Environmental Assessment Worksheet

This most recent Environmental Assessment Worksheet (EAW) form and guidance documents are available at the Environmental Quality Board's website at: https://www.eqb.state.mn.us/. The EAW form provides information about a proposed project's potential environmental effects, and also used as the basis for scoping an Environmental Impact Statement. Guidance documents provide additional detail and links to resources for completing the EAW form.

Cumulative potential effects can either be addressed under each applicable EAW Item or can be addressed collectively under EAW Item 21.

Note to reviewers: Comments must be submitted to the RGU (Responsible Government Unit) during the 30-day comment period following notice of the EAW in the *EQB (Minnesota Environmental Quality Board) Monitor*. Comments should address the accuracy and completeness of information, potential impacts that warrant further investigation and the need for an EIS (Environmental Impact Statement).

1.0 Project Title:

Tamarack Mining Project

2.0 Proposer

Contact person: Christopher Wallace, Talon Nickel (USA) LLC
Title: Environmental and Permitting, VP
Address: 165 Warren Street
City, State, ZIP: Tamarack, MN 55787
Phone: 218-768-3292
Email: wallace@talonmetals.com

3.0 RGU

Contact person: MN Department of Natural Resources
Title:
Address: 500 Lafayette Road
City, State, ZIP: St. Paul, MN 5515
Phone:
Email:
[R1_Cmt_#1]

4.0 Reason for EAW Preparation

(check one)
Required: Discretionary:
☒ EIS Scoping ☐ Citizen petition
☐ Mandatory EAW ☐ RGU discretion
☐ Proposer initiated

If EAW or EIS is mandatory, give EQB rule category subpart number(s) and name(s):

An Environmental Impact Statement (EIS) is mandatory per Minnesota Rules, part 4410.4400, subpart 1 “Threshold Test” and 8.B, “Metallic Mineral Mining and Processing: For the construction of a new facility for mining metallic minerals or for the disposal of tailings from a metallic mineral mine, the” Minnesota Department of Natural Resources (DNR) is the Responsible Government Unit (RGU).

5.0 Project Location

County: Aitkin County

City/Township: City of Tamarack, Clark Township, PLS Location (¼, ¼, Section, Township, Range): Table 5.1 summarizes the Public Land Survey (PLS) Location of the Project.

Watershed (81 major watershed scale): Mississippi River – Grand Rapids

GPS (global positioning system) Coordinates: Table 5.2 summarizes the GPS Coordinates for the Project.

Tax Parcel Number: Table 5.2 summarizes the Tax Parcel Numbers for the Project. Tax Parcel Number: Table 5.2 summarizes the Tax Parcel Numbers for the Project.

Table 5.1 Summary of Project PLS Location

Township	Range	Section	¼ ¼ Sections
48	22	3	NENW, SENW, SWNW, NWNE, SWNE, NWSW, NESW, SWSW, SESW, NWSE, SWSE
48	22	4	SENE
48	22	10	NWNW, NENW, SENW, NWNE, SWNE, NESW, SWSW, SESW, NWSE, SWSE
48	22	15	NWNW, NENW, NWNE

Table 5.2 Summary of Project GPS Coordinates and Tax Parcel Numbers

Tax Parcel Number	Latitude	Longitude
05-0-003400	-93.11416	46.67868
05-0-003500	-93.11153	46.67562
05-0-003700	-93.11942	46.67867
05-0-003900	-93.12440	46.67386
05-0-003901	-93.11924	46.67202
05-0-004000	-93.11936	46.67566
05-0-004400	-93.12418	46.66838
05-0-004500	-93.11912	46.66839
05-0-004600	-93.11139	46.67017
05-0-005300	-93.12994	46.67565
61-0-002100	-93.11395	46.66470

Tax Parcel Number	Latitude	Longitude
61-0-002200	-93.11403	46.66103
61-0-002400	-93.11911	46.66472
61-0-002500	-93.12415	46.66473
61-0-002600	-93.12168	46.66106
61-0-002800	-93.11928	46.65742
61-0-003000	-93.12459	46.65379
61-0-003100	-93.11935	46.65379
61-0-003300	-93.11407	46.65741
61-0-003400	-93.11413	46.65380
61-0-003700	-93.11478	46.65150
61-0-004100	-93.11964	46.65095
61-0-004200	-93.12480	46.65036
61-0-033000	-93.12005	46.64973

[R2_Cmt_#775] [R2_Cmt_#774]

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List of Abbreviations and Acronyms

ACFM	Actual Cubic Feet per Minute
ANFO	Ammonium Nitrate Fuel Oil
AUID	Assessment Unit Identifier
BNSF	Burlington Northern Santa Fe
CCCL	Center for Corporate Climate Leadership
CFM	Cubic feet per minute
CFR	Code of Federal Regulation
CGO	Coarse Grained Ortho-Cumulate
CMS	Cavity Monitoring System
CO	Carbon Monoxide
CRF	Cemented Rock Fill
CSAH	County State Aid Highway
DNR	Department of Natural Resources
EAW	Environmental Assessment Worksheet
ECS	Ecological Classification System
eGRID	EPA Emissions & Generation Resource Integrated Database
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
EQB	Minnesota Environmental Quality Board
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GHG	Greenhouse Gas
GPD	Gallons Per Day
GPM	Gallons Per Minute
GPS	Global Positioning System
HAP	Hazardous Air Pollutant
HUC	Hydrologic Unit Code
IPCC	Intergovernmental Panel on Climate Change
MTB	Mobile Tunnel Borer
MW	Megawatt
MDH	Minnesota Department of Health
MnDOT	Minnesota Department of Transportation [R2_Cmt_#776]
MPCA	Minnesota Pollution Control Agency
MSHA	Mine Safety and Health Administration [R3_Cmt_#1365]
MSU	Massive Sulfide Unit
NHIS	Natural Heritage Information System
NIOSH	National Institute for Occupational Safety and Health
NO_2	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
ORVW	Outstanding Resource Value Waters
OSA	Minnesota Office of the State Archaeologist
PSIG	Pounds per Square Inch Gauge
PWI	Public Water Inventory
RCRA	Resource Conservation and Recovery Act
RGU	Responsible Government Unit
SBS	Sites of Biodiversity Significance

SCAQMD EMFAC	South Coast Air Quality Management District Emission Factor
SDS	State Disposal System
SHPO	State Historic Preservation Office
SM	Soil Mixing
SMSU	Semi-Massive Sulfide Unit
SWPPP	Stormwater Pollution Prevention Plan
TBM	Tunnel Boring Machine
TIC	Tamarack Intrusive Complex
TMDL	Total Maximum Daily Load
USFWS	United States Fish and Wildlife Service
VOC	Volatile Organic Carbon
WMA	Wildlife Management Area

6.0 Project Description

a. Provide the brief project summary to be published in the *EQB Monitor*, (approximately 50 words).

Talon Nickel (USA) LLC ("Talon") is proposing development of a new underground mine near Tamarack, Minnesota, focused on the extraction of a domestic source of high-grade metal ore that contains nickel, copper and iron for use in electric vehicles and other industries. The Project (defined below) would include a rail loadout area to transport the ore to a separate location outside of Minnesota (Mercer County, North Dakota) for processing and tailings disposal. [R1_Cmt_#11]

b. Give a complete description of the proposed project and related new construction, including infrastructure needs. If the project is an expansion include a description of the existing facility. Emphasize: 1) construction, operation methods and features that will cause physical manipulation of the environment or will produce wastes, 2) modifications to existing equipment or industrial processes, 3) significant demolition, removal or remodeling of existing structures, and 4) timing and duration of construction activities

6.1 Project Ownership Status

Talon Nickel (USA) LLC is the majority-owner and has operational control of the Tamarack Mining Project ("Project") through a joint-venture agreement with Kennecott Exploration Company, which is part of the Rio Tinto Group of Companies ("Rio Tinto").

As of September 2023, Talon owns a 51% share of the Project while Rio Tinto owns a 49% share. Talon is currently responsible for funding 100% of project expenditures. Upon completion of certain Project milestones as well as a cash payment of US $10 million to Rio Tinto, Talon will become the owner of up to 60% of the Project at which time Rio Tinto would be responsible for funding 40% of Project expenses on a pro-rata basis, otherwise its ownership share would be progressively diluted (reduced).

At all times, Talon maintains operational control of all project decisions including technical items as well as financial items such as selection of customers for the metal concentrate offtake. [R1_Cmt_#12]

6.2 Project Overview

Talon proposes to construct an underground mine and surface facilities at the Project Area near Tamarack, Minnesota (Project) Figure 1. Graphic 6.1 shows the co-located surface facilities in magenta and the underground facilities in blue, Graphic 6. is a three-dimensional representation of the surface facilities layout.

The total acreage of new plus existing developed surfaces utilized as part of the Project would amount to 58.9 acres. [R1_Cmt_#22]

The total additional surfaces developed for the Project would amount to approximately 55.0 acres (53.5 acres developed/impervious surfaces and 1.5 acres industrial stormwater pond) after construction is complete. This encompasses the buildings, parking areas, and various other facilities for production operations including the railway spur to connect to the existing BNSF (Burlington Northern Santa Fe) railway line. [R2_CMT_#24]

Approximately 13.4 acres within the Project Area already consists of developed surfaces (encompassing existing residential and agricultural buildings, parking areas, etc.); some of these features would be replaced with Project-related developed surfaces such as those mentioned above. [R1_Cmt_#22]

The Project Area is defined by the surface boundary and the underground boundary areas, as shown on Table 6.1, and together comprise 378.8 acres.

- Long-term facilities, buildings, and developed surfaces for production operations including approximately 58.9 acres, (3.5 acres of existing developed/impervious surfaces, 2.3 acres of an existing excavated pond, 39.3 acres of new developed/impervious surfaces, 12.3 acres created upland, and 1.5 acres industrial stormwater pond). The 58.9 acres would be divided between the mine site (37.7 acres) and the railway spur (21.2 acres).

- Areas that may be temporarily utilized during construction for staging of equipment and materials, but which would not result in a long-term developed surface after construction is complete. The area identified as Area G in Graphic 6.2, to be used during operations as the outdoor backfill materials buffer, would be used during construction as a temporary laydown area. The two additional construction staging areas (temporary) are shown on Figure 3 comprising approximately 17.6 additional acres of uplands within the project boundary that is suitable for use as temporary equipment staging without disrupting other construction activities. [R2_Cmt_#33] The equipment stored in temporary staging areas during construction would be removed following construction, and the areas would be reclaimed to their pre-construction use or condition. [R3_Cmt_#1255] This acreage has some overlap with the developed surfaces described above and temporary access surfaces described below. It is expected that not all of this area would ultimately be utilized for temporary staging of construction equipment and supplies.

- Areas that may be temporarily utilized during construction for a variety of purposes including gaining temporary access to various areas of the site, maneuvering of equipment, placement of construction cranes, conducting earthwork activities, placement of aerial or underground utility lines, etc. For these activities, an offset distance of approximately 100 feet (30.4 m) has been applied between the extent of the developed surface and the project boundary (with variability as appropriate to align with public roadways, certain property boundaries, and other project features). These activities would not result in a developed surface after construction is complete. [R1_Cmt_#22] [R1_Cmt_#34] [R2_Cmt_#40]

The underground boundary area is the area in which mining would occur below the surface and encompasses approximately 206.2 acres and overlaps with the surface boundary area by approximately 28.5 acres.

See table below for a listing and breakdown of the different surface types and acreages discussed in the text above. [R1_Cmt_#455]

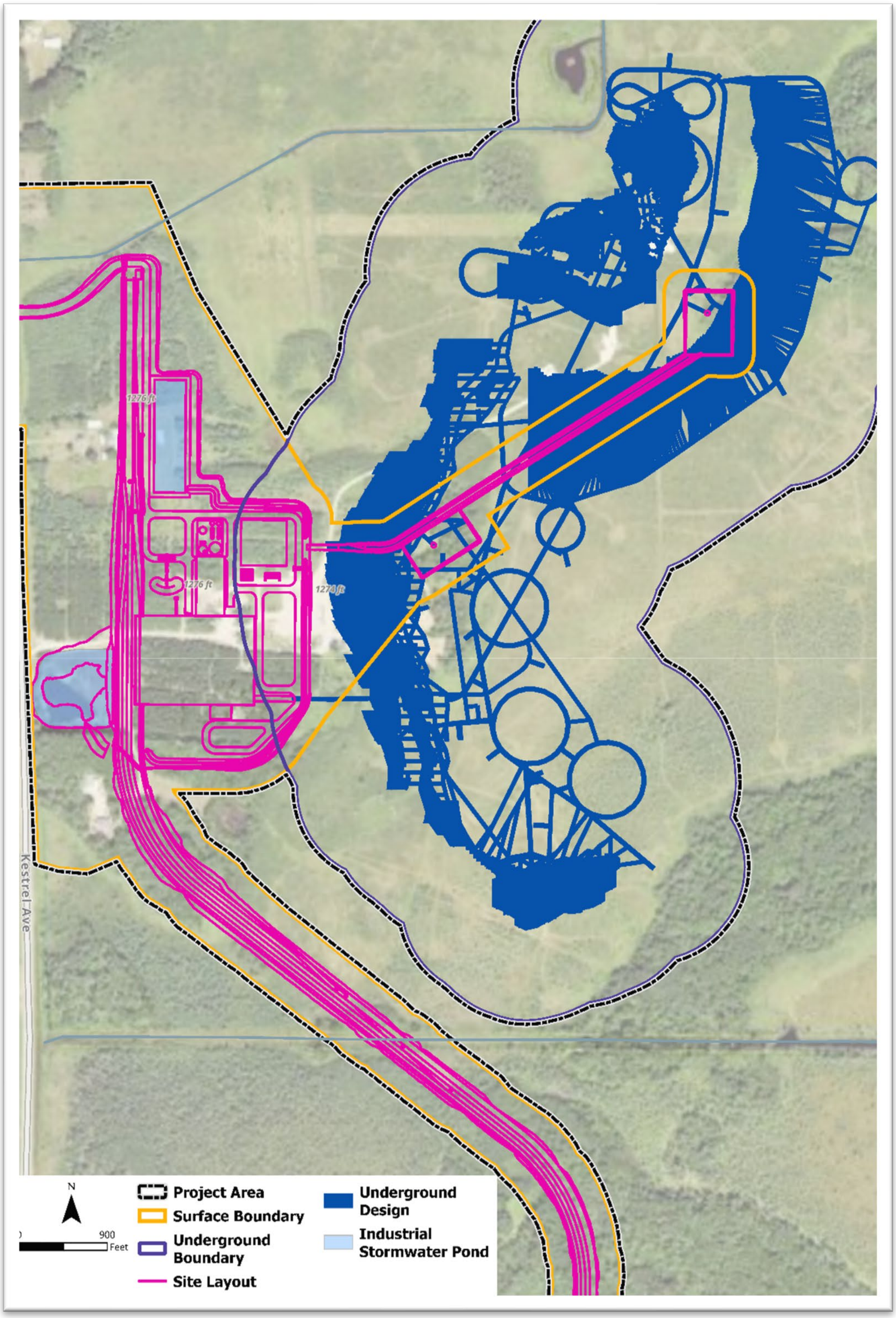
Table 6.1 Summary of Project Area Acreage

Project Component	Acreage (acres)
Surface Boundary	201.1
New Developed/Impervious Surfaces (39.3 acres)	
New Industrial Stormwater Pond (1.5 acres)	
Existing Developed/Impervious Surfaces (3.5 acres)	
Existing Excavated Ponds (2.3 acres)	
Created Upland (12.3 acres)	
Temporary Construction Laydowns & Staging Areas (17.6 acres)	
Other Potential Temporary Uses (ex. Construction Access, Equipment Maneuvering) (124.6 acres)	
Underground Boundary (surface acreage above underground workings)	206.2
Overlap between the Surface Boundary and Underground Boundary	-28.5
Project Area (sum of the above)	378.8

[R1_Cmt_#455] [R2_Cmt_#13] [R2_Cmt_#784] [R2_Cmt_#785] [R2_Cmt_#786]

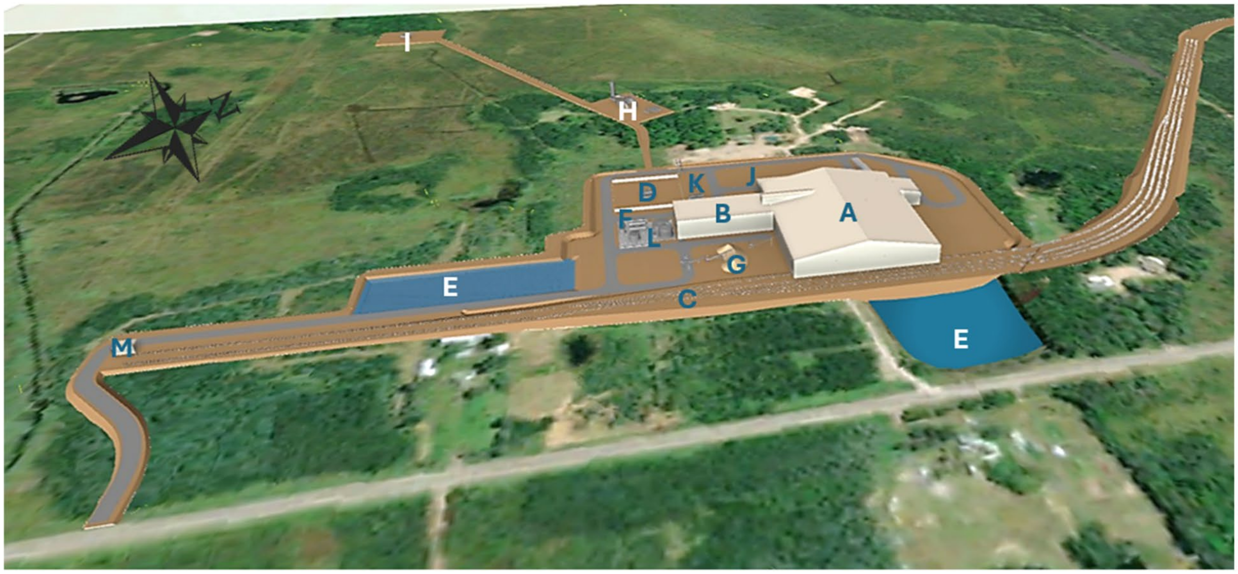
(see Figure 2 USGS 7.5 Minute Map for project boundary areas)

Graphic 6.1 Co-located Surface Facilities and Underground Facilities



[R1_Cmt_#25] [R1_Cmt_#26] [R1_Cmt_#27] [R2_Cmt_#859] [R2_Cmt_#951]

Graphic 6.2 Tamarack Mine Surface Infrastructure from the Northwest.



A – Ore Transfer Building

- Locker Room
- Maintenance Area
- Warehouse
- Wash Bay
- Refueling Bays
- Emergency Response
- Ore Buffer Area
- Waste Rock Buffer Area
- Crushers
- Dust Collection System
- Rail Loadout Area
- Backfill Plant
- Portal

B – Contact Water Treatment Building
E – Industrial Stormwater Pond
H – Surface Raise #2
K – Generators
C - Rail Yard
F – Fuel Storage Area
I – Surface Raise #1
L – Water Tanks
D – Electrical Substation
G – Outdoor Backfill Materials Buffer
J - Parking
M - Gate

(see Figure 3 for details)

[R1_Cmt_#29] [R1_Cmt_#32] [R2_Cmt_#789]

Ore processing and tailings disposal would take place off-site at a location in Mercer County, North Dakota. This offsite processing facility is not part of the Project. [R1_Cmt_#11]

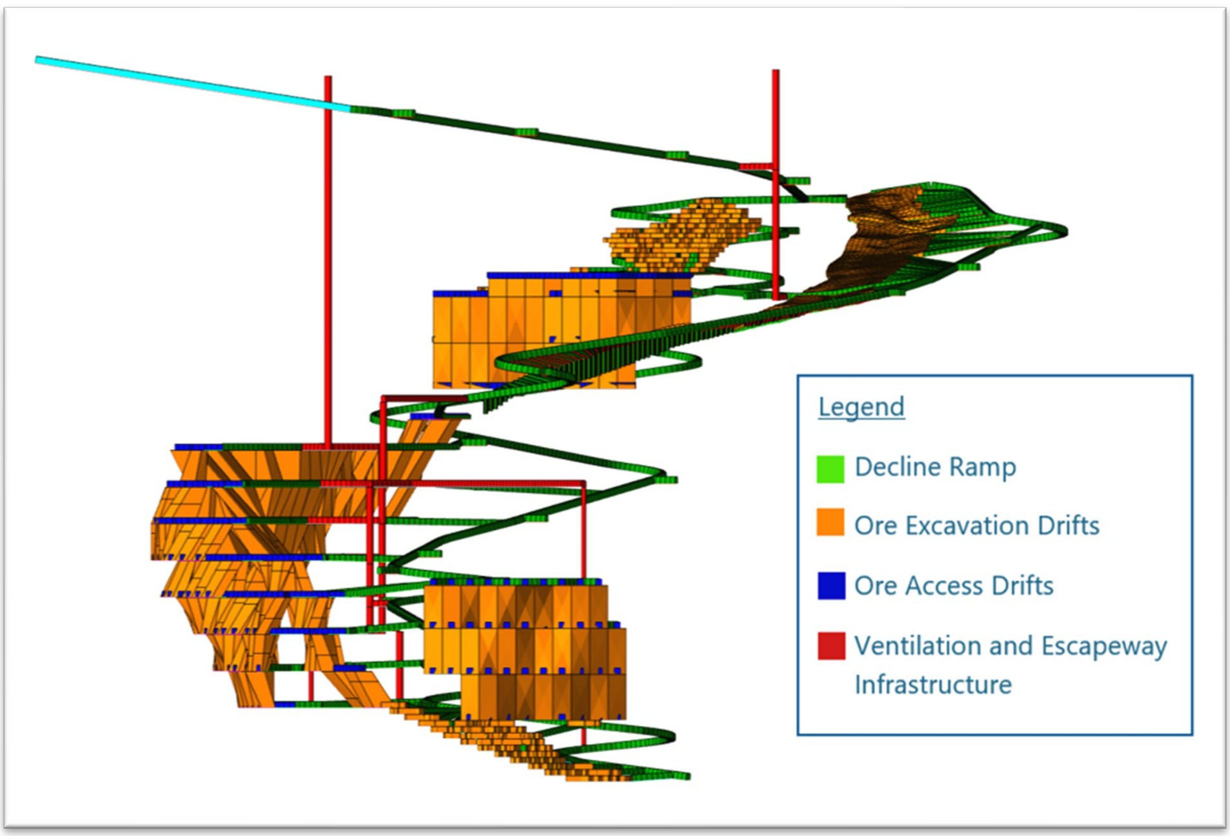
The Project would involve the construction and operation of several facility elements (and Graphic 6.3), including:

- Underground mine, accessed via the Decline Ramp
- Mine ventilation infrastructure (e.g., primary intake fans, mine exhaust)
- Ore Transfer Building (e.g., including ore transfer area; rail loadout, air compressors, and backfill plant)
- Contact water treatment building and plant

- Sanitary water collection
- Industrial stormwater ponds
- Outdoor backfill materials buffer
- Electrical substation and transmission line
- Supplies storage including propane and diesel fuel storage tanks
- Utilities, roadways, and minor supporting infrastructure

[R1_Cmt_#29]

Graphic 6.3 Three-Dimensional Sketch of Underground Mine Workings



[R2_Cmt_#59]

An approximately 1.5-mile (2.41 km) railway spur would be constructed to connect the Ore Transfer Building to the existing Burlington Northern Santa Fe (BNSF) Railway line located immediately north of the City of Tamarack. The Project Area would be accessed from an existing two-lane paved road, County State Aid Highway (CSAH) 31.

Once operational, the Project is expected to employ at least 300 workers during full steady-state production. Staffing levels would be further refined to inform the EIS.

6.3 Timing and Duration of Construction

Project construction is anticipated to commence in 2028, and the construction duration is anticipated to be less than 27 months, with production starting in 2029. Table 6.2 shows this progression, including the shift to the operational phase at the end of 24 months (red line). Description of the ramp-up to full production over the subsequent 1.5 years can be found in Section 6.15. [R2_Cmt_#45] [R2_Cmt_#46]

The Project's design encompasses all facilities required to complete the mining cycle (Graphic 6.9, and Graphic 6.10) and transport the ore to the concentrator.

Table 6.2 Preliminary Project Construction, Commissioning, and Ramp-Up Schedule

Activity	Y1Q1	Y1Q2	Y1Q3	Y1Q4	Y2Q1	Y2Q2	Y2Q3	Y2Q4	Y3Q1	Y3Q2	Y3Q3	Y3Q4	Y4Q1	Y4Q2
Construction														
Construction Start	◆													
Civil Construction	■	■	■	■	■	■								
Surface Infrastructure Construction		■	■	■	■	■	■	■	■					
Decline Ramp, Raise Bore Construction, and Preliminary Development Tunnels	■	■	■	■	■	■	■	■	■	■	■	■	■	
Commissioning and Ramp-Up														
First Ore Mined							◆							
Mine Commissioning and Ramp-up							■	■	■	■	■	■	■	■
Steady State Production														◆

6.4 Surface Facilities Construction

The first phase of construction activity would be mobilizing the civil contractor to site. The civil works would include the following activities:

- Erection of fencing and access control installations
- Construction of the Stormwater Pollution Prevention control measures

- Construction of access roads to the site
- Clearing and grubbing the site [R2_Cmt_#805]
- Demolition of the existing buildings on site and removal of septic tanks
- Bulk earthworks to prepare the construction site for the construction of the Decline Ramp, and all other structures intended to be erected on the site, including preparing a temporary construction laydown area for site support facilities
- Construction of onsite roads and parking facilities
- Constructing bases for Diesel and Propane storage tanks
- Construction of permanent industrial stormwater ponds

Leveling of the Decline Ramp construction area would be done to allow the Portal and Sequential Excavation Method (SEM) sections' construction teams to set up the site infrastructure and resources. A level graded area of approximately 200 ft x 300 ft (61 m x 91.44 m) would be prepared for the Decline Ramp contractor(s) to establish the surface-based equipment and facilities to commence with the Decline Ramp construction.

The next phase would include establishing temporary utilities and infrastructure required for construction, such as power, offices, staging areas, support facilities, and maintenance facilities. Thereafter, the excavation of the mine Decline Ramp would occur concurrently with construction of the remainder of the mine surface facilities.

Conversion of wetlands to uplands for the railway spur to the existing BNSF railway would also begin. The upland area would be routed to minimize wetland take, but some degree of construction in the wetlands would be unavoidable to connect the existing railway to the main mine site. Areas of shallow peat would be excavated and replaced with fill material, while limited areas of deeper peat would require installation of pilings as indicated by the location of the load transfer platform as indicated on Figure 4. [R2_Cmt_#810] Imported fill material would be placed and compacted in a layer of at least 3 ft (1 m) over peatland sections where pilings are required. Conversion of the wetlands to uplands for the railway spur would use appropriate materials (e.g. coarse rock) or features (e.g. culverts) to enable water to flow across and/or under the developed surface to facilitate water movement between each side of it and address the potential for differences in water levels and/or other hydrological impacts. [R1_Cmt_#52] [R1_Cmt_#56] [R1_Cmt_#585] [R2_Cmt_#808] [R2_Cmt_#811] [R2_Cmt_#812] The total length of rail track that would be installed on the upland, inclusive of the mainline connection within the BNSF right-of-way and the rail yard comprising 3 parallel unit train tracks, the loading track through the ore transfer building, and 14 track switches, is 29,320 ft (8,937 m). [R2_Cmt_#232]

Construction work on the erection of the Ore Transfer Building would also commence immediately after site preparation. Once the site for the building has been leveled, the foundations would be excavated, concrete poured, and the concrete slab on grade would be constructed after compaction of the sub-base. The pre-engineered steel structure, which would be fabricated off-site prior to site mobilization, would be transported to site and erected on the building foundations. The dust control system would be erected by the time the facility is operational, and would utilize temporary construction electrical power until the electrical substation is commissioned.

Construction of the Contact Water Building would commence in parallel with, or immediately following completion of the Ore Transfer Building, due to the need for contact water treatment to be available once the construction of the Bedrock Section of the Decline Ramp commences. [R2_Cmt_#981] Once the area for the building has been leveled, the foundations would be constructed. The engineered steel structure, which would be fabricated off-site prior to site mobilization, would be transported to site and erected on the building foundations.

6.5 Decline Ramp

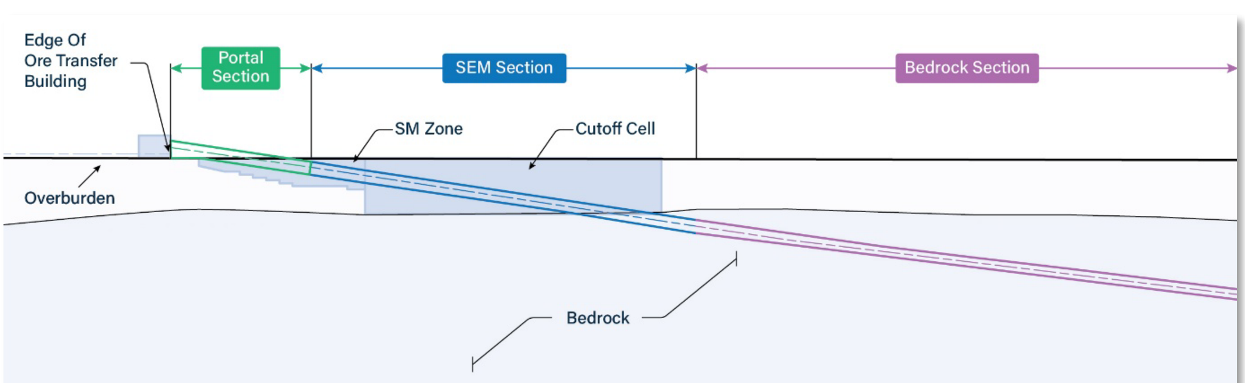
The primary access to the underground mine would be via a Decline Ramp from surface originating in the Ore Transfer Building. The decline would be constructed in three sections:

1) Portal Section: A ramping open cut portal would utilize Soil Mixing (SM) to create a watertight excavation. At tunnel completion, a steel canopy shell would be placed in the portal and backfilled to isolate mine access from weather.

2) Sequential Excavation Method (SEM) Section: SEM tunneling would advance from the end of the open cut portal through the overburden soil until reaching bedrock. Two ground improvement strategies would be used in conjunction with SEM tunneling to control groundwater during tunneling: 1) SM to create a block of soil-cement with low permeability; and 2) constructing a Cutoff Cell to form a groundwater barrier wall around the tunnel alignment. The ground improvement strategy used would be dependent on depth and applicability, with safety being the primary criterion.

3) Bedrock Section: Once in bedrock, either traditional drill-and-blast development or a hard rock MTB (mobile tunnel borer) to excavate the Decline Ramp to the orebody.

Graphic 6.4 Illustration of the Decline Ramp comprising the Portal, SEM and Bedrock Tunnel sections. Item is not to scale.



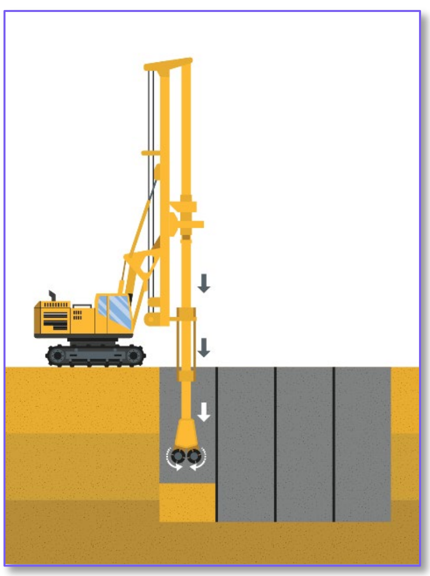
The construction details for the three sections of Decline Ramp are described below.

6.5.1 Portal Excavation in Soil Mixing (SM) Zone

The first two sections of the Decline Ramp would be constructed in unsaturated and saturated overburden, consisting of fine overburden that is unsuitable for traditional excavation methods such as open-cut excavation and cut-and-cover. The fine overburden extends to depths up to 65 ft (20 m) and is primarily composed of silty sand and silty clay, with scattered lenses of silt and clay. Localized pockets of non-silty sand are also present.

The Portal section of the Decline Ramp would extend from the Ore Transfer building into a Soil Mixing (SM) zone. This SM zone would gradually deepen (consult Graphic 6.4), with approximate dimensions of 320 ft (98 m) in length, 40 ft (12 m) in width, and 60 ft (18 m) in height. A second SM section (Block section), joining the Portal area to the Cutoff Cell (see below) would extend for approximately 98.5 ft (30 m) in length, 40.5 ft (12.30 m) in width, and 50 ft (15 m) in height. SM involves mechanically mixing cementitious binders with soil in situ using rotating mixing tools. This process creates overlapping columns of soil-cement, forming solid blocks of improved ground (see Graphic 6.5). This depth of SM was selected due to the limitations posed by employing the SM mixing equipment in the dense, coarse-grained overburden at greater depths.

Graphic 6.5 An example of the Soil Mixing Process. Item is not to scale.



Upon completion of the SM ground preparation, the project would begin excavation using an excavator or a roadheader (a machine that excavates using a rotating head on the end of a boom). The project would excavate a 19.7 ft (6 m) diameter tunnel through the SM zone at an approximate gradient of -15%.

When completed, this tunnel would be covered with the previously excavated till. A concrete driving surface would be established for vehicle use. Further description of the Portal's roof and completed appearance from surface can be found in section 6.21.9.

6.5.2 SEM Section of the Decline Ramp

Following passage through the fine overburden, the Decline Ramp would continue into the coarse overburden, consisting predominantly of sand and silty sand with scattered gravel lenses. The coarse overburden is typically very dense and consists of saturated unconsolidated sediments (quaternary deposits) to a depth between approximately 65-115 ft (20-35 m).

Cutoff Cells are a common civil construction solution employed in the United States. On I-35 in Minneapolis (Graphic 6.6), for example, the state recently used similar construction equipment and methods to build six 113 ft (34 m) deep shafts to function as stormwater storage tanks.

Graphic 6.6 Similar construction methods to the planned cutoff cell were used Minnesota on I-35 in Minneapolis to prevent the highway from flooding during storm events.

To prepare this portion of the overburden for tunneling, a roughly 40 ft (12 m) wide, 570 ft (174 m) long, and 65-115 ft (20-35 m) high Cutoff Cell would be constructed. This cell would be formed in stages using SM methods to construct roughly 3 ft (1 m) thick panels that extend from surface down to competent bedrock. The resulting structure cell would form a groundwater cutoff wall, fully enclosing the future tunnel area.

Once the Cutoff Cell is completed, the interior would be dewatered using approximately six wellpoints installed along the interior perimeter. Preliminary calculations estimate a total dewatering volume between

1.6 to 3.9 million gallons (6.1-14.8 million liters), which, when averaged over a 14-day pumping period, would result in a flow rate of 81-196 gpm (gallons per minute) (307-741 L/min). The dewatering of the SEM Section of the Decline Ramp during construction would be done by pumping the water into the industrial stormwater management system. Sediment would be allowed to settle, and the water would be released into the watershed near the northern boundary of the Project Area. The Project does not consider this water to be contact water. The EIS data submittal, however, would provide additional analysis regarding the flow and level of treatment required for discharge. [R2_Cmt_#806] [R2_Cmt_#807] [R2_Cmt_#836] [R4_Cmt_#1642]

Dewatering the soil would improve ground stability and mitigate pooling of water at the face during excavation, allowing for the safe tunneling to continue. Beginning in the SM block from the portal excavation's lowest point, the project would use the Sequential Excavation Method (SEM) to tunnel through the remaining SM zone, the Cutoff Cell, and the dewatered Cutoff cell, until bedrock is exposed. The precise excavation sequence would adapt based on ground conditions but would generally involve partial face excavation, using a combination of a front-end loader in softer ground and a roadheader (a machine that excavates using a rotating head on the end of a boom) in harder ground where mechanical breakage is required. Probing would precede excavation and spiles (steel dowels or cables encased in grout) would be installed in advance of excavation around the perimeter of the tunnel. After completion of an excavation round, tunnel support would be placed, consisting of a combination of steel ribs, shotcrete and wire mesh. Face support, which could include bolts, dowels and/or shotcrete, would also be required during tunnel advancement to maintain face stability during excavation. If large boulders are encountered that could not be safely removed using a front-end loader or fractured using a roadheader, packaged explosives may be used to fragment these larger rocks. [R2_CMT_#848] [R2_Cmt_#48] Similarly, once the transition zone between soil and bedrock has been reached, a mix of SEM and blasting would be required until the full excavation face is within bedrock.

Excavated material from the Portal and SEM Sections of the Decline Ramp, consisting primarily of overburden, would be hauled to the surface and loaded onto trucks for transport off-site to a licensed landfill site. [R2_Cmt_#58] [R2_Cmt_#76] [R2_Cmt_#78] [R2_Cmt_#77] [R2_Cmt_#80] [R2_Cmt_#82] Preliminary estimates suggest that approximately 20,200 tons (18,400 tonnes) of material would be excavated over the 12-month construction period. Using 20-ton (18-tonnes) haul trucks, this haulage would require approximately 4 truckloads a day.

Overall, the Project would use SEM for the coarse overburden due to several benefits:

- Safety: This method is well-established and performed safely throughout the United States. SEM enables a controlled excavation pace, with continual monitoring and adjustments to ground support and excavation methodology, as needed.
- Flexibility: The ability to use varied excavation methods provides crews and engineers the adaptability required to respond effectively to changes in ground conditions.
- Environment: The Cutoff Cell would confine dewatering to a localized area, reducing the scale of water management needed for excavation.

6.5.3 Portal and SEM Sections Construction Supporting Infrastructure

Additional service equipment to support SEM excavation through the SM and Cutoff Cell sections would include scissor lifts and/or telehandlers for installing services such as piping and power cables. The project would also utilize a shotcrete sprayer and hauler, a supply truck, and various light-duty service equipment to support the SEM crew. A crane would be required for moving heavy equipment, including ground support and portal segments. The excavation process would also require several temporary facilities including a laydown area, office trailers, electrical generators, a grout batch plant, water handling and treatment, materials storage, shop facilities, and other supporting infrastructure. Some of the equipment would be shared with other aspects of the project and/or retained for mine operations (e.g. pickup trucks, roadheader, fuel tanks). An evaluation of these synergies would be completed during the EIS.

6.5.4 Portal and SEM Sections of the Decline Ramp Construction Water Management

Talon anticipates that water from the SM and Cutoff Cell zones would be considered construction stormwater and would be routed to the construction stormwater treatment system (see section 6.19.7). The EIS data submission would clarify these requirements.

While the SM and Cutoff Cell would limit inflows during construction, the designs for the Portal and SEM sections of the Decline Ramp incorporate long-term water mitigation (as the overburden within the Cutoff Cell would slowly saturate once the construction is complete and dewatering has ended). While the primary function of spiles (see section 6.5.2) is to provide structural support, it would also offer early shielding from groundwater inflows. As the SEM excavation advances, groundwater inflow would be minimized by applying a lining consisting of two passes of shotcrete to the back and ribs of the tunnel, which would be separated when required by a waterproof membrane. [R2_Cmt_#65] [R2_Cmt_#74] [R2_Cmt_#75] [R2_Cmt_#83] [R2_Cmt_#96] [R2_Cmt_#97] [R2_Cmt_#98] [R2_Cmt_#99] [R2_Cmt_#100] [R2_Cmt_#101] [R4_Cmt_#1289]

6.5.5 Construction of the Bedrock Section of the Decline Ramp

Upon completion of the SEM Section of the Decline Ramp (which would take approximately 12 months), construction would proceed with the excavation of the Decline Ramp into bedrock. This section of the Decline Ramp would be built using either drill-and-blast methods or mechanical excavation, such as a hard rock Mobile Tunnel Borer (MTB) or the Komatsu MC51. These methods are described below and will be evaluated while the proposer continues to advance engineering studies to determine which method(s) would be brought forward into the EIS. The proposer does not consider these methods to be alternatives because, if a mechanical excavation method is selected, the project would still drill-and-blast development areas underground. A detailed analysis of potential impacts from vibrations and air blasts produced by the selected method(s) will be provided for the Environmental Impact Statement (EIS). This analysis will consider potential effects on fractures and faults, groundwater inflow, existing drinking water wells, and mine infrastructure. [R2_Cmt_#734] [R2_Cmt_#874]

Regardless of the Decline Ramp construction method used, the railway spur would be completed before bedrock excavation commenced, ensuring that the Ore Transfer Building would be fully enclosed and operational. This setup would allow excavated rock to be loaded into the gondola railcars and transported to the concentrator.

Some rock mass from the Bedrock Section of the Decline Ramp and development areas would be treated as ore since the proposer would expect to process the material at a concentrator facility to extract associated mineral products as per Minnesota Rules, part 6125 (this material is not included in the mine's mineral reserve), or used as construction material for the tailings disposal facility adjacent to the concentrator. This material would be brought to surface using an underground haul truck, directly into the ore transfer building, loaded into a gondola railcar using a front-end loader and transported to the offsite processing facility. The remaining rock mass from the Bedrock Section of the Decline Ramp and development would be treated as waste rock and used as backfill. The criteria for whether this material would be ore or waste rock would be provided in the EIS data submittal.

Construction of the Bedrock Section of the Decline Ramp would require several types of temporary facilities including a lay down area, office trailers, electrical generators, water management, materials storage, shop facilities, and other supporting equipment. Many of these facilities would be shared with the SEM and surface contractors. Water used for excavating the Bedrock Section of the Decline Ramp would be classified as Contact Water due to its contact with the waste rock and ore present in the underground mine. [R2_Cmt_#94]

6.5.5.1 Drill-and-blast Construction Method for the Bedrock Section of the Decline Ramp

The process of drilling, blasting and moving rock, as well as the equipment used, closely resembles that applied by civil contractors to advance roadwork, as well as surface and quarry mining (see section 6.9.1). Drill-and-blast would be required in some capacity, whether the Decline Ramp is developed using mechanical excavation or drill-and-blast, as an MTB cannot easily develop infrastructure and crosscut headings perpendicular to the Decline Ramp due to its size.

6.5.5.2 Mechanical Excavation Methods for Bedrock Decline Development

The Project is also evaluating mechanical excavation methods for developing the Bedrock Section of the Decline Ramp as a class of construction techniques. Ongoing industry development of mechanical excavation technology is expected to yield additional equipment options with similar operating principles and environmental characteristics. Mechanical excavation methods are defined as underground excavation systems that use mechanical cutting tools (e.g., rotating cutterheads, cutting drums, or other mechanically-driven cutting elements) to fragment bedrock.

One example of mechanical excavation being considered by the project is a Mobile Tunnel Borer (MTB) (Graphic 6.7), which is a product developed by Master Drilling. The MTB consists of a cutterhead, that would cut a circular profile in the rock. Lagging behind the cutter head are a second set of cutters that would cut a square profile in the sides of the tunnel from the mid-point down to the floor, which would yield a flat floor and an arched roof similar to traditional drill-and-blast development. Rock is pulled onto an internal conveyor that discharges into either the back of a haul truck or a hopper that can then be transferred to a haul truck when available. The MTB includes a dedicated personnel refuge space, onboard compressors, hydraulic pumps, boosters required for equipment operations, and two drills capable of drilling probe holes in advance of the MTB as well as holes for ground support.

While the MTB is modular and can re-use components from previous jobs, it would be customized for the project based on a number of factors including but not limited to the dimensions of the Decline Ramp, geotechnical conditions, electrical power requirements, etc. The machine's particular configuration would be assembled and tested at Master Drilling's fabrication plant in South Africa, then shipped to the project site where it would be assembled and commissioned prior to commencement of production. [R2_Cmt_#85]

The MTB is currently in advanced-stage development and has been successfully deployed at three sites in Africa to demonstrate proof of concept and to refine the technology. They are also under contract to develop a similar tunnel at the Bokoni mine in South Africa. Previous projects completed by Master Drilling using the Mobile Tunnel Boring Machine include Eland Mine Decline extension project for Northam Platinum Limited in South Africa in 2020 (Northam, 2021), and the construction of the Mogalakwena-Sandsloot exploration decline in South Africa for Anglo Platinum in 2022 (International Mining, 2021). [R2_Cmt_#105] [R2_Cmt_#106]

The MTB is similar to a Tunnel Boring Machine (TBM), in that it uses a similar cutterhead, however an MTB:

- Has been designed specifically for mining applications, whereas a traditional TBM is designed for much larger civil projects.
- Is significantly more maneuverable and can be assembled and dismantled with relative ease underground.
- Advances by using grippers that push off against the rock walls as opposed to pre-cast concrete liners that TBMs traditionally use.
- Is tracked, and each modular train segment can operate/move in and out of the heading independently, making the MTB easier to reverse and withdraw from tunnels compared to a TBM.

During MTB mobilization, the machine components are transported to the site in standard intermodal shipping containers. This approach allows for machine parts to be sized for easy assembly and disassembly on-site, making transport and handling more efficient. The Project would handle all prep work for the bedrock face and site, including setting up and managing services to the face, establishing staging and maintenance areas as needed, and ensuring there's sufficient space for staging and laydown. The MTB, including cutter head, which consists of several segments and its trailing gear, would then be assembled at the portal. Concurrently, a chamber approximately 22 ft (7 m) diameter and 33 ft (10 m) long, would be excavated in the bedrock using drill-and-blast methods. This chamber would be used to anchor the gripper shields to the sidewalls and allow the cutter head to be propelled forward by means of the hydraulic cylinders. Inside the chamber, a series of concrete ground beams would be constructed adjacent to the gripper shields, which would provide the thrust anchor allowing the MTB to advance forward. Once inside the tunnel, and competent rock forms the inside walls of the tunnel, the gripper shields would provide the thrust anchor for the forward movement of the MTB. Once the machine has fully extended the hydraulic cylinders, the stabilizer pads would extend from the cutter head against the inside of the tunnel rock surface, and the support trailers would be pulled forward when the hydraulic cylinders contract.

The MTB has two water circuits. The first is a closed cooling water circuit circulating 66 gpm (250 L/min) to cool motors and hydraulic equipment. The second is service water used at a maximum rate of 66 gpm (250 L/min). The resulting contact water would be pumped to surface and be treated via the Contact Water Treatment Plant. In total, the MTB uses approximately 19,800 gallons per day (75,000 L/day) of water.

To-date the MTB has been successfully used to tunnel approximately 3,300 ft (1,006 m) and has the capability to advance at an average rate of approximately 33-40 ft/day (10-12 m/day). Once the decline is complete, the MTB could potentially be deployed to other parts of the mine to construct long stretches of development currently in the mine plan, which could include, ventilation drives or level access drives, where possible. Additionally, given the modularity of the equipment, the cutter head can be replaced with a smaller or larger cutter head, if required, offering flexibility if used for different functions.

Graphic 6.7 Master Drilling Mobile Tunnel Borer

Image Credit: Master Drilling

Another example of mechanical excavation equipment being considered for constructing the Bedrock Section of the Decline Ramp, as well subsequent level development and drift and fill mining, is the Komatsu MC51 hard rock continuous miner. The MC51 is a remote-controlled, fully electric, mechanical excavation system designed specifically for underground hard rock mining applications. Excavation using the MC51 is continuous rather than cyclical, resulting in steady-state operating conditions. At 41 ft (12.50 m) long 13 ft 7 in (4.14 m) wide 11 ft 8 in (3.56 m) high, machine mechanically employs a mechanical hard rock cutterhead mounted on an articulated boom, allowing it to mechanically fragment bedrock in 1-2 ft (0.31-0.62 m) slices in a controlled manner. As excavation progresses, cut rock is gathered by the integrated collection system directly at the face and transferred to an internal conveyor system that can load directly into haul trucks or LHD buckets for removal from the heading. The MC51 has been successfully deployed to three sites (including Western Australia and Sudbury, Canada) and is currently being trialed in Northern Quebec, Canada in rock conditions that are highly analogous to Tamarack's.

Graphic 6.8 Komatsu MC51 hard rock continuous excavator

Image Credit: Komatsu

Mechanical excavation methods share a set of environmental characteristics that are consistent across equipment types in that they:

- Produce ~4" or smaller rock that can be gathered and hauled to the Ore Transfer Building
- Generate continuous and relatively steady noise associated with operation of mechanical cutting equipment, conveyors, and motors. Resulting vibration levels are generally low and uniform
- Produce a consistent excavation profile and limits disturbance to the perimeter of the opening
- Utilize mechanical components that require routine lubrication and maintenance, resulting in similar types of consumables and potential maintenance-related environmental considerations
- Require ventilation, and water services within a common range of underground mine infrastructure requirements
- Do not require the use of explosives to advance development headings

Accordingly, mechanical excavation methods are a category of underground mine development techniques that share common operating principles and environmental characteristics, independent of specific equipment models. Differences among mechanical excavation systems primarily relate to scale or configuration and would not alter the general nature of the associated environmental effects. These environmental characteristics are inherent to the excavation method itself rather than to individual equipment designs.

6.5.6 Ventilation Raises

In addition to the decline ramp, two vent raises from the underground mine to the surface would be constructed for ventilation purposes. Surface Raise #1 would also serve as a secondary emergency egress route. [R2_Cmt_#66] [R3_Cmt_#1304]

- Surface Raise #1 would be approximately 295 ft (90 m) deep, with a finished diameter of approximately 17-20 ft (5.2-6.1 m). This raise would be constructed using raise bore methods described in section 6.10.2. A pilot hole drills a first pass downward from the dill platform until it breaks through the bottom access. Once the pilot hole has broken through, a reamer head is attached to the bottom of the drill steel, and the reamer head is pulled upward towards the drill platform until it breaks through to surface of bedrock. Depending on the finished diameter of the raise, this could require 2-3 passes. In this case, the raise bore machine would be situated on a surface pad around the raise collar. Consequently, with the exception of establishing access to the raise bottom and removal of cuttings, all work would be conducted and managed from the surface. This includes:
    - The surface raise bore pad setup
    - Providing and managing services to the raise bore pad, including power, service water, water management, communications, and roadway access
    - Removal of cuttings from the pilot hole
    - Installation of any necessary ground support, such as shotcrete or rock bolts, which would typically be applied from the top of the raise downward
- Surface Raise #2 would be approximately 1,000 ft (305 m) deep, with a finished diameter of approximately 17-20 ft (5.2-6.1 m). This raise would be constructed as a raise bore, using the method described in section 6.10.2 and using similar surface requirements described for Surface Raise #1.

The conversion of the wetlands to uplands for the access road would use appropriate materials (e.g. coarse rock) or features (e.g. culverts) to enable water to flow across and/or under the developed surface to facilitate water movement between each side of it and address the potential for differences in water levels and/or other hydrological impacts. For further discussion of the project's overall ventilation design, consult Section 6.12. For further descriptions of the ventilation equipment, consult Section 6.21.8. [R3_Cmt_#1262]

6.5.7 Temporary Services and Construction Laydown Area

Temporary services would be provided for the site support facilities erected at the Construction Laydown area. These temporary services would consist of water, electrical power, and temporary ablution facilities.

Lake Country Power has indicated that a 2.0 MW temporary electrical construction connection would be available from the nearby power transmission line. This capacity would be directed to and connected with the temporary construction site power network for use during the construction phase.

6.6 Primary Mine Access/Egress

All personnel, equipment, and supplies would enter and exit the mine via the Decline Ramp within the Ore Transfer Building. For descriptions of the construction of the Decline Ramp, consult section 6.5. Given that this section of the mine access would experience heavy traffic in addition to serving as a ventilation intake, strict physical and automated controls would be maintained to ensure that activities are efficient and safe. [R3_Cmt_#1309] All areas of the mine would be accessed through the same decline artery that would be driven at a maximum grade of -15% and an average grade of -13%. The decline would terminate at the bottom of the mine, approximately 2,000 vertical ft (609.6 m) below surface.

6.7 Secondary Mine Access/Egress

A secondary mine egress network, which would serve as the secondary mine access in the case of a blockage of the primary mine access and/or mine emergency, would be constructed in an independent fresh air system (separate from the primary mine access). Surface Raise #1 would be collared east of the Ore Transfer Building. Once underground, a network of dedicated fresh air lateral and vertical tunnels would connect into each working area of the mine. Raises within the secondary escape route, including Surface Raise #1 would be equipped with permanent ladderways where the vertical length of the raise is less than 300 ft (91.4 m) or a mechanical lifting device where the raise is longer than 300 ft (91.4 m) tall. While the full ventilation system for deeper parts of the mine plan may not be complete at the start of production, dual independent means of egress would be completed prior to the first production blast and the function of those vent drives and raises established at the start of production would be modified to meet ongoing production requirements, if needed. In the case of a mine emergency, employees would exit the mine via the primary mine egress unless unsafe to do so. If this were the case, miners would exit via the secondary mine egress network once it is deemed safe to proceed.

6.8 Ore and Waste Rock Extraction

Selection of mining method is dependent on several factors, which include but are not limited to: resource thickness and orientation, ground conditions, economics, sensitivity to dilution (planned or unplanned low or zero grade material that is typically unavoidable, that gets mined as a consequence of its proximity to desirable ore), recovery, grade, proximity to surface and geological features. Several conventional methods for material extraction would be employed underground. These include:

1. Constructing the Bedrock Section of the Decline Ramp through means of the drill-and-blast or mechanical excavation methods such as the Mobile Tunnel Borer MTB and the Komatsu MC51 (see 6.5.5.2).

2. Mining of ore through Drift and Fill, mechanical excavation, and Long Hole Stoping methods.

3. Vertical development, which is used primarily for ventilation and secondary egress, would be completed by either traditional drill-and-blast raising or raise boring equipment.

6.9 Lateral Development

6.9.1 Drill-and-Blast Development

Underground development consists of all excavation which takes place outside of the ore body. This category includes the Decline Ramp which would link level access tunnels, ventilation excavations to enable airflow, infrastructure excavations such as underground shops and pump stations, and various miscellaneous excavations.

The majority of underground development would consist of horizontal or declined excavations ranging from approximately 15-25 ft (4.6-7.6 m) wide and 15-25 ft (4.6-7.6 m) high, with certain areas (such as maintenance shops) requiring larger dimensions. The ventilation and escapeway systems would also require vertical development (raises), which may range from approximately 10-18 ft (3-5.5 m) in diameter and may be excavated using either drill-and-blast or mechanical methods.

Bedrock material generated by development activities during the construction phase would be shipped to the concentrator. During commissioning, ramp up, and full production, the bedrock material generated by development activities would be used as backfill feed or sent to the concentrator.

Inflows from groundwater, mining equipment, water sprays, and underground services would be pumped from the underground mine to keep the workings dry (see section 6.19 below).

The lower areas of the ore body would be accessed by constructing the Decline Ramp. The majority of underground development would occur during the first few years of the mine life, concurrently with the early years of production. There would be a lesser residual amount of development activity continuing until the final year of the mine life.

Underground development would also include various types of underground construction activities in addition to excavation work. These activities would extend through the first few years of the mine life, even after production has begun. For a full list of these facilities, please consult section 6.21.12.

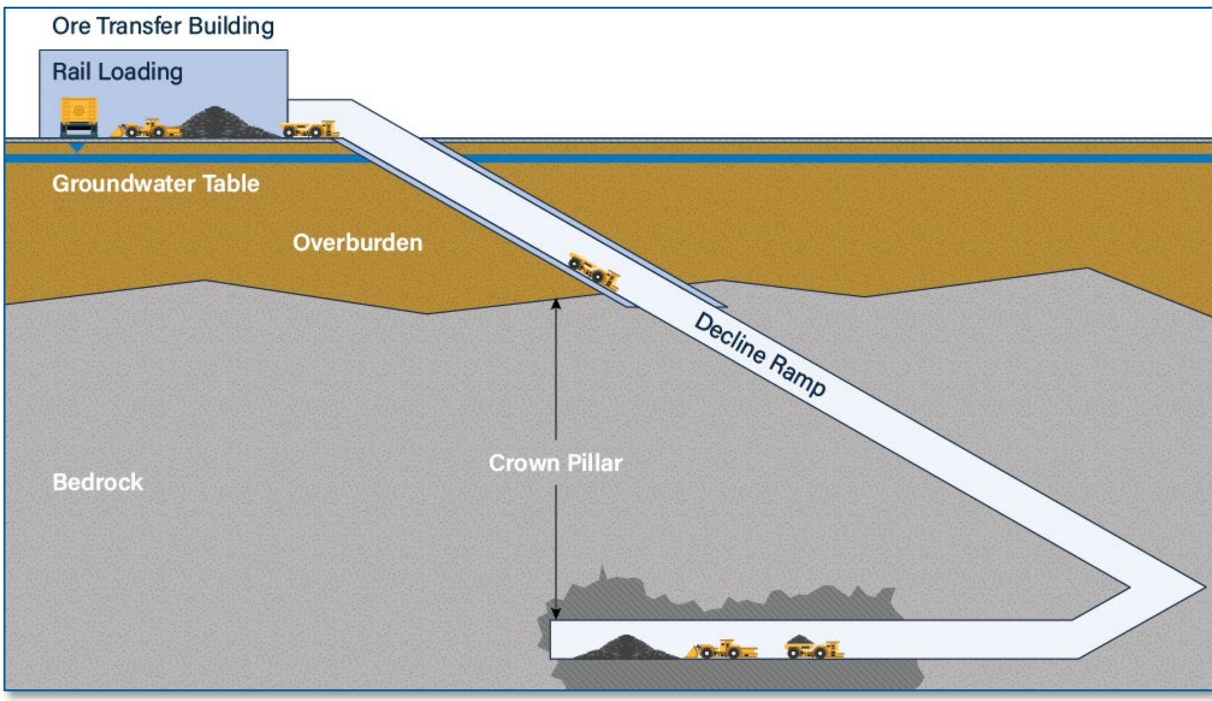
6.9.2 Drift and Fill Mining

Drift-and-fill mining would be the preferred method where the ore body thickness and orientation are not easily amenable to bulk mining methods and where the ore body orientation and host rock surrounding the ore body render them highly sensitive to dilution. The geometry of the ore body in these areas is highly variable, ranging in thickness from approximately 6-30 ft (1.8-9.1 m) and dip on an average angle of approximately 23 degrees downward from North to South. Use of drift-and-fill mining enables the mining excavations to closely fit the ore geometry and minimize dilution. [R2_Cmt_#875] This solution is an important environmental and economic consideration since the ore would be transported to the out-of-state processing site located in Mercer County, North Dakota.

Drift-and-fill development would be driven in a square profile (drift) up to 22 ft (6.7 m) wide and from 13-18 ft (4.0-5.5 m) high, using temporary support (friction bolts and screen). [R2_Cmt_#125] [R2_Cmt_#876] Development would advance from the access drift across the full width of the ore body. Once the full cut has been excavated backfill would be placed in the drift, allowed to cure, and then subsequent cuts would be excavated per the mine sequence. In areas where the ore geometry is wider than a single drift, multiple drifts at the same elevation could be utilized, with the first being backfilled prior to beginning the second. Similarly, where the ore geometry is too thick to enable full recovery within the height of a single drift plus bench (a vertical cut into the floor from the main drive), multiple drifts at different elevations would be utilized, with the first being backfilled prior to beginning the second. Drift-and-fill zones would be developed using primary/secondary sequencing, meaning that a series of primary cuts (cuts that are in virgin ground and are not exposed to fill material adjacent to them), would be mined first, followed by secondary cuts that have already been mined and filled directly adjacent to them. [R1_Cmt_#11].

An illustration of the facility's rock transportation cycle is shown below in Graphic 6.9.

Graphic 6.9 Simplified Illustration of Rock Transportation Method from the Face to the Surface. Item is not to scale.



[R2_Cmt_#139] [R2_Cmt_#878]

6.9.3 Drift-and-fill Mining Cycle

Capital development and drift-and-fill mining would follow nearly identical mining cycles, highlighted below (Graphic 6.10).

Graphic 6.10 Drift-and-fill Mining Cycle. Item is not to scale.

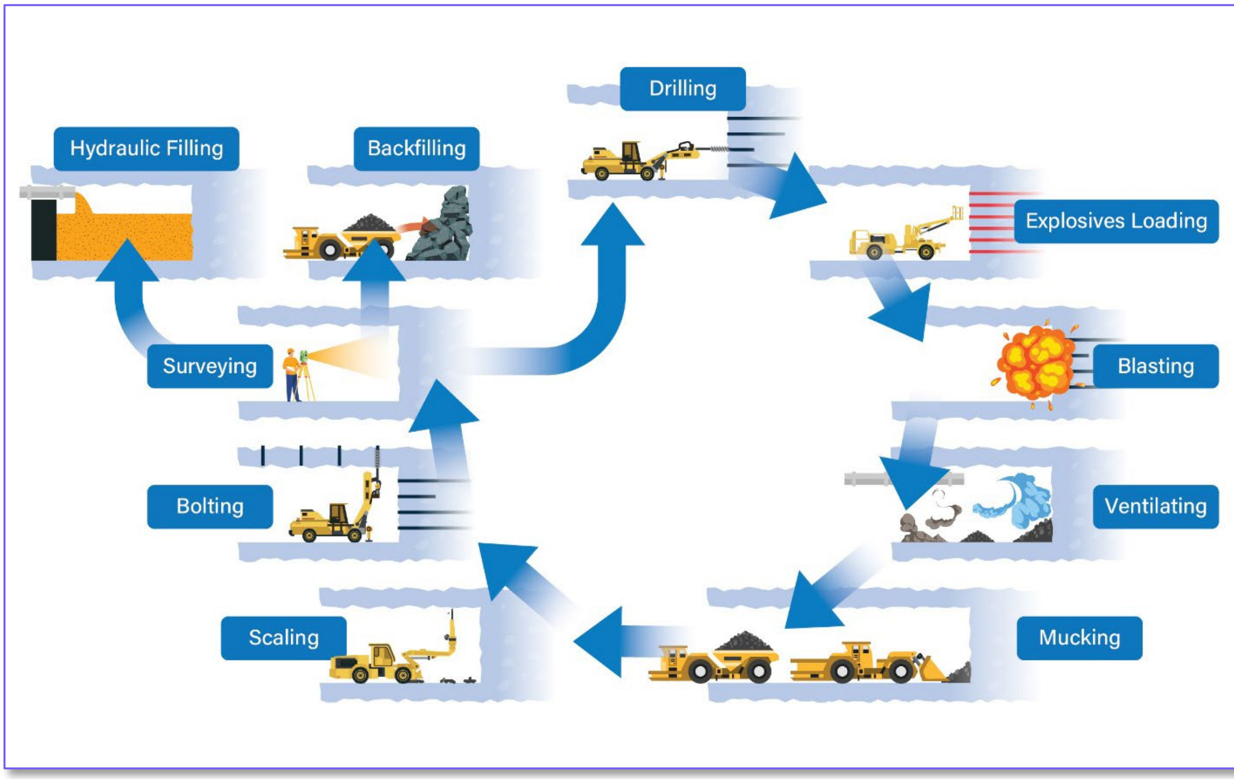


Image Credit: Inspired by Sandvik (Heiniö, 1999)

- Drilling – Lateral holes that are typically around 1.75–2 inches (4.4-5.1 cm) in diameter are drilled into the rock face using a "Jumbo" drill, which typically has 2 drill booms that operate simultaneously. Typical drill penetration into the rock is approximately 10-16 ft (3.0-4.9 m) per blasted round depending on the design requirements and ground conditions. In some headings, longer "probe holes" would also be drilled in advance of development along the same azimuth of the mine heading to check for geotechnical and groundwater conditions (see sections 6.19.1 and 6.19.2 below).

- Loading – The drill holes would be loaded with explosives, consisting of ANFO (ammonium nitrate and fuel oil) in a water-resistant emulsion format (explosive mixture). Two forms of emulsion would be used: packaged "boosters," which connect directly to the detonators and help initiate the blast, and bulk emulsion, which would be pumped into the holes in front of the detonator to the collar of the hole.

- Blasting – Detonation of the explosives would be done from a central blasting location. This would typically be done from surface, using an electronic control system and would occur at set times (typically during shift changes). All personnel must be out of the mine and accounted for prior to any blast.

- Ventilating – Workers are not permitted to re-enter the mine until blast fumes have cleared the underground workings. For this reason, fans and ducting are used to remove dust and blasting gases such as carbon monoxide CO and nitrogen dioxide NO_2 from the immediate area, and the primary mine ventilation system would then convey the gases to the mine exhaust circuit. Prior to release, the exhaust air would undergo a filtration or scrubbing process to reduce the amount of suspended dust and particulates. [R2_Cmt_#120] [R2_Cmt_#124]

- Removing Dislodged Material (Mucking) – The broken rock is then removed using an LHD (load-haul-dump, or loader). It would be loaded directly into a haul truck for transport to surface or placed in a nearby storage bay if no haul truck is available.
- Scaling – Any loose or unstable pieces of rock attached to the tunnel back or ribs would be removed using a pneumatic rock pick, water cannon, and/or a hand-held scaling bar prior to the installation of ground support.
- Bolting – Rock support systems are installed in the blasted area to ensure long term stability of the excavation. Steel bolts typically between 6-8 ft (1.8–2.4 m) in length are installed in a regular grid pattern in the back and ribs, spaced 3-5 ft (0.9-1.5 m) apart. Wire mesh is also installed to catch any smaller rocks located between the bolts. Multiple types of bolts could be used, including "friction bolts" (with steel directly in contact with the rock) or grouted/tensioned bolts (where a rebar or cable is grouted to the rock using a cementitious or resin grout and tensioned by active or passive means through the installation of a bolt and plate that is placed in contact with the rock face along the perimeter of the excavation). Bolts could be made of galvanized steel where corrosion resistance is required. During this phase, shotcrete (pneumatically applied concrete, reinforced with either steel or resin fibers) could also be applied to the back and ribs, as necessary. [R2_Cmt_#116] [R2_Cmt_#117] [R2_Cmt_#826]
- Surveying – The area is surveyed to document the extents of the area excavated by the blast, and to align the drill in the proper direction for the next set of blast holes.
- Backfill:
  - Cemented Rock Fill (CRF): In the case where drift-and-fill mining would require backfill, sized aggregate, sourced from waste rock and/or local quarries would be mixed with a binder and placed into the mined-out voids. Aggregate for CRF would be mixed in a batch plant on surface. The final product would be loaded into haul trucks and transported to the minded-out heading. The backfill would be subsequently pushed into the stope using a flat jamming plate mounted to a LHD, and rock would be tight filled from floor to back. The CRF mix would be sufficiently thick to remain in place during the jamming process.
  - Hydraulic fill: Hydraulic backfilling would also be used as a ground support method by blending sand, cement, and water to form a pumpable slurry that is hydraulically placed into mined-out voids. The sand provides the bulk structural material, while cement acts as a binder that imparts strength once the mixture hardens. Water would be added in a controlled proportion to achieve the required flow characteristics for pumping through pipelines and boreholes. A fill fence, constructed by placing aggregate at the stope access

and subsequently shotcrete to create a barrier wall, would mitigate spillage of water and/or fill material from the bottom of the stope. The slurry would be delivered to the stope or excavation under hydraulic pressure, where it would fill the void and conform to the surrounding rock geometry. After placement, excess water would drain into sumps or is consumed during hydration, allowing the cement to cure and the backfill to gain strength over time.

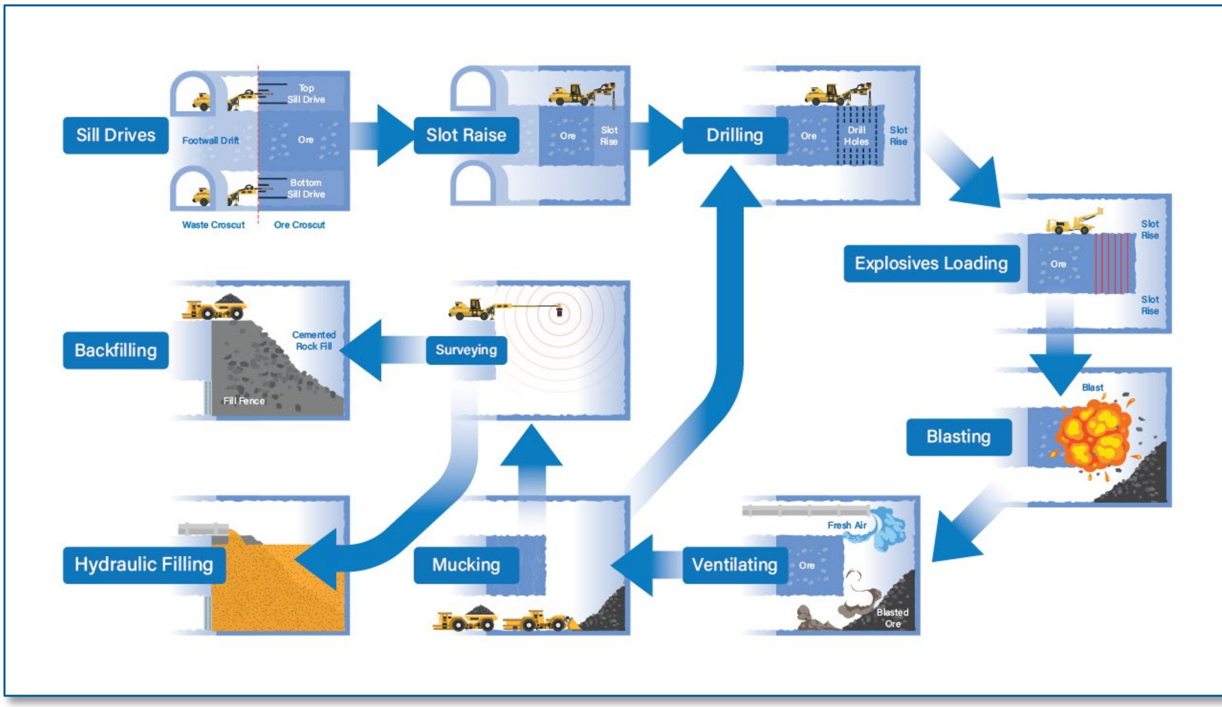
6.9.4 Longhole Stoping Introduction

Bulk mining would be used where the ore body geometry is more massive and vertically oriented. [R3_Cmt_#1324] Bulk mining would be done using a longhole stoping method, which consists of a top and bottom access and the ore between the two levels. Stopes are drilled and blasted from the top level and subsequently mucked from the bottom. A typical longhole stope would be approximately 50 ft (15.2 m) wide by 100 ft (30.4 m) long by 100 ft (30.4 m) high, however, each stope is modeled independently and can vary in size and/or shape depending on a number of conditions including, but not limited to:

- Ore body geometry
- Geotechnical and hydrogeological considerations
- Proximity to backfill
- Grade
- Sensitivity to dilution
- Mining sequence

A typical longhole stoping cycle is shown in Graphic 6.11 below:

Graphic 6.11 The Longhole Stoping Mining Cycle. Item is not to scale.



6.9.5 Longhole Stoping Mining Cycle

- Sill Drifts – Longhole stopes require access to the top and bottom extents of the stope, commonly referred to as "sill drifts." The top sill is used for drilling and blasting, whereas the bottom sill is used for mucking. These drifts are typically driven wider than the main stope access drives to maximize working space and improve ore recovery. Sill drives are, therefore, often driven in two passes: the first being similar to a typical lateral development (described above), and the second pass being a "slash" cut, to widen the drift, with drilling and blasting perpendicular to the direction of the sill drift.

- Slot Raise – A large vertical hole is excavated from within the stope to create void space or a free face for blasted rock to blast into. This raise is drilled from the top sill downward until it breaks through the bottom sill drift. The cut is then blasted bottom-up. The size of this raise can vary depending on the location and purpose.

- Drilling – vertical holes are then drilled into the floor using either a Top Hammer (also known a "longhole") drill or an ITH (In-the-hole) drill that typically has 1 drill boom. Drill holes would be approximately 85-135 ft (25.9-41.1 m) in length (the portion of the stope that is mined is the total height of the stope, less the excavated height of the bottom sill drift). The actual height of each stope would vary depending on the shape of the deposit and design considerations.

- Loading – The drill holes would be pumped with bulk emulsion from the top sill. The base of the holes would typically be loaded with packaged emulsion gel cartridges (boosters) which, similar to development mining, connect directly to the detonators to help initiate the blast. The stope is typically blasted in 2-4 vertical blasts from the end furthest away from the stope access to the front of the stope.

- Blasting – Detonation of the explosives would be done from a central blasting location. This would typically be done from surface, using a central electronic control system and would occur at set times (typically during shift changes). All personnel would be out of the mine and accounted for prior to any blast. [R2_Cmt_#865]

- Ventilating – Workers are not permitted to re-enter the mine until blast fumes have cleared the underground workings. For this reason, fans and ducting would be used to remove dust and blasting gases such as CO and NO_2 from the immediate area. The primary mine ventilation system would then convey the gases to the mine exhaust circuit. Prior to release into the environment, the exhaust air would pass through an engineered emissions control device to reduce the amount of particulate matter.

- Removing Dislodged Material (Mucking) – The broken rock would then be removed remotely using an LHD from the bottom sill. This work would be done by remote operation (the operator typically works from an elevated stand under supported ground, typically in the crosscut drive, where they have a line-of-sight view of the LHD). The mucked material would be either loaded directly into a haul truck for transport to surface or placed in a nearby storage bay if no haul truck is available.

- Surveying – Once the stope has been mined out, the area would be surveyed with a cavity monitoring system (CMS), which is a scanner that typically uses LIDAR technology. The scanner would be attached to either a long boom that extends into the stope, or a drone, to measure the extent of the excavated area, determine the amount of fill that would be required, and plan subsequent stopes.

- Backfill:

  - CRF: Stopes would be backfilled with sized aggregate, sourced from waste rock and/or externally sourced quarries, mixed with a binder, and placed into the mined-out voids. The recipe for this CRF application would be sufficiently fluid to self-place and fill the void. A fill fence, constructed by placing aggregate at the stope access and subsequently shotcrete to create a barrier wall in the bottom sill, would mitigate spillage of water and/or fill material from the bottom sill. Aggregate would be mixed using a batch plant on surface. The final product would be loaded into haul trucks and transported to the mined-out stope. Backfill would be placed into the stope from the top sill drift until the stope is filled up to the floor level of the top sill. The top sill would then be used as the bottom sill of the stope directly above it or filled similar to drift-and-fill drifts, as described above.

  - Hydraulic fill: Hydraulic backfilling would also be used as a ground support method by blending sand, cement, and water to form a pumpable slurry that is hydraulically placed into mined-out voids. The sand provides the bulk structural material, while cement acts as a binder that imparts strength once the mixture hardens. Water would be added in a controlled proportion to achieve the required flow characteristics for pumping through pipelines and boreholes. A fill fence, constructed by placing aggregate at the stope access and subsequently shotcrete to create a barrier wall in the bottom sill, would mitigate spillage of water and/or fill material from the bottom sill. The slurry would be delivered to the stope or excavation under hydraulic pressure, where it would fill the void and conform to the surrounding rock geometry. After placement, excess water would drain into sumps or is consumed during hydration, allowing the cement to cure and the backfill to gain strength over time.

6.10 Vertical Development

Vertical development would be required for ventilation, stope slot raises, secondary egress, and any boreholes for mine services. Vertical development would be completed by means of a drop raise (or longhole raise), which employes drill-and-blast methods or by mechanical boring methods (raise bore). Talon does not plan to use conventional (Alimak) raising, where raises are developed bottom-up using hand-held equipment, as this method would require miners to work directly in the raise, underneath unsupported ground.

6.10.1 Drop Raise

Drop Raises would be used to construct the stope slot raises, short connections between levels, and/or where a raise bore is either not available or needed. A drop raise is a type of vertical development that is mined from a top level, using conventional drills to drill into a level below it. It is then blasted from the bottom of the raise upwards in a series of lifts until it breaks through the top level. This methodology typically does not yield a smooth profile, which can reduce ventilation flow due to turbulence and resistance created by the uneven surface.

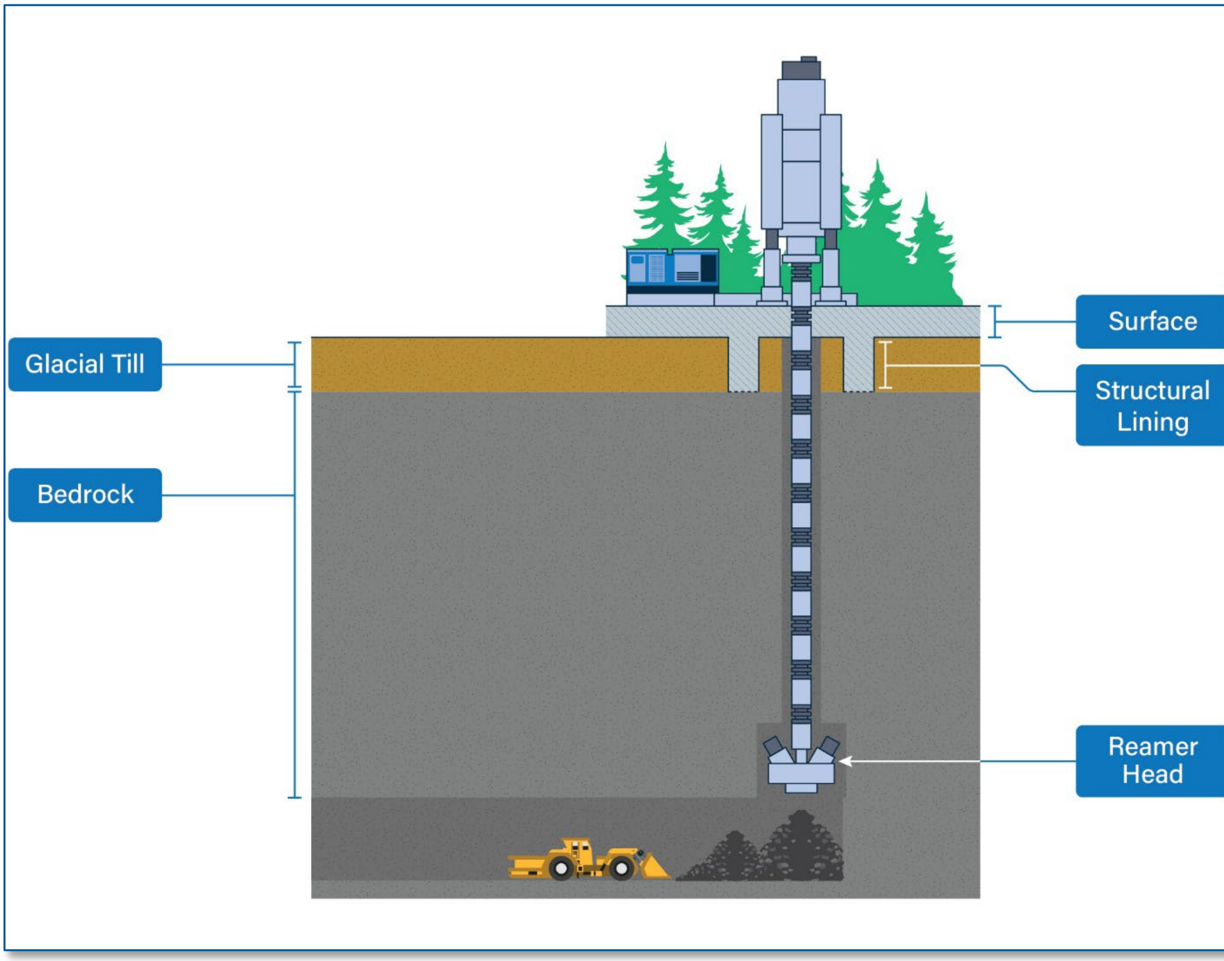
6.10.2 Raise Bore

Raise bores would be the preferred method of developing ventilation raises. Tamarack would have two bored raises that would originate from surface, which would both be developed conventionally (bottom-up). Underground raises would also be driven conventionally.

A raise bore is a type of vertical development driven by a boring machine that is stationed on a drill platform on the top collar of the hole. A pilot hole drills a first pass downward from the dill platform until it breaks through the bottom access. Once the pilot hole has broken through, a reamer head is attached to the bottom of the drill steel and the reamer head is pulled upward towards the drill platform until it breaks through to surface of bedrock. Depending on the finished diameter of the raise, this could require 2-3 passes. The waste rock is collected at the bottom using an LHD and loaded into haul trucks. The perimeter of the raise's overburden section would be supported by a structural lining.

It is anticipated that most of the raises would be vertical and be between 10-20 ft (3.0-6.1 m) in diameter and all raises that are required for ventilation and emergency escape that are longer than 80 ft (24.5 m) would be constructed using a raise bore machine.

Graphic 6.12 Raise Bore. Item is not to scale.



6.11 Underground Backfill

The bedrock material generated by development activities would be ore or waste rock. Some of the waste rock generated by this activity would be utilized for underground backfill.

After ore extraction in a drift is complete, the excavation could be backfilled using CRF, uncemented rock fill, or hydraulic fill. CRF and hydraulic fill would be produced in a backfill plant within the Ore Transfer Building and transported to the underground mine by haul trucks.

The shallowest planned ore mining is located approximately 300 ft (91.4 m) below surface, leaving a "crown pillar" (distance between the shallowest orebody excavation and the surface) of approximately 200 ft (61 m) of bedrock plus approximately 100 ft (30.4 m) of overburden. Numerical and empirical analysis of these planned excavations indicates crown pillar deflection would be negligible; thus surface subsidence is not expected. [R2_Cmt_#1144] Additional subsidence analysis and supporting data would be incorporated into the EIS data submission. [R1_Cmt_#774] [R1_Cmt_#322] [R2_Cmt_#109] [R2_Cmt_#145] [R2_Cmt_#146] [R2_Cmt_#147] [R2_Cmt_#154] [R2_Cmt_#155] [R2_Cmt_#156] [R2_Cmt_#157] [R2_Cmt_#158] [R2_Cmt_#161] [R2_Cmt_#162] [R2_Cmt_#163] [R2_Cmt_#889] [R2_Cmt_#890] [R2_Cmt_#891]

Current modeling indicates that the coarse-grained orthocumulate olivine (CGO) East and West zones have sufficient structural integrity that backfill would not always be required. Similarly, the MSU (Massive Sulfide Unit), SMSU and 138 zones would require some stopes to be backfilled, however, there would be opportunities in the secondary stopes to either partially fill or use Uncemented Rock Fill given the sufficient structural integrity of this area. [R2_Cmt_#892] The fill requirements would be further evaluated and detail provided in the EIS data submittal. [R2_Cmt_#159] [R2_Cmt_#16] [R2_Cmt_#1008] [R2_Cmt_#1010]

A preliminary and conservative estimate projects that approximately 4.0 – 7.0 million tons (3.6-6.4 million tonnes) of backfill would be required. Of this, approximately 0.8 – 2.8 million tons (0.7 – 2.5 million tonnes) would be supplied by waste rock, which would account for a portion of the requirements. Externally sourced aggregate would be required starting in the third year of production as the mine development begins to taper off once the decline ramp is completed. [R2_Cmt_#164]

6.11.1 Cemented Rock Fill (CRF)

The CRF recipe would be composed of a binder (e.g., cement), waste rock / externally sourced aggregate and add-mixtures needed to help set the concrete (which may include stabilizers, retardants or accelerants). [R3_Cmt_#1343] Add mixtures may be required depending on factors that may include, time from the batch plant to placement, recipe and climate. Varying proportions of binder would be added depending on the strength requirement of the area to be backfilled. Typical binder additions would be in the range of 3% to 10% by weight. Final addition rates would be determined during operation based on onsite strength tests. No tailings would be used as backfill during mine operations. [R1_Cmt_#153] [R2_Cmt_#149] [R2_Cmt_#215] [R2_Cmt_#886]

Water proportions would range from 2% to 5% of the CRF volume. Water for CRF production would typically be sourced from the Contact Water Treatment Plant, though additional water would sometimes be sourced from a well or potentially the stormwater management system. Water used for cemented rock fill (CRF) production would be suitable for concrete mixing and consistent with standard industry practices for hydraulic cement concrete. Potable water may be used without additional qualification, while non-potable water sources may be used provided they do not adversely affect concrete performance, such as strength development or setting characteristics.

At this stage, water for CRF production is anticipated to be sourced from groundwater (e.g., well water) and/or treated water from the contact water treatment plant. These sources are commonly used in concrete production and would be suitable for CRF production based on performance considerations rather than prescriptive chemical thresholds. [R4_Cmt_#1346]

The CRF would provide structural support for the subsequently mined drifts that would be located directly alongside or above the previous drift once the backfill has cured. At full production, several active areas would be in the mining and backfill phases simultaneously. After being deposited into the backfill area by a haul truck, the CRF would be pushed forward to the end of the excavation by an LHD with a jammer plate attachment.

6.11.2 Hydraulic Fill

Hydraulic fill is a backfilling method that utilizes a slurry composed of sand, water, and sometimes cement, to provide ground support within mined-out stopes (see 6.9.3). Cement addition rates and water content would be adjusted based on geotechnical requirements and desired curing characteristics.

Once mixed, the hydraulic fill slurry would be transported underground through a network of pipelines and boreholes using hydraulic pressure. The slurry would be discharged into mined-out areas, where it would flow and settle to fill voids and conform to the surrounding rock geometry.

Following placement, excess water would either drain from the fill mass or be consumed during cement hydration. As curing progresses, the cement binds the sand particles together, resulting in a consolidated backfill mass that gains strength over time. The cured hydraulic fill provides structural support to adjacent rock and mined openings and supports the safe sequencing of subsequent mining.

During placement, excess water would separate from the hydraulic fill mass and drain through fill barricades and drainage systems. This drainage of excess water would promote consolidation of the fill and support curing of the cemented hydraulic backfill. After exiting the stope, this water would be collected within the mine’s underground sumps and water treatment systems.

Water introduced through hydraulic fill operations is temporary in nature and is managed through pumping, treatment as necessary, and either reused within mine operations or discharged in accordance with applicable permits. The mine water balance and dewatering system design would account for hydraulic fill operations to ensure that pumping capacity is sufficient to manage periods of active fill placement. Additional details regarding the use of hydraulic fill placement are provided in Section 6.9.3.

6.12 Mine Ventilation

Underground ventilation would be facilitated through the Portal (Decline Ramp), Surface Raise #1, and Surface Raise #2, all of which would connect to the atmosphere at the surface. The function of the Portal and raises would vary during the construction phase, but upon completion of the permanent vent circuit, the following ventilation concept would exist [R2_Cmt_#819]:

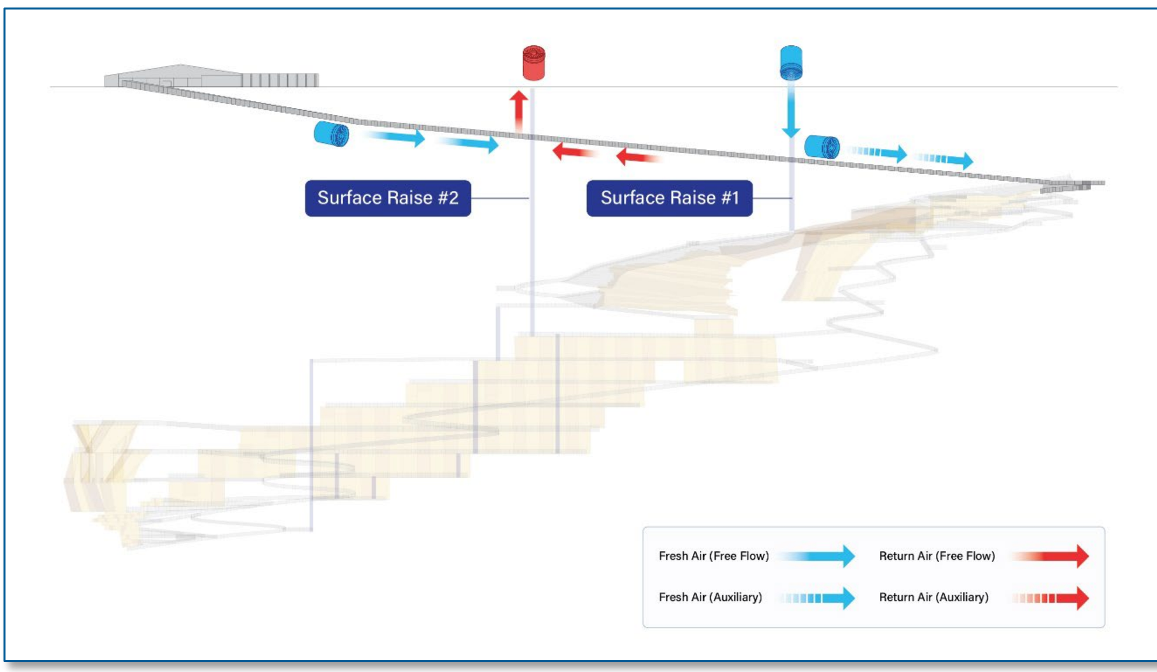
- Portal - fresh air intake and primary mine access/egress.
- Surface Raise #1- fresh air intake and secondary mine egress.
- Surface Raise #2 – dedicated exhaust air, no personnel access.

A description of the construction of surface infrastructure including fan and heater installation for the Portal and raises can be found in section 6.21.8. [R2_CMT_#19]

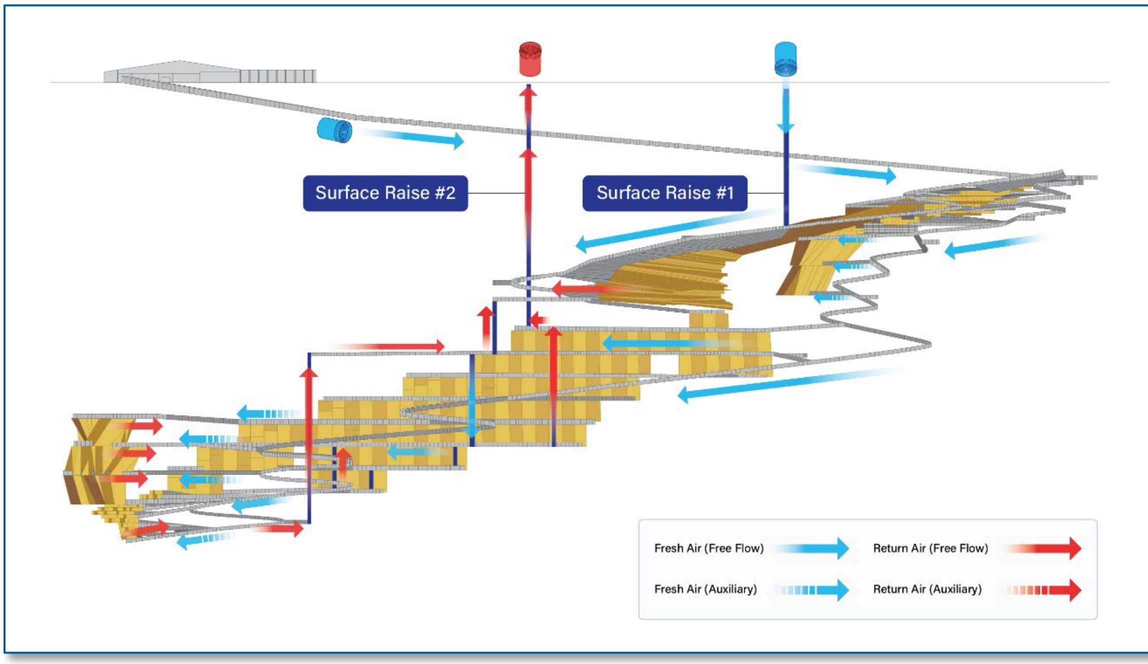
The ventilation system is designed as a "push-pull" system, featuring both fresh air and return surface fan installations. The current mine plan would utilize propane-fired heaters located near the portal and intake raise (Surface Raise #1) if required (further heat modeling to be completed to support the EIS would finalize the heating requirements). [R2_Cmt_#895] During colder months, intake air would be heated to approximately 41˚F (5°C) to prevent roadways and services from freezing during winter months. The mine ventilation air would be marginally warmer at depth due to a combination of thermal gradient, air resistance caused by pulling air over distance, and utilization of mine equipment underground. Ventilation air would be drawn into the Portal and Surface Raise #1 to ventilate the workings down to the bottom of the mine. Fresh air would sweep across each of the levels and be channeled into the exhaust system, which would comprise a series of raises and transfer drifts that would terminate in the main exhaust raise. As the main exhaust raise, Surface Raise # 2 would be equipped with a scrubber system to remove dust and diesel particulate matter, before exhausting the air.

As the mine advances, additional underground fans, including booster fans, which help maintain air velocity underground. [R2_Cmt_#171] Level (or 'stope') fans would be required to force air from the main ventilation circuit into each active heading where people and/or equipment would be present. Generally, level fans are connected to flexible vent ducting that is placed in the main vent circuit. Air is pulled from this circuit and directed to the active area. Exhaust air then naturally flows back to the main vent circuit.

Graphic 6.13 Ventilation during the construction phase. Note the final design for the excavation would include maintenance bays and other small facilities that are not depicted in this image. Item is not to scale.



Graphic 6.14 Ventilation during the Operational Phase. Item is not to scale.



Note, when tunnel appears to have bidirectional ventilation, fresh air would be ducted to the face and exhausted back out via the same excavation.

Ventilation on Demand (VOD) is a strategy that has been adopted by mines in recent years. VOD is an operational strategy whereby a series of fans and regulators are controlled to minimize air flow in non-working areas and to better manage air flow in the event of an emergency. The ventilation system would be designed to meet overall ventilation requirements, ensuring compliance with Mine Safety and Health Administration (MSHA) standards even without VOD. A global ventilation management strategy would be evaluated in future studies to assess how these controls could be integrated operationally and to explore potential opportunities for enhanced efficiency. [R2_Cmt_#121]

6.13 Explosives Storage and Use

In compliance with MSHA regulations, bulk explosives and detonators would be stored in separate magazines at least 25 ft (7.6 m) apart. The magazines would be constructed in separate excavated chambers, sealed with fire rated doors, and locked when not attended by trained personnel. These excavations would be among the first to be developed in bedrock along the main decline ramp. [R2_Cmt_#900] During the short period while drill-and-blast excavation of these magazines is ongoing, the necessary explosives would be delivered to site and utilized the same day to avoid the need for a temporary surface explosive storage facility.

6.14 Mobile Equipment

A diesel equipment fleet has been assumed as the basis for both mine development and operations. While most manufactures offer battery electric vehicle (BEV) or battery electric hybrid equipment, such options are not yet widespread in the mining industry, as purchase and operational costs can be prohibitive.

Additionally, limited data, including equipment performance, maintenance and battery life/management, as well as mine design considerations to optimized operational efficiencies is available. Given that the track record of underground BEV technology should be better understood and technology is expected to advance, Talon would continue evaluate the adoption of BEV technology and intends to avoid design choices that could hinder a future transition to BEV.

The underground fleet purchased for mine construction would continue to be used during mine production, and equipment would be sourced from as few vendors as possible to optimize maintenance capabilities and minimize the number of spares. Heavy equipment, including haul trucks and LHDs, would be rebuilt approximately every three years and replaced every 5-6 years, whereas service and light duty equipment would be rebuilt approximately every 5 years and would not require replacing given the planned mine life. No rebuilds would take place in the last 2 years of production and no replacements would be required within the last 4 years. When equipment is scheduled to be replaced toward the end of production, the equipment would instead undergo a subsequent rebuild or sufficient maintenance to keep it operational until the end of the mine life. Table 6.3 summarizes the anticipated fleet and quantities of each equipment type during production.

Table 6.3 Preliminary Underground Vehicle Fleet by Year

Equipment	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
Haul Trucks	2	5	9	9	9	9	9	8	
LHD	3	5	9	9	9	9	9	7	
Jumbo	3	3	3	2	2	2	2	1	
Production Drill	1	2	3	3	4	4	4		
Bolter	4	6	6	5	5	2	2	2	
Emulsion Loader	2	2	2	2	2	2	2	2	
Scissor Lift	3	3	3	2	2	2	2	1	
Shotcrete Sprayer	1	1	1	1	1	1	1	1	
Transmixer	2	2	2	2	2	1	1	1	
Telehandler	1	1	1	1	1	1	1	1	
Road Grader	1	1	1	1	1	1	1	1	
Boom Truck (supplies Handling)	2	2	2	2	2	2	2	2	
Personnel Carriers - for UG Laborers	1	3	3	3	2	2	2	2	
Light Vehicles (i.e., Pickup)	7	11	11	11	11	11	11	11	11
Fuel Truck	1	1	1	1	1	1	1	1	
Maintenance Vehicle	1	2	2	2	2	2	2	2	
Exploration Drill	1	2	2	2	2	2	2	2	
Backhoe	1	1	1	1	1	1	1	1	
Water Truck	1	1	1	1	1	1	1	1	
Mine Rescue Vehicle	1	1	1	1	1	1	1	1	
Total Fleet Count	39	55	64	61	61	57	57	48	11

A number of surface-based vehicles would be used primarily inside the Ore Transfer Building to manage the handling of ore and waste rock as they are delivered to the building from underground (Table 6.4). These vehicles would include wheeled front-end loaders, skid steer loaders, manlift, forklifts, and a railcar mover to shunt the gondola railcars in and out of the Ore Transfer Building. Apart from railcar mover as well as a wheeled front-end loader, all vehicles would remain confined to the inside of the Ore Transfer Building to prevent contamination of the ground outside the building.

When necessary, vehicles would only exit the building through the vehicle wash bay where high pressure water hoses would be used to remove ore / waste rock residue from the tires and body before the vehicle would exit the building. For further description of the Wash Bay, consult section 6.21.4.

Table 6.4 Preliminary Surface Vehicle Fleet by Year

Equipment	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
Front Wheel Loader	3	3	3	3	3	3	3	3	
Railcar mover	1	1	1	1	1	1	1	1	
Forklift	2	2	2	2	2	2	2	2	
Skid Steer Loader	1	1	1	1	1	1	1	1	
Manlift	1	1	1	1	1	1	1	1	
Light Vehicles (i.e., Pickup)	2	2	2	2	2	2	2	2	
Total Fleet Count	10	10	10	10	10	10	10	10	

6.15 Mine Production

Mine production would start within 18-24 months after the start of construction. First ore is contingent on completion of one of the raises to surface, as a secondary mine egress is required prior to first ore per MSHA regulations. First ore would be initiated in the CGO East and West zones, between the completion of Surface Raises #1 & #2. Once the MSU/SMSU zones have been reached, production would prioritize these higher-grade zones. Overall production is expected to reach steady-state mining in approximately an additional 24 months at an average rate of approximately 3,968 tons (3,600 tonnes) per day or 1.45 M tons (1.31 M tonnes) ore per year. Steady-state mining is expected to be maintained over a period of approximately 6-7 years and then taper off over approximately 12 months, yielding approximately 7-10 years of production with a total yield of approximately 10.5 M tons (9.5 million tonnes). [R3_Cmt_#1369]

6.16 Rock Transport

The Ore Transfer Building would connect to the Portal section of the Decline Ramp to ensure that ore and waste rock would be hauled to the surface and into the building without being exposed to precipitation or wind. [R2_Cmt_#939] [R2_Cmt_#942] [R2_Cmt_#943] [R2_Cmt_#945] [R2_Cmt_#966] [R2_Cmt_#967]

The building would be sized to include three major buffer areas: a rail loading area buffer that could hold 13,227 tons (12,000 tonnes), an ore buffer area that could hold 11,023 tons (10,000 tonnes), and an area that could hold 5,511 tons (5,000 tonnes) of waste rock that would be used for backfill or transported to the concentrator. [R2_Cmt_#224] [R2_Cmt_#931] Other sizing factors would include minimum turning radiuses of vehicles, space for six rail cars within the rail loadout, the provision for a refueling bay, 3 heavy vehicle maintenance bays, 3 light vehicle maintenance bays, an emergency vehicle bay, and a vehicle wash bay. Lubricants and coolants would be stored within a dedicated area within the vehicle maintenance area. [R2_Cmt_#43] [R2_Cmt_#224]

Overall, the building would contain the following:

- Ore buffer area
- Material conveyors, including a tramp metal removal system
- Crushers to reduce the top size of ore and waste rock
- Waste rock buffer
- Concrete Backfill Batch Plant with cement silo and external backfill material feed system
- Rail loadout area
- Service areas including:
    - Vehicle Maintenance Workshop
    - Warehouse
    - Wash Bay
    - Refueling Bay
    - Emergency Vehicle Bay

6.17 Overburden, Waste Rock, and Backfill

The Project would manage materials such as:

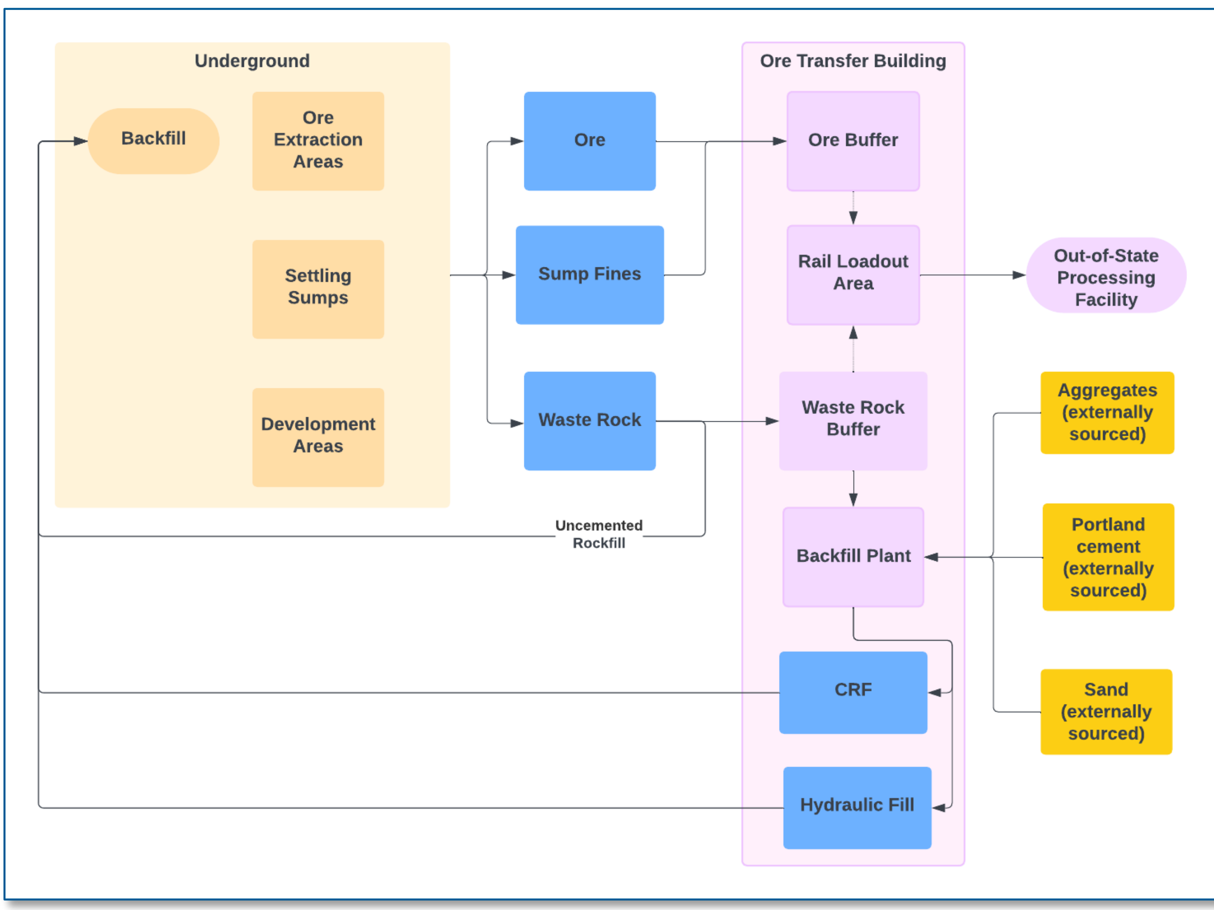
- Overburden excavated during construction of the surface facilities, and portions of the Decline Ramp
- Bedrock excavated during the construction of the Decline Ramp and development of the mine
- Commercial aggregate
- Fines (small particles) collected from underground settling sumps

All bedrock hauled to the surface would remain inside the Ore Transfer Building throughout its handling and preparation for rail transport or use as backfill material. Waste rock would be sized and then mixed with cement within the Ore Transfer Building to create backfill material that would be 'backhauled' into the mine by the haul trucks on their return. As necessary, externally sourced aggregate would be conveyed into the

Ore Transfer Building for addition to the backfill preparation system to overcome any shortfall of waste rock to meet the mine's backfill requirements in support of a safe and efficient mining operation.

Pursuant to Minnesota Rule 6132.1000, a geochemical materials characterization program is in progress that includes a comprehensive suite of static, kinetic, and mineralogical analyses on the geologic materials that would be handled during mining. [R2_Cmt_#136] [R2_Cmt_#913] These materials include overburden, rock produced as part of mine operations, including lithologies extracted as targeted ore, dilution within ore, and waste rock as well as backfill. [R2_Cmt_#141] [R2_Cmt_#142] [R2_Cmt_#143] [R2_Cmt_#144] The results from this program would be used to support materials management. [R1_CMT_#15] [R2_Cmt_#130] [R2_Cmt_#132] [R2_Cmt_#133] [R1_Cmt_#407] [R2_Cmt_#81] [R2_Cmt_#137] [R2_Cmt_#150] [R2_Cmt_#151] [R2_Cmt_#165] [R2_Cmt_#174] [R2_Cmt_#183] [R2_Cmt_#184] [R2_Cmt_#185] [R2_Cmt_#186] [R2_Cmt_#193] [R2_Cmt_#205] [R2_Cmt_#231] [R2_Cmt_#264] [R2_Cmt_#265] [R2_Cmt_#402] [R2_Cmt_#833] [R2_Cmt_#871] [R2_Cmt_#881] [R2_Cmt_#894] [R2_Cmt_#902] [R2_Cmt_#909] [R2_Cmt_#910] [R2_Cmt_#911] [R2_Cmt_#912] [R2_Cmt_#914] [R2_Cmt_#915] [R2_Cmt_#941] Graphic 6.15 depicts the flow of materials between the underground and the surface.

Graphic 6.15 Flowchart of Material Transfer between Surface and Underground



[R2_Cmt_#216] [R2_Cmt_#217] [R2_Cmt_#218] [R2_Cmt_#935]

Overburden excavated during construction of surface facilities such as SM areas and surface raises would be transported offsite to an appropriately licensed landfill. [R2_Cmt_#175] [R2_Cmt_#176] [R2_Cmt_#177] [R2_Cmt_#178] [R2_Cmt_#179] [R2_Cmt_#181] [R2_Cmt_#191] [R2_Cmt_#192] [R2_Cmt_#196] [R2_Cmt_#197] [R2_Cmt_#209] [R2_Cmt_#210] [R2_Cmt_#211] [R2_Cmt_#212] [R2_Cmt_#213] [R3_Cmt_#1625]

6.18 Materials Management

The Decline Ramp's construction through the bedrock would generate ore and waste rock. This rock would be managed in the Ore Transfer Building and shipped via rail to the concentrator where it would be used for commissioning.

Once the mine is fully constructed and operations have begun, waste rock would be used to produce cemented rock fill (CRF), produce uncemented rock fill, deposited in stopes that would be backfilled using hydraulic fill, or transported to North Dakota.

On days when the waste rock buffer is depleted or the mine is backfilling using hydraulic fill, externally sourced commercial material would be needed for backfilling. Aggregate and sand would be sourced from suitable permitted commercial aggregate supplier(s). A preliminary and conservative estimate projects that the mine would require an average of 551,000-772,000 tons (500,000–700,000 tonnes) per year during steady-state operations. [R2_Cmt_#152] [R2_Cmt_#198] [R2_Cmt_#199] This material would be delivered to the mine site via over-the-road truck and stored in the outdoor backfill materials buffer.

6.18.1 Cemented Rock Fill (CRF)

For CRF, waste rock collected from underground operations would be brought to the Ore Transfer Building via haul trucks and transferred to the waste rock buffer, designed for 5,511 tons (5,000 tonnes). Some waste rock would be fed into the backfill material crushing plant where the material would be crushed to less than 4 inches (10.2 cm). Dust would be controlled using best management practices in accordance with the project's Fugitive Dust Control Plan developed as part of the EIS and permitting process. [R2_Cmt_#214]

These backfill materials would be brought into backfill plant. The waste rock or externally sourced aggregate would be fed into a crusher to produce the smaller particles needed to produce the CRF mix. This crushed material, or externally sourced aggregate, would then be fed into a mixer where it would be blended with cement and water to make CRF. The blended CRF would be placed into the bed of a haul truck for return underground.

There would be occasions when the backfill material would not require cement. These may include end of life stopes or secondary sequence stopes where adjacent mining would not take place and a comparable structural integrity is not required. On these occasions, waste rock would be transported from the mining face and dumped into the stope being backfilled. When waste rock is unavailable, externally sourced aggregate from surface could again be used.

Further descriptions of the facilities that would support the production of CRF are available in section 6.21. [R1_Cmt_#218]

6.18.2 Hydraulic Fill

Hydraulic fill is a backfilling method that utilizes a slurry composed of sand, cement, and water to provide ground support within mined-out stopes (see 6.9.3). Sand for hydraulic fill would be sourced from suitable permitted commercial suppliers and delivered to the mine site by truck. Delivered sand would be stored in the outdoor backfill materials buffer. Dust would be controlled using best management practices in accordance with the project's Fugitive Dust Control Plan developed as part of the EIS and permitting process.

Sand for the backfill plant would be conveyed to the hydraulic fill plant, where it would be combined with cement and water to produce a pumpable slurry. Mixing would occur in a controlled environment to ensure consistent material properties. Once mixed, the hydraulic fill slurry would be transported underground through a network of pipelines and boreholes using hydraulic pressure (see 6.11.2).

6.18.3 Rock Transport

Ore and waste rock would be brought to the surface by haul truck to the ore and waste rock buffer areas. These piles would then be sized and conveyed to the rail loading buffer area within the Ore Transfer Building. This facility would include exhaust air scrubbers or fabric filters to control dust emissions.

The railcars would be loaded while stationary on rail scales to assure optimal loading is achieved while minimizing rail traffic, energy use, and overall environmental impacts. Inside the Ore Transfer Building, the railcar cover would be opened, then a front-end loader would load the ore and waste rock into the railcars. Ore and waste rock would not be comingled in the same railcar. The covers would be closed and secured before railcars exit the ore transfer facility. [R2_Cmt_#946] Railcar movement and loading operations would be conducted during day shift hours to minimize noise and outside activity disrupting the local community.

Empty and loaded railcars would be stored at the railway yard (see section 6.21.1) adjacent to the Ore Transfer Building. The Project would utilize a railcar mover to transport the railcars between the rail loadout area and adjacent railway yard. BNSF locomotives would arrive to the site at regular intervals to collect loaded cars and return empty cars. An outgoing shipment of approximately 140 railcars would be collected by the BNSF approximately every 4 days. The Ore would be transported by railway from the Project Area to a stand-alone processing facility with a concentrator located off-site in Mercer County, North Dakota. [R1_Cmt_#11] [R2_Cmt_#221] [R2_Cmt_#21] [R2_CMT_#16] [R2_CMT_#17] [R2_CMT_#18]

6.19 Categories of Operations Water

The Project would manage the following types of water:

- Contact water – Water that has directly contacted ore and/or waste rock. [R2_Cmt_#952] Contact water would be generated both on the surface and in the underground mine and processed at the Contact Water Treatment Plant.
    - Contact water generated on the surface would include the wash bay and other water captured within the Ore Transfer Building. This water would be collected, pumped, processed at the Contact Water Treatment Plant.

    - Contact water captured in the underground mine would include groundwater inflow (including water that flows through backfill) and water brought down from the surface for equipment use & dust control. This water would be collected underground and pumped to the surface and processed at the Contact Water Treatment Plant.

- Industrial stormwater – Stormwater that has contacted industrial activities or areas and is not contact water. The “industrial stormwater area” comprises the majority of the Project footprint which is outside, including the roof, the Ore Transfer Building (see Figure 5). [R3_Cmt_#1393]

- Construction stormwater – Stormwater that has contacted construction activities or surfaces disturbed by construction.

- Construction water – Surface water and groundwater encountered during excavation or construction activities that is removed to dry and/or solidify a localized area to enable construction. [R2_Cmt_#955]

- Stormwater – Water from natural, stabilized, and reclaimed surfaces that has not contacted ore, waste rock, industrial activities, industrial areas, construction activities, or surfaces disturbed by construction activities.

- Non-potable water – Non-potable water would include contact water that has been treated by the Contact Water Treatment Plant (producing RO permeate), raw well water (potentially the same well that would feed the Potable Water Treatment Plant), and potentially water from the stormwater pond(s) (see "Flowchart of Water Types and Handling” Graphic 6.16). This water would be used both underground and on surface, in both the contact area and the industrial stormwater area.

    - On surface, this water would be utilized for dust control on roadways, washing mobile equipment, washing fixed equipment and surfaces, fire suppression sprinkler systems, Cemented Rock Fill, mine ventilation scrubbing, and other uses.

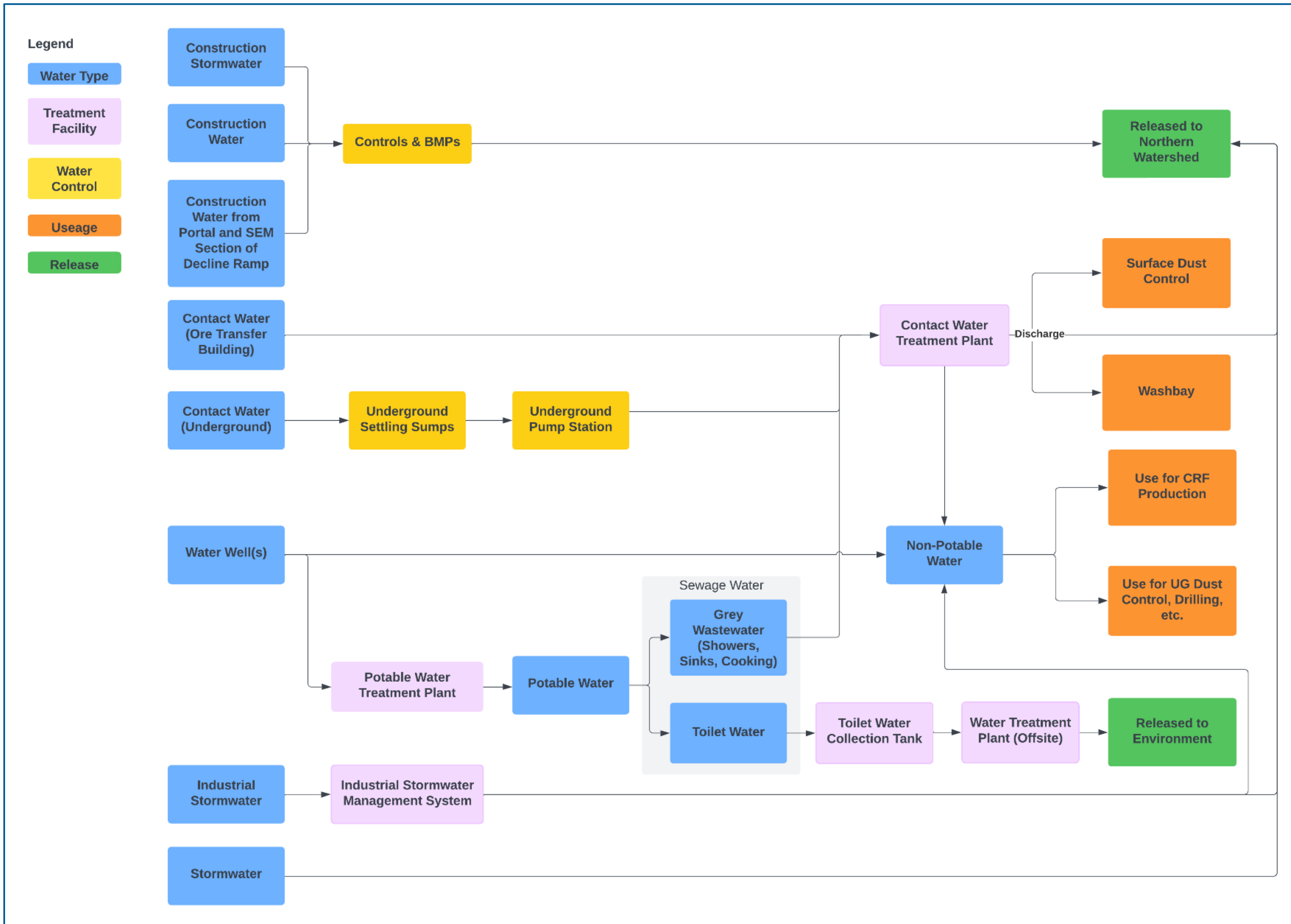
    - Underground, this water would be utilized for cleaning mobile and fixed equipment, dust suppression during materials handling, dust suppression and drill bit cooling during drilling operations, shotcrete batching, and other minor uses. [R1_Cmt_#238]

- Potable water – Water to be used for drinking, showering, and other purposes in the mine offices and locker room areas.

- Sewage waste – Waste produced by toilets, bathing, laundry, or culinary operations or the floor drains associated with these sources, or cleaning, collected from the mine offices and locker room areas.

Management of each type of water is described in the sections below and summarized in Graphic 6.16. Waters discharged to the environment would undergo evaluation, with additional information to be included in the forthcoming EIS data submittal. [R2_Cmt_#268]

Graphic 6.16 Flowchart of Generation and Management of Water Categories



[R1_Cmt_#239]

6.19.1 Management of Contact Water in the Underground Mine

Generation of contact water underground would be minimized by actively controlling groundwater inflow to the mine. While most of the bedrock is highly competent with negligible primary permeability, the mine workings are expected to intersect local discrete zones and areas of enhanced permeability. When mining occurs in areas where enhanced permeability zones are expected to be encountered, probe holes would be regularly drilled in front of the advancing mining faces to confirm the extent and boundary of the upcoming permeability zone and evaluate the degree of water inflows.

If a predetermined rate of inflow and duration is detected by the probe hole, additional holes could be drilled, which would be pressure-grouted using an injected resin or cementitious grout that would reduce groundwater inflow prior to advancing the mine workings through the area. Additional grouting (filling the annular space, or space between the well pipe and external protective casing, with grout) and sealing of discrete zones of enhanced permeability would be conducted as needed to minimize groundwater inflow occurring after the mining excavation has advanced through the area. [R2_Cmt_#258] [R2_Cmt_#263] [R2_Cmt_#863] [R2_Cmt_#974] Minnesota Rules, part 4725.0100, subpart 30 defines grout as "a low permeability material used to fill the annular space around a casing, or to seal a well or boring. Grout is either neat-cement grout, cement-sand grout or bentonite grout."

Contact water from the underground mine would be collected at underground settling sumps where initial solids removal would take place. Overflow water from these sumps would be routed to a pumping station. These pumping stations would include a secondary settling sump that would allow further settling prior to being pumped up the ramp to the Contact Water Treatment Plant on surface. Fines that accumulate in the underground settling sumps would typically be silt-sized particles consisting of varying portions of eroded roadbed material, drill cuttings from ore and waste rock, blasting fines from ore and waste rock, and shotcrete/cement fines. Fines would be removed from sumps then transported to the rail loading buffer area for transportation to the concentrator. [R2_Cmt_#203] [R2_Cmt_#893] [R2_Cmt_#927] [R2_Cmt_#936]

The volumes of water delivered to and pumped from the underground workings would be continuously monitored using flow meters and totalizers. Groundwater inflows would be estimated by calculating the difference between the measured volumes of water supplied to the mine and the volumes pumped out. This approach would provide a practical method for tracking groundwater inflow over time and evaluating the effectiveness of inflow control measures. [R3_Cmt_#1399]

A leakage detection system for the Decline Ramp is not planned, as it is not typical for this type of tunnel. The mine's underground water management system during operations would collect water from groundwater inflow, equipment, and general usage. These waters would be pumped to surface and routed to the Contact Water Treatment Plant. Detailed inspections of the Decline Ramp would be performed quarterly. Repairs would be carried out in accordance with General Plans of Operations. [R2_Cmt_#60] [R2_Cmt_#61] [R2_Cmt_#62] [R2_Cmt_#63] [R2_Cmt_#67] [R2_Cmt_#87]

6.19.2 Management of Contact Water on the Surface

Talon recognizes and respects the community's concern about potential environmental impact, particularly as it relates to water quality. Our project team is committed to using advanced, effective, and sustainable technology to ensure that water discharged from our operations is treated to applicable water quality standards. [R2_Cmt_#242]

On the surface, contact water would only be generated within the Ore Transfer Building. Vehicles operating within the building would be “captive,” and would rarely need to exit the building. Vehicle exiting the Ore Transfer Building would go through a vehicle wash, with water collected and managed as contact water. [R2_Cmt_#944]

Section 6.19.3 describes the Contact Water Treatment Plant, and Section 6.19.4 describes the management of the discharge from the Contact Water Treatment Plant.

6.19.3 Contact Water Treatment Plant

Contact water would be treated at the Contact Water Treatment Plant primarily using reverse-osmosis (membrane filtration), a technology that is successfully used by other mining operations and even in municipalities to produce potable water. As responsible stewards of the environment, Talon is resolved to have a treatment solution that meets or exceeds regulatory standards and safeguards water resources. [R2_CMT_#20] [R2_Cmt_#236] [R2_Cmt_#255] [R2_Cmt_#256] [R2_Cmt_#257]

The Contact Water Treatment Building (approximately 32,722 ft^2 (3,040 m^2)) would accommodate the reverse-osmosis treatment plant, ancillary pumps and components, as well as the potable water treatment plant. A non-potable water buffer tank, a fire water storage tank, a potable water buffer tank, as well as the sewage wastewater collection tank and system would also be accommodated in the vicinity of the building. A scrubber water handling system would be located on the Surface Raise #2 pad, whose input and output streams recirculate to the Contact Water Treatment Building.

Contact water would be pumped from the underground operations to the surface for treatment. It would undergo a series of processes, including clarification, reverse osmoses membrane treatment, and softening, to produce two water streams: one suitable for recirculation to operations, and another for discharge at the surface into the watershed to the north of the Project Area. Residual solid waste (e.g. salt derived from brines) from the Contact Water Treatment Plant would be disposed of at a suitably licensed landfill. [R3_Cmt_#1390] The precise system and configurations would be included with the EIS data submittal for evaluation. [R2_Cmt_#309]

6.19.4 Management of Non-Potable Treated Water

Contact water treated at the Contact Water Treatment Plant would become non-potable treated water. This water would be discharged to the watershed near the northern boundary of the Project Area in accordance with a future National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) permit. [R2_Cmt_#983] [R2_Cmt_#985] The watershed drains to the Tamarack River through a public drainage system that consists of a ditch and an altered natural stream (see Figure 7). [R1_Cmt_#279] The specific discharge location for the Water Treatment Plant would be decided by additional design development and would be presented in the EIS. [R2_Cmt_#540] [R2_Cmt_#269]

A portion of the non-potable treated water would be utilized on site for dust control, the fire suppression sprinkler system, underground drill bit flushing, equipment washing, backfill mixing, and other uses. [R2_Cmt_#238] It is anticipated that non-potable treated water from the Contact Water Treatment Plant would be sufficient to meet these needs. However, an additional water supply well would be installed to supply mining activities if the volume of non-potable treated water is not sufficient to meet non-potable water demand. For clarity, a well is defined in Minnesota Statutes 103I.005, subdivision 21 as an "excavation that is drilled, cored, bored, washed, driven, dug, jetted or otherwise constructed if the excavation is intended for the location, diversion, artificial recharge, monitoring, testing, remediation or acquisition of groundwater." The total volume of water to be appropriated from groundwater (mine inflows and pumping from wells) would be variable during the life of Project and dependent on but not limited to the site water balance and volume and timing of groundwater inflows into the mine. The site water balance and prediction for timing and volumes of mine inflows would be discussed in the EIS data submittal and provide input to estimating the water to be appropriated from well(s). [R2_Cmt_#283] [R2_Cmt_#284] [R2_Cmt_#987]

6.19.5 Management of Potable Water and Treatment Plant

Potable water for the facility would be sourced from a new well situated in proximity to the facility. The EIS would provide additional details regarding the precise location and design of the well. Based on preliminary assessments, the well is expected to draw from the basal permeable outwash sediment to ensure a reliable supply. [R2_Cmt_#1134]

The potable water well would supply water to a storage tank upstream of the potable water treatment plant. The treatment plant would have sufficient capacity to produce 8,000 gallons per day of potable water for the facility. [R2_Cmt_#990] Raw water would be processed through a treatment plant to meet the necessary specifications required for drinking water. Final potable water treatment design would be determined based on the results of source water quality testing. [R3_Cmt#_1411]

The design, construction, and operation of a potable water supply system would be subject to review and approval by the Minnesota Department of Health (MDH) under Minnesota Rules. These rules require submission and approval of complete plans and specifications prior to construction to demonstrate compliance with state drinking water standards and the federal Safe Drinking Water Act. Because the potable water treatment system design remains under engineering development and must undergo formal MDH plan review before implementation, detailed treatment processes are not provided at this stage of the Environmental Assessment Worksheet because the aforementioned reviews will take place during permitting.

The potable water well would be routinely monitored, and samples analyzed as required by the Safe Drinking Water Act and applicable MDH requirements to ensure compliance with state and federal drinking water standards. [R2_Cmt_#285]

6.19.6 Management of Industrial Stormwater

Industrial stormwater would be generated from portions of the site where precipitation, stormwater runoff, and snowmelt runoff come into contact with industrial activities or areas, as shown in Figure 5.

Industrial stormwater would be managed in accordance with the requirements of a future NPDES/SDS permit and an associated project-specific industrial Stormwater Pollution Prevention Plan (SWPPP). Best management practices (BMPs) would be specified in the industrial SWPPP and implemented to reduce or eliminate exposure of stormwater to pollutants (e.g., material storage and management practices, spill prevention practices) or remove contaminants from stormwater (e.g., stormwater treatment systems) prior to discharge from the site. [R2_Cmt_#172] [R2_Cmt_#270] [R2_Cmt_#270]

Industrial stormwater would be routed through appropriate treatment systems, specifically wet sediment basins, before discharging to the watershed near the northern boundary of the Project Area, in accordance with a future NPDES/SDS permit. The Project is designed to comply with the Minnesota Pollution Control Agency's (MPCA) requirements under the NPDES/SDS program for stormwater associated with industrial activity. Although infiltration systems were considered, Condition 20.6.b of this program prohibits infiltration systems in areas with less than three feet of separation between the base of the infiltration basin and the seasonally saturated soils or the top of bedrock. Given the site's depth to water, which is often near or below this threshold (as shown in Figure 8), infiltration is not considered viable. [R2_Cmt_#272] [R2_Cmt_#273]

Surface Industrial stormwater would follow constructed ditches on the surface that would channel the water to the stormwater collection ponds. Industrial stormwater run-off from large impervious surfaces such as the vehicle parking lot would be routed via gravity to industrial stormwater ponds. The evaluation of stormwater to ensure it meets appropriate standards, including monitoring and compliance, would be addressed during the future permitting process under the NPDES program. This process would specify monitoring requirements and establish protocols to confirm that water quality aligns with standards set forth in Minnesota Rules, chapter 7050.0220 subpart 3a, and other applicable regulations. The Project is investigating routing water from the stormwater pond(s) to the non-potable water system.

6.19.7 Management of Construction Stormwater and Construction Water

Construction stormwater and any water removed during construction activities would be managed in accordance with the Minnesota Construction Stormwater General Permit and a project-specific construction SWPPP. BMPs would be specified in the construction SWPPP and implemented during construction to prevent erosion (e.g., temporary and permanent soil stabilization), control sediment (e.g., silt fences, sediment logs, temporary sediment basins), and otherwise prevent impacts to the environment (e.g., spill prevention practices, material storage and management practices). Construction stormwater and construction water would be treated by and discharged through appropriate BMPs to the watershed near the northern boundary of the Project Area. [R2_Cmt_#273] [R2_Cmt_#274]

6.19.8 Management of Stormwater

Stormwater encompasses runoff, snowmelt runoff, and other surface runoff and drainage from natural, stabilized, and reclaimed surfaces that have not contacted ore, waste rock, industrial activities, industrial areas, construction activities, or surfaces disturbed by construction activities. This type of runoff would not require coverage under an NPDES/SDS permit unless it mixes with stormwater from areas requiring permit coverage.

6.19.9 Management of Sewage Waste

Sewage waste management for the project encompasses two primary waste streams: toilet waste and gray water. Toilet waste would be managed separately from gray water, which includes water from activities such as showering and handwashing. Each waste stream follows a distinct pathway for collection, treatment and disposal to ensure compliance with environmental and health standards. [R2_Cmt_#288] [R2_Cmt_#289]

6.19.9.1 Toilet Waste

Toilet waste, defined as waste commonly disposed of in toilets (including fecal matter, urine, toilet paper, and flushing water), would be routed by gravity to a lifting station and then pumped into a holding tank, until it can be transported to a treatment facility. Toilet waste from the underground operations would be collected and conveyed to the holding tank, which would be sized to accommodate expected daily flows, with additional capacity to account for any temporary interruptions in disposal. A service provider would collect the toilet waste from the holding tank and transport it to a nearby municipal wastewater treatment facility for disposal.

The anticipated flows and design are based on two shifts of up to 75 employees each under in full production operating conditions. According to MN Rule Chapter 7081, Part 7081.0130, Table 1, anticipated flows for commercial/industrial facilities—adjusted in accordance with MN Rule Chapter 7080.2240 Subpart 1.A—are as follows:

- Employee/8-hr shift = 17.5 gpd (66 L/day) /employee * 0.4 (toilet waste) = 7 gpd (26.5 L/day) /employee
- Employee/8-hr shift with showers: 25 gpd (94.6 L/day) /employee * 0.4 (toilet waste) = 10 gpd (37.9 L/day) /employee

Based on a conservative estimate, the daily flow to the holding tank would be approximately 2,250 gallons (8,500 L), calculated as 150 people x 10 gpd (37.9 L/day) x 1.5 (adjustment from 8-hr to 12-hr shift).

6.19.9.2 Gray Water

"Gray water" means sewage that does not contain toilet wastes, which would be routed by gravity to a lifting station and then pumped to the Contact Water Treatment Plant.

The anticipated flows and design are based on two shifts of up to 75 people each under in full production operating conditions. According to MN Rule Chapter 7081, Part 7081.0130, Table 1, anticipated flows for commercial/industrial facilities—adjusted in accordance with MN Rule Chapter 7080.2240 Subpart 1.A—are as follows:

- Employee/8-hr shift = 17.5 gpd (66 L/day)/employee * 0.6 (gray water) = 10.5 gpd (39.8 L/day) /employee
- Employee/8-hr shift with showers: 25 gpd (96.4 L/day)/employee * 0.6 (gray water) = 15 gpd (56.8 L/day) /employee

Based on a conservative estimate, the daily flow to the Contact Water Treatment Plant would be approximately 3,375 gallons (12,800 L), calculated as 150 people x 15 gpd (56.8 L/day) x 1.5 (adjustment from 8-hour to 12-hour shift).

6.20 Utilities

Project utilities would include electrical services, propane, diesel, compressed air, and water pipelines.

6.20.1 Main Incomer Substation

Electric power would be sourced from the existing 69kV Great River Energy transmission line through the north end of the Project Area and would step down for distribution at site. [R2_Cmt_#299] [R2_Cmt_#996] The Project would have an average electrical load of less than 12.5 MW (megawatt) when in full production, dependent on the level of equipment. A substation would be constructed to accommodate Project power demand during operations. A short overhead branch line would be constructed to connect the substation to the existing transmission line. After the substation is commissioned and online, electrical power would be distributed around the site using a mix of underground conduits, surface raceways, and/or overhead power lines.

Prior to commissioning the substation, temporary construction power would be drawn from an existing substation near Tamarack and could be supplemented with diesel electrical generators to accommodate the larger power draw of equipment like a Mobile Tunnel Borer if utilized. During operations, diesel electrical generators would be used as emergency backup power generation for critical systems required to protect life, the environment, and property.

Propane and diesel fuel storage is addressed below in 6.21.5.

Compressed air supply for operations is addressed below in 6.21.7.

6.20.2 Site Electrical Reticulation and Distribution

Power supplies would be provided to the Ore Transfer Building and the Contact Water Treatment building, from where power would be internally distributed, including to the small power and lighting circuitry. Two supply cables (for redundancy), which include one main and one redundant line, would be installed to feed the ventilation and underground electrical power consumer stations.

Electrical distribution would include support for site lighting for the rail yard and main site parking area, as well as the outdoor backfill materials buffer.

6.20.3 Emergency Electrical Generators

Emergency power generation on the surface would be sized to supply emergency power to the underground infrastructure facilities, as well as to the surface-mounted mine ventilation fan motors. Diesel-driven electrical generators would supply emergency power to the underground network, and to surface-based mine ventilation, egress lighting, and water treatment system. The emergency electrical generators would be located in a central location on surface, near the fuel storage area, and farther than 100 ft (30.5 m) from the access tunnel ventilation fan inlets. The size and quantity of the diesel-driven emergency generators will be provided during the EIS data submittal.

6.21 Support Facilities

A variety of support facilities would be required to sustain the operation. The Vehicle Maintenance Facility located within the Ore Transfer Building would have multiple heavy-vehicle repair bays sized to be able to accommodate the largest equipment utilized by the Project, including an overhead gantry crane. The Ore Transfer Building would include locker rooms, showers, crew lineout areas. It would also contain a bay for emergency response vehicles and gear.

Access to the site would be controlled via a gate at the entrance. Sufficient parking would be provided to accommodate all personnel and visitors expected to be onsite during a shift, plus some additional parking to accommodate the arrival of a limited amount of personnel from the subsequent shift prior to the departure of the previous shift's personnel. Employees would access the Administration and Locker Room facilities within the Ore Transfer Building.

6.21.1 Rail Yard

The project would access the BNSF mainline northeast of Tamarack, MN. To create an efficient exchange of unit train sets while minimizing the footprint, the rail yard would provide three parallel full unit train length tracks adjacent to the mine surface facilities connected at both ends to accommodate a loaded unit train set for release to BNSF, receipt of the empty unit train set returning for loading and a "run-through" track to maintain full access (see Figure 4). [R2_Cmt_#222] The use of shorter lighter weight railcars would result in these parallel tracks being less than 6,300 ft (1,920 m) in length allowing a single 0.2-mile (0.30 km) spur track to the mainline wye connection. The mainline connection would be designed as a wye connection providing efficient access from either the west or east and allow BNSF to turn locomotives (or railcars) around as necessary. Each intersection of the wye would be accessed by a new gravel road for switch operation and maintenance. This road would be an extension of the existing driveway for the Talon-owned property immediately adjacent to the BNSF track (Figure 3).

A loadout siding connecting at both ends to the rail yard tracks would allow movement of railcars into the enclosed railcar loading area within the Ore Transfer Building. Each railcar would be inspected for mechanical issues prior to loading. If an issue arose that cannot be corrected immediately, the railcar would be "bad ordered" and moved to the set-out track for repair or shipment to a railcar repair shop. A set-out track would be located north of the crossover to the ‘run-through’ track (Figure 4). [R2_Cmt_#228] This configuration would help to optimize rail operations while minimizing overall footprint. [R2_Cmt_#42]

Index railcar loading would fill six railcars of a longer string of cars at a time and then move forward (indexes) to fill the next railcar(s). This method would position the railcars on track scales and move rock into the railcars until they are filled to the optimum weight to provide the most efficient shipping. The covers would then be secured on each railcar before being moved out of the Ore Transfer Building. Each railcar would pass through an air-wash to remove fugitive particulates before exiting the building. After up to 20 railcars are loaded and securely enclosed, the railcar mover would pull this group of loaded railcars forward on the lead track to clear the cross-over switch. After the switch is realigned, the railcar mover would push up to 20 loaded railcars out on the release track connecting them to the previously loaded railcars. In this manner all loaded railcars would be staged for release as part of the next unit-train shipment. The railcar mover would then return to the Ore Transfer Building to continue indexing railcars for loading. This index railcar loading approach can reliably fill ~36 railcars per day to transport a 4,000 ton (3,600 tonnes) daily production rate.

Loading of the railcars would occur within the Ore Transfer Building with a dust collection system designed to meet EPA method 204 enclosure standards. In the event of a temporary BNSF slowdown, ore and waste rock would continue to be stored in the enclosed Ore Transfer Building or in the underground. The railcars would be weather-tight to prevent precipitation contact and dust emissions. Talon is currently expecting to use conventional gondola railcars with covers made of solid and impervious material that would be securely fitted, enclosing the railcars prior to exiting the Ore Transfer Building. [R2_Cmt_#226] All railcars used would be completely enclosed throughout transit between the Ore Transfer Building and the processing destination. Empty railcars would be stored with the covers in place in the Tamarack and/or other suitable off-line rail yards. [R2_Cmt_#229]

With the current expected optimal payload capacity of 115.7 tons (105 tonnes) per railcar, each 140-car unit train would haul approximately 16,200 tons (14,700 tonnes). At the projected mine rate, BNSF would need to exchange train sets every 4.1 days on average. If a unit train was released every 4.1 days (about 90 trains per year), the annual shipments would total approximately 1.5M tons (1.3M tonnes). [R2_Cmt_#43] [R2_Cmt_#221] [R2_Cmt_#223] [R2_Cmt_#791]

The BNSF Railway would exchange the loaded unit train with a unit train of empty enclosed railcars returning from the processing facility in the on-site rail yard on a regular basis. About 36 of the empty unit train cars would be loaded each day and consolidated on the release track until the next 140-car unit train is filled and released for shipment. To accommodate some variations in BNSF’s rail cycle, a rail buffer area with up to 13,277 tons (12,000 tonnes) of capacity would be available within the Ore Transfer Building to prevent interruptions in material flows. [R2_Cmt_#224]

During transit, BNSF has responsibility for the railcars and their contents and has established protocols for managing derailments and necessary related environmental response for all commodities that they transport. Railcars would be inspected again at the destination after unloading and removed from service for repair if an issue is found.

6.21.2 Outdoor Backfill Materials Buffer

The outdoor backfill materials buffer would be sized to supply the backfill batch plant with externally sourced aggregate when waste rock production quantities are insufficient, as well as sand. A truck unloader facility would be provided at the Outdoor backfill materials buffer to facilitate rapid unloading of trucks at the mine site. The aggregate or sand would be offloaded, piled and conveyed into the Ore Transfer Building for use in the Backfill Plant.

6.21.3 Ore Crushing and Backfill Plant

The crushing and backfill plant equipment would be installed within the Ore Transfer Building. The backfill plant layout and equipment selection within the Ore Transfer Building would be based on the Simem WetBeton WB180 twin shaft mixer. The batching capacity of this plant would be 159 ft^3 (4.5 m^3), with a cycle time of 2 minutes, equating to 4,767 ft^3/hr (135 m^3/hr). This capacity was used to determine the sizing of the ancillary equipment in the batch plant. [R2_Cmt_#793] [R2_Cmt_#795] [R2_Cmt_#883]

Feedstock would include waste rock and commercially sourced aggregate. The waste rock would be fed into the backfill material crushing plant, where it would be crushed to less than 4 inches (10.2 cm). This crushed waste rock and/or the aggregate rock material would then be fed into the backfill plant, creating a Cemented Rock Fill. Once batched, the CRF would be transported by haul trucks to the underground for backfilling. [R2_Cmt_#93] [R2_Cmt_#173] [R2_Cmt_#182] [R2_Cmt_#885]

Cement needed to produce CRF and Hydraulic Fill would be delivered via trucks and conveyed using a pneumatic system to the cement storage bin adjacent to the backfill plant. The backfill plant may also be used to mix shotcrete for use underground. Water would be sourced from the site’s non-potable water sources (see section 6.19.4).

The ore transfer area within the Ore Transfer Building would accept run-of-mine ore from the mining operations and crush it to less than 8 inches (19.5 cm) to avoid potential for oversized rock to damage the rail cars. It also provides an opportunity for the operators to remove tramp metal from the ore flow, which can damage the crusher and further downstream processes. The crushed ore would then be conveyed into the Rail Loading Buffer Area and loaded into the rail cars by FEL.

6.21.4 Wash Bay

Any vehicle that has entered the mining operations or ore handling areas must go through the wash facility before exiting to outside roads to prevent the tracking of mined material outside of the Ore Transfer Building. The washing bay would be equipped with a concrete slab floor, one bay and high-pressure water washer guns. The bay would be sized to accommodate all major equipment including haul trucks and pickup trucks which would be washed one at a time. Raised platforms would be included within the bay to facilitate safe and efficient cleaning of the haul trucks. Water collected in the wash bay would drain to a collection sump, where an oil separator would remove oil and lubricants from the water for subsequent disposal. The water would then be pumped to the Contact Water Treatment plant for processing.

6.21.5 Fuel Storage Area

A total of 120,000 gallons (454,249 L) of propane storage would be installed, for use in the heating equipment for the various facilities. Propane is used for the ventilation fan/heater installation at the Portal, the ventilation fan/heater installation at Surface Raise #1, and heating for buildings where required. Two sets of ancillary equipment would be installed to service these users, which would include 2 vaporizer liquid feed pumps (1 x duty, 1 x emergency), an electrically heated vaporizer, piping, valves, electrical controls and instrumentation.

Liquid pressurized propane would be pumped to an electrically heated vaporizer, transforming the liquid into a gas, which would then be piped to the heating appliance, where it would be ignited to provide the heating to the airstream where it would be mounted.

Two 20,000-gallon (75,700-L) diesel storage tanks would store diesel for the surface, underground vehicles, and the emergency electrical generators. The double-walled fuel tanks, also known as a self-bunded tank, would be installed on tank supports. Hard stand concrete slabs on grade would be constructed adjacent to the storage tank, to allow for tanker refueling of the tanks. The diesel dispensing equipment and piping would route the diesel fuel to the inside of the Ore Transfer Building, where dedicated refueling bays would allow surface and underground vehicles to refuel without having to exit the controlled building. Diesel from the storage tanks would also be piped to the emergency electrical generators.

6.21.6 Dust Control System

The Ore Transfer Building and the rail loadout area within it require dust filtration for two primary purposes:

- To collect and filter air from ore handling areas and equipment, ensuring that employee dust exposure remains within safe levels as defined by the Mine Safety and Health Administration (MSHA).
- To filter building ventilation air, removing particulates before releasing it into the environment.

Based on experience designing and measuring ventilation rates from other ore processing and transfer facilities in northern Minnesota, greater than 2.0 cfm/ft^2 (0.6096 m^3/min/m^2) would be used to design this facility.

Furthermore, the design would meet the requirements of Total Enclosure according to the EPA (United States Environmental Protection Agency) Method 204. [R2_Cmt_#225] This criterion requires any open door to have 200 fpm (1.02 m/s) inward airflow to prevent dust from leaving the facility.

The ore transfer area would be 59,837 ft^2 (5,559 m^2) requiring a dust collection system of at least 119,673 cfm (56m^3/s). The backfill management area would be 36,748 ft^2 (3,413 m^2) and requires at least 73,496 cfm (35 m^3/s) of dust collection. The rail loadout area would be 54,907 ft^2 (5,101 m^2) and requires at least 109,893 cfm (52 m^3/s) of dust collection. Individual collection points on material processing equipment would come off these systems and be part of these total airflow volumes. The volume of air required at these process points would be calculated during detailed engineering design of the material processing systems.

To achieve this airflow rate, a dust collection system with sheet metal ducting would be installed inside the Ore Transfer Building. The air collected would be ducted to the dust collector and filtration baghouse located inside the building, where the air containing the dust would pass through filtration media to collect the dust particles. Periodic pulses of compressed air released into the dust filter bags, would dislodge the dust particles which would then be collected, and removed from the system. This material would be added to the ore transfer, which would then be loaded into gondola railcars.

Dry cartridge baghouses would be used for the facility. Each baghouse system would have a downstream particulate monitor to detect any upset condition in the cartridges that allow dust to pass the cartridge. Should this condition arise, the baghouse fan would be stopped, and an alarm would sound, which would require a maintenance technician to investigate the cause and repair the condition. The Project would provide an estimate of particulate capture efficiency of the dust control system as part of the EIS data submittal once additional engineering work has been completed. [R2_Cmt_#111]

6.21.7 Compressed Air

Compressed air would be produced and distributed to surface users, including dust collection and filtration baghouses, automated valves, and the gondola air wash. Additional compressed air would be supplied to the vehicle maintenance workshop for pneumatic tools and vehicle tire repairs.

Ambient air would be the source for the compressor equipment. Compressed air systems would be decentralized with generation, treatment, and storage systems located at discrete points across the Ore Transfer Building and Contact Water Treatment Building. The main components of the compressed air system would include air receivers, dryers/filters, and compressors. Refrigerant type air dryers (approximately 37°F (2.78°C) dew point) would be considered in the design where necessary to reduce the amount of condensate collected in the main pipe header on surface. Other components of the Compressed Air Plant include inline filters and water separators. Compressed air required for underground and mining operations use would be generated underground.

6.21.8 Mine Ventilation – Fans, Heaters, and Wet Scrubber

The ventilation system consisting of the Decline Ramp and the Surface Raises would be designed to provide a controlled and phased management of fresh and exhaust air to ensure safe construction and operational conditions for the underground workings.

As the SEM tunnel is constructed, the decline would be ventilated using two duct runs, each consisting of 4.5 ft (1.37 m). diameter 250 hp silenced fans and temporary heaters, supplying approximately 60,000 cfm (28.3 m^3/s) of air within 5 ft (1.52 m) plastic round ducts. The intake ducting, along with the fans and heater, would extend approximately 30 m back from the portal to prevent recirculation.

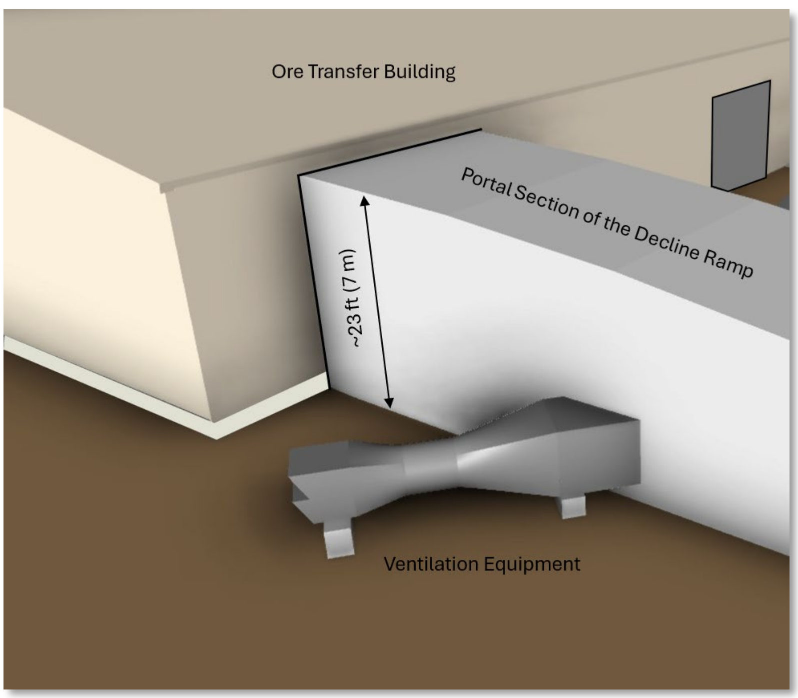
Construction of the surface raises would be prioritized once construction of the Decline Ramp transitioned from SEM to hard rock excavation. During this phase, the Return Air Raise (Surface Raise #2) would be prioritized for early commissioning. Surface Raise #2 would be equipped with twin fans with wet scrubbers, where each fan would have a capacity of approximately 400,000 cfm (188.8 m^3/s) and have a total fan duty of approximately 800,000 cfm (377.6 m^3/s). The fans would operate at a de-rated capacity until steady-state mining is reached. When Surface Raise #2 is commissioned, fresh air would continue to be ducted from the portal using the temporary fans and heaters.

Prior to the mining of the SMSU, the Fresh Air Raise (Surface Raise #1) would be completed and commissioned with twin fans and a total fan duty of approximately 730,000 cfm (344.5 m^3/s), each fan having a duty of approximately 365,000 cfm (172.3 m^3/s). At this time, the permanent portal heater would be commissioned and the fresh air would be drawn from Surface Raise #1 with a small amount of air (approx. 70,000 cfm (33.0 m^3/s) being fed from the portal to ventilate the decline between the portal and Surface Raise #1. All air would continue to be exhausted from Surface Raise #2. [R2_Cmt_#111] [R2_Cmt_#127] [R2_Cmt_#167] [R2_Cmt_#168]

6.21.9 <u>Mine Access Portal Tie-In to Ore Transfer Building</u>

Once the Portal and SEM Sections of the Decline Ramp are completed and the Ore Transfer Building is erected, the final tie-in and enclosure of the opening between the two structures would be installed to ensure that the ore being transported from the underground to the Ore Transfer Building is never exposed to outdoor air or precipitation. [R2_Cmt_#816] [R2_Cmt_#827]

Graphic 6.17 Rendering of the Portal Section of the Decline Ramp's connection to the Ore Transfer Building and ventilation equipment.



6.21.10 <u>Vehicle Maintenance Workshop</u>

The vehicle maintenance workshop, located within the Ore Transfer Building, would be equipped with equipment able to service both underground and surface vehicles. The equipment would include oil and grease lubrication dispensers, hydraulic fluid dispensers, coolant dispensers, along with hand tools and consumables.

6.21.11 Overhead Cranes and Monorail Hoist

An overhead gantry crane would be installed in the vehicle maintenance workshop, which would serve the vehicle service bays. The crane would have a lifting capacity of at least 8.25 tons (7.5 tonnes), able to lift the heaviest component from the body of a haul truck.

Above the rail loadout area, six individual hoists with spreader beams would lift and place the gondola railcar covers during and after loading operations.

6.21.12 Underground Maintenance Area and Storage

The maintenance facility would accommodate light duty maintenance including, but not limited to:

- Oil/lube top-up/replacement
- Tire changes
- Minor repairs, such as replacement of hoses, filters and small parts
- Preventative maintenance

In addition to the Underground Maintenance Facility, the underground would also require water filtration and pumping infrastructure, fans and ventilation infrastructure, diesel and lubricant storage areas, if needed battery charging stations, emergency refuge stations, electrical transformers and distribution equipment, explosives storage magazines, and a variety of other fixed infrastructure as typically seen in underground metal mining operations.

6.22 Reclamation and Closure

Reclamation would occur during operations and closure. The closure plan would be developed to ensure that, once implemented, the site would achieve a stable and self-sustaining condition without the need for ongoing, long-term maintenance. [R2_Cmt_#320]

During operations, depleted ore extraction drifts would be backfilled as mining progresses, as described above. Upon mine closure, if there is no beneficial reuse for the site, most surface and underground infrastructure would be removed, and disturbed surfaces would be regraded and revegetated.

Closure of the underground mine would progress in stages. When mining is complete, underground engineering controls such as water-tight barriers called bulkheads, or other controls could be constructed at various locations to minimize interaction between the deeper bedrock water and the shallower bedrock water. Other potential mitigation measures, such as increasing the rate of mine flooding would also be evaluated during the EIS.

To advance this planning and provide important data for both permitting activities and EIS analysis, the project intends to develop a model to predict water quality in the underground mine post-operations. This model would incorporate the mitigation strategy of increasing the rate of mine flooding, as research shows that oxygen—a necessary component for acid rock drainage (ARD)—has a very low diffusion rate through water and becomes quickly depleted under flooded conditions. By minimizing oxygen exposure, this strategy effectively limits/halts ARD progression. Further details on water quality modeling and specific backfill and flooding plans, along with other mitigation options that could be implemented as needed would be available in the Reclamation and Closure Plan included in the Permit to Mine. [R2_Cmt_#200] [R2_Cmt_#201] [R2_Cmt_#202] [R2_Cmt_#203] [R2_Cmt_#1006] [R2_Cmt_#1007] [R2_Cmt_#1012] During closure, water from the underground mine would be managed to meet regulatory requirements. The mine Decline Ramp, and mine development areas excavated outside the ore body would not be backfilled. [R2_Cmt_#1005] The determination of the appropriate timing for bulkhead sealing of the Ramp Decline would be guided by the requirements set forth in Minnesota Rules 6132, which emphasize ensuring stability and minimizing hydrologic impacts to protect natural resources. The decision on when to implement bulkhead sealing would be made in consultation with the Minnesota Department of Natural Resources (DNR) and detailed in the closure plan or permit to mine, with final approval by the Commissioner and County Mine Inspector. [R2_Cmt_#1009] [R2_Cmt_#79]

Details of reclamation and closure would be further discussed in the EIS data submittal. [R2_Cmt_#314]

6.23 Forthcoming Information

As engineering progresses additional details on project design, construction, operation, and closure would be developed and available to support the development of the EIS. Additional details are anticipated in areas such as:

- Construction of the railway spur and associated surface disturbance
- Project water balance and estimated discharge quantities
- Details on the water treatment facilities, including anticipated technologies that would be utilized
- Closure of the underground mine workings, including the engineering controls that would be employed

c. Project magnitude:

6.24 Project magnitude:

Project magnitude is described in **Error! Reference source not found.**. [R2_Cmt_#31] [R2_Cmt_#777] [R2_Cmt_#809] [R2_Cmt_#818] [R2_Cmt_#873]

Table 6.5 Project Magnitude

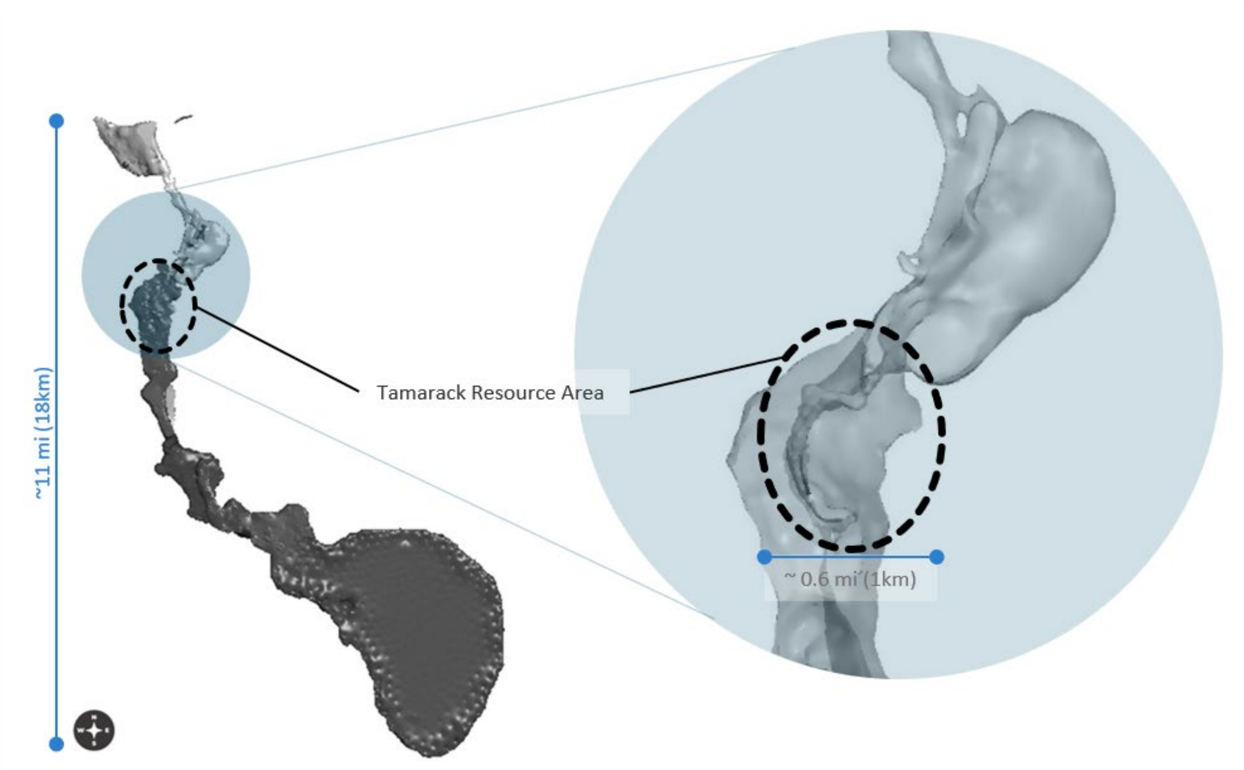
Description	Number
Total Project Area	378.8 acre (153.3 hectares)
Linear Project Length	2.13 mile (3.43 km)
Top of Mine (below ground surface)	300 ft (91.5 m)
Bottom of Mine (below ground surface)	2,000 ft (609.6 m)
Ore Transfer Building Area	173,654 ft^2 (16,133 m^2)
Ore Transfer Building Height	52 ft (15.9m)
Contact Water Treatment Building Area	32,722 ft^2 (3,040 m^2)
Contact Water Treatment Building Height	73 ft (22.3 m)
Exhaust Stack Height	78 ft (23.8 m)
Portal Tunnel Height	23 ft (7 m)

d. Explain the project purpose; if the project will be carried out by a governmental unit, explain the need for the project and identify its beneficiaries.

6.25 Purpose Statement:

The purpose of the Project is to mine high-quality non-ferrous metallic sulfide ore from the Tamarack Resource Area within the Tamarack Intrusive Complex using underground mining methods. This ore will be transferred via rail to Mercer County, North Dakota, for processing to produce predominantly nickel and copper concentrates and recover associated mineral products, including iron.

Graphic 6.18 Tamarack Resource Area within the Tamarack Intrusive Complex



e. Are future stages of this development including development on any other property planned or likely to happen? ☐ Yes ☒ No
If yes, briefly describe future stages, relationship to present project, timeline and plans for environmental review.

None currently planned. There is ongoing exploration activity conducted by the Proposer in the vicinity of the Project Area; however, given the uncertainty of the information that may be learned through exploration, no future development is currently planned. [R1_Cmt_#339] [R2_Cmt_#341] Should exploration yield potential for additional development, such activity would be subject to review under the Minnesota Environmental Policy Act and/or the National Environmental Policy Act as appropriate.

f. Is this project a subsequent stage of an earlier project? ☐ Yes ☒ No
If yes, briefly describe the past development, timeline and any past environmental review.

No, the Project is not a subsequent stage of an earlier project.

7.0 Climate Adaptation and Resilience

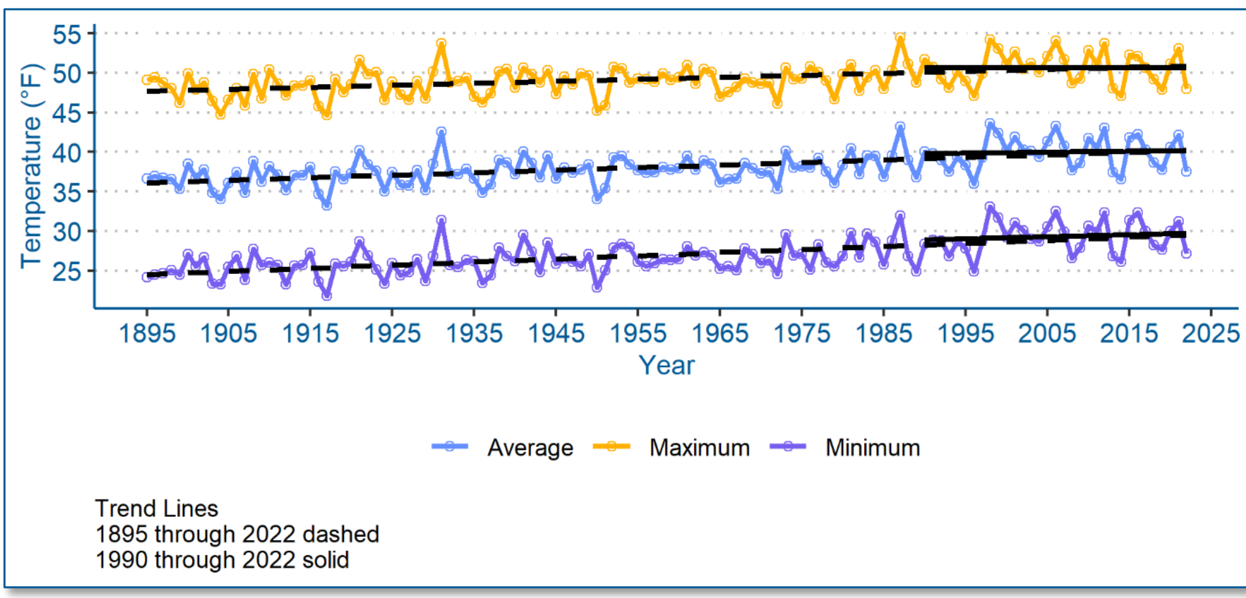
a. Describe the climate trends in the general location of the project (see guidance: *Climate Adaptation and Resilience*) and how climate change is anticipated to affect that location during the life of the project.

7.1 Project Historical Climate

Historical climate trends for the region in which the Project Area is located were obtained from the Minnesota Climate Explorer Tool (MDNR, 2023B) and based on data provided by the National Oceanic and Atmospheric Administration (NOAA) National Center for Environmental Information (NOAA, 2023). Historical temperature and precipitation trends for the Mississippi River – Grand Rapids watershed is summarized below.

Graphic 7.1 summarizes the historical climate trends within the region where the Project Area is located. Historical annual average temperature trends have increased by a rate of approximately 0.32°F (0.18°C) per decade from 1895 through 2022 and 0.11°F (0.06°C) per decade from 1990 through 2022. Maximum annual temperature trends have increased by a rate of approximately 0.25°F (0.14°C) per decade from 1895 through 2022 and stayed nearly constant from 1990-2022 at -0.04°F (-0.02°C) per decade. [R3_Cmt_#1451] Historical average minimum temperature trends have increased by a rate of approximately 0.39°F (0.22°C) per decade from 1895 through 2022 and by 0.25°F (0.14°C) per decade from 1990 through 2022 (MDNR, 2023B) [R1_Cmt_#349]

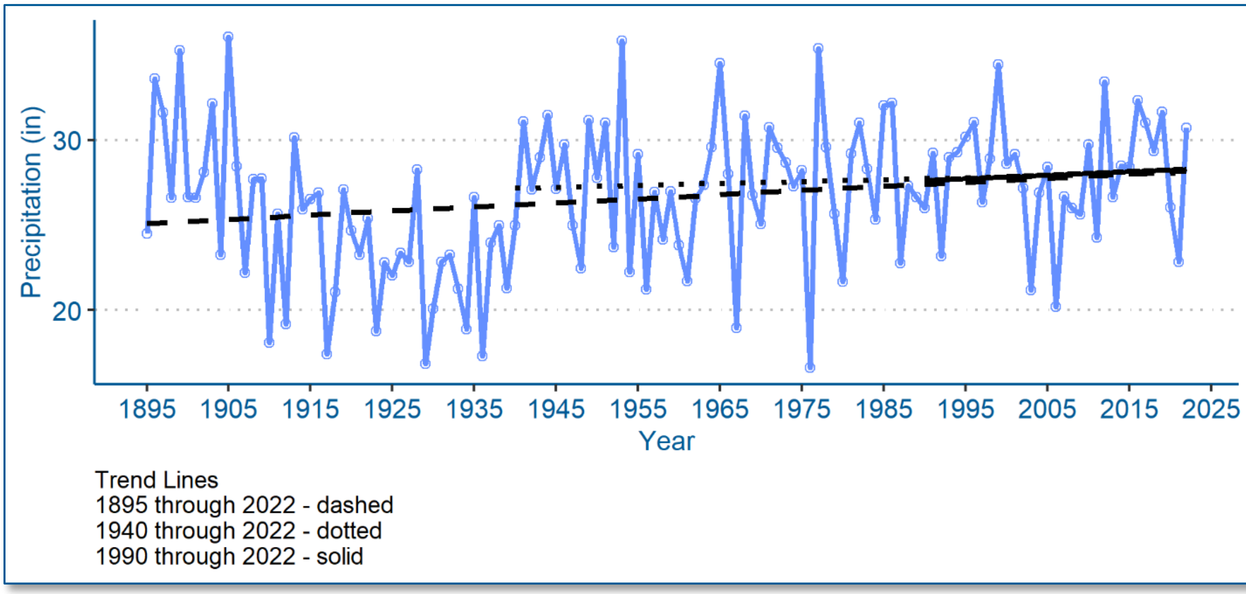
Graphic 7.1 Annual Temperature for the Mississippi River-Grand Rapids watershed from 1895 through 2022



[R1_Cmt_#349]

Graphic 7.2 summarizes the historical annual precipitation within the region where the Project Area is located. The overall annual precipitation trend from 1895 through 2022 shows an increase of approximately 0.24 inches (6.1 mm) per decade. This period captures both long-term climate variability and historical events, such as the drought from 1910-1940, which heavily influences the overall trend. To provide context for contemporary conditions, recent data from 1990-2022 were reviewed, showing an increased trend of 0.21 inches (5.3 mm) per decade. This recent period reflects more contemporary climatic patterns relevant to current project planning. [R2_Cmt_#349]

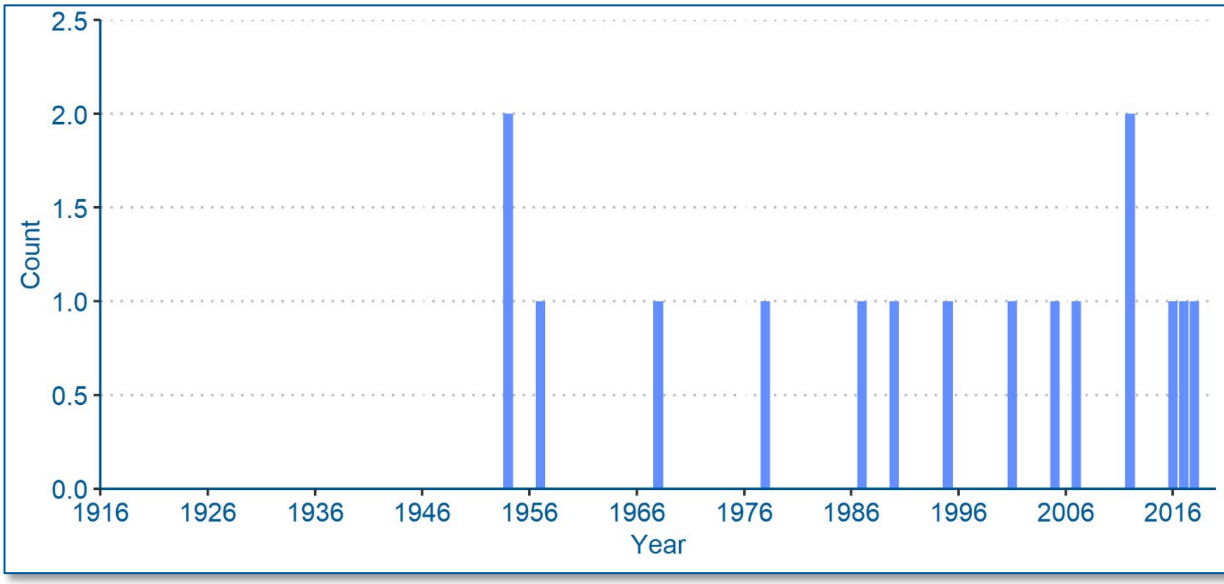
Graphic 7.2 Annual Precipitation for Mississippi River – Grand Rapids Watershed from 1895 through 2022



[R1_Cmt_#349]

The Mississippi River – Grand Rapids watershed has experienced an upward trend in annual precipitation, accompanied by an increase in the frequency of severe storm events in Minnesota since 1950 (Graphic 7.2). [R2_Cmt_#349] The data presented in Graphic 7.3 represents the number of 100 year storm events from 1916 to 2020 for 38 precipitation monitoring stations across Minnesota, including Ada, Canby, Cass Lake, Cloquet, Collegeville, Crookston, Duluth, Faribault, Grand Marais, Grand Meadow, Grand Rapids, Gull Lake Dam, Hallock, Itasca, Leech Lake Dam, Milaca, Milan 1NW, Montevideo, Mora, Morris, MSP, Park Rapids, Pine River Dam, Pipestone, Pokegama, Red Wing, Redwood Falls (Municipal), Rochester, Sandy Lake Dam, St. Cloud, St. Peter, Tracy, Two Harbors, Waseca, Wheaton, Winnebago, Winnibigoshish, and Zumbrota. [R2_Cmt_#350]

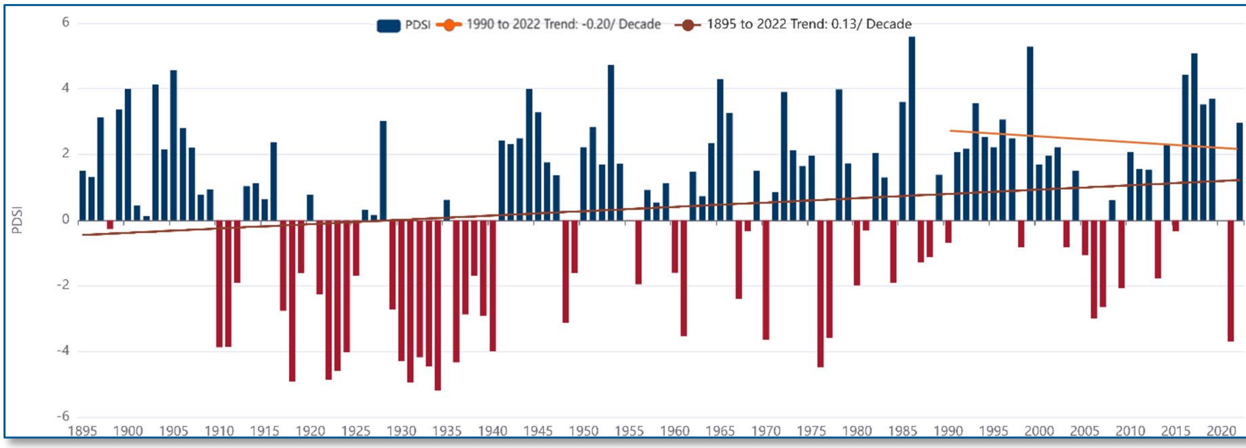
Graphic 7.3 Number of 100-year Storm Events from 1916 to 2020 for 38 Stations in Minnesota



The Palmer Drought Severity Index (PDSI) evaluates the increasing risk of drought by quantifying the duration and intensity of drought-inducing circulation patterns. Drought is generally defined as a prolonged deficiency of precipitation over an extended period, typically lasting a season or more. The PDSI is calculated on a monthly time scale but accounts for cumulative effects, meaning the drought intensity during a given month depends not only on current weather patterns but also on the moisture balance from preceding months. This cumulative methodology enables the PDSI to capture both monthly variations and persistent drought conditions that span seasons or years, providing a more comprehensive measure of drought severity across different time frames.

The index utilizes temperature and precipitation data to estimate soil moisture conditions, incorporating the influence of global warming through changes in potential evapotranspiration. It is a standardized metric where positive values indicate moisture surplus, and negative values indicate moisture deficit, generally ranging from -4 (severe drought) to +4 (severe wet conditions), with extreme values falling outside this range. Graphic 7.4 presents historic PDSI values for September (MDNR, 2023B), chosen to be conservative because late summer and early fall (August and September) often experience relatively dry conditions. This period is typically marked by reduced rainfall, higher temperatures, and increased evapotranspiration rates, which can exacerbate soil moisture deficits and contribute to meteorological drought. The dataset spans 1895 to 2022 for the Mississippi River - Grand Rapids watershed. The data reveal, a mean of 0.38, and a gradual upward trend in PDSI values, approximately 0.13 per decade, indicating a shift toward wetter conditions over this time frame. This trend is evident in the predominance of positive PDSI values over time, as depicted in the graph. To provide context for contemporary conditions, recent data from 1990-2022 were reviewed, showing a downward trend in PDSI values of -0.20 per decade, suggesting the region is drier in September but remains predominantly wet overall, with a mean PDSI of 1.26.

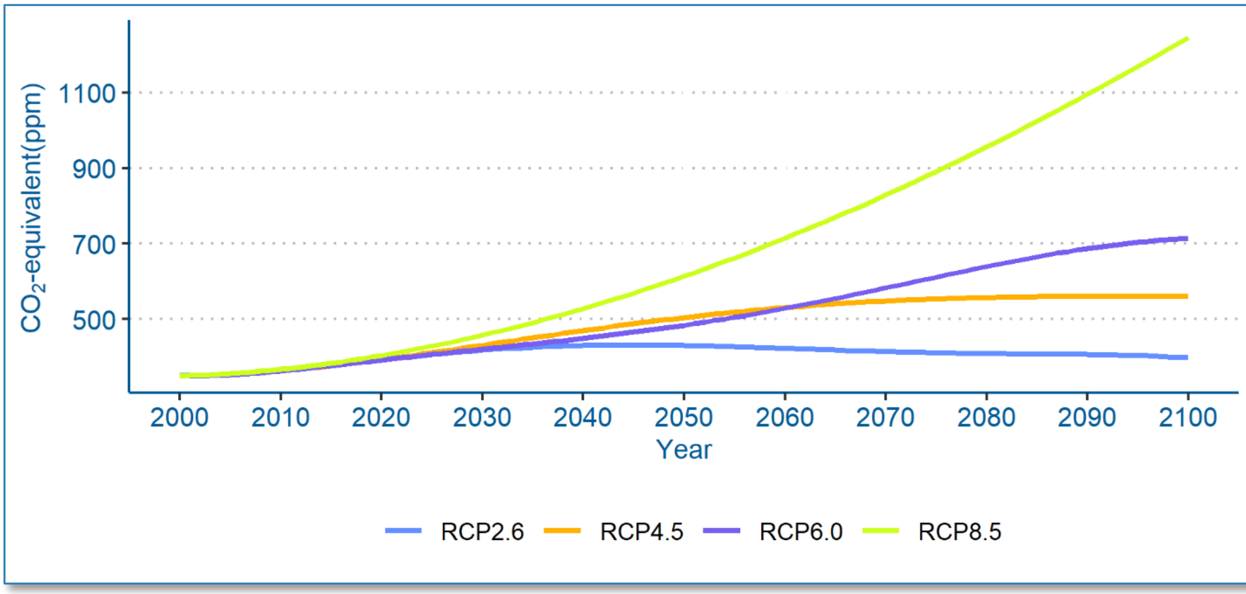
Graphic 7.4 Palmer Drought Severity Index for the Mississippi River-Grand Rapids Watershed (September)



7.2 Project Future Climate

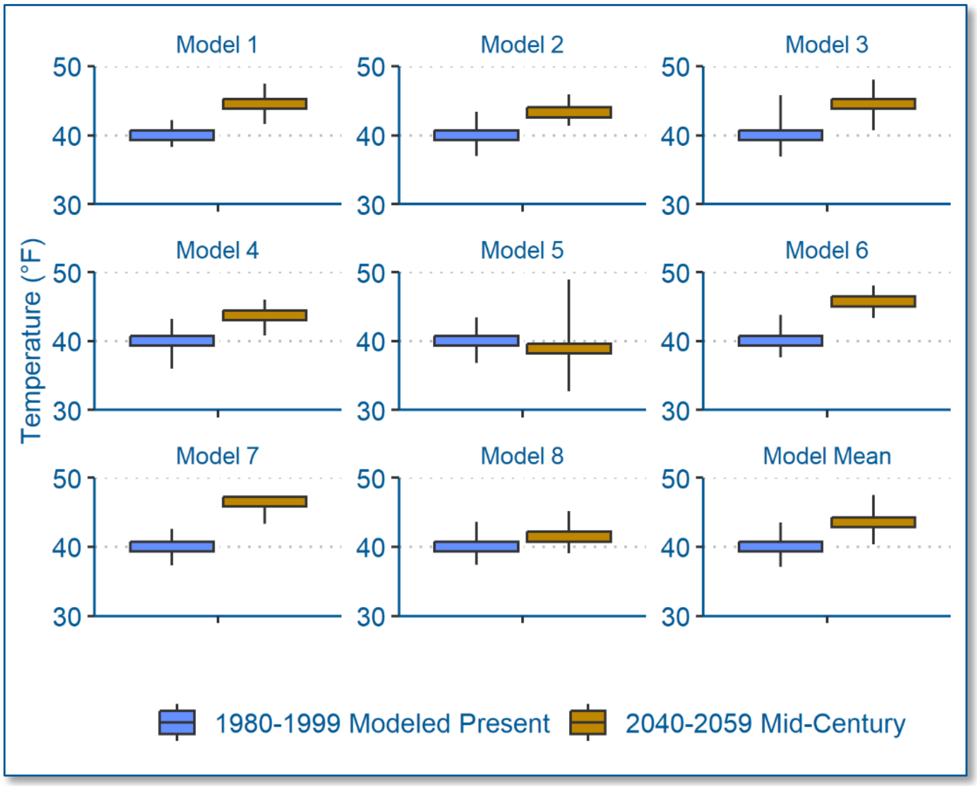
The future climate projections are based on a downscaled modeled dataset developed from the University of Minnesota (UMN). A more detailed analysis of the future climate would be addressed in the EIS. The UMN projected climate data summarized in two scenarios, Representative Concentration Pathway (RCP) 4.5 and RCP 8.5. RCP is a measure adopted by the Intergovernmental Panel on Climate Change (IPCC) to represent various greenhouse gas concentration pathways (Graphic 7.5). The RCPs model potential greenhouse gas concentrations and the warming effects on a global scale, rather than predicting specific emissions levels. This global framework facilitates the evaluation of broader climate outcomes, which are then applied regionally by downscaling data to Minnesota. [R2_Cmt_#1024] The numbers (i.e., 4.5 and 8.5) represent the amount of net radiative forcing the earth receives in watts per meter squared, where a higher RCP signifies a more intense greenhouse gas effect resulting in a higher level of warming. RCP 4.5 represents an intermediate scenario where emissions begin to decrease around 2040 and RCP 8.5 represents a scenario with no emissions reductions through 2100 (UMN, 2019). Radiative forcing is the term used to describe the impact trapped solar radiation has on earth's climate. The energy from this radiation can force climate change (Massachusetts Institute of Technology, 2020).

Graphic 7.5 Intergovernmental Panel on Climate Change Representative Concentration Pathways from the Fifth Assessment Report



The UMN projected data is published for eight different climate models (UMN, 2019). Graphic 7.6 shows the projected change in average temperature for the Mississippi River – Grand Rapids watershed. Changes in future annual average temperature projections for the Mississippi River - Grand Rapids watershed vary by climate model from the 1980-1999 30-year average baseline. For 2040 to 2059 under RCP 4.5, the temperature is projected to change by -3% (38.9°F (0.83°C)) to +16% (46.6°F (8.11°C)) across the models with an average increase of +9% (43.6°F (6.44°C)) (UMN, 2019). Graphic 7.6 shows modeled temperature trends in a different format.

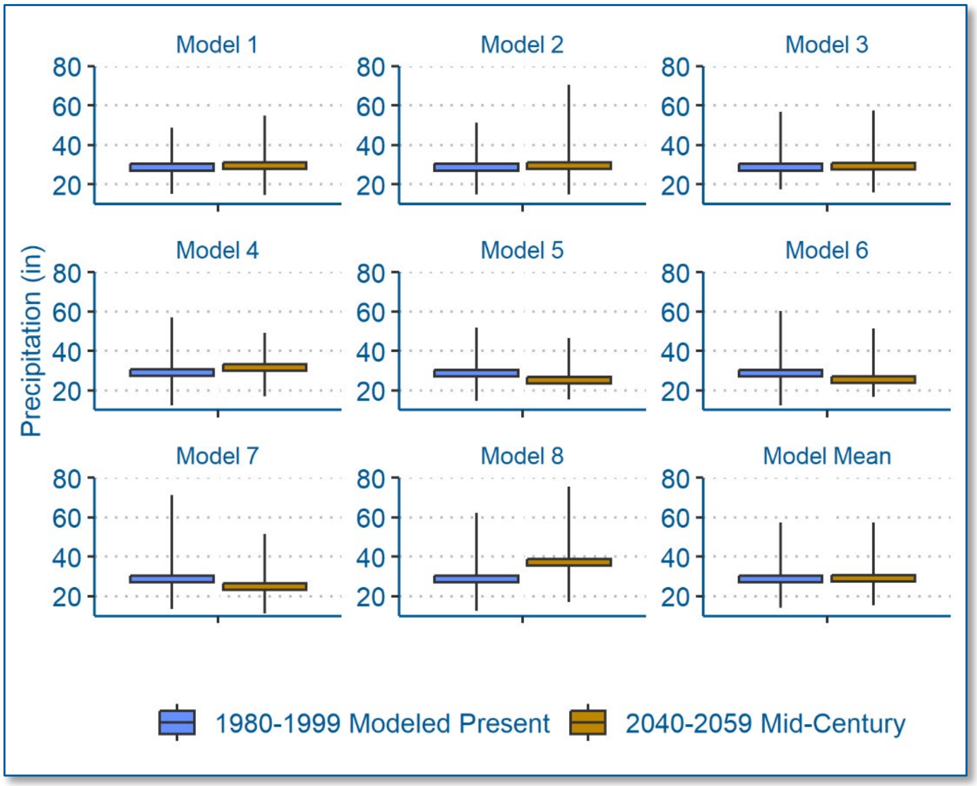
Graphic 7.6 Projected Annual Temperature Trends in the Mississippi River – Grand Rapids Watershed for Scenario RCP 4.5



[R1_Cmt_#35]

Graphic 7.7 shows the projected annual precipitation trend for the Mississippi River – Grand Rapids watershed. Changes in future annual average precipitation projections for the Mississippi River – Grand Rapids watershed vary by climate model from the 1980-1999 30-year average baseline. For 2040 to 2059 under RCP 4.5, annual average precipitation is projected to change by -14% (24.8 in (0.63 m)) to +29% (37.1 in (0.94 m)) across the models with an average increase of +1% (29.0 in (73.7 m)) (UMN, 2019).

Graphic 7.7 Projected Annual Precipitation Trends for Mississippi River – Grand Rapids Watershed for Scenario RCP 4.5



[R1_Cmt_#354]

The EPA Climate Resilience Evaluation and Awareness Tool anticipate an increase in 100-year storm intensity of 13.5% in 2030 and 26.3% in 2060 (EPA, 2022B). These projections suggest heightened storm intensity over the long term. Stormwater management and infrastructure design will account for current and anticipated storm intensities to support project resilience throughout its lifespan, (7-10 years). This approach will ensure that the project's systems are appropriately designed to handle foreseeable conditions as informed by current climate data. [R2_Cmt_#1029]

By mid-century, Aitkin County is projected to experience a modest increase in annual average temperatures of approximately 3°F (-16.1°C), with more frequent hot days above 90°F (32.2°C) and warmer nighttime minimums, particularly in winter and spring. While annual precipitation is expected to increase slightly, the number of wet days is projected to remain relatively constant, resulting in more rainfall during events. Despite these changes, the overall climate is anticipated to remain within the historical range of variability already considered in project design. (U.S. Global Change Research Program, n.d.) [R3_Cmt_#1450]

The EPA Streamflow Projections Map anticipates an increase in annual daily average streamflow by a ratio of 1.2-1.4 for the period 2071 to 2100 under RCP 8.5, compared to baseline historical flow from 1976-2005 (Bureau of Reclamation, 2014). These projections offer a general view of potential long-term streamflow changes based on annual averages. [R1_Cmt_#356] [R2_Cmt_#1030] The methodology and sources for future climate change projections used ion the various assessments would be detailed in the EIS data submittal. [R2_Cmt_#533]

Project operations are anticipated to last 7-10 years and therefore long-term climate change, with the exception of the already observed increase in extreme rainfall events, would have minimal impact on the location, during the proposed project period. [R2_Cmt_#358] Because the UMN future climate datasets are presented in 30-year averages that do not include the years of project life (2040-2059 and 2080-2099), a more detailed analysis of climate change impacts during the project life will be addressed in the EIS, which will include an evaluation of evapotranspiration. [R2_Cmt_#1028] [R1_Cmt_#344]

Given the relatively short project life of 7-10 years, long-term climate changes are unlikely to have a major impact on the project. However, the region has experienced more intense rain events in recent years, and this would be incorporated into project design. Table 7.1 describes adaptations that could be utilized to address future intense rain events.

Table 7.1 Summary of Climate Considerations and Adaptations

Resource Category	Climate Considerations	Project Information	Adaptation Strategies
Project Design	More frequent and intense rain events	The Project would convert an open area to an industrial area, resulting in loss of wetlands and associated flood storage, forest cover, and reduced carbon sequestration. Portions of the upland area may be used for agricultural production. [R4_Cmt_#1678]	Maintain existing vegetation where feasible. Plant buffer strips and additional vegetation. Minimize wetland impacts by reducing the development footprint and maximizing use of uplands.
Land Use	More frequent and intense rain events	No FEMA (Federal Emergency Management Agency) floodplains are located in the Project Area; however, it includes a wetland complex.	Construct stormwater best management practices (BMPs), including two stormwater ponds to reduce runoff velocities, erosion potential, and runoff volumes.
Water Resources	Climate-related impacts addressed in Section 12	Addressed in Section 12	Addressed in Section 12
Contamination / Hazardous Materials / Wastes	More frequent and intense rain events	will be stored on-site. A warmer and wetter climate may impact secondary containment. Hazardous wastes may be generated.	Use Above Ground Storage Tanks (ASTs) with double-walled construction meeting MPCA standards. Track and manage hazardous materials per regulatory requirements.
Site Infrastructure & Earthworks	Intense rainfall and runoff variability	Graded surfaces and drainage systems established for project layout.	Use engineered slopes and flood-resilient grading. Design site drainage to accommodate increased storm intensity.

Resource Category	Climate Considerations	Project Information	Adaptation Strategies
Buildings & Facilities	Seasonal temperature extremes and freeze-thaw variability	Most project activities occur indoors with enclosed, climate-controlled environments.	Ensure buildings are designed for thermal efficiency. Incorporate passive systems where applicable.
Transportation & Access	Seasonal freeze-thaw and localized flooding	Access via CSAH 31 and rail spur to BNSF line. Increased peak traffic during shift changes.	Use durable surfacing materials. Design culverts and swales to handle heavier rainfall.
Water Management Systems	Increased storm event intensity	More frequent high-flow events.	Design ponds and conveyances to manage extreme rainfall.
Water Management Systems	Reduced annual precipitation	Contact water is collected and reused when possible	Facility is less reliant on wells to source non-potable water
Energy Systems	Climate-resilient operations and emergency readiness	Project includes surface and underground ventilation and electrical systems.	Install emergency generators. Design facilities to maintain indoor conditions under variable climate loads.
Ecological Restoration & Reclamation	Long-term climate variability, drought resilience	Closure and revegetation to be planned at end of mine life.	Use native species suited to projected climate. Apply soil stabilization techniques and adaptive erosion control.

[R2_Cmt_#363]

8.0 Cover Types

Cover types in the Project Area before (as per the National Land Cover Database) (USGS, 2018), during and following Project development are summarized in Table 8.1. Green infrastructure elements before and following Project development are summarized in Table 8.2. Tree coverage before and following Project development is summarized in Table 8.3. Slight variations between totals in these tables may occur due to rounding.

Table 8.1 Existing and Proposed Cover Types

Cover Types within Project Boundary (Surface and Underground)	Before (acres)	Change due to Operations	During Operations (acres)	Change due to Closure	After Closure (acres)
Wetlands, shallow lakes (<2 meters deep) and ditches (public drainage systems)	271.5	-18.16	253.34	0.0	253.34
Deep lakes (>2 meters deep)	0	0	0	0	0
Existing Excavated Ponds	2.6	-2.3	0.3	3.8	4.1
Wooded/forest	49.4	-21.4	28	0.0	28
Rivers and/streams	0	0	0	0.0	0
Brush/Grassland	3.6	-0.1	3.5	42.8	46.29
Cropland	0	0	0	0	0
Livestock rangeland/pastureland	33.1	-13.4	19.7	0.0	19.7

Cover Types within Project Boundary (Surface and Underground)	Before (acres)	Change due to Operations	During Operations (acres)	Change due to Closure	After Closure (acres)
Lawn/landscaping	0	0	0	0.0	0
Green infrastructure TOTAL (from **Error! Reference source not found.**)	0	0	0	0.0	0
Existing Developed/Impervious surface	18.7	-3.5	15.2	0.0	15.2
Developed/Impervious surface	0	42.79	42.79	-42.8	0
Industrial Stormwater Ponds (wet sedimentation basin)	0	3.8	3.8	-3.8	0
Other (created upland)	0	12.3	12.3	0.0	12.3
TOTAL	378.9	0	378.9	0	378.9

[R1_Cmt_#375] [R1_Cmt_#239]

Table 8.2 Existing and Proposed Green Infrastructure

Green Infrastructure	Before (acres)	After (acres)
Constructed infiltration systems (infiltration basins/infiltration trenches/ rainwater gardens/bioretention areas without underdrains/swales with impermeable check dams)	0	0
Constructed tree trenches and tree boxes	0	0
Constructed wetlands	0	0
Constructed green roofs	0	0
Constructed permeable pavements	0	0
Other (describe)	0	0
TOTAL	0	0

Table 8.3 Existing and Proposed Trees

Trees	Percent	Number
Percent tree canopy removed, or number of mature trees removed during development	21.1%	Unknown
Number of new trees planted	[1]	Unknown

[1] As potential mitigation measures for visual and noise impacts, the Project is considering augmenting the existing natural buffer with additional trees. However, the quantity and extent have not been determined.

9.0 Permits and Approvals Required

List all known local, state and federal permits, approvals, certifications and financial assistance for the project. Include modifications of any existing permits, governmental review of plans and all direct and indirect forms of public financial assistance including bond guarantees, Tax Increment Financing and infrastructure. All of these final decisions are prohibited until all appropriate environmental review has been completed. See Minnesota Rule 4410.3100.

Anticipated Project permits and approvals are summarized in Table 9.1.

2020 **Table 9.1 Summary of Required Permits/Approvals**

Unit of Government	Type of Permit/Approval	Status
United States Army Corps of Engineers	Clean Water Act Section 404 Permit Includes Section 106 Consultation with the State Historic Preservation Office and Section 7 Consultation with the U.S. Fish and Wildlife Service (USFWS)	Pending submittal
United States Environmental Protection Agency	Class V Underground Injection Control (UIC) for hydraulic backfill	Pending submittal
United States Fish and Wildlife Service	Section 7 determination of effect concurrence	Pending submittal; issued with Section 404 Permit
Minnesota Department of Natural Resources (DNR)	Permit to Mine	Pending submittal
DNR	Natural Heritage Information System Protected Species Review	Pending submittal
DNR	Work in Public Waters Permit	Pending submittal
DNR	Water Appropriations Permit	Pending submittal
DNR	Wetland Conservation Act Replacement Plan Approval	Pending Submittal
DNR	License to Cross Public Waters	Pending Submittal
DNR	License to Cross Public Lands	Pending Submittal
DNR	Lease/Easements on Public Lands	Pending Submittal
DNR	Aquatic Vegetation Removal Permit	Pending Submittal
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Individual Wastewater Permit	Pending submittal
MPCA	NPDES/SDS Industrial Stormwater General Permit (or combined with Individual Wastewater Permit)	Pending submittal
MPCA	NPDES/SDS Construction Stormwater General Permit	Pending submittal
MPCA	Section 401 Water Quality Certification	Pending submittal; issued with Section 404 Permit
MPCA	Air Permit	Pending submittal
MPCA	Hazardous Waste Generator License	Pending submittal
MPCA	Aboveground Storage Tank Notification	Pending submittal
MPCA	Aboveground Storage Tank Permit	Pending submittal
Minnesota Department of Administration State Archaeologist	Office of the State Archaeologist (OSA) License [R2_Cmt_#384]	--
Minnesota Department of Health (MDH)	Water Supply Well Notification	Pending submittal
MDH	Water Supply Well Plan Review and Approval [R3_Cmt_#1473]	Pending submittal
Minnesota Department of Transportation (MnDOT)[R2_Cmt_#1045]	Railroad Warning Signal Operator License	Pending submittal
State Historic Preservation Office (SHPO)	Section 106 concurrence	Pending submittal; issued with Section 404 Permit

Unit of Government	Type of Permit/Approval	Status
Aitkin County	Building Permits	Pending submittal
Aitkin County	Conditional Use Permit [R3_Cmt_#1483]	Pending submittal

Note: Final determination of needed permits/approvals would be determined as part of the EIS.

[R1_Cmt_#383]

Cumulative potential effects are discussed in Section 21.0. [R2_Cmt_#1051]

10.0 Land Use

a. Describe:

i. Existing land use of the site as well as areas adjacent to and near the site, including parks and open space, cemeteries, trails, prime or unique farmlands.

The Project is in Aitkin County on a combination of state and private lands within the 1855 Treaty boundary, and is located approximately 3 miles (4.8 km) west of the adjudicated 1854 Treaty area. Talon recognizes and respects Native American communities retained rights to hunt, fish and gather. [R2_Cmt_#387] There are a handful of structures within the Project Area, including farmsteads and infrastructure associated with Talon's current exploratory drilling program. Existing land use around and within the Project Area consists of industrial development (environmental studies, geophysical surveys, and exploratory drilling), farmsteads and associated pastures/hay fields, areas of upland forest, timber harvesting tree plantations, and large wetland complexes. Some of the land in the area was ditched and drained several decades ago for agricultural purposes. [R1_Cmt_#47] [R1_Cmt_#392] [R1_Cmt_#393]

Portions of the Project Area would lie within Savanna State Forest, which would include a small section of surface infrastructure as well as portions of the underground mine. [R2_Cmt_#388] The larger surrounding area includes other land areas that, while not directly impacted by the Project, are worth noting in the context of the local watersheds. Savanna State Portage Park, located approximately 7 miles (11.3 km) northeast of the Project Area, is a notable recreational resource, and the Grayling Marsh Wildlife Management Area lies about 2.5 miles (4.0 km) west of the Project Area. Big Sandy Lake, located approximately 8 miles (12.9 km) northwest of the Project Area, is also a recreational resource known for boating, fishing, and other public recreational activities. [R3_Cmt_#1476] These areas provide important habitat and recreational opportunities. Although the Project is not anticipated to have direct or indirect impacts on these areas, they are part of the broader regional context and watershed. [R2_Cmt_#1053]

A snowmobile trail traverses through the southern part of the Project Area (Figure 10) and much of the state land in the area is used for hunting; however, no parks or other recreational resources are present in the Project Area. Public access to the active Project Area would be restricted year-round for safety reasons, precluding hunting within the mine site. No additional seasonal restrictions beyond existing state hunting regulations are proposed. Hunting opportunities on adjacent public lands would remain available subject to Minnesota Department of Natural Resources regulations. [R3_Cmt_#1475] Additional information regarding the cultural resource potential for the Project is discussed in Section 15.0 (Historic Properties).

There are no cemeteries located in the Project Area. Small areas of prime farmland (6% of the Project Area) and prime farmland if drained (10% of the Project Area) are located in the southern part of the Project Area; however, the majority of the Project Area (84%) is not classified as prime farmland per the United State Department of Agriculture - Natural Resources Conservation Service classifications (NRCS, 2022).

ii. Plans. Describe planned land use as identified in comprehensive plan (if available) and any other applicable plan for land use, water, or resources management by a local, regional, state, or federal agency.

The Project Area is located just north of the City of Tamarack in Clark Township. The City of Tamarack is currently in the process of developing a comprehensive land use plan. No comprehensive land use plan exists for Clark Township (City of Tamarack, 2021).

The Project Area is located in Aitkin County and falls under the Aitkin County Comprehensive Land Use Management Plan (Aitkin County Plan) (Aitkin County, 2000). The mining activity associated with the Project would result in a further conversion of land use from open to industrial land use. The Aitkin County Plan discusses mineral resources in the context of commercial and industrial development and promotes continued, but careful, exploration of mineral resources so the location and extent are known. Furthermore, the Aitkin County Plan emphasizes that extraction of minerals should follow state mineral regulations and assures environmental protection for all new non-sand and gravel mining proposals (Aitkin County, 2000).

iii. Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.

The Project is located in an area zoned by Aitkin County as Open and Farm Residential; the portion of the Project Area located near the City of Tamarack is identified as "City" in the Aitkin County zoning map (Figure 10). Figure 10 also shows tax-forfeited county-administered lands, state trust lands, and state-administered lands within the consolidated conservation (Con-Con) area. [R2_Cmt_#1230] The Project Area is not located within a designated shoreland area as defined by the Aitkin County Shoreland Management Ordinance. [R3_Cmt_#1479]

Example land uses in areas zoned as Open include the following: duplex dwelling, dwelling – secondary unit; agricultural and forestry uses; and floodplains, swamp lands, and other areas unsuitable or unsafe for development (Aitkin County, 2017). Per the Aitkin County Zoning Ordinance, mining in areas zoned as Open or Farm Residential may occur in accordance with the Aitkin County Mining and Reclamation Ordinance.

As stated in the Aitkin County Zoning ordinance, Section 6.01 "the Mining of metallic minerals …", as defined in Minnesota Statutes, sections 93.4-93.51, are regulated under the provisions of the Aitkin County Mining ;and Reclamation Ordinance (Aitkin County, 2009). No amendment to the zoning classification would be required for the proposed mining activities, as the project aligns with the existing zoning regulations. [R2_Cmt_#1057]

iv. If any critical facilities (i.e., facilities necessary for public health and safety, those storing hazardous materials, or those with housing occupants who may be insufficiently mobile) are proposed in floodplain areas and other areas identified as at risk for localized flooding, describe the risk potential considering changing precipitation and event intensity.

No critical Project facilities would be located in Federal Emergency Management Agency (FEMA)-delineated floodplains or areas identified as at risk for localized flooding. Additionally, the Project has eliminated the outside storage of materials that could be potentially hazardous, further reducing potential risks related to flooding. Furthermore, during the June 2012 500-year event, which saw between 7 to 10 inches of rainfall in a 24-hour period, the proposed upland location for the main surface facility was not affected by flooding. Given these measures and the site's resilience during past extreme events, the Project is well-positioned to mitigate potential flood-related risks. Additional assessment work will be performed including hydrology and hydraulic modelling for the EIS. [R2_Cmt_#400]

b. Discuss the project’s compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.

The conversion of land use from open to industrial land use would occur as a result of the Project. The Project would be compatible with current zoning and the Aitkin County Plan. As noted above, the Aitkin County Plan promotes exploration of mineral resources that follow state mineral regulations and assure environmental protection (Aitkin County, 2000).

c. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 10b above and any risk potential.

With a conditional or interim use permit, from Aitkin County, the Project would be compatible with current land uses; as such, no land use mitigation measures are incorporated into the Project.

11.0 Geology, Soils, and Topography/Land Forms

a. Geology – Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.

11.1 Surficial Geology

Quaternary deposits include glaciolacustrine (glacial lake) sediments, till and re-worked till deposited by glacial ice, outwash and glaciofluvial sands and gravels (Figure 11). The glaciolacustrine deposits in the Project Area appear to be composed of clayey sediment and fine-grained sand with silt and clay layers (Lusardi, 2019). Various layers of till, outwash, and glaciolacustrine sediments are present below the surficial sediments. These deposits represent a complex sequence of sediment recording multiple advances and retreats from the last glaciation which spanned 10,000-100,000 years ago. The glacial stratigraphy in the Project Area includes a relatively thick (typically 100-130 ft (30.48-39.62 m)) package of glacial sediments, with western-sourced pre-Wisconsinan tills and pre-Late Wisconsinan or pre-Wisconsinan Superior lobe tills overlain by the Wisconsinan Rainy Lobe (northeast-sourced) Independence Formation. In turn, the

Independence Formation is overlain by the Superior-basin sourced Cromwell Formation, and lastly by the Aitkin Formation. The Aitkin Formation consists of Glacial Lake Aitkin 2, Prairie Lake, Nelson Lake and Alborn members containing sediments deposited from the advance and retreat of the St. Louis-sublobe. The result of this depositional history is a complex layering of coarse and fine-grained sediments, ranging from predominantly sand to predominantly silt/clay, along with mixed layers of diamicton. Individual layers vary in thickness and may or may not be laterally extensive.

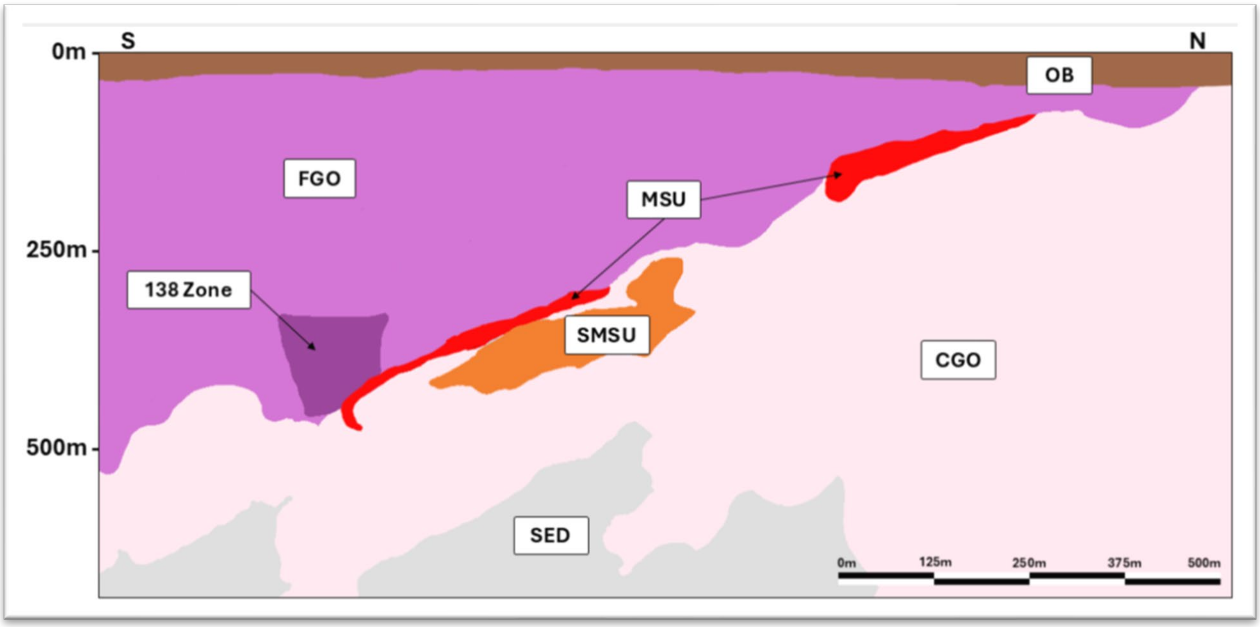
11.2 Bedrock

Bedrock in the Project Area consists of ultramafic to mafic igneous rock of the Tamarack Intrusive Complex (TIC) related to the early evolutions of the 1.1 billion years ago (Ga) Mid-Continent Rift which intruded into slates and graywackes of the Thomson Formation (Figure 12) ((Jirsa, 2011) and (Boerboom, 2009)). The Thomson Formation is part of the of the Paleoproterozoic Animikie Group which consists of metasedimentary rocks (SED) that were deposited in a deep-water basin that formed adjacent to a newly forming mountain belt to the south during the Penokean Orogeny (approximately 1.8 Ga) and subsequently was regionally metamorphosed. In the Project area, the Thomson Formation has been subsequently metamorphosed by contact with the TIC in a zone approximately 100-300 ft (30.5-91.5 m) thick along the TIC contact (Boerboom, 2009). The Thomson Formation strata are folded by nearly upright, open regional folds with single, subvertical axial-planar slaty cleavage (Boerboom, 2009). Sedimentary rock of the Cretaceous Coleraine Formation is regionally present overlying the Thomson Formation though it is not mapped in the Project Area. [R1_Cmt_#406]

The resource area is interpreted to consist of a multistage magmatic event which intruded mafic to ultramafic material into Thomson Formation siltstones and sandstones. The different intrusions include FGO (fine grained orthocumulate), CGO (coarse grained orthocumulate), and MZNO (mixed zone). The FGO can be found between approximately 80-1,800 ft (25-550 m) below surface. The 138 zone is net textured sulfide mineralization in the FGO. [R3_Cmt_#1325] The CGO can be found between approximately 130-2,300 ft (40-700 m) below surface. The MZNO is typically found between the FGO and CGO. The intrusive package dips at approximately 15-20 degrees to the south. Sulfide mineralogy is predominately pyrrhotite, pentlandite, and chalcopyrite and typically hosted along the FGO/SED contact. [R2_Cmt_#1065]

The TIC hosts nickel-copper-cobalt sulfide mineralization with associated platinum, palladium, and gold. The intrusion, which is completely buried beneath the Quaternary-age glacial and fluvial (unconsolidated) sediments, consists of a curved, elongated, unit striking north-south to southeast over 11 miles (17.7 km). The configuration resembles a tadpole shape with its elongated, northern tail up to 0.6 miles (1 km) wide and large ovoid shape body, up to 2.5 miles (4 km) wide, in the south. The northern portion of the TIC hosts the mineral resources that would be developed as part of the Project (Graphic 11.1). Mineralization within the TIC can be divided into three basic types: a massive sulfide unit (MSU) hosted in the metamorphosed sediment (~12.5%); "semi-massive sulfide unit (SMSU) [R3_Cmt_#1485] composed of net textured sulfides within the intrusion (~37.5%); and a disseminated sulfide unit composed of mostly intrusive rock with discrete sulfide blebs (~50%). [R2_Cmt13] In general, the intrusive body is massive, competent rock with increased local fracturing near the basal contact. The intrusion shows a small weathering profile at bedrock surface and decreases with depth.

Graphic 11.1 Cross-sectional sketch of the intrusive body [R2_Cmt_#1067].



11.3 Susceptible Geologic Features

No susceptible geologic features are present in the Project Area related to bedrock or unconsolidated deposits. Limestone deposits are not present in the region, and no sinkholes or karst conditions exist. Shallow groundwater is present, and groundwater information is presented in the water resources section (Section 12.0).

b. Soils and topography – Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability or other soils limitations, such as steep slopes, highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 12.b.ii.

11.4 Topography

Approximately 85% of the Project Area has very low relief with a near level 0-3% slope as the area is within the former lake plain of Glacial Lake Aitkin. A few small hills are locally present with slopes greater than 3% and isolated areas greater than 9% (Figure 13).

11.5 Soil Descriptions and Characteristics

Soil description and characteristics data were obtained from the Natural Resources Conservation Service, United States Department of Agriculture, Web Soil Survey (NRCS, 2022). The soil map is presented as Figure 14 and soil descriptions and characteristics are presented in Table 11.1. Approximately 32% of the surficial soil within the Project Area is sandy loam to loamy sand, and approximately 10% is silt loam. Hydric or predominantly hydric soils cover approximately 67% of the Project Area, including peat, muck, and standing water areas. The non-sandy soils are present on slopes of less than 1%. [R2_Cmt#_1073]

Table 11.1 Soil Characteristics

Map Unit Symbol	Map Unit Name	Hydric Status	Percent of Project Area
Hydric and Predominately Hydric			
531	Beseman muck	Predominantly hydric	3.9
540	Seelyeville muck	Predominately hydric	2.3
549	Greenwood peat	Predominantly hydric	4.9
625	Sandwick loamy sand	Predominantly hydric	6.6
628	Talmoon muck, depressional	Predominately hydric	2.1
980	Blackhoof and Mahtowa soils	Predominately hydric	0.3
1115	Newson loamy sand	Predominately hydric	3.3
1983	Cathro muck, stratified substratum	Predominantly hydric	10
1984	Leafriver muck	Predominately hydric	2.8
B111A	Markey muck, occasionally ponded, 0%-1% slopes	Hydric	4.3
B147A	Rifle-Rifle, ponded, complex, 0%-1% slopes	Hydric	24.3
	Subtotal		**64.8**
Predominately Non-Hydric			
502	Dusler silt loam	Predominantly non-hydric	10.5
564	Friendship loamy sand	Predominantly non-hydric	8.2
504B	Duluth fine sandy loam, 1%-6% slopes	Predominantly non-hydric	5.1
B39A	Meehan loamy sand, 0%-3% slopes	Predominantly non-hydric	2.6
D458B	Menahga loamy sand, 1%-8% slopes	Predominantly non-hydric	8.8
	Subtotal		35.2
Other			
W	Water	Not Applicable	0.2
	Subtotal		**0.2**
	Grand Total		**100.2**

11.6 Impacts to Soils

The Project would use underground mining techniques, which minimize impacts to soils outside of direct construction or operation areas. Topographic slopes in the Project Area are low which minimizes erosion. An engineering evaluation of soils would be conducted as part of Project design for areas that would be impacted for construction and operational purposes. Areas with peat or muck soils would be avoided to the extent possible. Surface facilities would be constructed in upland areas with well-drained sandy soil, to the extent practicable. This choice supports efficient construction and reduces the need for additional fill material, as these soils are naturally more suitable for building. However, the feature that would be built on peat or muck soils would be the upland corridor for the rail spur. [R2_Cmt_#1075]

11.7 Excavation, Grading, and Cut and Fill Balance

Some excavation and grading would be required to develop the Project infrastructure. Table 11.2 provides an estimate of the volumes of cut and fill material that would be needed to bring the site to final grade.

Table 11.2 Estimated Excavation, Grading, and Cut and Fill Balance

Description	Estimated Quantity	Unit of Measure
Site Clearing and Grubbing	55	acres
Cut	60,249	yd^3
Fill	376,455	yd^3

yd^3 – cubic yards
[R2_Cmt_#1076]

12.0 Water Resources

a. Describe surface water and groundwater features on or near the site in a.i. and a.ii. below.

i. Surface water – lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, shoreland classification and floodway/floodplain, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include the presence of aquatic invasive species and the water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within 1 mile of the project. Include DNR Public Waters Inventory number(s), if any.

The Project is within the USGS, Upper Mississippi River Region, Hydrologic Unit Code (HUC) 7 by 8-digit legacy classification (for a reference, HUC 2 for the 12-digit HUC classification). The watershed is further divided into the USGS HUC 8 Prairie-Willow (HUC-8, 07010103) watershed that is equivalent to DNR Major Watershed, Mississippi River-Grand Rapids. [R2_Cmt_#1079] The Project Area sits within two sub-watersheds, as delineated by the hydrologic unit code 10 (HUC10) level: the Headwaters to Big Sandy Lake (HUC10 #0701010305) and the Big Sandy Lake Outlet (HUC10 #0701010306) (Figure 15). Watershed delineations aid in identifying areas for potential surface water impacts. The entire Project Area is located within the watershed tributary to Big Sandy Lake. The HUC10 watersheds are further subdivided into multiple USGS HUC12 and DNR level 8 watersheds (Figure 15). The Project Area is located within two HUC12 watersheds: Mud Lake watershed (HUC12 #070101030603) and Tamarack River watershed (HUC12 #070101030504). The watersheds in the vicinity of the Project Area are characterized by many tributary ditches, stream channels, and lakes (flow through and landlocked). The portion of the Project Area within HUC12 Tamarack River watershed (Figure 16) flows north through a ditch network to the Tamarack River then into the Prairie River. The portion of the Project Area within HUC12 Mud Lake watershed (Figure 16) flows south and west through a ditch network to Minnewawa Creek and the Sandy River. The Prairie River and the Sandy River generally drain from east to west discharging into Big Sandy Lake. [R1_Cmt_#42[R2_Cmt_#1081]

Public waters basins located in HUC12 watersheds that include the Project Area (HUC12 #070101030603 and HUC12 #070101030504) are presented in Table 12.1 and on Figure 16. There are no public waters basins located within 1.0 mile (1.61 km) of the Project Area (MDNR, n.d.) as shown on Figure 17. None of the Public Water Basins located in HUC12 watersheds #070101030603 and #070101030504 are classified as trout lakes, wildlife lakes, or migratory waterfowl lakes. Within HUC12 watersheds #070101030603 and #070101030504, Mud Lake (Minnesota Public Water Inventory (PWI# 01-0029-00) and Tamarack Lake (PWI# 09-0067-00) and Tamarack River (PWI# 07010103-757, 07010103-758) are listed as wild rice waters. (Figure 15). Big Sandy Lake is also listed as a wild rice water. [R3_Cmt_#1404]

The DNR has assigned shoreline classifications of "natural environment" or "recreational development" to some public waters basins in the HUC12 watersheds (Table 12.1); Big Sandy Lake is assigned a "general development" shoreline classification. DNR shoreline classifications guide development by regulating lot area and width, structure and septic setbacks, and areas where vegetation and land altering activities are limited. Minnesota Rules, part 6120.2600 provides the minimum standards and criteria for the subdivision, use and development of shoreland areas. Aitkin County provides additional shoreline minimum standards and criteria for subdivision in shoreland areas in the Aitkin County Shoreland Ordinance (amended 2017). [R1_Cmt_#433]

Table 12.1 Public Waters Basins Within Watersheds HUC12 #070101030603 and #070101030504 and Big Sandy Lake

Public Waters ID Number	Resource Name	Public Waters Class	Area (acres)	Shoreline (miles)	DNR Shoreline Classification [1]	Listed MPCA 303d Impaired Waters [2]
01-0006-00	Mud Lake	Lake	14.8	0.6	Natural Environment	Not listed
01-0008-00	Spruce Lake	Lake	18.9	0.8	Natural Environment	Not listed
01-0011-00	Cranberry Lake	Wetland	24.7	0.8	Natural Environment	Not listed
01-0012-00	Louma Lake	Wetland	20.1	0.7	Natural Environment	Not listed
01-0023-00	Round Lake	Lake	553.5	3.7	Recreational Development	Yes Hg-F
01-0029-00	Mud Lake [3]	Lake	588.8	3.9	Natural Environment	Not listed
01-0254-00	Bone Lake	Wetland	14.0	0.6	Not assigned	Not listed
01-0255-00	Unnamed	Wetland	63.3	1.2	Not assigned	Not listed
09-0067-00	Tamarack Lake [3]	Lake	240.2	4.5	Recreational Development	Yes Hg-F; Nutrients
09-0068-00	Cole Lake	Lake	143.8	2.4	Recreational Development	Not listed
01-0062-00	Big Sandy Lake [3] [4]	Lake	6,124	57.0	General Development	Yes Hg-F; Nutrients

[1] DNR assigns shoreline classifications and establishes the minimum standards and criteria for the subdivision, use and A's special and impaired waters search development of shorelands.

[2] MPCA maintains a list (303(d)) list of waters not meeting their intended uses (i.e., impaired waters) due to stressors including mercury in fish tissue (Hg-F) and excessive amounts of phosphorus (nutrients). Waters in this table that are classified as not listed may not have been evaluated by the MPCA at the time of completion of this worksheet.

[3] A DNR identified wild rice water (https://public.tableau.com/app/profile/mpca.data.services/viz/wild_rice_v4/Information and 2024 Minnesota Impaired Water List) [R2_Cmt#432]. Wild rice may be present in streams, rivers and lakes that are not listed in the EAW. [R2_Cmt_#1085]

[4] Water levels in Big Sandy Lake are controlled by Big Sandy Lake Dam.

In Minnesota, the MPCA, as required by the federal Clean Water Act, assesses all waters of the state and creates a list of impaired waters – those that fail to meet water quality standards – every two years (MPCA, 2024). Such waters are classified as "impaired waters" and included on the State's impaired waters 303(d) list. For such waterbodies, the State requires a total maximum daily load (TMDL) study that identifies the allowable pollutant load and/or pollutant reductions necessary to achieve the beneficial use(s) of the waterbody. Development activity upstream of impaired waters may be subject to pollutant loading limits based on applicable TMDL studies. There are no impaired Public Water Basins within 1.0 mile (1.6 km) of the Project Area (Figure 17). Impaired lakes located in HUC12 watersheds #070101030603 and #070101030504 are identified in Table 12.1 and shown on Figure 16. Big Sandy Lake (Figure 15 and Figure 16), which is further downstream from the HUC12 watersheds that include the Project Area, is listed as impaired by the MPCA due to excess nutrients and mercury in fish tissue. Sources of excess nutrients to Big Sandy Lake identified in the MPCA's 2011 TMDL (Barr Engineering, 2011) study include internal loading and nonpoint sources including agriculture, stream channel erosion, and developed land use.

Flowering rush, an aquatic invasive species was identified by the DNR (MDNR, 2023A) within the Big Sandy watershed.

There are many streams, ditches, and intermittent channels present in the HUC12 watersheds that include the Project Area (HUC12 #070101030603 and #070101030504) and shown on Figure 16. Many of these are unnamed streams and ditches that are delineated in the national hydrography dataset but are not classified as public waters streams (MDNR, n.d.). None of the Public Waters Courses located in the HUC12 watersheds that include the Project Area (Figure 16) are classified as trout streams or outstanding resource value waters (ORVW). ORVWs are waters identified under Minnesota Rules, part 7050 as having unique or sensitive characteristics (e.g., ecological, recreational) and are subject to extra levels of protection to preserve these characteristics. The nearest downstream ORVW is the Mississippi River (Figure 15; the Sandy River flows into the Mississippi River downstream of Big Sandy Lake. Two reaches of public ditches drain from east to west through the Project Area, including County Ditch 23 (generally draining east to west) and County Ditch 13 (generally draining south to north). Approximately 1.1 miles (1.8 km) of delineated public ditches are located within the Project Area (Figure 17). Streams, ditches, and channels in the HUC12 watersheds that include the Project Area (HUC12 #070101030603 and #070101030504) are included in the Public Waters Inventory summarized in Table 12.2 and shown on Figure 16

As with lakes, the MPCA's Impaired Waters list also identifies streams that do not meet designated beneficial use categories, including supporting aquatic life and aquatic recreation. There are no impaired Public Waters Watercourses within 1.0 mile (1.61 km) of the Project Area as shown on Figure 17. Impaired streams in the HUC12 watersheds that encompass the Project Area are identified in Table 12.2. A portion of Minnewawa

Creek upstream of its public waters classification is also listed as impaired for fish bioassessments and invertebrate bioassessments; the MPCA has not yet identified stressors contributing to this impairment.

Each of the public waters identified in Table 12.2 is subject to MPCA's designated beneficial use classifications under MN Rule Chapter 7050. These include Class 2 waters, which are protected for aquatic life and recreation. The specific classification for each waterbody will be confirmed in the EIS. [R3_Cmt_#1494]

Table 12.2 Public Waters Watercourses within watersheds HUC12 #070101030603 and #070101030504

Public Waters ID Number	Assessment Unit Identifier (AUID) [1]	Name	Public Water Inventory (PWI) Classification	Length (miles)	Listed MPCA 303d Impaired Waters [2]
01-020a	07010103-758	Tamarack River[5]	Public Water Watercourse	27.2	Yes E. coli [3]
01-022a	07010103-735	Unnamed Stream	Public Ditch/ Altered Natural Watercourse	1.4	Not listed
01-022a	07010103-735	Unnamed Stream	Public Water Watercourse	0.5	Not listed
01-023a	07010103-999	Unnamed Stream	Public Water Watercourse	1.1	Not listed
01-013a	07010103-518	Minnewawa Creek	Public Water Watercourse	3.2[4]	Fishes bioassessments; Invertebrate bioassessments

[1] Assessment unit identifier assigned by the MPCA to specific reaches of streams.
[2] MPCA maintains a list (303(d)) list of waters not meeting their beneficial use(s) designation(s) due to stressors; stressors present in streams in HUC12 #070101030603 and #070101030504 include poor indices of biological integrity (IBI) for fish and/or macroinvertebrates and bacteria (E. coli). Waters in this table that are classified as not listed may not have been evaluated by the MPCA at the time of completion of this worksheet.
[3] Impaired reach is from Little Tamarack River to Prairie River; E. coli source is not specified in Mississippi River-Grand Rapids Watershed Restoration and Protection Strategies report (USGS, 2022A).
[4] Does not include stretch downgradient of Lake Minnewawa that is not listed MPCA as being impaired.
[5] A DNR identified wild rice water (https://public.tableau.com/app/profile/mpca.data.services/viz/wild_rice_v4/Information and 2024 Minnesota Impaired Water List) [R2_Cmt#432]. Wild rice may be present in streams, rivers and lakes that are not listed in the EAW. [R2_Cmt_#1085]

Floodplains have been delineated by the Federal Emergency Management Agency (FEMA) for several areas and resources within the Big Sandy Lake watershed, including the Tamarack River, Prairie River, and Sandy River, as well as several lakes (Figure 18). The floodplains in the Big Sandy Lake watershed were delineated approximately 40 years ago and are "unmodernized" per FEMA standards; unmodernized floodplains are based on quick digitization by FEMA and cannot be used for regulatory purposes. FEMA has not established modern, regulatory floodplains within the Big Sandy Lake watershed. The Project Area is located outside the FEMA-delineated floodplain.

Talon is monitoring surface water flow and surface water quality at numerous locations near and within the Project Area to characterize baseline surface water conditions. Surface water baseline data would be provided for the EIS. The baseline data would be used to develop a conceptual model for surface water flow, which would be presented in the EIS. The conceptual model would form the basis for quantitative models and/or evaluations that would be conducted and presented for the EIS to estimate the potential effects of the Project on water resources.

The Project Area is primarily classified as wetlands (Figure 19). A Level 3 wetland delineation across the Project Area was conducted between June and September 2022 (GEI, 2024). Approximately 302 acres of wetland are present within the Project Area. This delineation report was submitted to the agencies on July 17, 2023, and is pending review by the Technical Evaluation Panel (TEP), which includes representatives from the Local Government Unit (Aitkin County), the Soil and Water Conservation District (SWCD), the Board of Water and Soil Resources (BWSR), and the Minnesota Department of Natural Resources (DNR). The U.S. Army Corps of Engineers (USACE) will provide separate concurrence on the delineation for purposes of federal permitting. [R3_Cmt_#1505]

Wetlands, which are shown on (Figure 19), are dominated by coniferous and open bogs, shrub swamps (shrub-carr and alder thicket), and hardwood swamps. Additional wetland community types in the Project Area include shallow marsh, deep marsh, fresh (wet) meadow, and sedge meadow wetlands. Eight small, excavated ponds, which were excavated over 20 years ago, totaling approximately 4.5 acres, and ranging in size from less than 0.1-2.3 acres, were documented in the Project Area during the wetland delineation.

Talon is monitoring wetland water levels and water quality within and near the Project Area to characterize baseline wetland conditions. Wetland baseline data would be provided for the EIS. The baseline data would be used to develop a conceptual model of the wetland system within and near the Project Area, which would be presented in the EIS. The conceptual model would form the basis for quantitative models and/or evaluations that would be conducted and presented for the EIS to estimate the potential effects of the Project on water resources.

Talon has been collecting water resources (surface water, wetlands and groundwater) monitoring data since 2007 with over 200 monitoring locations for water quality, flow and/or water level measurements with various active durations within the Project Area and vicinity. Monitoring stations and parameters have been adjusted periodically using a scientific, iterative approach by continuously reviewing data and updating the monitoring program as needed for continuous improvement. The data frequency depends on the parameter and objectives with for example a quarterly frequency for routine water quality monitoring, with greater frequency for select times and events, to hourly for routine water level measurements, with a greater frequency used for select events such as for hydraulic tests and for select parameters. Data collection and review is ongoing and being integrated with other data sources such as climate and geology information. [R2_Cmt_#440] Monitoring data would be provided, as necessary, as part of the EIS submission. [R2_Cmt_#444]

ii. Groundwater – aquifers, springs, seeps. Include: 1) depth to groundwater; 2) if project is within a MDH wellhead protection area; 3) identification of any onsite and/or nearby wells, including unique numbers and well logs if available. If there are no wells known on site or nearby, explain the methodology used to determine this.

There are no mapped springs within approximately 20 miles (32.2 km) of the Project Area based on data from the Minnesota Spring Inventory (MDNR, 2022B).

The Project Area is not within a Minnesota Department of Health (MDH) wellhead protection area based on data from the Source Water Protection Web Map Viewer (MDNR, 2022B). A wellhead protection area is defined in Minnesota Statutes 2022, Section 103I.005, Subdivision 24 as "the surface and subsurface area surrounding a well or well field that supplies a public water system, through which contaminants are likely to move toward and reach the well or well field." The nearest wellhead protection area is in McGregor located approximately 9.0 miles (14.5 km) west of the Project Area.

Water supply wells near and within the Project Area are installed in Quaternary aquifers. The Minnesota Well Index (MWI) identifies 32 water supply wells that are located within 1.0 mile (1.61 km) of the Project Area (Figure 6). The water supply wells are classified in the MWI as domestic wells (24 wells), public supply/non-community-transient wells (5 wells), public supply/non-community wells (2 wells), and irrigation wells (1 well). All the water supply wells identified in MWI that have depth and stratigraphic information are screened within sand or gravel layers in the Quaternary unconsolidated sediments at depths ranging from 28-202 ft (8.5–61.6 m) below ground surface. Three of the wells are between 28-50 ft (8.5-15.2 m) deep, 15 wells are 50-100 ft (15.2-30.4 m) deep, 10 wells are 100-200 ft (30.4-61 m) deep, one well is more than 200 ft (61 m) deep, and depths are not available for three wells. The sand layers in which the wells are completed are all beneath one or more layers of clay for wells where stratigraphy logs are available. Six of the wells are completed in a deep sand layer below additional layers of sand and clayey sediments. Depth to water in the wells as listed on the MWI logs range from 1-25 ft (0.3-7.6 m) below ground surface. Information from the MWI indicates that the majority of the water supply wells (28 wells) are installed in a Quaternary buried artesian aquifer, which are buried sand or gravel units with groundwater present under confined conditions. One well is completed in a Quaternary undifferentiated aquifer and no information is available for three wells.

Monitoring wells have been installed in and around the Project Area (Figure 6) to characterize baseline groundwater conditions (groundwater levels and groundwater quality). Groundwater level measurement and groundwater quality monitoring is ongoing, and this baseline data would be provided for the EIS. The baseline data would be used to develop a conceptual model for groundwater flow in and around the Project Area, which would be presented in the EIS. The conceptual model would form the basis for quantitative models and/or evaluations that would be conducted and presented in the EIS to estimate the potential effects of the Project on water resources.

Based on soil data from the Natural Resources Conservation Service, depth to water in surficial soils is less than 1 ft (0.305 m) in approximately 77% of the Project Area (Figure 8). Depth to water is greater than 3 ft (1 m) in approximately 15% of the area, and greater than 5 ft (1.5 m) in approximately 8% of the Project Area. The depth to water map would be updated with site-specific data for the EIS data submittal [R2_Cmt_#503].

The groundwater monitoring program includes wells and multi-zone vibrating wire piezometer installations completed in the peat, the quaternary and the bedrock. Existing water supply wells within and near the

Project Area, as discussed above, are completed within the quaternary, The details for the monitoring network would be discussed and reported on in the EIS process.

The Project water resources modeling, monitoring data, characterization data and relevant publicly available information would be used in conjunction to evaluate the area of potential effect that would provide input into monitoring that would be recommended for construction, operation and closure phases. During these Project phases, the adequacy of the monitoring program would be accessed for continuous improvement as additional data is collected and reviewed. As required, the monitoring program would be modified to be protective of the environment.

In the EIS data submission, groundwater and geochemical modeling will be employed to evaluate the potential for changes in water quality to migrate within the subsurface environment. The modeling framework will be used to simulate the flow of groundwater and assess the fate and transport of chemical constituents under varying hydrogeologic and geochemical conditions.

During operations, groundwater in proximity to the mine would be monitored through a network of wells located near the underground workings and surface infrastructure. The specific design of the groundwater monitoring program, including well locations, frequency, and analytes, would be developed through the permitting process.

All applicable wells and borings would be sealed in accordance with Minnesota Rules Chapters 4725 and 4727 and Minnesota Statutes Chapter 1031.

b. Describe effects from project activities on water resources and measures to minimize or mitigate the effects in Item b.i. through Item b.iv. below.

iii. Wastewater – For each of the following, describe the sources, quantities and composition of all sanitary, municipal/domestic and industrial wastewater produced or treated at the site.

(1) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.

The Project currently plans to dispose of toilet waste (sanitary wastewater) at a publicly owned treatment facility. However, the specific facility has not yet been identified. As part of the EIS, the Project will evaluate the capability of potential treatment facilities to manage the added water and waste loadings, including any required pretreatment measures and potential effects on municipal wastewater infrastructure.

(2) If the wastewater discharge is to a subsurface sewage treatment systems, describe the system used, the design flow, and suitability of site conditions for such a system. If septic systems are part of the project, describe the availability of septage disposal options within the region to handle the ongoing amounts generated as a result of the project. Consider

the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion.

The Project would not discharge to a subsurface sewage treatment system.

(3) If the wastewater discharge is to surface water, identify the wastewater treatment methods and identify discharge points and proposed effluent limitations to mitigate impacts. Discuss any effects to surface or groundwater from wastewater discharges, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects.

The Project would produce two types of wastewater: contact water and sewage waste. Sewage waste can be further subdivided into toilet waste and gray water. Sources of contact water and sewage waste, along with their management, treatment, and discharge, are described in the Project Description (Section 6.0). The following paragraphs focus on contact water and gray water, describing their expected quantity and composition and discussing potential effects on surface water or groundwater. Toilet waste, which is managed off-site, is not addressed in this section. The composition and quantity of contact water would be modeled for the EIS.

One source of contact water is mine inflow. Overall, Talon is following a scientific process with a preliminary inflow estimate presented in the EAW with the intent to continue to check and update the model predictions as additional data is collected and reviewed with the understanding evolving through this iterative process. This is the general approach used for the Eagle Mine in Michigan with pre-mining inflow estimates in the range of 75 gpm (base case or expected rate, 284 L/min) to 220 gpm (upper bound estimate, 833 L/min) (Wardell Armstrong, 2013), with actual inflows typically less than 10 gpm (38 L/min) as documented in 2023 (WSP Golder, 2023). [R2_Cmt_#513]

The preliminary peak life-of-mine inflow simulation is 180 to 350 gpm (Barr, 2025). The estimate is based on the hydrogeological data collected and reviewed to the end of 2024 and the use of a three-dimensional numerical groundwater model designed to predict mine inflows. The range is based on parameter sensitivity distribution, i.e. a range of parameter sets that provide similar matches to the pumping tests due to correlations between parameters. The inflow estimate would be refined and updated for the EIS to reflect the updated mine plan, additional hydrogeological information and assessment, additional understanding gained by iteratively updating mine inflows, assessment of mitigation methods to reduce inflows and a more detailed three-dimensional numerical groundwater model to address expanded objectives.

At the surface, all ore and waste rock handling and storage would be performed within an enclosed building with an impervious surface; contact water within the building would be collected and routed to the Contact Water Treatment Plant facility. As a result, there would be no surface contact water produced from storm events. The estimated peak surface contact water generated from within the Ore Transfer Building would be less than 100 gpm (379 L/min). The estimated peak discharge rate (including mine inflow and surface contact water) from the Contact Water Treatment Plant is calculated to be 300-400 gpm (1,136 – 1,515 L/min). These preliminary calculations illustrate that the discharge rate is predominantly dependent on the mine inflow. This estimate would be updated and refined with additional information, data, and models for the EIS. [R1_Cmt_#517] [R1_Cmt_#516]

The composition of the gray water would be typical of domestic wastewater. The average volume of gray water would be approximately 2.4 gpm (9 L/min), or 3,375 gpd (12,776 L/day), but instantaneous generation rate would be highly variable throughout the day with an estimated peak of approximately 100 gpm (379 L/min). Gray water would be routed to the Contact Water Treatment Plant for treatment and discharge. Refer to 6.19.9 for management details.

The discharges from the Contact Water Treatment Plant would increase the flow in the north ditch network above baseline flow levels. The potential effects of this increased flow on hydrology, wetlands, shallow and deep groundwater systems, and aquatic biota in the north ditch network would be evaluated for the EIS. [R2_Cmt_#275] Preliminary evaluation indicates that the ditch has the capacity to handle the estimated increased flow due to discharge of treated water based on the following:

- Generally, a stream can adapt to an increase in flow that is up to 20% above its channel forming flow (defined as the 1.5-year recurrence flood flow).
- The channel-forming flow at LV-006 was estimated using the United States Geological Service's (USGS) StreamStats tool to be approximately 13,500 gpm (51,100 L/min) (USGS, 2022B).
- Twenty percent of the channel-forming flow is 2,700 gpm (10,221 L/min), which is greater than the conservative discharge estimates enumerated above.

Therefore, this preliminary assessment indicates that potential impacts due to increased flow from the Project discharge could be controlled by permit conditions of a future NPDES/SDS permit and water appropriations permit. Additional evaluation of potential effects associated with the flow increase from the Contact Water Treatment Plant discharge would be addressed in the EIS. [R2_Cmt_#280]

As described in Section 6.0, discharges would meet permit conditions established to protect water quality and aquatic biota. The potential effect of discharges on water quality in receiving and downstream waters and surface water-groundwater interactions would be evaluated in the EIS.

Current Minnesota climate trends and anticipated climate change in the general location of the Project are not expected to influence how a discharge of treated water would affect water resources. Based on a qualitative review of the discussion in the Section 7.0 Climate Adaption and Resilience [R3_Cmt_#1529], the water balance in the area, and the patterns of large precipitation events are expected to remain in the current range during the timeframe that the Project would be operational, which would be the timeframe with the highest discharge rate. A more quantitative assessment of climate projections would be included in the water resources modeling that would be incorporated into the EIS data submittal. Depending on the duration of discharge after operations, climate trends toward slightly higher temperature and slightly higher precipitation (described in response to Section 7.0), could affect flows in the receiving waters. However, because the discharge would be treated as described above, and because the NPDES/SDS permit must be renewed every 5 years, permit conditions would control impacts to water resources under future flow conditions. The EIS would provide additional information on the potential influence of current climate trends and anticipated climate change on potential Project effects on water resources.

ii) Stormwater – Describe changes in surface hydrology resulting from change of land cover. Describe the routes and receiving water bodies for runoff from the Project area (major downstream water bodies as well as the immediate receiving waters). Discuss environmental effects from stormwater discharges on receiving waters post construction including how the project will affect runoff volume, discharge rate and change in pollutants. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity and amount with this discussion. For projects requiring NPDES/SDS Construction Stormwater permit coverage, state the total number of acres that will be disturbed by the project and describe the stormwater pollution prevention plan (SWPPP), including specific best management practices to address soil erosion and sedimentation during and after project construction. Discuss permanent stormwater management plans, including methods of achieving volume reduction to restore or maintain the natural hydrology of the site using green infrastructure practices or other stormwater management practices. Identify any receiving waters that have construction-related water impairments or are classified as special as defined in the Construction Stormwater permit. Describe additional requirements for special and/or impaired waters.

As described in the Project Description (Section 6.0), stormwater from surface areas external to the Ore Transfer Building and Contact Water Treatment Plant would be managed as industrial stormwater. Figure 5 shows the boundaries of the industrial stormwater management areas.

Construction of the Project would replace existing pervious surfaces (e.g., vegetation) with new impervious surfaces (e.g., gravel, asphalt) and industrial infrastructure. Project construction would result in greater than one acre of land disturbance, which would require coverage under the Minnesota Construction Stormwater General Permit. A construction SWPPP would be developed and implemented in accordance with the permit requirements. The construction SWPPP would include a range of BMPs to address soil erosion and sedimentation, including erosion prevention practices, sediment control practices, inspection and maintenance requirements, pollution prevention management measures, and permanent stormwater treatment systems, as well as controls to manage water where necessary. The permanent stormwater treatment systems would be as described below.

In accordance with the Minnesota Construction Stormwater General Permit's permanent stormwater treatment requirements, a volume of water equivalent to 1-inch (2.54 cm) of runoff from impervious surfaces created for the Project would be routed to industrial stormwater treatment systems prior to discharge to the environment. Industrial stormwater treatment systems are primarily passive treatment systems focused on removal of suspended solids and may include a combination of volume reduction practices (e.g., infiltration system(s)) and retention practices (e.g., wet sedimentation basin(s)) as appropriate based on-site conditions and constraints. The environmental effects from industrial stormwater discharges on receiving waters are anticipated to be minor. Further details on industrial stormwater treatment system design would be provided for the EIS.

At the surface, all ore and waste rock handling and storage would be performed within an enclosed building with an impervious surface with contact water within the building collected and routed to the Contact Water Treatment Plant facility. As a result, there would be no surface contact water produced from storm events. [R2_Cmt_#535]

The immediate receiving waters for stormwater discharged from the Project would be the nearby unnamed wetlands and/or ditches. These wetlands and ditches are within either the Headwaters to Big Sandy Lake (HUC10 #0701010305) or Big Sandy Lake Outlet (HUC10 #0701010306) watersheds that are both ultimately tributary to Big Sandy Lake (as described in Item 12.a.i). It is anticipated that the majority of stormwater from the Project would be discharged generally northward from the Project Area to either wetlands or ditches and then follow the north ditch network to the Tamarack River within the Headwaters to Big Sandy Lake (HUC10 #0701010305) watershed.

The effect of changes in land cover from pervious to impervious surfaces on surface hydrology would be evaluated in the EIS. Runoff volumes and rates from impervious surfaces are generally greater than from pervious surfaces; however, the effect of this on the environment would be minimized by collection, treatment, and discharge of stormwater via the industrial stormwater treatment systems. Modification of drainage areas as part of managing industrial stormwater would alter surface hydrology in the immediate vicinity of the Project Area. Stormwater from pervious natural, stabilized, and reclaimed surfaces would not be actively managed and would continue to follow natural existing drainage pathways. [R3_Cmt_#1539] Further analysis of the effects of changes in land cover would be completed for the EIS.

Based on qualitative review of the current Minnesota climate trends and anticipated changes in rainfall frequency, intensity, and amount, future climate changes are not expected to significantly influence the environmental effects from stormwater discharges on receiving waters. Limited to no effect is expected because, as noted in reply to Section12.b.i.3), the water balance in the area and the patterns of large precipitation events are expected to remain in the current range during the timeframe that the Project would be operational. Any potential effects would be mitigated by the same factors discussed above: control of stormwater discharge volumes and rates, industrial stormwater treatment systems, compliance with industrial stormwater requirements under an NPDES/SDS permit. Additional quantitative assessments would be performed and provided in the EIS data submittal. [R2_Cmt_#536]

Based on the MPCA's special and impaired waters search tool (USGS, 2022B), no receiving waters associated with the project construction area have been identified with construction-related impairments or are classified as special under the Minnesota Construction Stormwater General Permit. [R2_Cmt_#1128]

iii) Water appropriation – Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Discuss how the proposed water use is resilient in the event of changes in total precipitation, large precipitation events, drought, increased temperatures, variable surface water flows and elevations, and longer growing seasons. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation. Describe contingency plans should the appropriation volume increase beyond infrastructure capacity or water supply for the project diminish in quantity or quality, such as reuse of water, connections with another water source, or emergency connections.

The Project would appropriate groundwater and DNR water appropriation permits would be required. No water would be directly withdrawn from surface water or wetlands. Groundwater would be withdrawn for four purposes: temporary construction dewatering, potable use, non-potable use, and inflow of groundwater to the underground mine.

Construction activities would temporarily remove groundwater to dry and solidify areas as needed to construct surface facilities as well as for the Cutoff Cell for the Decline Ramp. Surface facilities would be primarily sited in upland areas as illustrated in Figure 22, which would minimize the amount of water management required. The quantity of water would be estimated for the EIS and permitting; however, preliminary estimates are that the total amount of water would be less than 50 million gallons per year, which is the threshold for coverage under Temporary Projects General Permit No. 1997-0005. Construction activities would be conducted in accordance with the conditions of the Minnesota Construction Stormwater General Permit, which requires BMPs to control effects due to the discharge of water from the construction site. [R1_Cmt_#556].

Refinement in the volumes and timing of withdrawals for construction activities would be developed as the details for the design progresses. The projected groundwater withdrawals would be included in a numerical groundwater model and used for the development of an appropriate monitoring program during construction. [R2_Cmt_#555] Talon understands that DNR would need to determine if construction dewatering would be covered under General Permit 1997-0005 or an individual water appropriation permit. [R2_Cmt_#561]

For potable use, the Project would install a new well into the Quaternary deposits. The groundwater would be used for drinking water and to support sanitary facilities for the workforce. The potential maximum daily withdrawal from this well for potable water use could be up to approximately 8,000 gpd (2.9 million gallons per year). Groundwater for potable use would be withdrawn during the construction and operations phases of the mine. Based on preliminary site investigations and the presence of thick, saturated quaternary sediments, adequate groundwater is available in the Quaternary deposits.

The Project's water use of potable water is expected to be resilient with respect to climate trends based on a qualitative review of the discussion in the Climate Adaption and Resilience section (See Figure 1 in Stanton et. al., 2017) that suggests the groundwater supply is expected to remain in the current range during the timeframe that the Project would be operational. Consistent with the discussion above, the Project Area is within a regional area that is mapped as low risk regarding water supply sustainability in Year 2050 that considers factors such as but not limited to climate change (Stanton et. al., 2017; see Figure 1). In addition, the aquifer sustainability would be evaluated quantitatively with a three-dimensional groundwater model that would include climate projections and presented in the EIS data submittal. [R2_Cmt_#547] [R2_Cmt_#550]

For non-potable uses, the Project would primarily rely on the recycling of treated contact water, however, it is possible that there would be a need to supplement this source during the early stages of mine development. If needed, supplemental non-potable water would be withdrawn from a new well installed into the Quaternary deposits to supply the construction stage (if needed) and during the early stages of operations when groundwater inflow to the underground mine is expected to be minimal. Groundwater inflow to the underground mine is expected to increase as development and mining progress and it is anticipated to be sufficient to supply non-potable water needs within the first couple of years. The need for a non-potable water supply well, and the potential withdrawal rate, would be determined by water balance studies for the EIS. Recycling of treated contact water for non-potable uses would minimize the amount of water appropriated from the Quaternary deposits.

Groundwater inflow would be pumped from the underground mine to keep the workings dry. Groundwater inflow would originate as seepage from bedrock at depths from approximately 400-1,900 ft (122-579 m) below ground. Preliminary mine inflow estimates are discussed in Section 12.bi.3). Groundwater inflow to the underground mine would be combined with other sources of contact water from the underground mine and treated at the Contact Water Treatment Plant and discharged as described in section 6.0. This discharge and potential environmental effects are described in Section 12.b.i.3).

An assessment would be completed for the EIS that characterizes the potential impact of withdrawing groundwater inflow from the underground mine on surface water and wetland features and would include both a hydrological and a hydrogeochemical evaluation.

The Project would not appropriate surface water. As a result, there would be no need for contingency plans for alternate supply in the case of a drought or the suspension of a surface water appropriation permit.

i. Surface Waters

(1) Wetlands – Describe any anticipated physical effects or alterations to wetland features such as draining, filling, permanent inundation, dredging and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid (e.g., available alternatives that were considered), minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed and identify those probable locations.

The Project would use underground mining techniques, which minimize impacts to wetlands compared to surface mining. Surface facilities to support underground mining are being designed to avoid wetlands to the extent practicable. The Project Area was designed to minimize wetland impacts by aligning surface infrastructure within previously disturbed areas and upland zones where possible. Wetland avoidance was prioritized during site layout, particularly in areas containing deep marsh, open bogs, or interconnected wetland complexes. While some overlap with wetlands remains unavoidable due to the extent and distribution of wetland resources within the landscape, the configuration of the Project Area reflects a deliberate effort to limit encroachment and reduce the potential for direct impacts. [R3_Cmt_1545]

However, some direct impacts to wetlands would occur in parts of the Project Area where ground disturbance is proposed and wetlands are unavoidable. As a result of grading, excavating, and filling activities associated with the construction of the surface facilities and the railway spur, an estimated 20.5 acres of wetland including existing flooded borrow pits would be permanently impacted. Additional wetlands may be temporarily impacted during construction activities. Potential permanent and temporary wetland impacts would be further evaluated as part of the EIS.

In addition to direct wetland impacts, there is a potential for the Project to result in indirect wetland impacts. Indirect wetland impacts could occur from wetland fragmentation, changes in wetland hydrology, and atmospheric deposition from dust or other air emissions, which may affect water quality. [R3_Cmt_#1551] Potential indirect wetland impacts and proposed monitoring would be further analyzed as part of surface, groundwater, and wetland studies being completed to support the EIS.

Impacts to wetlands would require a permit from the United States Army Corps of Engineers under Section 404 of the Clean Water Act and from the DNR under the requirements of Minnesota's Wetland Conservation Act (WCA). [R3_Cmt_#1554] The Section 404 Clean Water Act permit would also include Section 401 Clean Water Act Water Quality Certification, which is coordinated with the MPCA. Unavoidable wetland impacts would be mitigated through compensatory wetland mitigation such as purchasing wetland bank credits from approved wetland banks from the appropriate service area.

b) Other surface waters- Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

Potential Project physical impacts to surface waters include direct and indirect impacts to stream channels and ditches. Currently planned physical alterations of surface waters are limited to construction of discharge structures for the Contact Water Treatment Plant discharge. Generally, the use of underground mining would minimize physical impacts to surface water resources. Project features on the land surface would be located to avoid existing ditches where possible. Where avoidance is not possible, existing ditches may be diverted and rerouted around Project features, and/or filled. Approximately 1.1 miles (1.77 km) of channelized ditches are present in the Project Area. Much of this length has been previously altered for drainage purposes and is not representative of a natural stream channel.

In addition to direct physical impacts, the Project could result in indirect impacts to downstream hydrology due to discharge of treated water, alteration of upstream tributary watersheds, and stormwater management. These potential effects are described in response to Sections 12.b.i.3) and 12.b.ii. The railway spur would be constructed with appropriate materials and/or features to facilitate water flow between each side of the railway spur and address potential for differences in water level or other hydrological impacts. [R1_Cmt_#52]

The Project does not anticipate impacting the number or type of watercraft usage within or downstream of the Project Area. [R1_Cmt_#595]

13.0 Contamination/Hazardous Materials/Wastes

This section addresses hazardous material handling and waste management practices that would be employed by the Project.

a. Pre-Project area conditions – (Describe existing contamination or potential environmental hazards on or near the Project area such as soil or ground water contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-Project area conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.)

A review of the What's in My Neighborhood (MPCA, 2022) web mapping tool was conducted to identify potential areas of concern on or within 1 mile (1.6 km) of the Project Area (Figure 9). Features that were searched included, but were not limited to, active and inactive or closed hazardous waste generators, solid waste facilities, remediation sites, leak sites, and locations with above-ground storage tanks. The review indicated the following activities:

2) Active and inactive industrial stormwater permits

3) Active and inactive aboveground storage tanks

4) The City of Tamarack Wastewater Treatment Plant

5) Active and inactive hazardous waste generator permits

6) No actions associated with the Project are anticipated to disturb these sites

There are subsurface sanitary wastewater treatment systems (septic systems) located to the north and west of the Project. In and/or near the City of Tamarack, there are several closed leak sites and a closed dump (the Tamarack Dump) which has undergone investigation and cleanup since its closure in 1998 (MPCA, 2022).

In addition to these existing conditions, local activities related to the exploration and definition of the Tamarack Resource Area (SMSU, MSU, CGO East, CGO West, and 138 Zone) and associated baseline environmental data collection include waste and material storage and handling [R2_Cmt_#135]. These activities include drilling and surface geophysical exploration, maintenance of access roads and trails, temporary boarding of staff members and/or contractors, and operating various equipment in support of these activities. Site conditions related to these activities include:

7) Aboveground tanks (TS0130875) at the exploration staging area [R2_Cmt_#1149] (Figure 9)

8) Hazardous waste small quantity generator status (Figure 9)

9) Storage and use of hazardous materials and petroleum products (e.g., oil, fuel) associated with drill pad locations and the exploration staging area [R2_Cmt_#1149]

10) Refuse related to work at drill pad locations and the exploration staging area [R2_Cmt_#1149]

11) Septic system and/or leach fields associated with the house and farmhouse at the site

12) Buried drill cuttings in the exploration staging area [R2_Cmt_#1149]

Potential environmental effects from existing site conditions that would be caused or exacerbated by Project construction and operation would be discussed in the EIS. The EIS would identify measures to avoid, minimize, or mitigate adverse effects from existing potential environmental hazards. A Contingency or Response Action Plan would be developed as part of the EIS for tanks, wastewater treatment, and any hazardous waste generation associated with the Project.

b. Project related generation/storage of solid wastes – (Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.)

To facilitate a common understanding of the terminology used in this section, the following definitions of solid waste are provided.

Solid Waste – According to the Resource Conservation and Recovery Act (RCRA) of Title 42 of the U.S. Code Chapter 82 § 6903, the term solid waste refers to “any garbage or refuse, sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sanitary wastewater, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 1342 of title 33, or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended."

Minnesota Statutes, section 116.06, subdivision 22 and Minnesota Rules, part 7035.0300, subpart 100 define Solid waste as "garbage, refuse sludge from a water supply treatment plant or air contaminant treatment facility, and other discarded waste materials and sludges, in solid, semisolid, liquid, or contained gaseous form, resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include hazardous waste; animal waste used a fertilizer, earthen fill, boulders, rock; sewage sludge; solid or dissolved material in domestic sewage or other common pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste water effluents or discharges which are point sources subject to permits under section 402 of the federal Water Pollution Control Act, as amended, dissolved materials in irrigation return flows; or source, special nuclear or by-product material as defined by the Atomic Energy Act of 1954, as amended."

The Project would produce solid waste during construction, operation, and closure. The facilities or activities anticipated to produce solid waste include general construction refuse, the maintenance shop and wash bay, the storage warehouse, general refuse associated with the shops and the locker room facilities, cement storage, use of shotcrete, and the explosives magazine. Solid waste, as defined in the RCRA, would be disposed of in accordance with federal, state, and local regulations. The Project would also generate residuals from the water treatment process. These residuals are anticipated to be managed as solid waste in accordance with applicable regulations. [R2_Cmt_#1151]

Solid industrial wastes anticipated to be generated by the Project include tires, scrap metal, concrete, construction waste, non-salvageable demolition debris, and office waste (paper, utensils etc.). Solid industrial waste generated by the Project would be taken off site by a third party and recycled when available or disposed of.

Potential environmental effects from solid waste handling, storage, and disposal would be discussed in the EIS. The EIS would identify measures to avoid, minimize, or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.

c. Project related use/storage of hazardous materials – (Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location and size of any new above or below ground tanks to store petroleum or other materials. Indicate the number, location, size and age of existing tanks on the property that the project will use. Discuss potential environmental effects from accidental spill or release of hazardous materials. Identify measures to avoid, minimize or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.)

To facilitate common understanding of the terminology used in this section, the following definition of hazardous materials is provided.

Minnesota Statutes 115B.02: Subd. 8. Hazardous substance. "Hazardous substance" means:

- any commercial chemical designated pursuant to the Federal Water Pollution Control Act, under United States Code, title 33, section 1321(b)(2)(A);
- any hazardous air pollutant listed pursuant to the Clean Air Act, under United States Code, title 42, section 7412; and
- any hazardous waste.

Hazardous substance does not include natural gas, natural gas liquids, liquefied natural gas, synthetic gas usable for fuel, or mixtures of such synthetic gas and natural gas, nor does it include petroleum, including crude oil or any fraction thereof which is not otherwise a hazardous waste.

Subd. 9. Hazardous waste. "Hazardous waste" means:

- any hazardous waste as defined in section 116.06, subdivision 11, and any substance identified as a hazardous waste pursuant to rules adopted by the agency under section 116.07; and
- any hazardous waste as defined in the Resource Conservation and Recovery Act, under United States Code, title 42, section 6903, which is listed or has the characteristics identified under United States Code, title 42, section 6921, not including any hazardous waste the regulation of which has been suspended by act of Congress.

Minnesota Statutes 116.06 Subd. 11. Hazardous waste. "Hazardous waste" means any refuse, sludge, or other waste material or combinations of refuse, sludge or other waste materials in solid, semisolid, liquid, or contained gaseous form which because of its quantity, concentration, or chemical, physical, or infectious characteristics may (a) cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. Categories of hazardous waste materials include, but are not limited to explosives, flammables, oxidizers, poisons, irritants, and corrosives. Hazardous waste does not include source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended."

Like hazardous materials, hazardous wastes are subject to state and federal requirements regarding management, transportation, and disposal. Locally, Minnesota implements regulations for hazardous wastes through the MPCA and the MnDOT (Minnesota Department of Transportation).

The Project would store and use common materials that are considered hazardous during construction and operation. The facilities anticipated to use and/or store hazardous waste include: the explosives magazine, the fuel storage area, propane storage, the maintenance shops, and the locker room facilities. Hazardous materials stored on the Project site would include diesel fuel, gasoline, propane, lubricants, coolant, batteries, explosives, and explosive devices.

The chemicals and/or hazardous materials that would be used and/or stored during construction and operation of the Project, including method of storage, would be discussed in the EIS. The EIS would indicate the number, location, and size of any new above or below ground tanks to store petroleum or other materials. In the EIS, the potential environmental effects from accidental spill or release of hazardous materials would be discussed. Measures to avoid, minimize or mitigate adverse effects from the use and/or storage of chemicals and/or hazardous materials including source reduction and recycling would be identified. Fuel storage and consumption and the use of chemicals would be estimated, a review of product Safety Data Sheets would be conducted, and a spill prevention plan would be developed for the EIS.

d. Project related generation/storage of hazardous wastes – (Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.)

The Project would generate and store hazardous waste during construction and operation. The facilities anticipated to generate and store hazardous waste include the fuel storage area and the maintenance shops. To reduce the potential for incidental contact and spills, hazardous waste would be stored on site in facilities that comply with the RCRA regulations prior to being transported off site. Hazardous waste would be transported off site by an EPA licensed transporter in United States Department of Transportation approved containers for disposal at appropriately permitted RCRA hazardous waste treatment, storage, and disposal facility(s). Additionally, the Project would comply with all RCRA waste management regulations including proper labeling, employee training, recycling, and practicing proper documentation of disposal protocols to avoid potential adverse effects. The following is a list of some expected waste streams that would be generated by the project:

- Expired blasting agents: Expired or damaged containers of detonators, initiators and fuses, and other high explosives used in blasting. These items would be taken back by the explosive distributor/contractor.
- Waste maintenance products: The operations are expected to generate solvent-contaminated wipes, waste grease, lubricants, anti-freeze, and solvents. Waste maintenance products that cannot be recycled would be properly characterized and disposed of as hazardous waste using appropriately licensed disposal vendors.
- Used oil: Used oil and lubricants would be collected and transported offsite by an appropriately licensed used oil recycling vendor.

Hazardous wastes generated and/or stored during construction and/or operation of the Project, including the methods of disposal, would be described in the EIS. Where possible, the facility would recycle waste. Examples of recyclable waste materials include batteries, coolant and used oil. Recyclable materials would be transported and recycled by appropriately licensed vendors. The EIS would discuss potential environmental effects from hazardous waste handling, storage, and disposal, and would identify measures to avoid, minimize, or mitigate adverse effects from the generation/storage of hazardous waste including source reduction and recycling.

14.0 Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)

a. Describe fish and wildlife resources as well as habitats and vegetation on or in near the site.

The DNR, in collaboration with the U.S. Forest Service, developed an Ecological Classification System (ECS) for hierarchical mapping and classification of Minnesota land areas with similar native plant communities and other ecological features. Based on the ECS, the Project Area is located in the Tamarack Lowlands Subsection of the Minnesota Drift and Lake Plains Section of the Laurentian Mixed Forest Province (MPCA, 2022).

As discussed under Section 12.0 (Water Resources), the Project Area is dominated by open and coniferous bog, shrub-carr, and hardwood swamp wetland communities. Uplands consist of mixed forest, pine plantations, and hay fields associated with farmsteads. The only watercourses in the Project Area are county ditches, which were initially constructed decades ago to drain wetlands for agricultural use. No DNR identified wild rice lakes are located within the Project Area; however, several wild rice waters are located downstream of the Project Area in the Big Sandy Lake Outlet and Headwaters Big Sandy Lake watersheds.

A portion of the wildlife habitat within and near the Project Area is fragmented with roads, railways, and minor development (i.e., farmsteads). However, the wetland and upland areas within and around the Project Area provide habitat for common wildlife, including mammals, such as fox, deer, squirrels, beaver, and muskrats; birds, such as hawks and perching birds; and amphibians, such as frogs, toads, and salamanders.

b. Describe rare features such as state-listed (endangered, threatened or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number (LA-) and/or correspondence number (ERDB) from which the data were obtained and attach the Natural Heritage letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe the results.

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Natural resources field surveys are currently being conducted within and across the Project Area. Information gathered during these surveys would be included in the EIS.

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) online tool identifies two federally threatened species and one federally endangered species as potentially occurring near and within the Project Area. These species include the federally threatened Canada lynx (*Lynx canadensis*; state special concern) and the gray wolf (*Canis lupus*; no state status) and the federally endangered northern long-eared bat (*Myotis septentrionalis*; state special concern). IPaC also identified the monarch butterfly (*Danaus plexippus*), a federal candidate species, and the tricolored bat, a federally proposed endangered species, as potentially occurring near and within the Project Area. No designated critical habitat is present within the Project Area.

Canada lynx inhabit boreal forests of northern Minnesota, primarily in the Arrowhead region (MNDNR, 2022F). Lynx are generally found in association with their primary prey, snowshoe hare, which are typically most abundant in younger regenerating boreal forest patches with a coniferous component. Suitable habitat for Canada lynx is present within the Project Area.

Gray wolves primarily inhabit temperate forests in northern Minnesota (USWFS, 2022A) However, gray wolves are habitat generalists and would choose habitats based on where their primary prey species, including white-tailed deer, moose, and beaver, are present. Suitable habitat for gray wolf is present within the Project Area.

The northern long-eared bat inhabits caves, mines, and forests (MDNR, 2022D). Suitable forested habitat for northern long-eared bats is present in the forested areas within and near the Project Area. According to the DNR and USFWS, the nearest known hibernacula is located over 80 miles (128.7 km) northeast of the Project Area in St. Louis County, and the nearest known maternity roost tree has been documented over 3.0 miles (4.8 km) west of the Project Area in Aitkin County (Township 48N, Range 23W) (MDNR, 2022D).

The tricolored bat inhabits similar habitats to the northern long-eared bat but can also roost in road culverts and human-made structures. According to the DNR and USFWS, the tricolored bat can use the same hibernacula as the northern long-eared bat. It is unknown if any tricolored bats utilize the hibernacula referenced above, located 80 miles (128.7 km) northeast of the Project Area, but the range of this species includes the Eastern half of the United States, including all of Minnesota. The USFWS has listed the tricolored bat as proposed endangered (USFWS, 2022C). However, proposed species are not protected under the Endangered Species Act (ESA).

In December 2020, the USFWS assigned the monarch butterfly as a candidate for listing under the ESA due to its decline from habitat loss and fragmentation; however, candidate species are not protected under the ESA. The monarch butterfly inhabits fields and parks where native flowering plants, including milkweed

(Asclepias species) which is required for breeding, are common (MDNR, 2022C). Suitable monarch butterfly habitat containing milkweed is present in the vicinity of the Project Area.

Barr Engineering Company (Barr) has a license agreement (LA-986) with the DNR for access to the Natural Heritage Information System (NHIS) database, which was queried in September of 2022 to determine if any rare species could potentially be affected by the Project. The NHIS database indicates that the state-watchlist and federally endangered rusty patch bumble bee (*Bombus affinis*) was documented within the vicinity of the Project Area in 1939. The NHIS does not indicate documentation of any other state-listed species within 1.0 mile of the Project Area.

The rusty patched bumble bee inhabits open areas with abundant flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and undisturbed soil for overwintering sites (USFWS, 2022B). While some areas of suitable habitat are present in the vicinity of the Project Area, IPaC did not identify the rusty patched bumble bee as a species potentially occurring in the Project Area, and the Project Area is not located in the rusty patched bumble bee high potential zone (USFWS, 2022B).

Wild rice (*Zizania palustris*) is a native plant found in area lakes and streams downstream of the Project Area and is of particular significance to the local and indigenous communities. [R3_Cmt_#1568] This aquatic plant is sensitive to changes in water levels, nutrients, and sulfate, along with other factors. Baseline data collection has been ongoing on or near several MPCA designated wild rice waters since 2008.

Data from the DNR Minnesota Biological Survey were reviewed to determine if any Sites of Biodiversity Significance (SBS), native plant communities, Scientific Natural Areas, or other sensitive ecological resources are present within or near the Project Area. While this is valuable data, it is also important to recognize and acknowledge that to many local and indigenous people, all native plant communities are significant, and measures should be taken to protect them.

As shown on Figure 21 part of a DNR SBS, which has a moderate biodiversity significance rank, is within the Project Area. The DNR describes SBS of moderate biodiversity significance as follows: “sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes” (MDNR, 2022A). DNR native plant communities have been mapped near the Project Area, but not within it. No state Wildlife Management Areas (WMAs) are located within the Project Area. The closest WMAs are located approximately 2.5 miles (4 km) west (Grayling Marsh WMA) and south (Salo Marsh WMA) of the Project Area (Figure 21). No scientific natural areas or other sensitive ecological resources have been mapped within the Project Area.

c. Discuss how the identified fish, wildlife, plant communities, rare features and ecosystems may be affected by the project including how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.

14.1 General Impacts

Construction and operation of the Project would result in the direct impact of approximately 71 acres of upland and wetland wildlife habitat and could further habitat fragmentation in the Project Area. The presence of equipment and associated noise and human activity during construction and Project operation may cause some species, even those accustomed to human proximity, to abandon habitats near the Project Area; however, extensive areas of similar habitat are present outside of the Project Area. Direct impacts to aquatic biota are not anticipated, as Project discharge would meet all applicable water quality standards.

As discussed in Section 7.0 (Climate Adaptation and Resilience), future climate trends in the area indicate anticipated increases in temperature and variability in precipitation. Given the nature and anticipated duration of project operations, direct effects from climate change on fish and wildlife are expected to be limited. However, the Environmental Impact Statement (EIS) process would provide a more detailed assessment of potential indirect and cumulative climate impacts associated with the project. [R2_Cmt#_1173]

14.2 Federal and State Listed Species

Although there is suitable habitat for Canada lynx and gray wolf in the Project Area, it is anticipated that similar to other wildlife, during construction and operation these species and their prey would avoid the Project Area for comparable habitat outside of the Project Area. As such, adverse effects on Canada lynx and gray wolf are not anticipated from the Project.

Habitat for northern long-eared and tricolored bats is present within the Project Area, and tree clearing could affect this habitat. Although no maternity roost trees or hibernacula have been documented within the Project Area, tree removal would follow federal laws in relation to the northern long-eared bat; as such, adverse effects on northern long-eared and tricolored bats are not anticipated from the Project.

Some areas of suitable habitat for rusty patched bumble bees are present in the Project Area. However, based on the IPaC results not noting this species as potentially being present, the fact that the Project Area is not located in a high potential zone, and the date of the last documented record (1939), rusty patched bumble bees are not likely to be present in the Project Area. As such, adverse effects on rusty patched bumble bees are not anticipated from the Project.

Clearing and grading activities associated with the Project could impact the habitat for monarch butterflies. However, as previously noted, this species is not legally protected at the federal or state level.

14.3 Sensitive Ecological Resources

Construction and operation of the Project would directly impact the DNR SBS that is located within the Project Area. Except for the 1939 record of a rusty patched bumble bee, no state or federally listed species have been documented within the portion of the SBS that is within the Project Area. While impacts to wild rice lakes are not anticipated from the Project, a baseline wild rice habitat delineation is being conducted for the Project in downstream waterbodies. No other sensitive ecological resources have been identified within the Project Area or its immediate vicinity as such no impacts to other sensitive ecological resources are anticipated.

14.4 Invasive Species

Invasive species are non-native species that cause or may cause economic or environmental harm or harm to human health; or threaten or may threaten natural resources or the use of natural resources in the state (Minnesota Statutes, 2022, section 84D.01, subdivision 9a). Vegetation clearing and the movement of construction equipment in and out of the Project Area could make it susceptible to the introduction and spread of invasive plant species. In addition to the potential for terrestrial invasive species introduction, project activities may present a risk for the introduction of aquatic invasive species. [R3_Cmt_#1598] To minimize the spread of invasive species, contractors would be required to comply with applicable Minnesota regulations, which could include measures such as cleaning construction equipment prior to arriving on site and upon leaving the site (MDNR, 2022A)

d. Identify measures that will be taken to avoid, minimize, or mitigate the adverse effects to fish, wildlife, plant communities, ecosystems, and sensitive ecological resources.

The Tamarack Mining Project's design has been developed to minimize potential environmental impacts through comprehensive engineering and operational controls. Nearly all project activities will take place within a single enclosed building, with the exception of an outdoor backfill materials buffer. The site surface is primarily gravel, and all stormwater runoff will be managed to meet federal and state regulatory standards.

To prevent sediment discharge, the project's stormwater management system is designed to capture runoff and route it through treatment processes that remove particulate material. Additionally, the ventilation systems for both the facility and the mine are engineered to control emissions through advanced filtration devices, reducing any potential airborne particulate matter from impacting surrounding areas. [R2_Cmt_#1182]

The underground mining techniques proposed for the Project would reduce potential impacts to wildlife habitat by decreasing the area of ground disturbance. With the majority of the operations contained within the Ore Transfer Building, only a small portion of the developed surface will be fenced to control access to the site from CSAH 31 and to prevent access to the two ventilation pads. Wildlife would be able to freely move through the rest of the site, and there would also be ample adjacent undeveloped land available for wildlife to pass through including along the rail spur. [R2_Cmt_#1181]. Current habitat within the Project Area is listed as predominantly upland, with small portions of alder thicket, open bog, shrub-carr, hardwood swamp and excavated ponds. These small habitat areas are near areas that have been disturbed regularly for decades. [R1_Cmt_#640]

As noted above, impacts to northern long-eared and tricolored bats would be minimized by following federal laws in relation to the northern long-eared bat. The EIS would provide further details on these measures and ensure compliance with state and federal standards for protecting downstream habitats and sensitive resources. [R2_Cmt_#1183]

15.0 Historic Properties

Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include: 1) historic designations, 2) known artifact areas, and 3) architectural features. Attach letter received from the State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to historic properties.

The Project is located on the traditional, ancestral, and contemporary lands of the Očhéthi Šakówiŋ (Mdewakanton Dakota) and the Anishinaabe (Ojibwe) peoples, and many others forgotten in time. [R2_Cmt_#645] It is important to acknowledge that the Native American nations played a vital role in Minnesota's history and continue to influence its culture today. Additionally, the wetland complex in the Project Area may have been used as burial sites, raising the possibility of inadvertent discoveries. Other potential cultural resources and traditional uses associated with the landscape may also be present. [R3_Cmt_#1582] This concern requires evaluation as part of the EIS process. [R2_Cmt_#646]

The Project Area is situated within Archaeological Region 5C (Central Lakes Coniferous – Central), as defined by the Minnesota Department of Transportation's Mn/Model framework, which is characterized by glaciated landscapes, abundant lakes and wetlands, and coniferous forests. This regional context informs the potential for undiscovered archaeological resources. [R3_Cmt_#1584]

Barr requested data from the Minnesota State Historic Preservation Office (SHPO) on May 9, 2022, to identify previously recorded archeological sites and historic architectural resources located near and within the Project Area. The Minnesota Office of the State Archaeologist (OSA) Portal for archeological sites was also reviewed on May 16, 2022. In addition, Barr completed an in-person records check at the Minnesota SHPO on October 11, 2022.

The data provided by SHPO and reviewed through the OSA Portal identified no known archeological sites or historic architectural resources within the Project Area. In the area surrounding the Project Area, two potential precontact archeological site locations have been identified. These sites are both designated "alpha sites," as they have not been confirmed by formal archeological survey. One site (21CLi) represents a potential flat-topped mound as reported in The Aborigines of Minnesota (Winchell, 1911), while the second (21Akbc) represents the potential location of a precontact village site as reported in Kathio (Brower, 1901). The exact locations and presence of these sites is unknown; however, as they are currently mapped in the OSA Portal, both are located over 1 mile (1.6 km) from the Project Area. Eight documented historic architectural resources may be in visual proximity to the Project Area; however, at least three have been demolished since their original documentation (Table 15.1, Figure 20).

Table 15.1 Previously Identified Cultural Resources in Visual Proximity (1-mile buffer) to the Project Area

Resource Number	Resource Type	Township	Range	Section	NRHP Eligibility
AK-TMC-001	First State Bank of Tamarack	48	22	16	demolished
AK-TMC-002	Marcus Theater	48	22	15	demolished
AK-TMC-003	Tamarack Cooperative Store	48	22	15	undetermined
AK-TMC-004	Mayhall House	48	22	15	demolished
AK-TMC-005	Tamarack Town Hall	48	22	15	undetermined
AK-TMC-006	Tamarack School	48	22	15	undetermined
AK-TMC-007	Marcus Nelson Barn	48	22	15	undetermined
XX-ROD-153	Trunk Highway 210	48	22	15	not eligible

The majority of the previously recorded historic architectural resources are located in Tamarack, Minnesota. Tamarack began as a railroad town and was founded in 1874 when the Northern Pacific Railroad created a line from Duluth to Brainerd (Brower, 1901).

The nearest listed National Register property is the Savanna Portage Historic Trail, located approximately 10 miles (16.1 km) north of the Project Area, within Savanna Portage State Park. Given the distance and the nature of the Project, no direct or indirect effects on this property are anticipated. [R3_Cmt_#1579]

If historic properties or archaeological sites eligible for listing in the National Register of Historic Places are identified within the Project Area, Talon would coordinate with the State Historic Preservation Office, Tribal Historic Preservation Offices, and other appropriate parties to develop avoidance, minimization, or mitigation measures. Avoidance of impacts would be prioritized where feasible. If avoidance is not possible, mitigation measures such as data recovery excavations or formal documentation would be implemented in accordance with applicable guidelines. [R3_Cmt_#1587]

The cultural resources records check indicates that the Project Area has not been previously investigated for cultural resources; therefore, it is possible that undocumented archeological sites and/or historic architectural resources persist within the area. Based on available information and the lack of prior archaeological survey coverage, the Project Area is inferred to have unknown site potential under the Survey Implementation Model developed by the Minnesota Office of the State Archaeologist. [R3_Cmt_#1586]

The Project would require a permit from the United States Army Corps of Engineers (USACE), constituting an undertaking subject to Section 106 of the National Historic Preservation Act. As a result, cultural resources investigations, including tribal cultural resources investigation, an archeological reconnaissance, and a historic architectural survey, would be completed prior to construction to determine whether historic properties eligible for the National Register of Historic Places are located within the Project Area. [R2_Cmt_#647] As directed by the USACE, revisiting and re-evaluation of previously recorded architectural resources may occur within the Area of Potential Effect, as defined by the USACE. [R2_Cmt_#650] Talon would coordinate with Tribal Historic Preservation Offices (THPOs) throughout the Environmental Impact Statement (EIS) and permitting process. Consultation would be initiated to identify potential cultural concerns, and ongoing engagement would ensure that THPOs have input on the studies and findings. [R2_Cmt_#1185]

16.0 Visual

> Describe any scenic views or vistas on or near the Project area. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

The Project would alter the landscape from a rural setting with tree cover to an industrial setting that, in addition to the underground mine, would include the surface features described in response to Section 6.b. [R2_Cmt_#1190]

The Project Area is surrounded by various land ownerships, including private and State of Minnesota owned lands. Two private residences exist in the immediate vicinity of the Project Area. The first residence is located directly west of the Project across CSAH 31. The other private residence is located one half mile north of the Project along CSAH 31 and borders the Project Area’s northernmost property boundary. Within the Project’s property boundary, there are three farmsteads owned by Kennecott Exploration. One is located on the west side of CSAH 31 and two are located on the east side of CSAH 31 within Project boundaries. The scope of the Project Area extends eastward away from the Surface Boundary of the mine layout and into the Savanna State Forest, providing a gradual transition from a small-scale industrial facility into a natural landscape of a mixture of wetlands, lowland conifers and lowland deciduous tree types that help protect the aesthetic quality of the landscape. Young to middle-aged coniferous and deciduous tree types provide a natural buffer along the stretch of CSAH 31 that runs adjacent to the Project’s western property boundary. There are no scenic vistas within or near the Project Area that require special attention regarding adverse visual impacts. [R2_Cmt_#1192]

The Project would be partially visible to anyone traveling on the roadway adjacent to the Project Area during construction and operation. It may also be visible or partially visible to the farmsteads and residences adjacent to the Project, depending on the time of year and persistence of tree cover over time.

Project-related visual effects during construction would consist of large equipment and heavy machinery movement throughout the Project Area and increased traffic along CSAH 31, as well as the introduction of new buildings and facilities within the Project Area, as described in response to Section 6.b. [R2_Cmt_#1193] Once constructed, the Project would operate 24 hours a day, seven days a week, 365 days of the year.

During Project operation, visual effects would consist of the presence and use of the aforementioned surface facilities and buildings, which would be extant at least for the entirety of operations. Upon mine closure, if there is no beneficial reuse for the site, surface infrastructure would be removed as described in response to Section 6.b. [R2_Cmt_#1195]

Visual effects would also consist of daily activities for mining operations, including the movement of haul trucks throughout the facilities, delivery, and employee traffic on CSAH 31 and increased railway activity for the loading and shipment of the mined ore to the concentrator.

The City of Tamarack, Minnesota is located in a rural setting. The sky in and around the city has a Class rating of 2 or 3 on the Bortle Dark Sky Scale (Bortle, 2006) which is a qualitative index developed in 2001 to "provide a consistent standard for comparing observations with light pollution" (Bortle, 2006). The Bortle Dark Sky Scale groups the visibility of stars, galaxies, and zodiacal light into 9 classes (Bortle, 2006). A Class rating of 2 describes a truly dark sky and is considered excellent for stargazing (Bortle, 2006). A Class rating of 3 describes rural sky. Under Class 3 skies, there is indication of light pollution on the horizon, but they are still considered ideal for stargazing. The Project is located in a Bortle Class 3 area. Under Bortle Classes 1 through 3, "most observers feel they are in a natural environment, with natural features of the night sky readily visible" (Bortle, 2006). While there is no specific Minnesota standard for dark skies, the Project is also working to include Bureau of Land Management guidance for lighting and dark sky compliant lights in the design (Sullivan, 2021) [R2_Cmt_#1197].

Several miles to the northwest of the Project is the Savanna State Portage Park and despite the nearby communities of Floodwood and the lake house communities around Big Sandy Lake, Minnewawa Lake, and Round Lake—generating light pollution, the Park is known for its natural night-sky viewing experience. Given the existing sources of light pollution from nearby communities — including Floodwood, McGregor, Cromwell, and lake house communities around Big Sandy Lake, Minnewawa Lake, and Round Lake — as well as the Project's enclosed operations design, minimized outdoor nighttime activity, and intention to employ dark-sky-compliant lighting practices, it is unlikely that the Project would significantly alter the current night-sky quality in the park. [R3_Cmt_#1590]

Screening barriers are also required per the Aitkin County Mining and Reclamation Ordinance (adopted November 17, 2009) (Aitkin County, 2009) Ordinance 3.6(E) requires a screening barrier between the mining site and adjacent residential and commercial properties, as well as between the mining site and any public road within 500 ft (152.4 m) of the mining facility. The screening barrier must be planted with a species of fast-growing trees, and existing trees and ground cover along public road frontage must also be preserved and maintained (Aitkin County, 2009). The Project intends to maintain the existing screening buffer along the Project's western property boundary adjacent to CSAH 31 to the extent practicable using the pre-established coniferous and deciduous trees. To preserve the natural aesthetics of the surrounding landscapes, the Project also intends to maintain a screening barrier around most of the Project Area and incorporate additional tree plantings in areas where cover is minimal. Additionally, maintaining and improving these screening barriers would create habitat for wildlife and improve ecological diversity while also reducing some of the Project's emissions, such as air pollutants and noise levels from equipment and machinery (USDA, 2008). The Project is also working to include Bureau of Land Management guidance for lighting and dark sky compliant lights in the design (Sullivan, 2021). As outlined by the Bureau of Land Management (Sullivan, 2021), some of the controls the Project plans to incorporate into their design include but are not limited to: aiming floodlights down, fully shielding light fixtures to emit light only below the horizon, using vegetation to screen light sources, using the minimum level of illumination necessary, using lighting controls such as motion sensors, and using wildlife friendly light colors such as amber, orange or red lighting where possible. A viewshed analysis would be performed for the EIS.

17.0 Air

a. Stationary source emissions - Describe the type, sources, quantities and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants. Discuss effects to air quality including any sensitive receptors, human health or applicable regulatory criteria. Include a discussion of any methods used assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.

The preliminary air pollutants from stationary sources that would be analyzed in the EIS are criteria air pollutants, hazardous air pollutants (HAPs), and greenhouse gas (GHG) emissions. Some of the specific pollutants that would be evaluated in the EIS are as listed below. [R2_Cmt_#866] [R2_Cmt_#867] [R2_Cmt_#868]

- Particulate matter (PM), particulate matter less than 10 microns (PM10), particulate matter less than 2.5 microns (PM2.5)
- Sulfur dioxide (SO2)
- Nitrogen oxides (NOX)
- Carbon monoxide (CO)
- Volatile Organic Compounds (VOC)
- Lead (Pb)
- HAPs (Single HAP [including Elongated Mineral Particles] and Total HAPs)
- Carbon dioxide equivalence (CO_2e) are the number of metric tons of CO_2 emissions with the equivalent global warming potential as one metric ton of another greenhouse gas [R2_Cmt_#667]

The list of emission sources and potential pollutants would be updated, and provided for the EIS, as additional facility design is completed. The EIS would calculate emissions for all sources and air pollutants. However, anticipated sources are described further below. Specific air monitoring methods and compliance standards, including particulate control and mitigation measures, would be developed and finalized as part of the EIS and the permitting process. Talon is committed to ensuring that emission sources, including particulate exhaust, meet applicable standards under the Clean Air Act and Minnesota ambient air quality standards as set forth in MN Rule 7009. [R2_Cmt_#708]

17.1 Exhaust Stack Sources

Several emission-producing activities would be located underground and would emit exhaust through a stack. Prior to release, the exhaust air would undergo a filtration or scrubbing process to reduce the amount of suspended dust and particulates. Underground excavation activities would consist of drilling holes, blasting using an explosive material, and underground transfer of ore, waste rock, as well as placing CRF and hydraulic fill. The explosives would produce emissions, in addition to particulates emitted from the rock and ore.

Aboveground, several sources would exhaust through stacks. Ore and waste rock would be transferred from the trucks within the Ore Transfer Building, to the Rail Loading Buffer Area, and then into railcars for shipping. At no time during this process would the ore be exposed to the outdoors. [R2_Cmt_#1206] A backfill plant would be located on the surface inside the Ore Transfer Building. The facility would also include ore and waste rock crushers. The buffers for rail loadout and backfill would be enclosed within the building. Propane heaters for heating the mine and emergency electrical generators would produce emissions. Propane could also be used to heat buildings.

The Project would install control equipment as needed to meet applicable regulatory requirements for stack, fugitive, and engine emissions. This equipment would include bag houses for the material handling and loadout operations (see section 6.21.6), along with wet scrubbers (see section 6.21.8) to reduce emissions from underground mining activities. [R2_Cmt_#169] Additionally, levels of relevant gases in the mine ventilation exhaust circuit would be monitored in real-time, and particulate levels would be regularly sampled in alignment with health and safety standards. Further details on these measures would be provided in the EIS. [R2_Cmt_#106] [R2_Cmt_#122] [R2_Cmt_#896] [R2_Cmt_#898]

17.2 Air Regulatory Framework

Under Minnesota Rules, part 7007.0200 and Minnesota Rules, part 7007.0250, an air permit is needed if EPA emission standards from 40 CFR (Code of Federal Regulation) Part 60 or 61 apply. In addition, if the potential emissions are above the air permitting thresholds for stationary sources, then an air permit would also be needed.

Based on the Project's scope and scale, similar to the Eagle Mine in Michigan, which did not trigger Prevention of Significant Deterioration (PSD) review, the Project anticipates that PSD requirements would not apply, but an individual state or Title V air permit would be required. [R2_Cmt_#1209]. EPA has an emission standard under 40 CFR Part 60 Subpart LL for Metallic Mineral Processing that establishes a particulate matter limit for rail loadout. Minnesota rules require an air permit if this Metallic Mineral Processing standard applies. The Project plans to obtain an individual facility permit.

Additional EPA emission standards apply to Project equipment. The EPA emission standard under 40 CFR Part 60 Subpart OOO may apply for crushing of ore and waste rock at the Project Area. The Project may purchase a certified generator engine to meet additional EPA requirements under 40 CFR Part 60 Subpart

IIII. Vehicles would meet EPA's Tier 4 mobile diesel engine limits. Tier 2 and 3 certified vehicles would only be used when Tier 4 vehicles are unavailable.

The Project expects to have Hazardous Air Pollutant (HAP) emissions below the Title V thresholds and therefore would be a HAP area source. The emergency electrical generator engine would be subject to 40 CFR Part 63 Subpart ZZZZ but would meet this standard by meeting 40 CFR Part 60 Subpart IIII.

The Project would also include emission sources that generate mercury emissions through combustion of propane. Facilities with mercury emissions of three or more pounds per year are subject to Minnesota Rules, part 7007.0502. The Project does not expect mercury emissions above the 3 pound per year threshold. The MPCA Mercury Risk Estimation Method spreadsheet would be used to assess risks and hazards from the Project mercury emissions. [R2_Cmt_#128] [R1_Cmt_#692]

All federal and state regulations would be evaluated in detail for the EIS once equipment design is finalized.

17.3 Class I and II Modeling

To support the EIS development, modeling analysis for all federally approved Class I areas within 200 km (124.3 miles) (Figure 23) of the Project Area will be conducted. This may include an initial screening, a significant impact analysis, and a particle transport modeling analysis to assess potential project impacts on these areas. (R2_Cmt_#696] For these studies, the Project would develop a modeling protocol according to the Federal Land Managers Air Quality Related Values guidance.

Additionally, the Project would complete Class II air dispersion modeling for the EIS to evaluate what modifications may be needed to meet these standards. The Project would follow MPCA's Air Dispersion Modeling Practices and EPA's Guideline on Air Quality Models. A modeling protocol, needing MPCA approval, would be developed. Talon has constructed a meteorological station and will begin using this on-site data to support the modeling once a complete year of data is available. Modeled air concentrations would be compared against the Significant Impact Levels and National and Minnesota Ambient Air Quality Standards for each pollutant and averaging period, as applicable.

17.4 Risk Assessment

A health risk assessment per MPCA applicable requirements would be completed for the Project EIS. Potential health effects from inhalation of Project air emissions and through indirect contact of deposited air emissions would be identified using the MPCA Air emissions risk analysis (AERA) Risk Assessment Screening Spreadsheet (RASS) (aq9-22). Sensitive receptors would be assessed as a part of the health risk assessment. [R1_Cmt_#698]

b. Vehicle emissions - Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g., traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.

Although the goal is to electrify the vehicle fleet as much as possible there would likely still be some mobile tailpipe emissions. The mobile engine emissions would be included in the proposed air dispersion modeling completed for the EIS but would be excluded from emission totals used to evaluate permitting requirements. Electric vehicles would be used for operations, if practical. Where electric vehicles are impractical, vehicles would be equipped with Diesel Emission Fluid (DEF) to minimize NOx emissions.

c. Dust and odors - Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under item 17a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.

17.5 Fugitive Dust

Fugitive particulate emissions at the Project Area could originate from aboveground paved and unpaved roads. Commercially sourced aggregate may be received and stored outdoors for use in Cemented Rock Fill and as material for unpaved roadbeds. The transfer and outdoor storage of aggregate material could produce particulate emissions. Additionally, the grading of unpaved roads to maintain the surface could generate particulate emissions. [R2_Cmt_#227]

The Project's Fugitive Dust Control Plan would include visible emissions checks with mitigation measures in place if emissions were observed. Mitigation measures may include sweeping and spraying of paved surfaces, dust suppressants and water sprays on unpaved surfaces, wind barriers for piles, and water sprays or the use of vegetation. [R2_Cmt_#1220] During construction, sources of fugitive dust are expected to be similar to those encountered during operations, and the same types of mitigation measures, would be applied to control emissions. [R2_Cmt_#706]

17.6 Odors

Use of explosives and diesel trucks, if necessary, are expected to be the primary sources of odors associated with the Project. Explosives use would be entirely enclosed within the mine, and exhaust air from blasting would pass through a wet scrubber system expected to help minimize odors. Blasting is expected to occur daily, with associated emissions anticipated to dissipate within an hour.

Diesel engines are recognized odor sources; however, electric vehicles would be used if available, and all non-electric vehicles would use EPA Tier 4 certified engines if available. The diesel exhaust fluid and particulate filters in Tier 4 engines are expected to further reduce odors. Underground tailpipe emissions would be vented through the mine ventilation system, while surface tailpipe emissions would exhaust near ground level. With much of the Project activity now occurring indoors or in enclosed areas, odors are expected to be minimal, temporary, and localized to the immediate project vicinity. [R2_Cmt_#1221]

18.0 Greenhouse Gas (GHG) Emissions/Carbon Footprint

a. GHG Quantification: For all proposed projects, provide quantification and discussion of project GHG emissions. Include additional rows in the tables as necessary to provide project-specific emission sources. Describe the methods used to quantify emissions. If calculation methods are not readily available to quantify GHG emissions for a source, describe the process used to come to that conclusion and any GHG emission sources not included in the total calculation.

The Project's Greenhouse Gas (GHG) emissions may consist of a combination of both direct and indirect emissions from construction and operational activities. GHG emissions from construction activities would include both on-road and non-road [R2_Cmt_#1226] mobile equipment (e.g., diesel-, gasoline-, propane-, natural gas-powered) [R2_Cmt_#704], land use change, and potential electrical consumption. [R2_Cmt_#1225]

Operational GHG emissions would consist of:

- stationary combustion equipment such as propane heaters and emergency electrical generator
- mobile source emissions (e.g., trucks, trains, and equipment) [R2_Cmt_#770]
- fugitive sources from blasting activities
- land use conversion
- usage of Portland cement [R2_Cmt_#140]
- electrical consumption
- offsite waste disposal

GHG emissions during construction and operations would be calculated for the EIS, as summarized in Table 18.1 and Table 18.2.

Table 18.1 Construction GHG Emission Types and Calculation Methods

Scope	Type of Emission	Emission Sub-type	Calculation Methods
Scope 1	Combustion	Mobile Equipment - On Road	Calculated using emission factors for fuel usage from EPA 40 CFR Part 98 Subpart C Table C-1 [1] Calculated using EPA CCCL (Center for Corporate Climate Leadership) Emission Factors for Greenhouse Gas Inventories, Table 3 and Table 4 [2]
Scope 1	Combustion	Mobile Equipment - Non-Road [R2_Cmt_#1226]	Calculated using emission factors based on South Coast Air Quality Management District Emission Factor, SCAQMD EMFAC 2007 (v2.3) [3] Calculated using EPA CCCL Emission Factors for Greenhouse Gas Inventories, Table 5 [2]
Scope 2	Purchased Energy	Electrical	Calculated using emission factors from the EPA Emissions & Generation Resource Integrated Database (eGRID) or from supplier information [4]
Scope 1	Land Use	Area	Calculated using emission factors based on the following:

Scope	Type of Emission	Emission Sub-type	Calculation Methods
			2020 net CO2 flux for converted land type and the total US land use change from each converted land type from the Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 - 2020 [5] 2006 IPCC Guidelines for National Greenhouse Gas Inventories [6] 2013 Wetlands Supplements for wetlands and sources/sinks for uplands [7]

[1] Source: (EPA, 2022D)
[2] Source: (EPA, 2022A)
[3] Source: (SCAQMD, 2022)
[4] Source: (EPA, 2022C)
[5] Source: (EPA 2022E)
[6] Source: (European Environment Agency, 2006)
[7] Source: (IPCC, 2013)

Table 18.2 Operation GHG Emission Types and Calculation Methods

Scope	Type of Emission	Emission Sub-type	Calculation Methods
Scope 1	Combustion	Stationary Equipment	Calculated using emission factors for fuel usage from EPA 40 CFR Part 98 Subpart C Tables C-1 and C-2 [1]
Scope 1	Combustion	Mobile Equipment - On Road	Calculated using emission factors for fuel usage from EPA 40 CFR Part 98 Subpart C Tables C-1 and C-2 [1] Calculated using EPA CCCL Emission Factors for Greenhouse Gas Inventories, Table 3 and Table 4 [2]
Scope 1	Combustion	Mobile Equipment - Non-Road [R2_Cmt_#1226]	Calculated using emission factors based on South Coast Air Quality Management District, SCAQMD EMFACT 2007 (v2.3) [3] Calculated using EPA CCCL Emission Factors for Greenhouse Gas Inventories, Table 5 [2] Calculated using emission factors for fuel usage from EPA 40 CFR Part 98 Subpart C Tables C-1 and C-2 [1]
Scope 1	Fugitive	Area	Calculated using emission factors from AP-42 Section 13.3 Explosives Detonation, Table 13.3-1 National Institute for Occupational Safety and Health (NIOSH) “Factors Affecting Fumes Production of an Emulsion and ANFO/Emulsion Blends” [R2_Cmt_#126] [R2_Cmt_#247] Calculated using emission factor for fuel oil from 40 CFR 98 Subpart C Tables C-1 and C-2 for any ANFO use
Scope 2	Purchased Energy	Electrical	Calculated using emission factors from the eGRID or from supplier information [4]
Scope 3	Off-site Waste Management	Area	Calculated using EPA CCCL Emission Factors for Greenhouse Gas Inventories, Table 9 [2]
Scope 3	Transportation	Rail Transport of Ore	Use EPA Greenhouse Gas Emission Factors Hub for fuel use or CO_2 per ton-mile factors.

[1] Source: (EPA, 2022D)

[2] Source:(EPA, 2022A)
[3] Source: (SCAQMD, 2022)
[4] Source: (EPA, 2022C)

b. GHG Assessment

i. Describe any mitigation considered to reduce the project's GHG emissions.

The Project plans to apply appropriate GHG mitigation measures. However, a measure must be compatible with project operations, ensuring it does not interfere with essential functions or compromise safety. [R2_Cmt_#719] Such measures may include:

- Using electric vehicles, if practical, to reduce mobile source combustion emissions
- Hauling of CRF on the return trip from ore being hauled to the surface
- Maximizing the use of Uncemented Rock Fill
- Purchasing certified green electricity
- Maintaining tree canopy and reducing any unnecessary clearing and grubbing to maintain natural carbon sinks
- Reduce use of non-road mobile construction equipment; [R2_Cmt_#1235]
- Practicing good vehicle and equipment maintenance
- Turning off equipment when not in use
- Reducing the amount of waste generation
- Planting trees in buffer zones and to improve habitat
- Habitat improvement programs

[R1_Cmt_#717]

ii. Describe and quantify reductions from selected mitigation, if proposed to reduce the project's GHG emissions. Explain why the selected mitigation was preferred.

GHG reduction quantifications from selected mitigation measures would be supplied for the EIS. Talon would use electric equipment if available and practical to Project needs; this would continue to be evaluated as design advances.

iii. Quantify the proposed projects predicted net lifetime GHG emissions (total tons/# of years) and how those predicted emissions may affect achievement of the Minnesota Next Generation Energy Act goals and/or other more stringent state or local GHG reduction goals.

It is anticipated that the net lifetime GHG emissions for the Project would be small and the GHG effects from the Project would have little impact on achieving the Next Generation Energy Act goals. A comparison of the estimated Project emissions to total statewide and national emissions would be provided in the EIS.

Additionally, the Project would support the achievement of GHG reductions by supplying the necessary metals for electric vehicle manufacturing to support the transition to a net-zero carbon environment.

19.0 Noise

> Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area, 2) nearby sensitive receptors, 3) conformance to state noise standards, and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

Existing noise in the region of the Project Area is typical of a small town, rural setting. Surrounding areas consist of residences, roadways, and railways. Currently, noise is generated primarily by local roadway traffic and the BNSF railway, located along the southern border of the Project Area. Nearby sensitive receptors include rural residences north and west of the Project Area and residences and businesses immediately south of the Project Area in the City of Tamarack.

Noise would be generated during Project construction and operation activities and would result from several sources of equipment, such as but not limited to bulldozers, excavators, front-end loaders, haul trucks, water trucks, ventilation fans, ore conveyors, rock crusher, water intake pumps, air compressors, and other machinery typical of mining operations, as well as from the construction of the Decline Ramp.

While construction noise is temporary and variable in nature, it may result in elevated noise levels near the Project Area during active construction periods. To minimize potential impacts to nearby sensitive receptors, construction activities would be conducted in compliance with applicable state noise standards. Additional best management practices, such as maintaining equipment in good working order and using noise-dampening technologies where feasible, may be implemented to further reduce construction-related noise. [R3_Cmt_#1602]

Baseline noise monitoring data would be collected to assess pre-construction conditions for the Minnesota Pollution Control Agency (MPCA) noise standards. These data could also be utilized for future modeling of the Project components within the Project Area. The ambient conditions monitored in this effort would provide a baseline for comparison to future noise levels and for use in modeling projected noise impact from the Project. Modeling analysis of potential future Project noise impacts may consist of modeling the area using standard ISO9613 noise propagation modeling techniques, coupled with Federal Rail Administration and/or Federal Highway Administration noise modeling tools for ore transportation. This information would be provided in the EIS.

Noise impacts from the Project would be subject to Minnesota regulations. These rules are based on statistical calculations that quantify noise levels over a one-hour monitoring period. The L10 calculation is the noise level that is exceeded for 10 percent, or 6 minutes, of the hour, and the L50 calculation is the noise level exceeded for 50 percent, or 30 minutes, of the hour. There is no limit on maximum noise. The statutory limits for a residential location are L10 = 65 dBA and L50 = 60 dBA during the daytime (7:00a.m.–10:00p.m.) and L10 = 55 dBA and L50 = 50 dBA during the nighttime (10:00p.m.–7:00a.m.) (Minn. R. 7030.0040). This means that during the one-hour period of monitoring, daytime noise levels cannot exceed 65 dBA for more than 10 percent of the time or 60dBA more than 50 percent of the time.

Noise area classifications (NAC) are based on the land use at the location of the person who hears the noise (Table 19.1), which does not always correspond with the zoning of an area. Therefore, noise from an industrial facility near a residential area is held to the NAC 1 standards if it can be heard on a residential property. [R2_cmt_#1238]

Table 19.1 Noise Area Classification and Associated Sound Level Limits for Various Land Uses

NAC	Land Use	Daytime (dBA)[1] L10	Daytime (dBA) L50	Nighttime (dBA) L10	Nighttime (dBA) L50
1	Residential housing, religious activities, camping and picnicking areas, health services, hotels, educational services	65	60	55	50
2	Retail, business and government services, recreational activities, transit passenger terminals	70	65	70	65
3	Manufacturing, fairgrounds and amusement parks, agricultural and forestry activities	80	75	80	75

[1] dBA – A-weighted decibels

With surface infrastructure enclosed within a single building, noise pollution from operational activities should be significantly attenuated. The enclosure of key noise-generating components, such as surface haulage and the maintenance shop, would further reduce the amount of noise escaping to the environment, thus enhancing overall noise mitigation and reducing potential impacts to nearby sensitive receptors. [R2_Cmt_#118] [R2_Cmt_#1239]

The Project would be constructed following Minnesota Rules, part 6132.2000, subpart 3; the location would be set back 100 ft (30.5 m) from a public roadway and 500 ft (152 m) from occupied dwellings. An augmented buffer of coniferous and deciduous trees between the western property boundary of the mine site and public structures currently exists and may have the potential to minimize effects of noise generated by the Project by 5 to 8 decibels (USDA, 2008) The Project is also exploring options to incorporate an additional natural barrier within the pre-established screening barrier. This added barrier could have the potential to reduce the effects of noise produced by machinery and equipment by up to 10 to 15 decibels (USDA, 2008) Furthermore, there is potential to explore engineered solutions designed to augment natural barriers. These solutions could involve the installation of sound-absorbing materials. Such materials could achieve transmission loss values of up to 30 decibels, depending on the design and environmental conditions. These engineered solutions are typically designed for easy integration into various settings. By doing so, the combination of natural and engineered components would, if needed, provide a comprehensive noise mitigation strategy, addressing potential noise concerns from project operations while maintaining aesthetic compatibility with the surrounding environment.

Blasting vibrations would primarily be propagated through the bedrock and surrounding materials. Given that the blasting is unlikely to occur less than 100 ft (30.5 m) below the surface in bedrock during construction (see section 6.5.2), the bedrock and the overburden would act as an attenuator, dissipating the energy of the vibrations over distance. [R2_Cmt_#821] When in operations, there would be no blasting above 300 ft (91.4 m) below the surface in bedrock. Blasting activities would be subject to Minnesota Rules, part 6132.2900, subpart 2. Vibration modeling would be conducted to simulate the propagation of blast-induce vibrations to predict the impact at nearby sensitive receptors, such as residences. This information would be provided in the EIS. [R2_Cmt_#72] [R2_Cmt_#73] [R2_Cmt_#95] [R2_Cmt_#107] [R2_Cmt_#108] [R2_Cmt_#110] [R2_Cmt_#733]

The vibration limits set forth in the regulations are designed to prevent structural damage to buildings and other infrastructure. By adhering to the peak particle velocity limit threshold and using blasting techniques designed to remain within these PPV limits, vibrations would be kept at levels that do not pose a risk to the integrity of nearby structures. [R2_Cmt_#1239]

20.0 Transportation

a. Describe traffic-related aspects of project construction and operation. Include: 1) existing and proposed additional parking spaces, 2) estimated total average daily traffic generated, 3) estimated maximum peak hour traffic generated and time of occurrence, 4) indicate source of trip generation rates used in the estimates, and 5) availability of transit and/or other alternative transportation modes.

During construction and operation, the Project would be accessed from CSAH 31, an existing two-lane paved road designated as a 10-ton route by Aitkin County, including during spring load restriction periods. [R#_Cmt_#1612] The MnDOT [R2_Cmt_#1240] traffic mapping application was used to assess annual average daily traffic, a measure of baseline traffic conditions, in vicinity of the Project Area (MnDOT, 2022). According to MnDOT, [R2_Cmt_#1241] the 2021 annual average daily traffic volume was 223 daily trips along CSAH 31 and 474 daily trips along County Highway 6; the data were collected near the intersection of CSAH 31 and County Highway 6, immediately west of the Project Area (Figure 1). Workers accessing the site during construction and operation of the Project would contribute to local traffic volumes. Future parking would consist of approximately 160 spaces. It is anticipated that there would be two 12-hour shifts, with approximately 50-100 workers (including employees) on day shifts and approximately 30-60 workers on night shifts on a typical day at peak production. Peak traffic volumes would occur during shift changes; one in the morning and one in the evening. Using the personnel data provided in Section 6 (Project Description) and assuming all future employees drive their own vehicles to work, it can be estimated that the Project would cause an increase in traffic volumes twice a day. During the construction phase, traffic volumes are expected to vary depending on construction activities and scheduling. In addition to construction workers commuting to and from the site, vehicle trips would be generated by the delivery of materials, equipment, and supplies. Traffic volumes may be higher during periods of site preparation, foundation work, and equipment staging. In contrast, once operational, traffic would be more stable and consist primarily of regular employee shift changes, along with periodic deliveries for maintenance, supplies, and consumables. [R3_Cmt_#1614] Due to the rural nature of the Project location, alternative transportation modes are impracticable. [R2_Cmt_#98]

The Project would include construction of a railway spur that would connect the Ore Transfer Building to the existing BNSF railway located immediately north of the City of Tamarack, as described in response to Section 6.0 (Project Description). Ore would be shipped to the concentrator via railway approximately every 4 days. [R1_Cmt_#221]

b. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system. *If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW.* Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 *(available at: http://www.dot.state.mn.us/accessmanagement/resources.html)* or a similar local guidance.

Construction and operation of the Project would increase traffic volumes in the area and potentially lead to periods of traffic congestion on local roads. A traffic impact study would be conducted to further assess the Project's impact on the regional transportation system (roadways and railways) [R2_Cmt_#1242] and the need for roadway improvements to accommodate Project traffic and minimize congestion on local roads; the results would be provided for the EIS.

c. Identify measures that will be taken to minimize or mitigate project related transportation effects.

It is expected that during construction and operation, all Project employees would abide by local load restrictions and speed limits. Additional measures to minimize or mitigate potential Project-related transportation impacts, if necessary, would be developed following a traffic impact study.

21.0 Cumulative Potential Effects

(Preparers can leave this item blank if cumulative potential effects are addressed under the applicable EAW Items)

a. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

The baseline environmental conditions for the Project reflect the combined impacts of past and present activities within the region, such as forestry, peat mining, transportation infrastructure, lake house communities, towns and cities, and agricultural use. These conditions form the foundation for evaluating the potential cumulative effects of the Project in combination with other existing and foreseeable actions. The EIS would assess impacts of the Project, layered onto this established baseline, to determine potential new cumulative effects that may arise from the interaction of the Project with other environmental factors. [R2_CMT_#1244]

21.1 Geographic Scales:

21.1.1 Local Scale

The immediate Project Area and surrounding areas, including air, water, and habitat, would be evaluated for cumulative impacts resulting from the Project in combination with existing land uses, such as neighboring peat mining operations, and agricultural use.

21.1.2 Regional Scale

The broader region surrounding the Project Area may experience cumulative impacts from the Project in combination with other industrial activities, such as logging, farming, and peat mining, as well as existing transportation networks. The EIS would evaluate these impacts relative to current regional conditions, which reflect decades of land use changes and development. [R3_Cmt_#1617]

21.1.3 Statewide Scale

The Project's contributions to statewide environmental conditions, such as greenhouse gas emissions, water resource management, and air quality, would be assessed in the Environmental Impact Statement (EIS). The EIS would evaluate how the Project adds to the cumulative impacts across these key resources.

21.2 Timeframes:

21.2.1 Short-term (Construction Phase)

During construction, the Project would potentially introduce temporary impacts such as increased traffic, noise, and habitat disruption. These would be assessed against the backdrop of current environmental conditions, which are already influenced by land use activities in the area.

21.2.2 Operational Phase

The long-term effects of the Project, including emissions, water usage, and land disturbance, would be evaluated in the context of existing regional and statewide environmental conditions. The EIS would explore how these ongoing effects combine with other industrial or development projects to produce cumulative impacts over the life of the mine.

21.2.3 Post-Closure (Reclamation and Long-term Monitoring)

After mining activities cease, the Project's reclamation and closure management plans would restore the area to a near-natural condition. At this stage, cumulative potential effects would be expected to be greatly diminished, if not entirely ceased, as key components of the Project would have either have been removed or stabilized.

The cumulative potential effects of the Project would be analyzed comprehensively in the EIS, building upon the baseline conditions established from past and present activities. This approach ensures that the cumulative impact analysis accounts for the current environmental landscape and evaluates any incremental contributions from the project.

b. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

A Record of Decision was issued on February 13, 2018, to Premier Horticulture, Inc. for the development of approximately 316 acres of the Wright Bog in Carlton County for horticultural peat extraction. The project, which is estimated to have a 25-year life, involves clearing and ditching of the site, with water drainage into the Little Tamarack River, part of the Headwaters Big Sandy Lake watershed, which overlaps with one of the watersheds of the Tamarack Mining Project. This project is a clear example of a reasonably foreseeable future project with a basis of expectation, given that it has already undergone formal review and received necessary approvals. As such, potential cumulative effects, particularly regarding water quality and hydrological impacts, may need to be evaluated if overlapping environmental footprints are confirmed.

At this time, no other known projects within the vicinity have met the criteria of a reasonably foreseeable project that may interact with the proposed Project. For a future project to be considered reasonably foreseeable, it must have a clear basis of expectation, such as having advanced to formal planning stages, permit applications, or other concrete actions demonstrating a high likelihood of proceeding. Speculative or exploratory activities without defined plans or resources do not meet this threshold.

Should new developments or projects arise that meet this criterion, they would be reviewed for potential cumulative effects during the EIS process.

c. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

The potential environmental effects resulting from the Project could combine with environmental effects from other projects to produce a significant impact on the environment. However, the Project has been designed to minimize or avoid environmental effects, reducing the potential for significant cumulative effects. The EIS would evaluate these cumulative potential effects to ensure the Project is environmentally sustainable and socially responsible. [R2_Cmt_#1250]

22.0 Other Potential Environmental Effects

If the project may cause any additional environmental effects not addressed by items 1 to 19, describe the effects here, discuss how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

Project-related impacts are described in items 1 through 19 above.

RGU CERTIFICATION. (The Environmental Quality Board will only accept **SIGNED** Environmental Assessment Worksheets for public notice in the EQB Monitor.)

I hereby certify that:

The information contained in this document is accurate and complete to the best of my knowledge.

The EAW describes the complete project; there are no other projects, stages or components other than those described in this document, which are related to the project as connected actions or phased actions, as defined at Minnesota Rules, parts 4410.0200, subparts 9c and 60, respectively.

Copies of this EAW are being sent to the entire EQB distribution list.

Signature ______________________________ Date ______________________________

Title ______________________________

23.0 References

(Only references cited in the EAW data submittal were included in the reference list.) [R1_Cmt_#759]

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Figures

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Figure 1 Project location

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