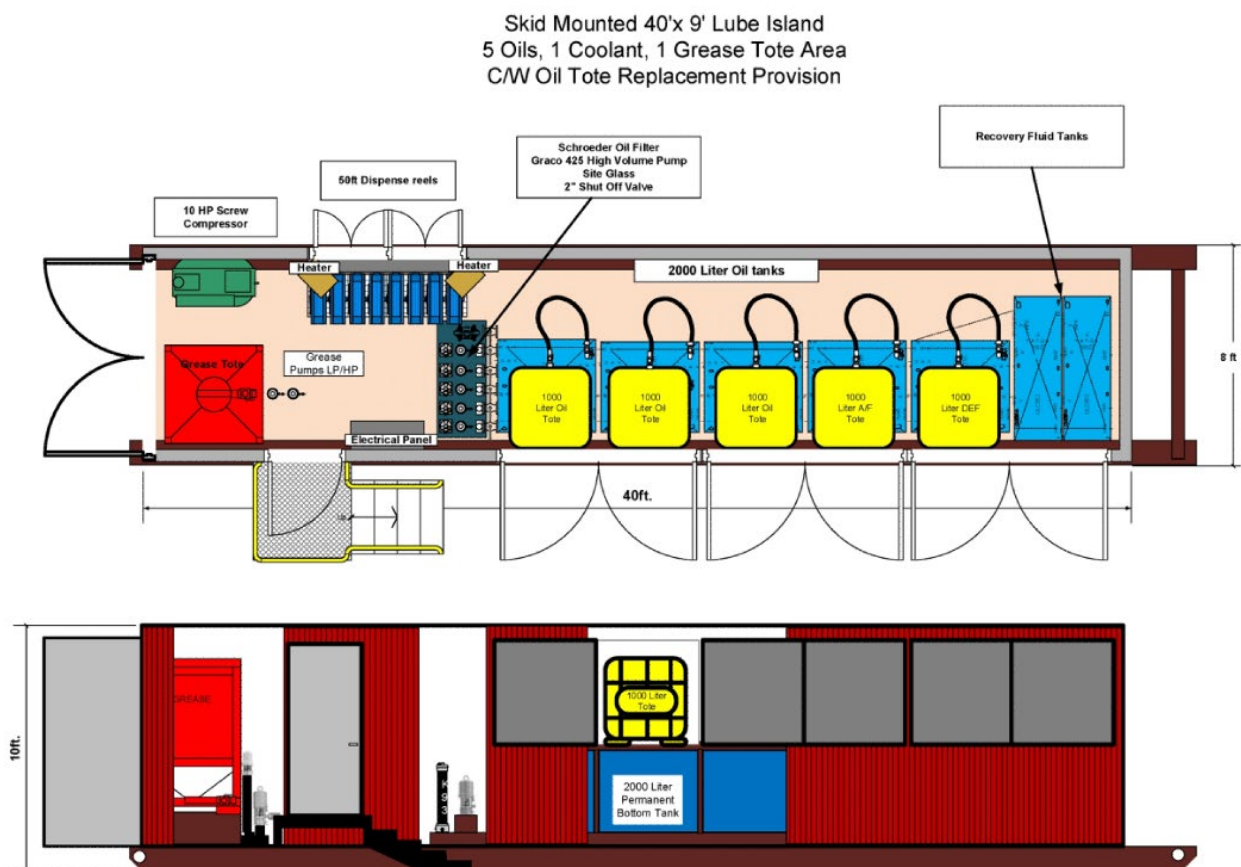


Figure 1.18-5: Pit Fueling Lubricant Storage Facility

1.18.1.5 *Maintenance Lubricant Storage Facility*

Lubricants for mining equipment and light vehicles will be stored in dedicated sea containers and on a lubricant storage pad adjacent to the Maintenance Facility and will be identified as the Maintenance Lubricant Storage Facility. A network of small-bore piping will connect the Maintenance Lubricant Storage Facility to the heavy vehicle maintenance bays both for the dispensing of lubricants and the collection of used lubricant and coolant back outside to tanks at the Maintenance Lubricant Storage Facility for disposal. Bulk delivery of lubricants and coolant to the Maintenance Lubricant Storage Facility will be via super B-train tanker trucks arriving at the Maintenance Facility. Similar tankers will be used to haul away used coolant while the used lubricants will be directed to the onsite boilers for burning to generate heat for the in-floor heating system. This system is a larger system than the one at the Pit Fueling Station but serves the same purpose. The system will be able to receive bulk deliveries of lubricants and will be able to dispense to both the reels inside the Maintenance Lubricant Storage Facility and to lubricant vehicles for transport to tracked vehicles. **Figure 1.18-6** below provides a plan view of the Maintenance Lubricant Storage Facility and photos of other similar existing facilities at other mine sites.

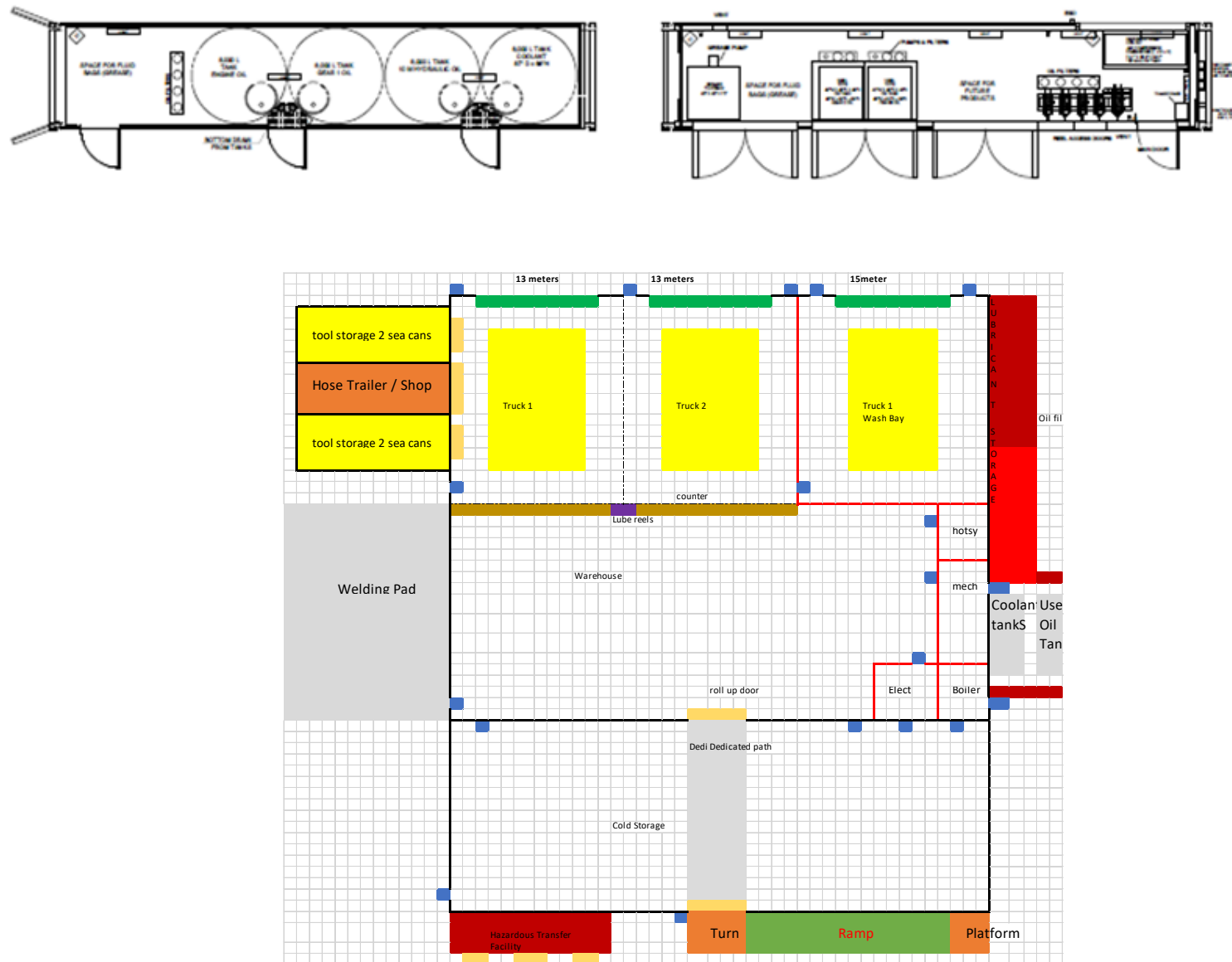


Figure 1.18-6: Lubricant storage facility schematic and location in relation to the Maintenance Facility

1.18.1.6 Coal Processing Plant (CPP) Reagent Storage Site

The CPP has a designated area for the storage of diesel and MIBC. Both reagents will be stored in 20,000 L skid mounted double-walled steel tanks. These will be protected by concrete blocks and bollards for protection. These tanks will primarily be used for supplying reagents to the CPP while a diesel tank will also provide a back up fuel source for site-based fuel trucks if required.

1.18.2 Chemicals and Material Management

The Project will also use other hazardous chemicals and materials during operations. One of the key materials that will be stored is MIBC, a reagent used in coal processing, which will be stored in a 15 m³ double-walled steel tank located adjacent to the CPP. All other hazardous material will be stored either at the Maintenance Facility or at the CPP.

Table 1.18-2 below provides an approximate list of materials which could be used during the Operation Phase and that are planned to be stored onsite. This table includes hydrocarbons previously presented in **Table 1.18-1**. Additional information can be found in the **CMSTHP**.

Table 1.18-2: Proposed Hazardous Materials Stored Onsite for the Tenas Project

Material	Site Category	Location	Stored Amount
Diesel	Hydrocarbons	Pit Fueling Station	1 * 100,000 L
		Rail Infrastructure Fueling Station	1 * 20,000 L
Gasoline	Hydrocarbons	Light Vehicle Fueling Station	1 * 20,000 L
DEF	Hydrocarbons	Pit Fueling Station	4 * 5,000 L
		Rail Infrastructure	1 * 1,000 L
Lubricants and Used Oil	Hydrocarbons	Pit Fueling Station	5 * 3,000 L, 1 * 2,200 L
		Maintenance Lubricant Storage Facility	4 * 8,000 L, 4 * 3,000 L
		Rail Infrastructure Fueling Station	3 * 3,000 L, 1 * 2,200 L
Glycol and Used Glycol	Hydrocarbons	Pit Fueling Station	1 * 3,000 L; 1 * 2,200 L
		Maintenance Lubricant Storage Facility	1 * 8,000 L, 1 * 8,000 L
		Rail Infrastructure Fueling Station	1 * 1,000 L, 1 * 2,200 L
Grease	Hydrocarbons	Pit Fueling Station	1 * 1,000 L
		Maintenance Lubricant Storage Facility	1 * 1,000 L
		Rail Infrastructure	1 * 1,000 L
Diesel (Process Reagent)	Hydrocarbons	Process Reagent Storage Facility	1 * 20,000 L
Methyl Isobutyl Carbinol (MIBC) (Process Reagent)	Chemicals	Process Reagent Storage Facility	1 * 20,000 L
Ammonia Nitrate and Fuel Oil (ANFO)	Explosives	Explosive Facility	50,000 kg

Material	Site Category	Location	Stored Amount
Emulsion	Explosives	Explosive Facility	30,000 kg
Packaged Emulsion	Explosives	Explosive Magazine	14,000 kg
Acetylene	Gas	Maintenance Facility	2 * 30,000 L
Oxygen	Gas	Maintenance Facility	2 * 50,000 L
Paint	Chemicals	Maintenance Lubricant Storage Facility	1 * 100 L, 1 * 50 L
Solvents	Chemicals	Maintenance Lubricant Storage Facility	3 * 200 L
Flocculants (Magnaflow 10)	Chemicals	Maintenance Lubricant Storage Facility	1,000 kg
Flocculants (IPACFLOC 16)	Chemicals	Process Reagent Storage Facility	1,000 kg
Envirocrust 829C	Chemicals	Rail Infrastructure Fueling Station	24,000 L
Enviomelt SCR1	Chemicals	Rail Infrastructure Fueling Station	16,000 L

Notes: *=multiplied by; kg=kilogram; L=litre

1.18.3 Explosives Infrastructure

The primary explosives used during mine operations will be a combination of ammonium nitrate fuel oil (ANFO) and emulsion. Blasting activities will be contracted out to a qualified third-party company. All required explosives will be obtained through an explosives supply contractor and stored onsite in silos and magazines. The location of the AN and emulsion silos and Explosive Magazine were presented by **Figure 1.10-2**. The size of the silos is 50 tonne for ANFO and 30 tonne for emulsion. See **Figure 1.18-7** below for example silos that will be used for ANFO and emulsion product storage.



Figure 1.18-7: One (1) 30 tonne emulsion silos and one (1) 50 tonne Ammonium Nitrate Fuel Oil (ANFO) silo for Storage

Emulsion will be manufactured offsite and brought to site for storage as the size of the proposed operation does not require emulsion to be manufactured onsite. Two (2) magazines will be required, each with a storage capacity of approximately 7,500 kg of explosives and one (1) magazine with a capacity of 100,000 detonators will be provided onsite. Explosives will be manufactured onsite by the third-party contractor utilizing a speciality design explosives mixing and delivery truck. TCL has a letter of intent signed with Orica to be the licensed explosive contractor. The transportation of explosives to and from the Minesite will comply with federal and provincial legislation related to the transportation of dangerous goods. Licenses and permits for an Explosive Facility and related storage and the Explosive Magazine will be required from both NRCAN and the BC MEMPR. Additional information can be found in the **EMP**.

The current plan is to operate a conventional drill and blasting unit to allow for the mining of the rock material within the Project by excavators and loaders. Annual explosives consumption was determined by Orica based on the Project mine plan and with that, a site plan and infrastructure requirements were recommended. In summary, the following main items are required to support blasting onsite:

- ▶ one 50,000 kg silo for ANFO (see **Figure 1.18-7** above);
- ▶ one 30,000 kg silo for emulsion (see **Figure 1.18-7** above);
- ▶ wash bay and maintenance area for explosive truck service and washdowns;
- ▶ 3 * 7,500 kg magazines (location in accordance with *Explosives Act*, 1985, c F-14 (GovCan 1985) and NRCAN Explosives Branch) and the Code;
- ▶ office space which will be provided in TCL's Administration Building or via a trailer; and
- ▶ water management structures.

An aerial photo of an example of an explosives facility recently constructed by Orica is provided by **Figure 1.18-8** below and is expected to be like the site design used for the Project. An example of an explosives magazine recently constructed by Orica is shown in **Figure 1.18-9** below and is expected to be like the site used for the Project.

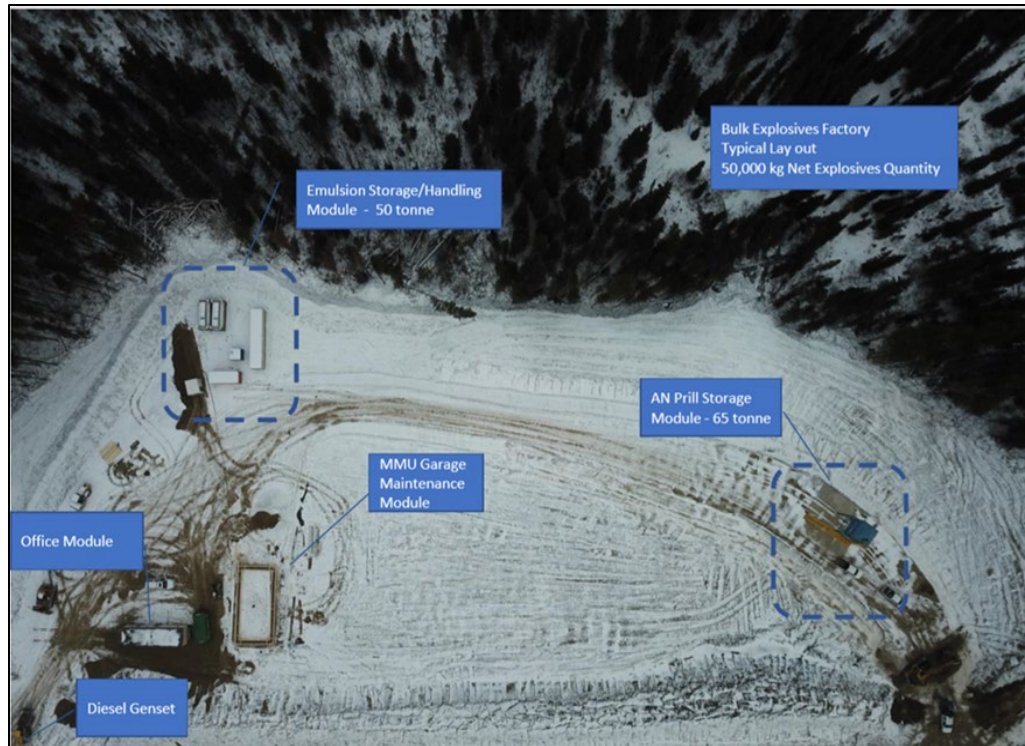


Figure 1.18-8: Example of explosive facility overhead view constructed in 2019 at similar Project in Western Canada



Figure 1.18-9: Example of explosive magazine that will be used for the Tenas Project

1.18.3.1 Explosive Use During the Operation Phase

During the Operation Phase, the Project will be using heavy ANFO for the bulk of blasting needs and has planned that 65% of the holes will be loaded with this blasting agent. The remaining 35% of the holes will be loaded with an emulsion blend consisting of 70% pure emulsion and 30% ANFO to provide superior water resistance where required. TCL and Orica completed blast simulations of the material based on the rock properties gathered during the geotechnical drilling stage and found that a powder factor of 0.50 kg/BCM should be sufficient to provide acceptable fragmentation results. During the Operation Phase, a detailed blasting tracking program will be implemented to optimize and monitor explosives usage and blasting results. **Table 1.18-3 a to c** below provide anticipated explosive usage over the mine life.

Table 1.18-3: a & c: Annual Summary of Explosives Use (Years -0.5 to 21)

a: Years -0.5 through 7

Year	-0.5	0	1	2	3	4	5	6	7
Blasted Material (BCM)	0	327,142	1,550,797	2,190,258	3,449,591	2,509,746	3,218,502	3,557,059	3,383,197
Heavy ANFO Use (kg)	0	122,678	581,549	821,347	1,293,597	941,155	1,206,938	1,333,897	1,268,699
Emulsion Use (kg)	0	40,893	193,850	273,782	431,199	313,718	402,313	444,632	422,900

*Notes: BCM=bank cubic metres; kg= kilogram***b: Years 8 through 15**

Year	8	9	10	11	12	13	14	15
Blasted Material (BCM)	2,948,714	3,382,260	4,307,764	3,804,171	3,238,772	2,444,278	2,575,845	3,124,538
Heavy ANFO Use (kg)	1,105,768	1,268,348	1,615,412	1,426,564	1,214,540	916,604	965,942	1,171,702
Emulsion Use (kg)	368,589	422,783	538,471	475,521	404,847	305,535	321,981	390,567

*Notes: BCM=bank cubic metres; kg= kilogram***c: Years 16 through 21**

Year	16	17	18	19	20	21
Blasted Material (BCM)	2,967,519	3,147,090	3,036,062	2,307,888	2,141,121	922,124
Heavy ANFO Use (kg)	1,112,820	1,180,159	1,138,523	865,458	802,920	345,797
Emulsion Use (kg)	370,940	393,386	379,508	288,486	267,640	115,266

Notes: BCM=bank cubic metres; kg= kilogram

1.18.3.2 Explosive Use During Construction

Currently, very little explosives are required for the Construction Phase of the Project and will be limited to using packaged product for generating material for road surfacing from a quarry located along the TAC. This explosive use will continue during the Operation Phase but will switch to using the same explosive products as the mine is intending to use. A total of 25,000 kg of Centra, which is a packaged explosive, will be used during the Construction Phase of the Project. The **CEMP** addresses this potential use.

1.18.3.3 Explosive Residues from the Site

As part of the completed site-wide water and load balance, explosive residue was one of the parameters analyzed and reported in the water quality predictions for the site. The following **Table 1.18-4** provides a summary of the concentration of nitrogen species related to blasting in surrounding watercourse receiving environments

Table 1.18-4: Summary of Blasting Residual Predictions In Receiving Environment Prediction Nodes, based on Monthly Average Winter Conditions in Post-closure under Project Case Conditions (Average Hydrology, Expected Source Terms And Groundwater Seepage Rates)

Stream	Water Quality Station	Nitrate(mg/L)	Nitrite (mg/L)	Ammonia (mg/L)
Tenas	WQS02	0.59	0.014	0.079
	WQS22	0.69	0.016	0.093
	WQS04	0.71	0.017	0.094
Four	WQS03DS	0.60	0.014	0.077
Goathorn	WQS06	0.069	0.0012	0.0067
	WQS05	0.12	0.0025	0.014
Telkwa	WQS09	0.023	0.00071	0.0037

Notes: mg/L=milligrams per litre

1.18.4 Geohazards for Hydrocarbon Facilities

The facilities (fuel and lubricant, explosives, and CPP process reagents) constructed for hazardous material management for the Project are located on a shallow sloping plateau located between the Tenas and Goathorn creeks and are not subject to any hazards due to adverse terrain. Furthermore, there are no large watercourses at the upslope end of the facilities that store hazardous materials that would cause mudflows and/or debris flows. Lastly with the shallow slope present the area is not at risk from avalanches. The only hazards the hazardous material management facilities face are the ones induced by the construction of upstream management ponds which are addressed through the geotechnical analysis conducted by SRK.

1.19 Power Supply and Distribution

1.19.1 Offsite and Onsite Powerline

An existing BC Hydro 25 kV distribution powerline runs just to the north of the Project which provides power to residents in the Cottonwood area which is part of the Village of Telkwa. This powerline will provide a tap-in point for a new 3.6 km 25 kV overhead powerline to be brought to site over Goathorn

Creek which overlaps both private property, which is offsite portion of the powerline, and within the existing coal licenses which is identified as the onsite portion of the powerline. See **Figure 1.19-1** that illustrates the key components of the powerline to site.

Discussions with BC Hydro indicate that this line can accommodate up to a 5 megavolt-ampere (MVA) load which is well more than the 3.1 MVA load required by the Project. This powerline will be owned and maintained by the TCL from the point of interconnection through to the termination of this line within the MIC.

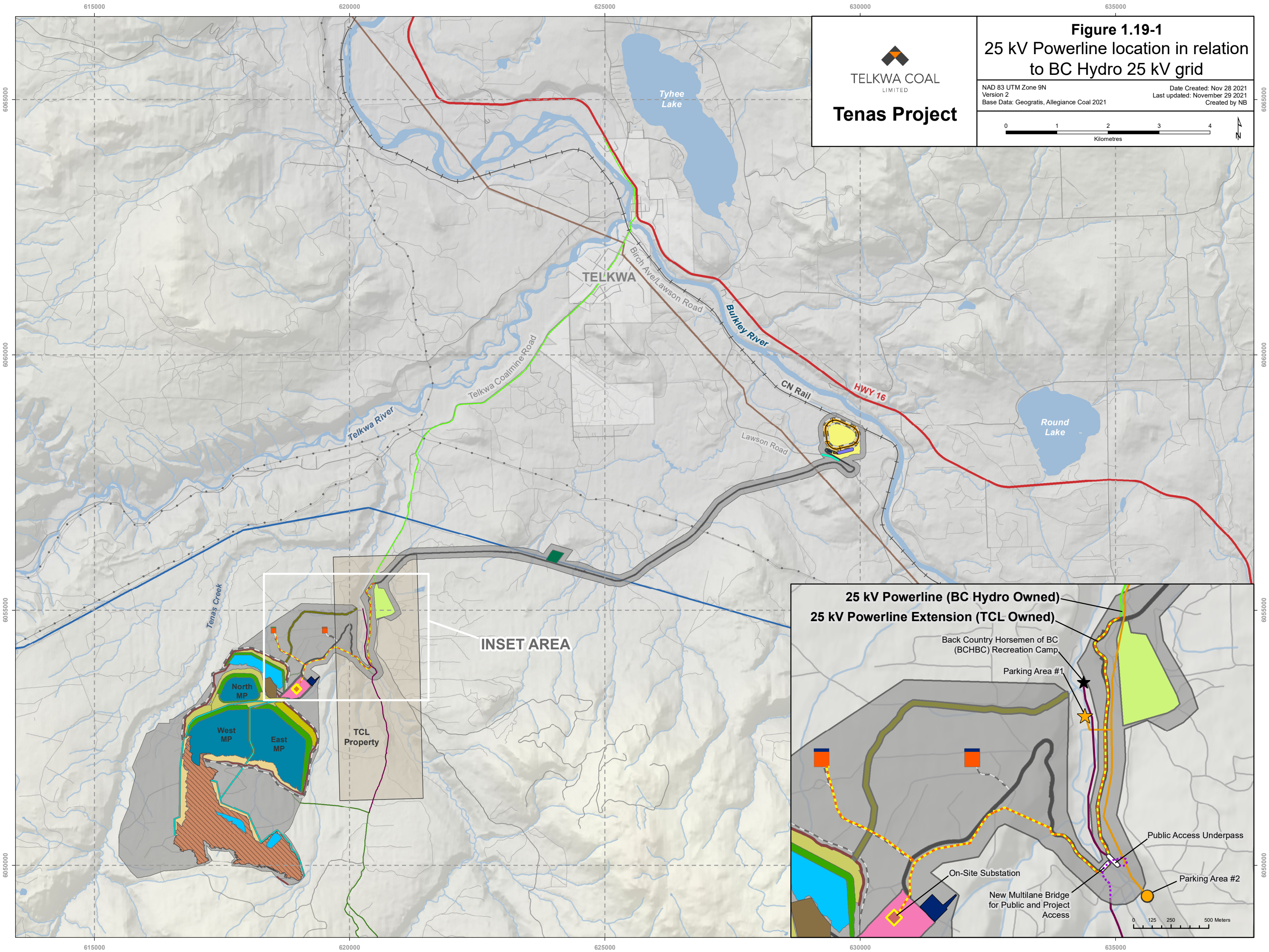
The 25 kV supply will be brought onsite to a local 25 kV metering unit adjacent to the CPP and MIC. It is assumed that the onsite 25 kV overhead line and metering unit will be supplied and installed by a licensed third-party contractor and will be owned by TCL.

The utility corridor was mapped in 2018 utilizing a combination of aerial orthophotography and Lidar mapping resulting in an overall accuracy of approximately 30 cm for the proposed powerline corridor. The 25 kV network at the CPP and MIC area will consist of an underground supply to the main CPP substation. The MIC and raw water pumping facilities will be fed from the CPP substation.

The power distribution to the Tenas Control Pond will be by means of underground cable, which will be stepped down to 600 V via a ground mounted transformer and switchgear installed at the CPP. Low voltage (120 V and 240 V) distribution in all areas will be via mini substations/transformers installed in each of the localized buildings.

A 0.50 km spur 25 kV powerline and a pole mounted 25 kV to 600 V transformer will be constructed at the Explosive Facility to supply electricity for the onsite maintenance shop.

Figure 1.19-1 illustrates the powerline location connecting the Project to the BC Hydro 25 kV grid.



Tensas Access Corridor Features

- | | |
|--|----------------------------------|
| Open Pit | Cleared Areas for Access |
| Backfilled Areas | Topsoil Stockpiles |
| Explosive Infrastructure | End Pit Lakes |
| Water Discharge Route | Management Pond - Covers |
| Mine Infrastructure Complex
(Coal Processing Plant, Maintenance Facility, and Pit Fueling Station, Administration and Mine Dry Building, Mine Rescue and Light Vehicle Maintenance Buildings) | Management Pond - Dams |
| Gravel Quarry | Management Pond - Buttresses |
| Rock Quarry | Rail Infrastructure |
| TCL Private Land | Rail Loop |
| | Rail Infrastructure Loading Area |

- | |
|---|
| Sedimentation Ponds
(Coal Processing Plant, Rail Infrastructure, Explosive Facility, and Explosive Magazine) |
| On-site Substation |
| 25 kV Powerline Extension (TCL Owned) |
| Haul Roads |
| Tensas Access Corridor |
| Channels (Ditches) |
| Service Roads |
| Alternate Access to Recreational Sites Beyond the Project |

Base Features

- | | |
|----------------------------------|-------------------------|
| Rail Line | Waterbody |
| Highway | Telkwa Village Boundary |
| Watercourse | |
| Secondary Roads and Trails | |
| Pacific Natural Gas Pipeline | |
| 500 kV Transmission Line | |
| 138 kV Transmission Line | |
| 25 kV Powerline (BC Hydro Owned) | |

This powerline will generally follow the TAC that accesses the Project. The powerline will span across the Goathorn Creek floodplain before heading west to the top of the valley and then south to the Project site. A 0.50 km 25 kV spur powerline will be constructed to the proposed Explosive Facility. The powerline follows BC Hydro standards for spans, pole types, powerlines, guide wires, and pole materials. There will be total of 67 pole structures.

The line will be an extension of circuit 25F52, fed from the Smithers substation. The wire size used for the line will be #2 Aluminum Conductor, Steel Reinforced (ACSR). This is the existing wire size at the tap-in point. The current ampacity of #2 ACSR is 184 amps. This corresponds to a design load of $1.73 \times 25 \times 184 = 8,000$ kVA. TCL has approached BC Hydro and they have confirmed that there is 5 MVA of spare capacity on the distribution network.

The CPP and associated buildings such as the Maintenance Facility will require a maximum load of 3,100 kVA as summarized in **Table 1.19-1**, therefore it is well within both the line's design capacity and 25 kV network. All design work has assumed a load of 4,000 kilovolt amps (kVA) to ensure systems are able to grow in the future if required. Poles will be Western Red Cedar (WRC), minimum Class 3 for straight line, and Class 2 for angles, 50 ft, and treated. Other less expensive options include Douglas Fir and/or Pine.

Table 1.19-1: Summary of Power Requirements for the Tenas Project

Area	Demand Power July 1, of Year 0	Demand Power Oct 1, of Year 0	Demand Power July 1, Year 1 onwards
CPP power (kW)	200	1,900	1,900
Rail Infrastructure power (kW), (sea container spray systems, lights, stacker/reclaimer system)	0	25	50
CPP Infrastructure power (kW) (coal lab, lights)	0	50	50
Mine Infrastructure Complex power (kW) (Maintenance Facility, Administration Building/mine dry, Light Vehicle Maintenance Building, lubricant storage facilities, lighting, Potable Water Treatment Plant, Sewage Treatment Plant)	200	100	600
Explosive Facility (kW) (silo pumps, wash bays, lighting)	0	200	200
Goathorn Pump Station (kW) (additional water for site)	0	150	150
TOTAL	400	2,425	3,100

Notes: CPP=Coal Processing Plant; kW=kilowatt

Table 1.19-2 summarizes the list of structures used for the 25 kV powerline and the corresponding BC Hydro specified power pole drawing.

Table 1.19-2: Summary of Structures Used for the 25 kilovolt (kV) Powerline

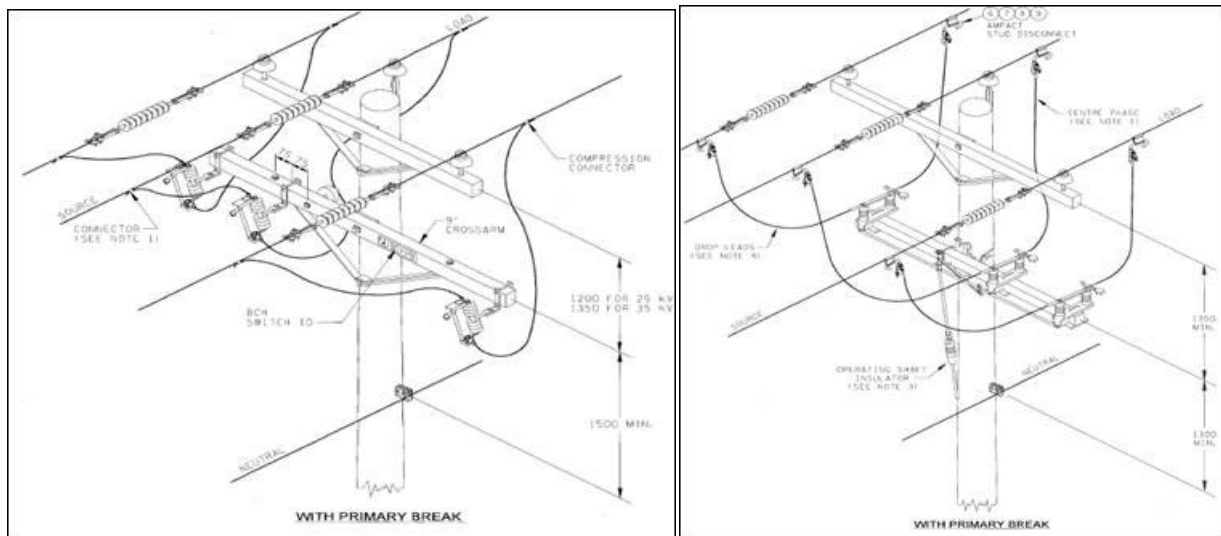
Structure Number	BCH Drawing	Easting (UTM)	Northing (UTM)	Horizontal Distance (m)	Cumulative (m)	Elevation	Line Angle Degree	No. of Poles	Pole Species	Pole Classes	Pole Height (ft)	Guy
0		620,450	6,055,326	50					WRC			
1		620,437	6,055,250	77	50	688		1	WRC	2	50	
2	K5-04.01	620,432	6,055,225	26	76	690		1	WRC	3	50	
3	K5-06.01	620,427	6,055,198	27	103	684		1	WRC	3	50	
4	K3-06.01	620,422	6,055,170	28	131	682		1	WRC	3	50	
5	J7-01.01	620,418	6,055,143	28	159	678		1	WRC	3	50	
6	G4-02.01	620,411	6,055,107	36	195	675		1	WRC	3	50	
7	G4-10.02	620,406	6,055,079	28	224	674	11	1	WRC	2	50	1
8	G4-02.01	620,407	6,055,023	56	280	673		1	WRC	3	50	
9	G4-02.01	620,407	6,054,964	59	338	672		1	WRC	3	50	
10	G4-02.01	620,408	6,054,913	51	390	671		1	WRC	3	50	
11	G4-02.01	620,409	6,054,858	55	445	671		1	WRC	3	50	
12	G4-02.01	620,410	6,054,801	57	502	671		1	WRC	3	50	
13	G4-02.01	620,410	6,054,741	61	562	672		1	WRC	3	50	
14	G4-02.01	620,411	6,054,680	60	622	672		1	WRC	3	50	
15	G4-02.01	620,412	6,054,626	55	677	672		1	WRC	3	50	
16	G4-02.01	620,412	6,054,566	59	737	673		1	WRC	3	50	
17	G4-10.02	620,413	6,054,512	55	791	675	11	1	WRC	2	50	1
18	G4-02.01	620,404	6,054,460	53	844	677		1	WRC	3	50	
19	G4-02.01	620,393	6,054,401	60	903	679		1	WRC	3	50	
20	G4-02.01	620,382	6,054,340	62	966	680		1	WRC	3	50	
21	G4-09.01	620,371	6,054,282	59	1,024	682		1	WRC	3	50	
22	G4-10.03	620,359	6,054,215	68	1,093	684	35	1	WRC	2	50	2

Structure Number	BCH Drawing	Easting (UTM)	Northing (UTM)	Horizontal Distance (m)	Cumulative (m)	Elevation	Line Angle Degree	No. of Poles	Pole Species	Pole Class	Pole Height (ft)	Guy
23	G4-02.01	620,390	6,054,148	74	1,166	686		1	WRC	3	50	
24	G4-02.01	620,426	6,054,071	86	1,252	688		1	WRC	3	50	
25	G4-02.01	620,462	6,053,995	83	1,335	690		1	WRC	3	50	
26	G4-02.01	620,497	6,053,918	85	1,420	692		1	WRC	3	50	
27	G4-11.01	620,537	6,053,833	94	1,514	692	95	1	WRC	2	50	2
28	G4-10.02	620,463	6,053,807	78	1,592	692	12	1	WRC	2	50	1
29	G4-11.01	620,413	6,053,800	51	1,643	693	55	1	WRC	2	50	2
30	G4-02.01	620,357	6,053,860	82	1,725	693		1	WRC	3	50	
31	G4-02.01	620,300	6,053,922	84	1,809	694		1	WRC	3	50	
32	G4-02.01	620,241	6,053,986	87	1,896	695		1	WRC	3	50	
33	G4-02.01	620,182	6,054,049	86	1,983	697		1	WRC	3	50	
34	G4-10.03	620,128	6,054,108	80	2,062	699	23	1	WRC	2	50	2
35	G4-02.01	620,050	6,054,144	86	2,149	705		1	WRC	3	50	
36	G4-02.01	619,965	6,054,182	93	2,241	725		1	WRC	3	50	
37	G4-02.01	619,887	6,054,217	85	2,327	735		1	WRC	3	50	
38	G4-02.01	619,810	6,054,251	84	2,411	750		1	WRC	3	50	
39	G4-11.01	619,728	6,054,288	90	2,501	765	49	1	WRC	2	50	2
40	G4-02.01	619,671	6,054,262	63	2,564	766		1	WRC	3	50	
41	G4-10.03	619,608	6,054,233	69	2,633	768	32	1	WRC	2	50	2
42	G4-02.01	619,564	6,054,165	81	2,714	770		1	WRC	3	50	
43	G4-02.01	619,526	6,054,107	70	2,784	772		1	WRC	3	50	
44	G4-11.01	619,490	6,054,051	66	2,850	775	47	1	WRC	2	50	2
45	G4-02.01	619,421	6,054,039	70	2,920	790		1	WRC	3	50	
46	G4-02.01	619,347	6,054,025	75	2,995	788		1	WRC	3	50	

Structure Number	BCH Drawing	Easting (UTM)	Northing (UTM)	Horizontal Distance (m)	Cumulative (m)	Elevation	Line Angle Degree	No. of Poles	Pole Species	Pole Classes	Pole Height (ft)	Guy
47	G4-10.03	619,269	6,054,012	79	3,074	787	28	1	WRC	2	50	2
48	G4-02.01	619,211	6,053,966	74	3,148	787		1	WRC	3	50	
49	G4-02.01	619,151	6,053,919	77	3,224	787		1	WRC	3	50	2
50	G4-11.01	619,089	6,053,870	79	3,303	787	53	1	WRC	2	50	2
51	G4-02.01	619,090	6,053,775	96	3,399	792		1	WRC	3	50	
52	G4-11.01	619,092	6,053,683	92	3,491	798	46	1	WRC	2	50	2
53	G4-02.01	619,058	6,053,643	52	3,543	801		1	WRC	3	50	
54	G4-11.01	619,007	6,053,598	68	3,611	801	95	1	WRC	2	50	2
55	K5-06.01	619,019	6,053,587	16	3,627	802		1	WRC	3	50	
56	J2-09-01A	619,032	6,053,577	17	3,644	803		1	WRC	3	50	
57	K3-06.01-04	619,045	6,053,566	17	3,661	790		1	WRC	3	50	1

Notes: BCH=BC Hydro; ft=feet; m=metre, X=easting NAD83 Zone 9N; Y= northing NAD83 Zone 9N; WRC=Western Red Cedar

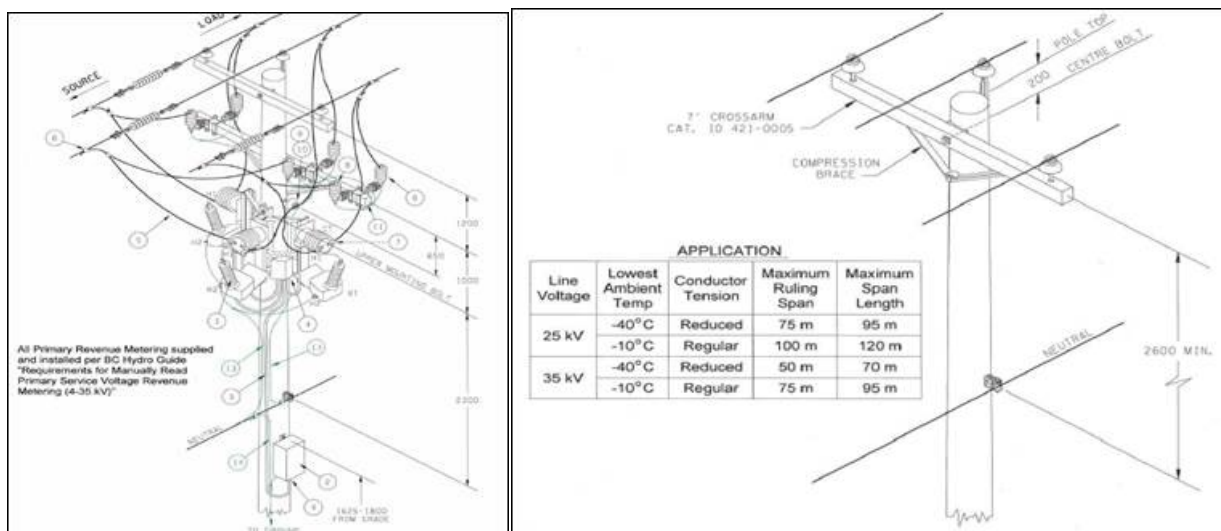
Figures 1.19-2 through 1.19-6 below illustrate the typical structures that will be used for the 25 kV powerline between the BC Hydro tap-in point and the CPP.



ES43 K5-04.01

ES K5-06.01

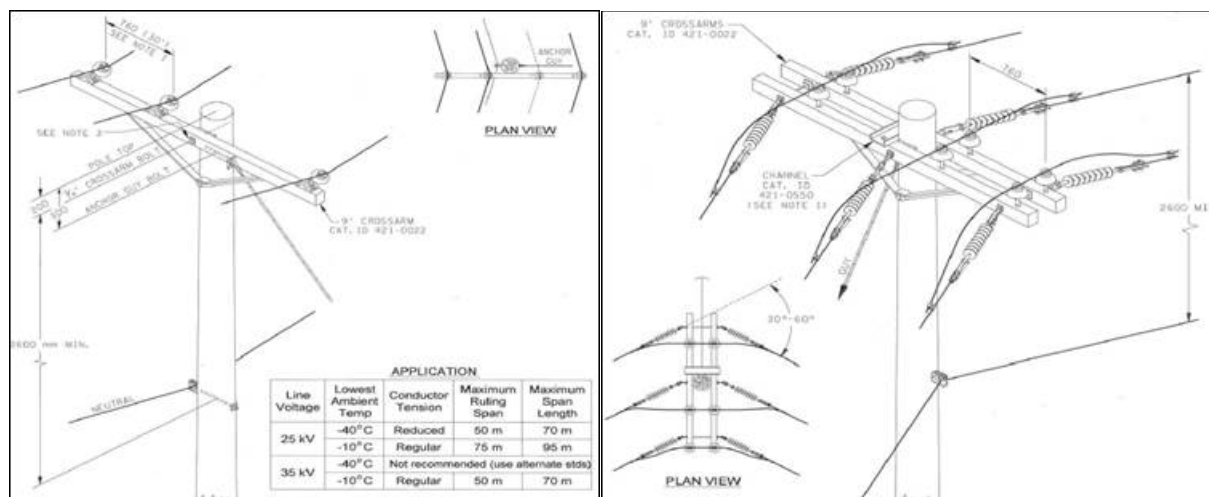
Figure 1.19-2: Sectionalizing three (3)-phase cut-outs



ES43 J7-01.01

ES43 G4-02.01

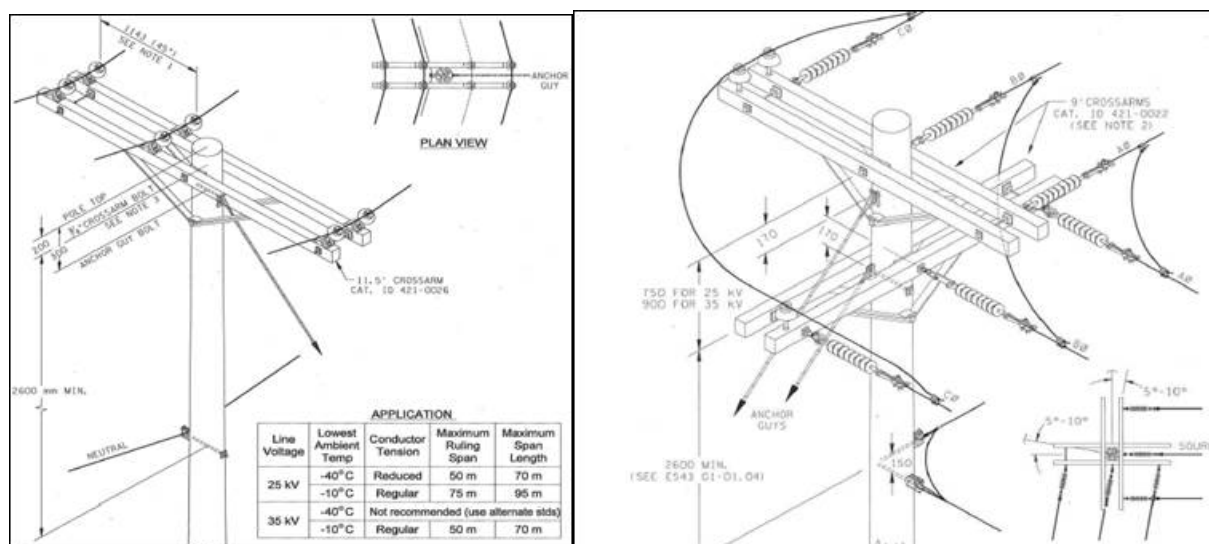
Figure 1.19-3: Primary revenue metering phase four (4) Wire J7-01.01 and three (3)-phase tangent skypin



ES43 G4-10.02

ES43 G4-09.01

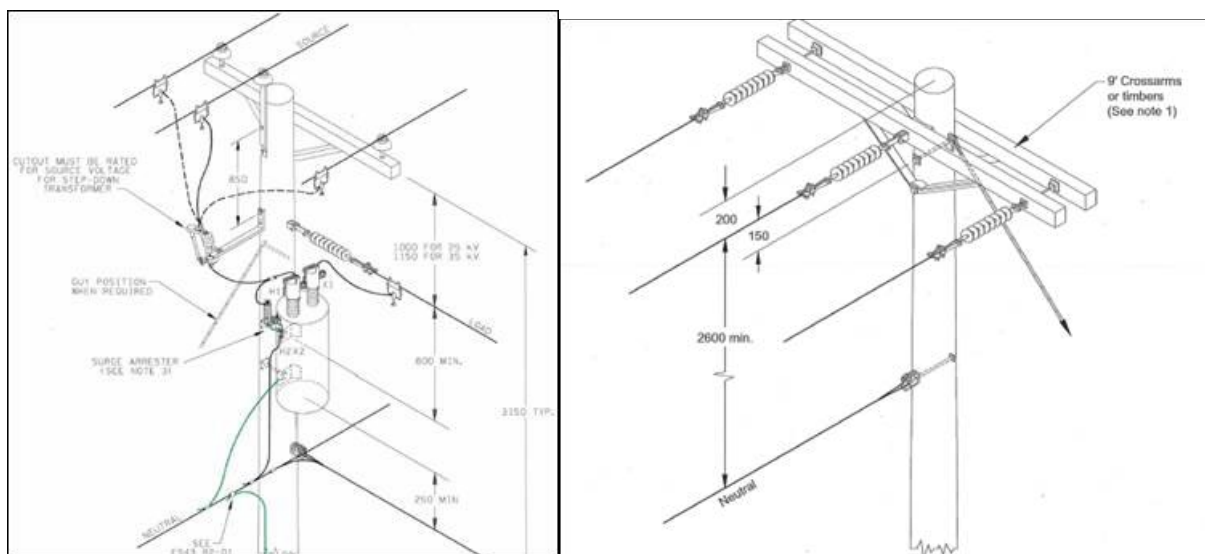
Figure 1.19-4: Basic line structures three (3)-phase angle 5°-25° and three (3)-phase horizontal angle 30°-60° crossarm



ES43 G4-10.03

ES43 G4-11.01

Figure 1.19-5: Basic line structures three (3)-phase angle 25°-45° flat and three (3)-phase corner 45°-90°



ES43 J2-09.01

ES43 G4-05.01

Figure 1.19-6: Single-phase transformer framing step-down tap, pole mounted and three (3)-phase dead end

The tap from BC Hydro will consist of a set of BC Hydro fused disconnects, followed by a TCL owned gang operated disconnect and recloser. The recloser will provide automatic reclosing upon temporary shorts (i.e., tree branches, birds etc.), but could be replaced by a set of fused disconnects, if the budget dictates.

The powerline's end at the CPP will have end protection that will consist of a recloser (identical to source end). The settings on the recloser would be programmed to protect the pad mounted step-down transformer. As the recloser can be remotely operated, it will eliminate the need for an incoming breaker on the switchgear.

Once the powerline reaches the CPP, it will be connected to the main transformer which steps the voltage down from 25 kV to 600 V. The overhead powerline would extend partly onto the CPP site pad and terminate at the recloser. From the recloser pole, there will be a high voltage cable extending down the pole, into a trench, then on to the main step-down transformer, at the east end of the process building (approximately 150 m). The high voltage cable will be direct buried, except for high traffic areas, where it would be encased in concrete, and PVC duct.

1.19.2 Onsite Substation

The main transformer will be rated 4,000/5,000 kVA, 25 kV-600 V, Oil Natural Air Natural/Oil Natural Air Forced (ONAN/ONAF), with 4-2.5% taps (2@ Full Capacity Above Normal [FCAN] and 2@ Full Capacity Below Normal [FCBN]), with low flammability oil (FCAN and FCBN refer to the tap position which affects the secondary voltage. Each tap affects voltage by 2.5%). The transformer will have sidewall mounted bushings for high and low voltage connections. The bushings will be enclosed in compartments with ample room for terminations, stress cones etc. High and low voltage cables will enter from below. The transformer will be mounted on a foundation with spill containment rated for 100% of the individual tank volumes.

Figure 1.19-7 illustrates the main step-down transformer that will be used for the Project.

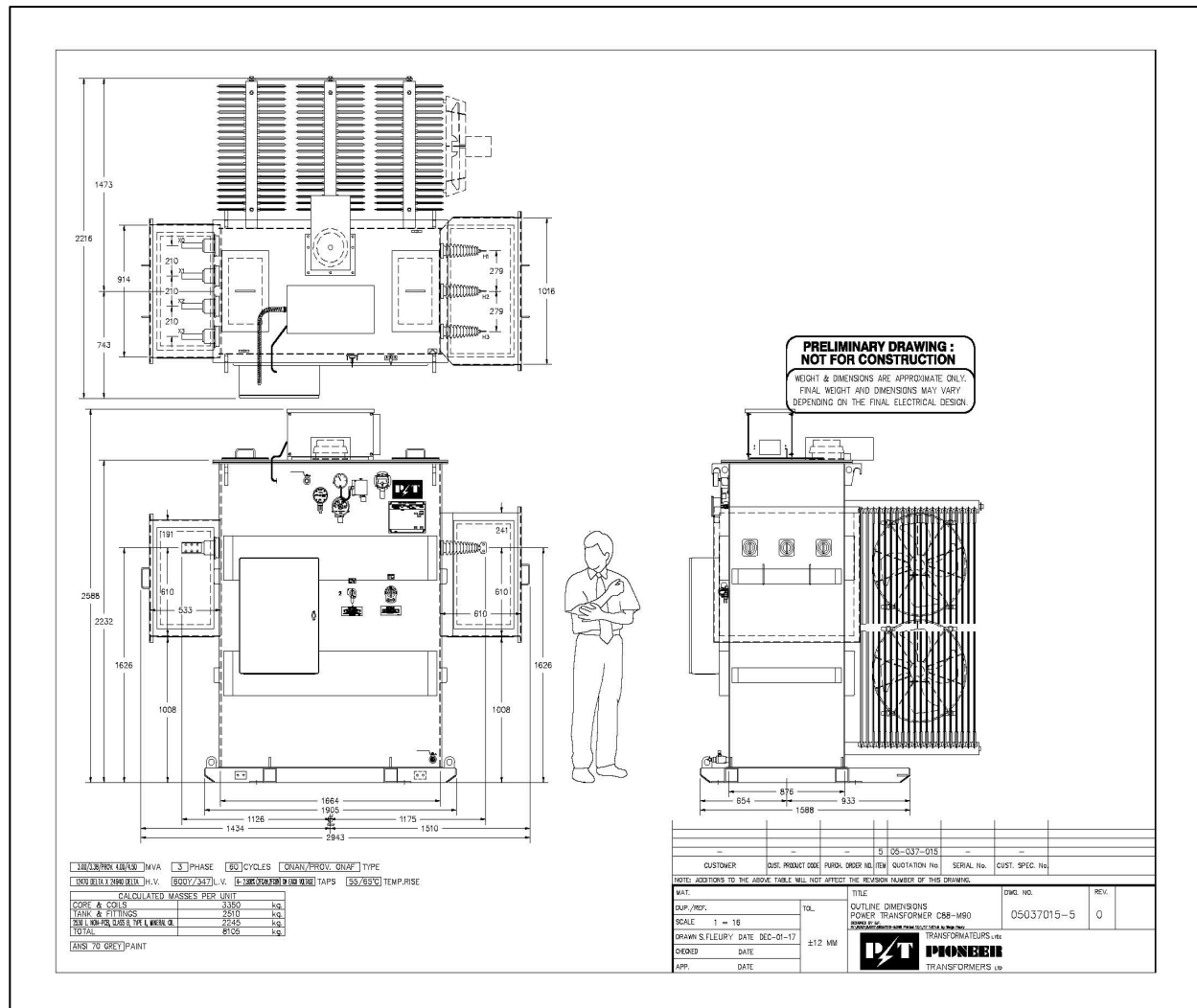


Figure 1.19-7: 4,000 kilovolt amps (kVA), 25 kilovolt (kV) to 600-volt (V) Minesite substation

The secondary transformer will feed an adjacent electrical house (E-House). The E-House will contain an incoming section and up to four (4) outgoing breakers. It will also contain 4 breakers and a compartment for harmonic filtering and power factor correction.

The E-House will be mounted on four (4) concrete pillars, and all cable entry will be from below. The mapping for the onsite substation included both a Lidar survey and a ground resistivity survey to ensure the appropriate grounding grid will be constructed.

The E-House will feed several main loads. The largest load will be MCC1, located within the CPP.

Figure 1.19-8 below illustrates the E-House selected for the power distribution system.

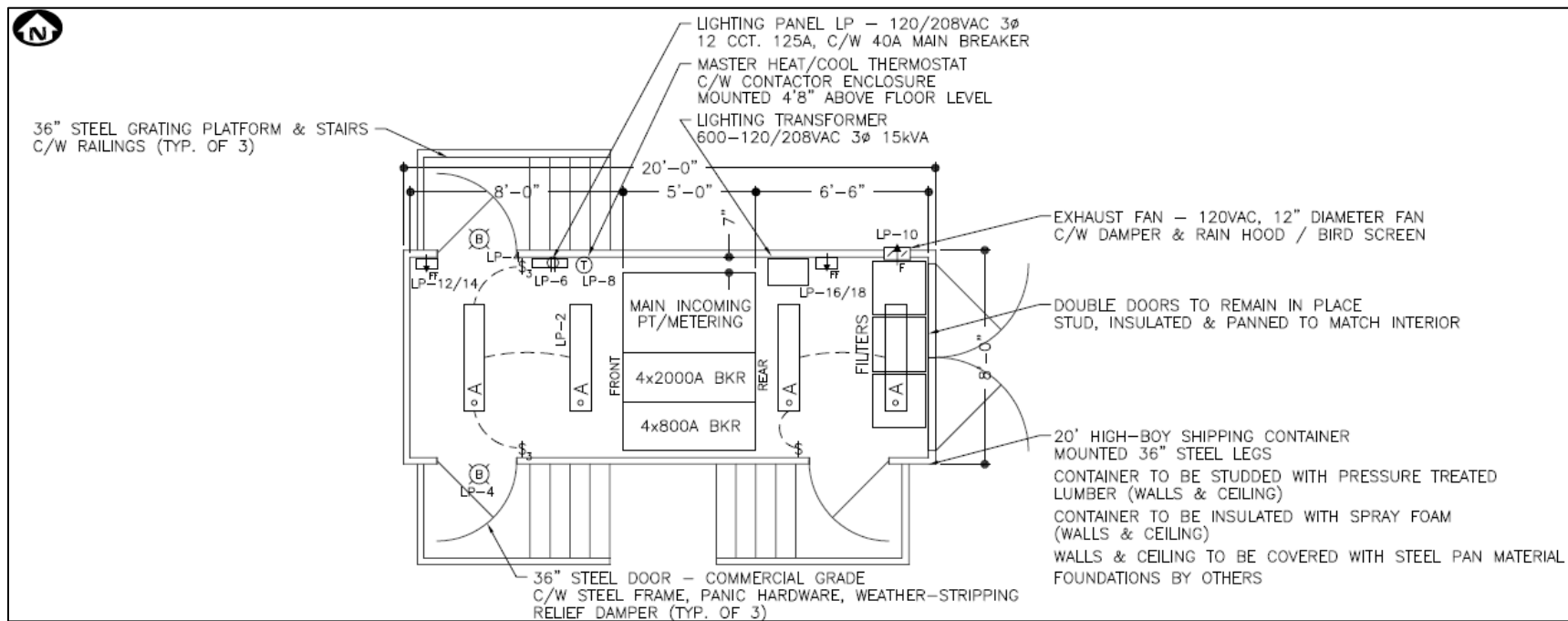


Figure 1.19-8: Electrical House (E-House) for Tenas Project