



# **AGNICO EAGLE**

**MEADOWBANK GOLD MINE**

**2023 WATER MANAGEMENT PLAN**

**MARCH 2024**

**VERSION 12**

## EXECUTIVE SUMMARY

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Agnico Eagle Mines Ltd. Meadowbank Division (Agnico) is operating the Meadowbank Gold Mine (the Mine), located on Inuit-owned surface lands in the Kivalliq region approximately 70 km north of the Hamlet of Baker Lake, Nunavut. The mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on December 30, 2006, and the Nunavut Water Board Water Licence No. 2AM-MEA1530 issued in May 2020.

The Water Management Plan is updated on a yearly basis as required by the Nunavut Water Board Water License 2AM-MEA1530. This document presents an updated version of the Water Management Plan 2022 and provides a revised site-wide Water Balance. Recommendations obtained during the 2022 Meadowbank Annual Report Review have been included in the 2023 Water Management Plan.

The 2023 Water Management Plan includes the 2023 Water Quality Forecast Update (Appendix C), the 2024 Freshet Action Plan (Appendix D) and the 2024 Ammonia Management Plan (Appendix E). The Freshet Action Plan details the RSF seepage issue at ST-16 and the Assay Road seepage as well as providing revised monitoring.

This water management plan update considers changes in the observed natural pit water inflows, updated tailings deposition parameters, mine and milling life schedule and production rate, tailings management strategy, and pit backfilling strategy.

The significant updates to this plan are:

- Update of water balance and water quality forecast model as per latest tailings deposition plan (including in-pit deposition)
- Update of quantitative water-related objectives/targets as per the TSM (Towards Sustainable Mining) Water Stewardship Protocol

The water management objectives are to keep the different water types separated to the extent practical; to control and minimize contact water; minimize freshwater usage to the extent practical; meet discharge criteria before any site contact water is released to the downstream environment; achieve a reduction in freshwater intake per tonne mined and ensure no events of non-compliance related to freshwater withdrawal criteria and effluent loading limits. The water balance update is based on these objectives, and quantitative targets have been added to the plan to help Operations track progress of actions taken to achieve these targets and help identify corrective actions to be implemented.

The revised Water Balance determines the demand and storage requirements of water over the life of the mine. The storage strategies and required transfers are presented. Closure related elements remain at a conceptual stage and will be further detailed in the Interim Closure and Reclamation Plan (ICRP) update until their designs are presented in the Final Mine Closure and

Reclamation Plan to be submitted prior to final closure in accordance with the current Type A Water License.

The freshwater reduction per tonne milled objective is achieved by reclaiming contact water from the tailings deposition area while transferring water from the active deposition area to the inactive pit. Pit E was the main area for tailings deposition in 2023 and will continue to be in 2024. A volume of tailings was also deposited in the South Cell in August and September 2023 to improve the landforms for closure purposes. For the remainder of mill operations, reclaim water is planned to be pumped from the in-pit. The current concept for Portage and Goose area flooding at closure is to remove as much water as possible from each pit by using a water treatment plant (WTP) and to re-flood the area using a combination of passive and active water inflow (from Third Portage Lake). This is a conservative assumption that will be revised in the Interim Closure and Reclamation Plan (ICRP) and Final Closure and Reclamation Plan (FCRP) as further data become available on the water treatment design for the in-pit water. Different flooding sequence concepts are being looked at for the re-flooding of the Portage and Goose Area to ensure the closure objectives will be met. The final elevation of the re-flooding will be the elevation of Third Portage Lake which is around 133.6 masl based on available data. The Goose Dike and South Camp Dike will be breached to allow reconnection of the area with Third Portage Lake when the closure objectives for pit flooding will have been achieved. The dikes shall not be breached until the water quality in the re-flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate site-specific water quality objectives, as per the Water License.

The flooding of the Vault Pit area will involve a combination of passive flooding (runoff) and active flooding at closure using water from Wally Lake. The final elevation of the re-flooding will be 139.9 masl for Phaser and Vault Lake. The Vault Dike will be breached to allow reconnection of the area with Wally Lake when the closure objectives for pit flooding will be achieved, as per Portage and Goose Pits. BB Phaser Pit and Phaser Lake will be flooded exclusively from their watershed run off inflows until the target elevation of Wally Lake is reached.

A water quality forecasting model update is included in this report. The report identifies certain contaminants of concern which may require removal by treatment for the pit water quality to meet water quality objectives. Based on the forecasted concentrations at the end of in-pit deposition, the new water treatment plant required at closure should be designed to treat and manage the following parameters of concern for aluminium, arsenic, cadmium, copper, mercury, nickel, total dissolved solids (TDS), total ammonia, pH, total suspended solids (TSS), and potentially low concentration of total cyanide. Treatment options for the pit water are being assessed as per the schedule outlined in the Meadowbank Water Quality Forecasting Update Technical Note rev. 00 (AtkinsRéalis, 2024). An update on the water treatment concept and pit flooding strategy will be provided in the next ICRP update and the final design will be submitted as part of the FCRP.

**DOCUMENT CONTROL**

Version	Date (YM)	Section	Page	Revision
1	March 2014	ALL	-	Revision for the 2012 Water Management Plan (by SNC) according to the updated LOM and water mgmt strategies
2	March 2015	ALL	-	Revision for the 2013 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
3	October 2015	ALL	-	Update of sections according to Water License renewal conditions
4	March 2016	ALL	-	Revision of the 2014 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
5	March 2017	ALL	-	Revision of the 2015 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
6	March 2018	ALL	-	Revision of the 2016 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
7	March 2019	ALL	-	Revision of the 2017 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
8	March 2020	ALL	-	Revision of the 2018 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
9	April 2021	ALL	-	Revision of the 2019 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies
10	April 2022	ALL	-	Revision of the 2020 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies. Addition of quantitative water management targets
11	March 2023	Section 3.1, 3.4, 4	-	Section 3.1 water management targets, Section 3.4 pit flooding profiles, Section 4 water quality forecast update
12	March 2024	ALL	-	Revision of the 2023 Water Management Plan (by Agnico) according to the updated LOM and water mgmt strategies.  2.1.1 Climate: updated maximum wind gust recorded.  Table 3.1: Added target 2024 for water objectives.  3.3.6 Goose pit: Updated water management strategy information.  3.3.9. Mill seepage collection system: Added information on Assay Road Seep South.

			<p>Figure 3.2: RSF seepage area: Changed figure.</p> <p>3.3.12 Central Dike Seepage: Updated information.</p> <p>3.4.1 Portage and Goose Area Flooding: Updated information.</p> <p>Table 3.2 and 3.3L: Updated according to the Water balance.</p> <p>Section 4 Water quality forecast: Updated information and add note for ongoing work.</p> <p>Appendix A : Added a note on reported values</p>
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Approved by:  \_\_\_\_\_

Eric Haley – Environment & Critical Infrastructure Superintendent

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## APPENDICES

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**Appendix B:** Water Management Schematic Flow Sheets

**Appendix C:** 2023 Meadowbank Water Quality Forecasting Update

**Appendix D:** 2024 Freshet Action Plan

**Appendix E:** 2024 Ammonia Management Plan

## **1 INTRODUCTION**

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Agnico Eagle Mines Ltd. (Agnico) has been operating the Meadowbank Gold Mine since 2008, officially beginning production in 2010. The mine is located approximately 70km north of the Hamlet of Baker Lake, Nunavut. The mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on December 30, 2006, and the Nunavut Water Board Water License No. 2AM-MEA1530 issued on May 2020.

This document presents an updated version of the Water Management Plan 2022 and provides a revised site-wide water balance that determines the demand and storage requirements of water over the life of the mine (LOM). The storage strategies and required transfers are presented. Closure related elements based on the Meadowbank Interim Closure and Reclamation Plan remain at a conceptual stage and will be further detailed in the Final Mine Closure and Reclamation Plan to be submitted prior to final closure in accordance with the current Type A Water License.

This water management plan update considers changes in the observed natural pit water inflows, updated tailings deposition parameters, mine and milling life schedule and production rate, tailings management strategy, and pit backfilling strategy.

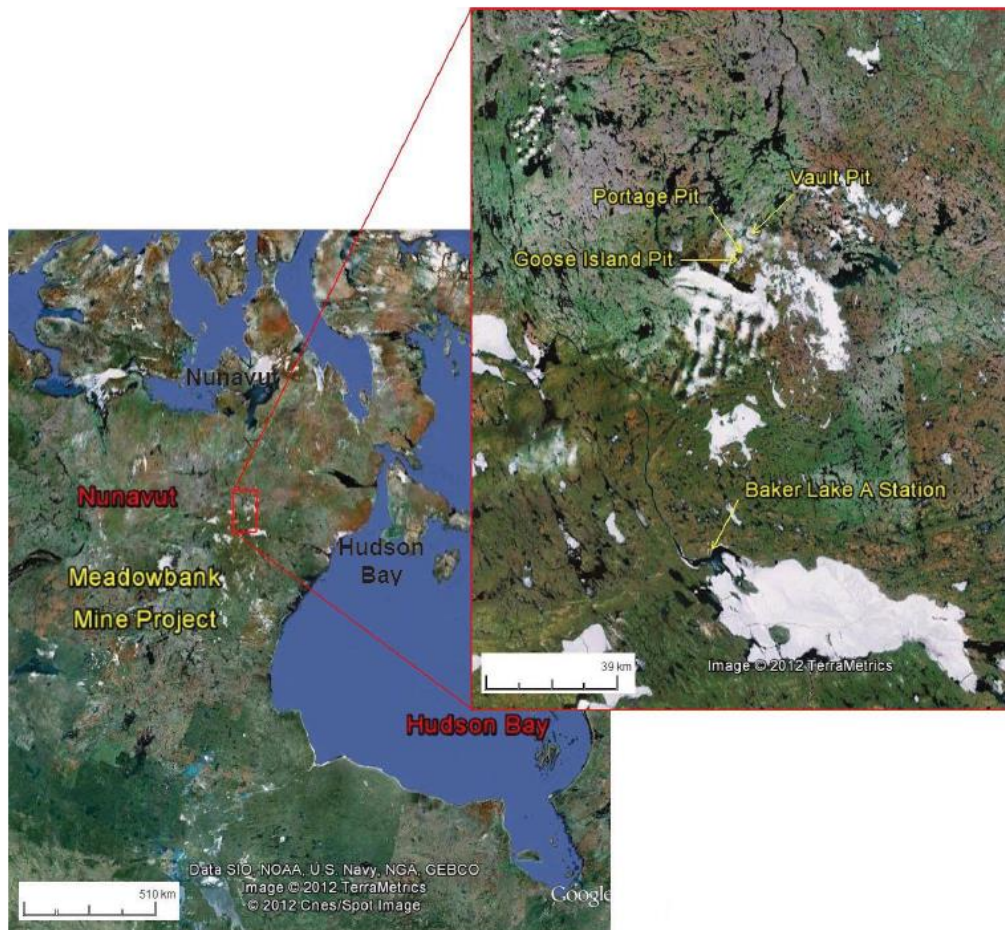
The significant updates to this plan are:

- Update of water balance and water quality forecast model as per latest tailings deposition plan (including in-pit deposition)
- Updates of quantitative water-related objectives/targets as per the TSM (Towards Sustainable Mining) Water Stewardship Protocol

## 2 BACKGROUND INFORMATION

### 2.1 SITE CONDITIONS

The location of the Meadowbank mine site is shown below in Figure 2.1. A close-up is also provided to show the location of the Baker Lake A Station used to obtain meteorological data.



Source: Google Earth Pro, 2012

**Figure 2.1: Meadowbank mine location**

#### 2.1.1 Climate

The Meadowbank mine is located within a low Arctic Eco climate described as one of the coldest and driest regions of Canada. Arctic winter conditions occur from October through May, with

temperatures ranging from +5°C to -40°C. Summer temperatures range from -5°C to +25°C with isolated rainfall increasing through September (Table 2-1).

**Table 2-1: Estimated average monthly climate data – Baker Lake**

Month	Max. Temp. (°C)	Air Min. Temp. (°C)	Air Rainfall (mm)	Snowfall (mm)	Total Precip. (mm)	Lake Evap. (mm)	Min. Relative Humidity (%)	Max. Relative Humidity (%)	Wind Speed (km/h)	Soil Temp. (°C)
January	-29.1	-35.5	0	6.9	6.9	0	67.1	75.9	16.3	-25.5
February	-27.8	-35.2	0	6.0	6.1	0	66.6	76.5	16.0	-28.1
March	-22.3	-30.5	0.0	9.2	9.2	0	68.4	81.4	16.9	-24.9
April	-13.3	-22.5	0.4	13.6	14.0	0	71.3	90.1	17.3	-18.1
May	-3.1	-9.9	5.2	7.7	12.8	0	75.7	97.2	18.9	-8.0
June	7.6	0.0	18.6	3.1	21.7	8.8	62.6	97.2	16.4	2.0
July	16.8	7.2	38.6	0.0	38.6	99.2	47.5	94.3	15.1	10.5
August	13.3	6.4	42.8	0.6	43.4	100.4	59.2	97.7	18.4	9.3
September	5.7	0.9	35.2	6.7	41.9	39.5	70.8	98.6	19.3	3.6
October	-5.0	-10.6	6.5	22.6	29.1	0.1	83.1	97.4	21.4	-2.8
November	-14.8	-22.0	0.2	16.2	16.4	0	80.6	91.1	17.9	-11.7
December	-23.3	-29.9	0	9.4	9.5	0	73.3	82.7	17.7	-19.9

**Note:** Data from Baker Lake A station is available from 1946 to 2011. During this period, the data quality is good, with the exception of years 1946 to 1949, and 1993, which were removed from the compilation.

The long-term mean annual air temperature for Meadowbank is estimated to be approximately -11.1°C. Air temperatures in the Meadowbank area are, on average, about 0.6°C cooler than Baker Lake air temperatures, and extreme temperatures tend to be larger in magnitude. This climatic difference is thought to be the effect of a moderating maritime influence at Baker Lake.

The prevailing winds at Meadowbank for both the winter and summer months are from the northwest. A maximum daily wind gust of 117 km/h was recorded on November 22<sup>nd</sup>, 2023. Light to moderate snowfall is accompanied by variable winds up to 70 km/h, creating large, deep drifts and occasional whiteout conditions. Skies tend to be more overcast in winter than in summer.

Table 2-1 presents monthly rainfall, snowfall, and total precipitation values for the mine site. August is the wettest month, with a total precipitation of 43.4 mm, and February is the driest month, with a total precipitation of 6.1 mm. During an average year, the total precipitation is 249.6 mm, split between 147.5 mm of rainfall and 102.1 mm of snowfall precipitation.

### **2.1.2 Faults**

Two main faults are inferred in the Portage deposit area and included in the groundwater model (Golder, 2011) used to estimate groundwater inflows and brackish water upwelling to the pits during mine life. These are the Bay Zone Fault and the Second Portage Fault shown in Figure 2.2 by bright blue lines.

The Second Portage fault trends to the northwest under Central Dike and the Tailings Storage Facilities (TSF), roughly parallel to the orientation of Second Portage Lake. This fault is a potential pathway for the Central Dike Seepage.

The Bay Zone Fault trends from South to North and crosses Third Portage Lake, Goose Pit and Portage Pit. This fault is a potential pathway for water infiltration from Third Portage Lake into Goose Pit.

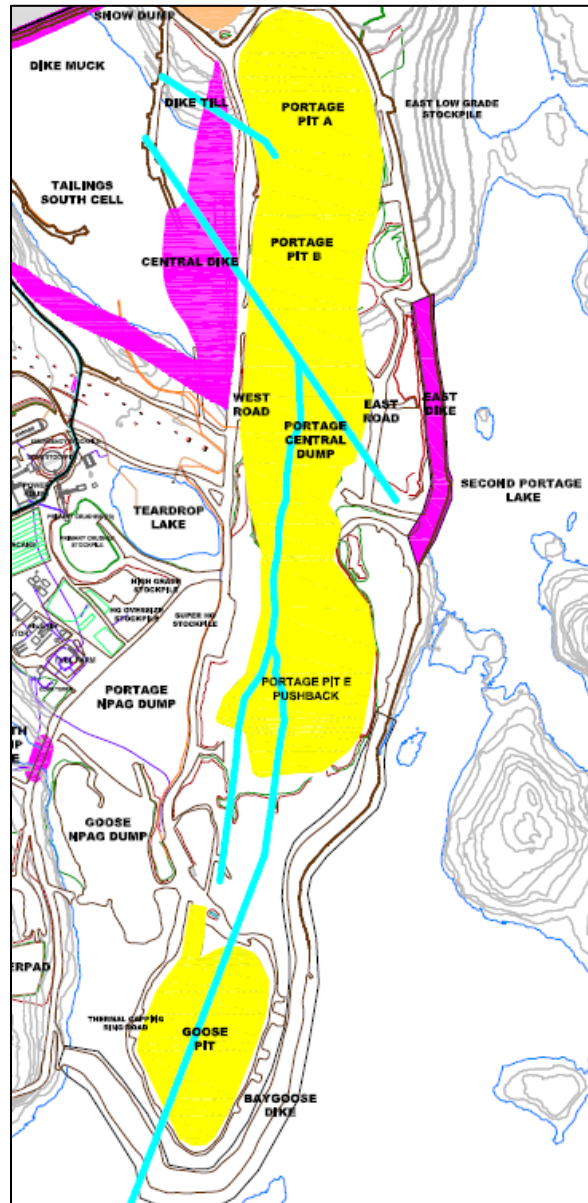


Figure 2.2: Portage Pit area – fault location

### 2.1.3 Permafrost

The Meadowbank Gold Mine is in an area of continuous permafrost. Lake ice thicknesses of between 1.5 m and 2.5 m have been encountered during geotechnical investigations performed mid to late spring. Taliks (areas of permanently unfrozen ground) could be expected where water depth is and/or has been greater than about 2 to 2.5 m. Based on thermal studies and measurements of ground temperatures (Golder, 2003), the depth of permafrost at site is

estimated to be in the order of 450 to 550 m, depending on proximity to lakes. The depth of the active layer ranges from about 1 to 1.5 m based on depth of overburden, vegetation and organics, and proximity to lakes.

Based on ground conductivity surveys and compilation of regional data, the ground ice content is expected to be low. Locally on land, ice lenses and ice wedges are present, as indicated by ground conductivity, and by permafrost features such as frost mounds. These areas of local ground ice are generally associated with low-lying areas of poor drainage.

#### 2.1.4 Hydrology

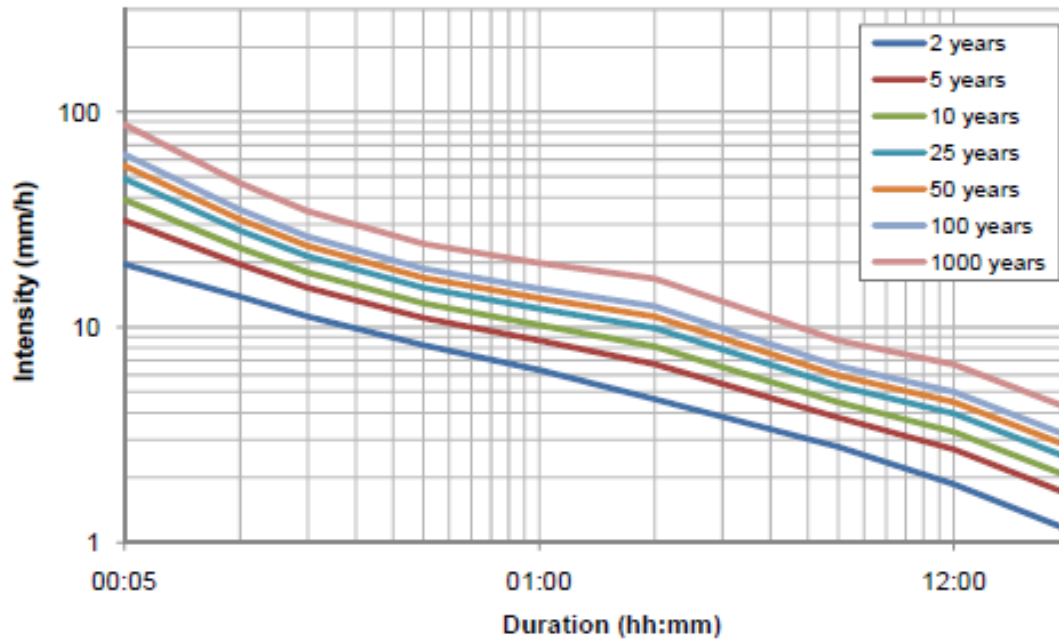
As shown above in Table 2-1, the Baker Lake A meteorological station was used to tabulate the monthly precipitation data. Using this data, SNC-Lavalin completed a Log-Pearson 3 probability distribution to determine the annual precipitation for different return periods. The results of this statistical analysis are presented in Table 2-2.

**Table 2-2: Total annual precipitation for varying return periods**

Return Period (years)	Precipitation (mm)
2	246
5	295
10	322
20	345
100	391

Source: SNC-Lavalin 2012 Water Management Plan (SNC, 2013)

Intensity duration frequency curves (IDF) computed by SNC-Lavalin (SNC, 2013) from the Baker Lake A meteorological station are presented in Figure 2.3. These IDF curves are for precipitations of short duration (5min-24hrs) based on data between 1987 and 2006.



Source: SNC-Lavalin Water Management Plan 2013 (SNC,2013)

**Figure 2.3: Baker Lake A meteorological IDF curves**

The beginning of freshet (spring period) varies from year to year however it has been observed that the winter snow accumulation (October to May) usually begins to melt at the beginning of June and continues throughout the month.

## 2.2 MINING OPERATION DESCRIPTION

The Meadowbank Gold Mine consists of several gold-bearing deposits within close proximity to one another. The three main deposits are Vault (Vault, Phaser and BB Phaser), Portage (South, Center and North Portage deposits), and Goose. Mining of these pits is completed, and no mining activity was done since 2019 at the Meadowbank site.

The South Portage deposit is located on a peninsula and extends northward under Second Portage Lake (2PL) and southward under Third Portage Lake (3PL). The North Portage deposit is located on the northern shore of 2PL. The South, Center and North Portage deposits are mined as a single pit, termed the Portage Pit, which extends approximately 2 km in a north-south direction. Portage Pit is isolated from the Second Portage Lake by the East Dike built in 2008-2009 and the Bay-Goose Dike (Pit E) built from 2009 to 2011.

The Goose deposit lies approximately 1 km to the south of the Portage deposit, and beneath 3PL. The pit is isolated from the Second Portage Lake and the Third Portage Lake by the Bay-Goose Dike and the South Camp Dike constructed in 2009-2010.



The Vault deposit is located adjacent to Vault Lake, approximately 6 km north of the Portage deposits. The deposit is isolated from the Wally Lake by the Vault Dike built in 2013.

### **2.2.1 Portage Pit Area**

The Portage area located between the Third Portage Lake (3PL) and Second Portage Lake (2PL) contains most of the infrastructure of the Meadowbank mine site including but not limited to the Portage Rock Storage Facility (RSF), the North and South Tailings Storage Facilities (NC & SC TSF), the mill, the camp, and the Stormwater Management Pond. The East Dike was constructed to isolate the north portion of the Portage Pit from the 2PL. Subsequent renaming of the pits led to the nomenclature for each pit (A, B, C, D and E). Mining activities in the Portage area ended in October 2019. Figure 2.4 presents the evolution of the Portage Pit and Figure 2.5 shows the Portage Pit Area and surrounding infrastructures.

Inflow of water into the bottom benches of Pit C and D has been observed before these pits were backfilled. Several areas of these pits are in an inferred talik area and cross a regional fault (Golder, 2009). The water inflow is thus likely a combination of ground and surface water. Pits A and B are in the permafrost and a minimal amount of water has been observed historically. Some water inflow is observed from the Pit E south wall since 2015. This inflow is mixed with other water sources at the bottom of Pit E.

On May 17<sup>th</sup>, 2019, Agnico received approval of amendment No.3 to the Meadowbank Type A water license 2AM-MEA1526 which permitted in-pit tailings disposal to take place within the Portage Pit. First, tailings were deposited in Goose pit, between July 2019 and August 2020. Since August 2020, tailings have been deposited in Pit E. An updated Tailings Deposition Plan has been prepared for the 2023 revision of the Water Management Plan. The updated deposition plan is presented in the 2023 version of the Meadowbank Mine Waste Rock and Tailings Management Plan. The latest life of mine exercise presents milling operations until 2026. For more information regarding in-pit tailings disposal please refer to the Waste Rock & Tailings Management Plan.

#### **2.2.1.1 Tailings Storage Facility**

The Tailings Storage Facility (TSF) is located with the Portage Pit Area and consists of the South Cell and the North Cell. These cells are delimited by tailings retaining dikes that were progressively built as capacity was required. More detailed information on the TSF can be found in the Meadowbank Waste Rock and Tailings Management Plan.

Stormwater Dike, constructed in 2009-2010, is an internal dike (El. 150m) that divides the TSF in the North and South Cell.

The peripheral structures of the North Cell are SD1, SD2, RF1 and RF2 built to El. 150 m from 2009 to 2010. In 2018, a North Cell Internal Structure (NCIS) was built in the northern part of the North

Cell over the existing tailings (variable El. from 152 to 154 m) to increase the tailings storage capacity.

The peripheral structures of the South Cell are SD3, SD4, SD5 and Central Dike built to El. 145 m from 2012 to 2018.

The diversion ditches (East and West), located around the perimeter of the North Cell TSF and the Portage RSF, are designed to collect the non-contact water runoff from the surrounding watershed. The ditches are divided in two sections – the west and east sections, to divert non-contact water respectively to Third Portage Lake and to NP2 Lake. On the west end of the diversion ditches, an Interception Sump was constructed in 2014-2015. The objective of the interception sump is to collect runoff water from the west section of the diversion ditches and to retain it until the total suspended solids in the water have reached the criteria allowing discharge to the environment.

As part of the construction of the NCIS, a ditch was built during the summer of 2018 in the rockfill capping located downstream of the NCIS, but within the TSF footprint, to avoid ponding of water against the structure. One sump was also built in a natural topographic low point at the north area of the cell and upstream of RF2, within the tailings footprint areas.

A volume of tailings was deposited in the South Cell during August and September 2023 to improve the landforms for closure purposes.

#### **2.2.1.2 Stormwater Management Pond**

The Stormwater Management Pond (SMP) is a small, shallow, and fishless, water body adjacent to Portage Pit (Figure 2.5). Treated sewage effluent is discharged to this pond as well as water containing hydrocarbon products. The pond also collects freshet flows within its catchment area, including most of the Primary Crusher area.

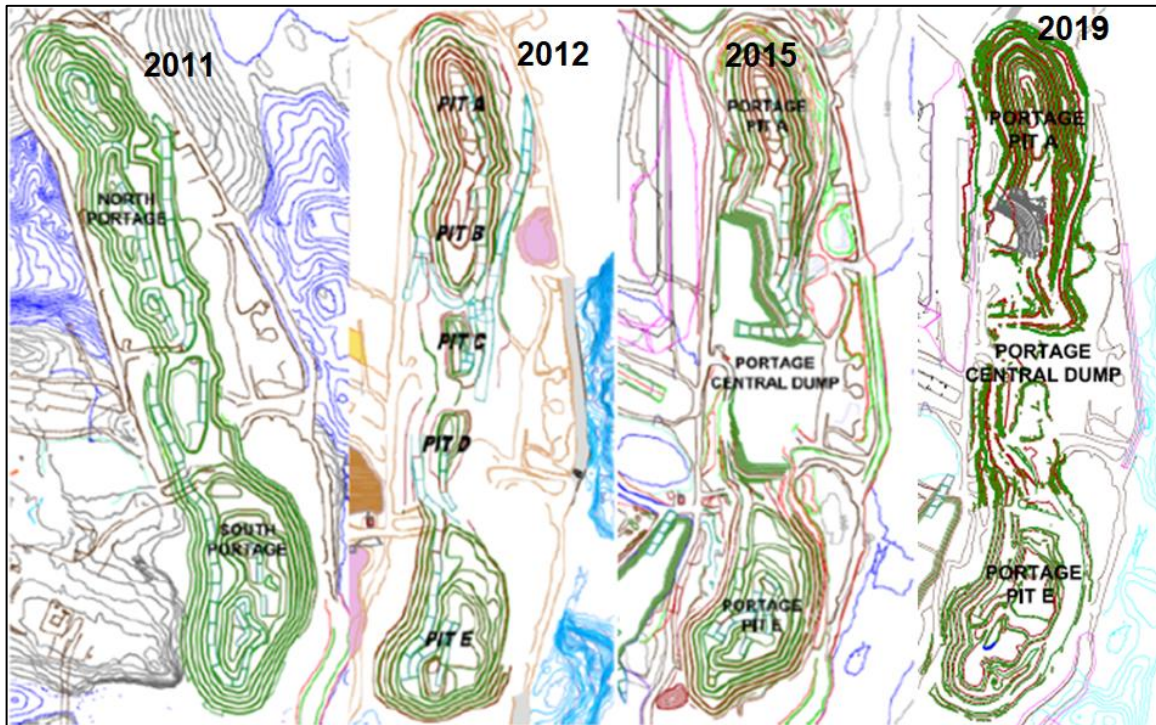


Figure 2.4: Portage Pit terminology

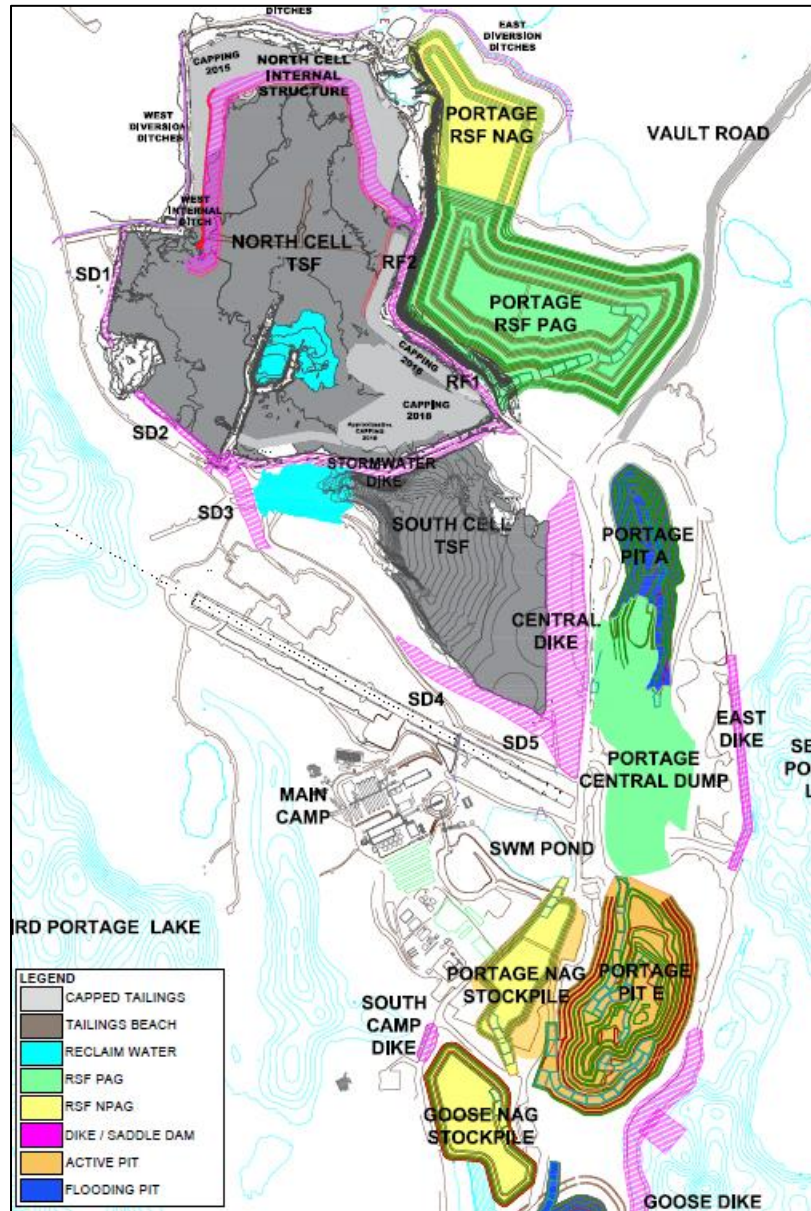


Figure 2.5: Portage Pit area map

## **2.2.2 Goose Pit Area**

The Goose Pit area is located within the dewatered portion of 3PL. Mining in Goose Pit began in 2012 and was completed in April 2015. On May 17<sup>th</sup>, 2019, Agnico received approval of amendment No.3 to the Meadowbank Type A water license 2AM-MEA1526 which permitted in-pit tailings disposal to take place within the Goose Pit. The Goose Pit area and surrounding infrastructures are illustrated in Figure 2.6. For more information regarding in-pit tailings disposal please refer to the Waste Rock & Tailings Management Plan.

The majority of Goose Pit is located within a talik zone. Historically, the main water inflow into Goose Pit has been observed from the fractured quartzite rock formation located in the South and West wall. No major water inflow has been observed from the eastern wall associated with the iron formation type rock with small volcanic lenses. Between the quartzite and iron formation, there is a large band of ultramafic rock (soapstone).

Since mining was completed in 2015, pumping of water out of the pit has ceased and the inflows are collected in the pit as part of the natural flooding process. As mentioned above, from July 5<sup>th</sup>, 2019, to August 19<sup>th</sup>, 2020, tailings have also been deposited in the Goose pit. Water is transferred between Goose Pit and Pit A as required.

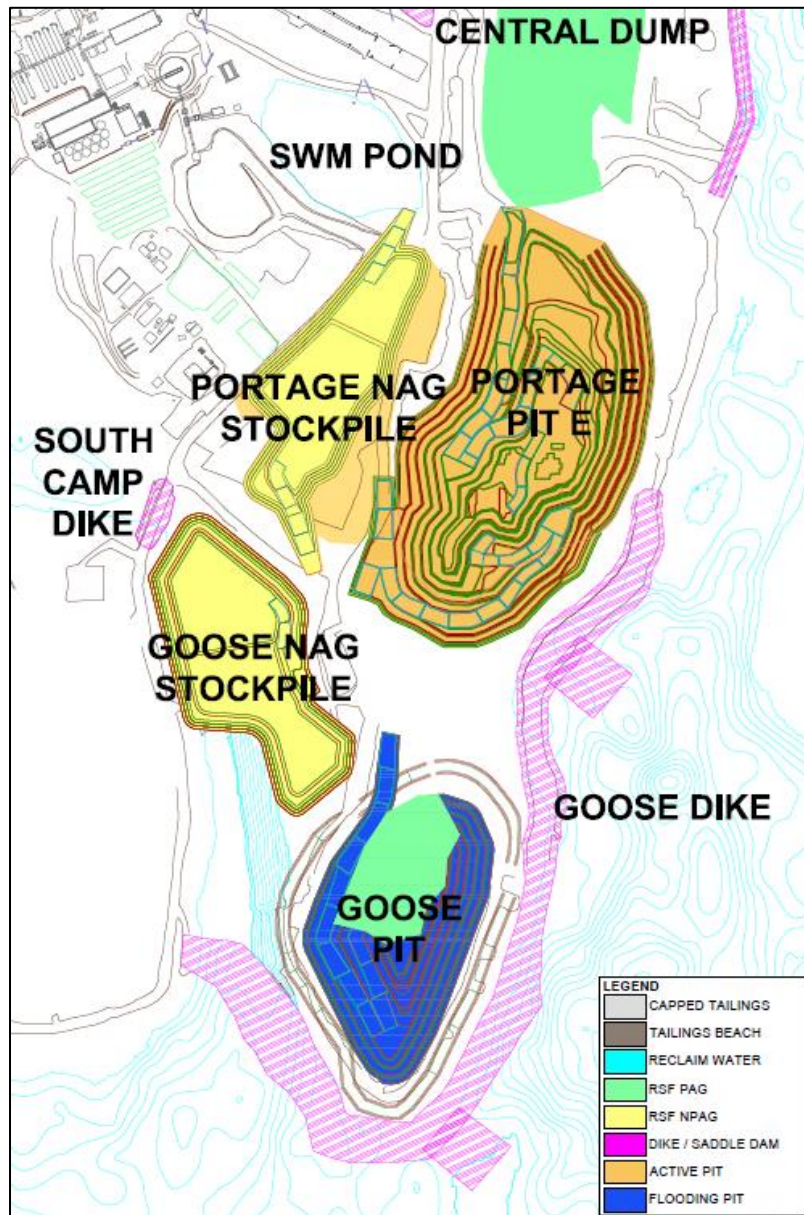


Figure 2.6: Goose Pit area map

### 2.2.3 Vault Pit Area

The infrastructure of the Vault Pit area includes the Vault RSF, ore and marginal pads, Vault Dike, Vault Pit, Phaser Pit, BB Phaser Pit, Vault attenuation pond and the emergency shelter. Figure 2.7 illustrates the Vault Pit area and surrounding infrastructure.

The Vault Pit, which is located under the former Vault Lake, required the construction of Vault Dike to isolate the mining area from Wally Lake and allow dewatering. Dewatering was undertaken in 2013 and 2014. This allowed for mining of Vault Pit and the creation of the Vault Attenuation Pond (ATP).

The Vault Pit began pre-mining operations in 2013 with active mining started in 2014 and completed in March 2019. The dewatering of Phaser Lake occurred during summer 2016 in preparation for mining activity in Phaser Pit and BB Phaser Pit. Phaser Pit mining activities were completed in October 2018. BB Phaser mining began in early 2018 and was completed in June 2019.

The Vault Attenuation Pond is comprised of four internal ponds named Pond A, B C & D. These ponds promote natural settling of the suspended solids. Water levels of these ponds are measured by surveying with a GPS at the location indicated by the red crosses on Figure 2.7.

Most of the water migrating into the pits of the Vault area has been observed to be runoff from the surrounding area during the freshet period. A localized water venue from the East wall of Vault Pit was historically above the 109 masl catch bench. During mining operations this inflow was collected in a sump located at the toe of the wall and then pumped into the Vault Attenuation Pond.

Water pumped from Vault Pit during mining operations was directed to the Vault Attenuation Pond (ATP). When required, the water was discharged into Wally Lake in accordance with the Water License and the MDMER. Agnico monitors the water quality of the Vault Attenuation Pond and discharge at sampling locations ST-25 and ST-10 respectively in accordance with the Water License. Water treatment for TSS has not been required to meet MDMER and Water license criteria prior to discharging in Wally Lake.

Since mining operations in Vault area are completed, there is no more active water management in that area. Passive reflooding is ongoing until active reflooding will begin during closure. As a result, no further discharges to Wally Lake are planned.

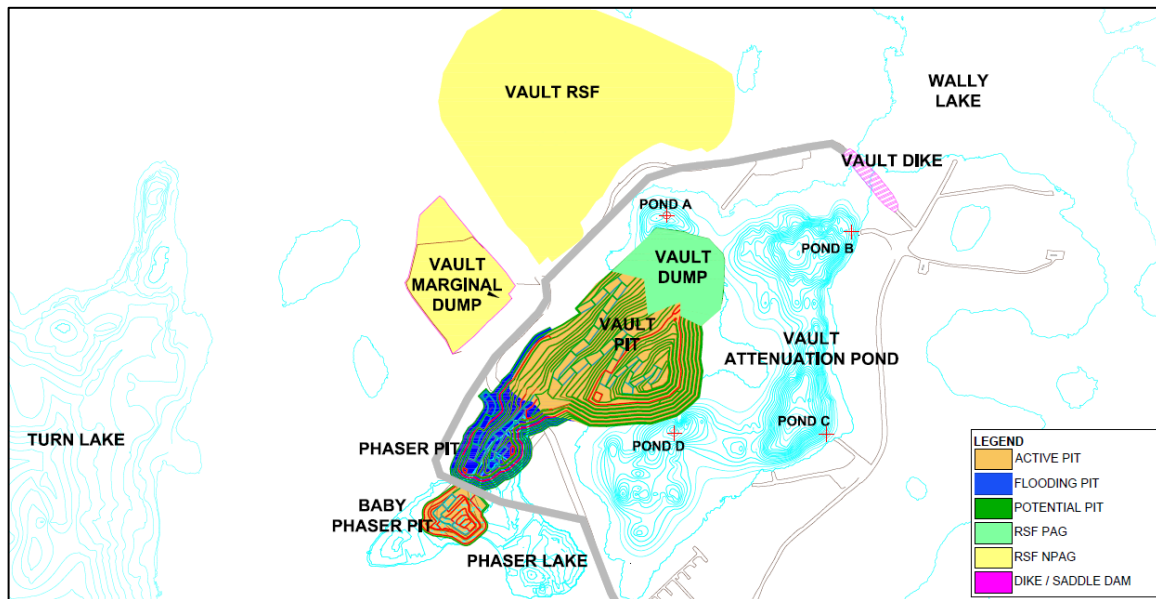


Figure 2.7: Vault Pit area map

### 2.3 LIFE OF MINE DESCRIPTION

The life-of-mine (LOM) is summarized in Table 3.1 of the 2023 Whale Tail Project Waste Rock Management Plan. The Meadowbank Process Plant will be operational until 2026.



### 3 WATER MANAGEMENT PLAN AND WATER BALANCE

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#### 3.1 WATER MANAGEMENT OBJECTIVES AND TARGETS

The water management objectives for the Meadowbank Site are:

- Keep the different water types (i.e. contact, non-contact, and freshwater) separated to the extent practical
- Control and minimize contact water through diversion and containment.
- Minimize freshwater usage by reclaiming the contact water to the extent practical
- Meet discharge criteria before any site contact water is released to the downstream environment.
- Reduction in freshwater intake per ton mined.
- No events of non-compliance.
  - Regulatory/Water License water quality criteria (effluent loading limits);
  - Regulatory/Water License freshwater withdrawal criteria.

The water management targets are summarized in Table 3-1. These targets are aligned with the water objectives of the Meadowbank Complex and go beyond the Water License limits. These targets strive to minimize risk, conserve freshwater, and minimize water usage. The 2024 targets assume continued improvements in the amount of reclaim water withdrawn from the pits to reuse in the Mill which will also decrease the amount of freshwater used per ton processed and increase the amount of water in recirculation. Targets are set to ensure continuous effort is made to improve water management and to encourage all groups to find and pursue opportunities to reduce freshwater consumption.

**Table 3-1: 2024 Targeted water hourly consumption per month – for Mill and Camp usage**

WATER OBJECTIVE	TARGET 2023	TARGET 2024
Fresh Water Withdrawn from 3PL (Mill and Camp)	865,000 m <sup>3</sup>	900 000 m <sup>3</sup>
Contact Water Withdrawn from Pit (reclaim water to Mill)	3,470,000 m <sup>3</sup>	3,300,000 m <sup>3</sup>
Freshwater per ton processed	0.20 m <sup>3</sup> /t	0.20 m <sup>3</sup> /t
Water discharge (treated)	0 m <sup>3</sup>	0 m <sup>3</sup>
Water discharge (fresh) – East Dike to 2PL	70,000 m <sup>3</sup>	35,000 m <sup>3</sup>
Water in recirculation (water recycled / total water use)	80.0%	80.0%

### **3.2 WATER MANAGEMENT STRATEGY**

To achieve the above water management objectives and targets the following key strategies are implemented in the Water Management Plan.

- Two levels of catchment disturbance have been defined for the area, namely undisturbed and disturbed. Areas that have been disturbed as part of the mine development are considered disturbed catchments, while the areas left unaffected are considered undisturbed catchments.
- For mine water management, runoff from undisturbed areas is considered non-contact water, while runoff from disturbed catchment areas is considered contact water. Surface water that is diverted around the mine facilities, or groundwater that does not emerge into a mine facility, is considered non-contact water. Any non-contact water that mixes with contact water becomes contact water.
- Conveyance and storage of contact water is controlled by channels, piping, and containment structures such as sumps and ponds. Sumps are installed in low points surrounding pits, the WRSF, and the TSF. Contact water is diverted in various sumps and water collection ponds and is conveyed to the TSF or the in-pit area.
- Contact water stored in the in-pit is reclaimed for the milling process.
- East Dike seepage is discharged into Second Portage Lake (when discharge criteria is met) or otherwise sent to the in-pit area.
- The collected water in the Meadowbank area will be treated prior to discharge if the water quality does not meet the discharge criteria established in the Water License 2AM-MEA1530.
- Non-treated effluent from the Vault Attenuation Pond can be discharged in Wally Lake if discharge criteria established in the Water License 2AM-MEA1530 are met.
- Non-contact water is intercepted and directed away from disturbed areas by means of natural catchment boundaries and/or diversion structures or pumping systems and will be allowed to flow or to be discharged to the neighboring waterbodies.
- As per the Water License 2AM-MEA1530, (Part E, Condition 10) Agnico will conduct weekly inspections of all water management structures during periods of flow. This is part of the Freshet Action Plan (Appendix D).

### **3.3 WATER MANAGEMENT SYSTEM AND WATER BALANCE**

The water management system includes the following components below. Additional water management system components can be put in place if required to adapt effectively to the site conditions and meet the water management objectives and targets.

The water management system includes the following components:

- Tailings Storage Facility (North Cell and South Cell) and associated dikes (SD1, SD2, SD3, SD4, SD5, Stormwater Dike, Central Dike, NCIS)
- In-pit tailings disposal area (Portage Pit and Goose Pit)
- Four water retention dikes (East Dike, Bay-Goose Dike, South Camp Dike, Vault Dike)
- Water diversion channel around the North Cell of the TSF (East and West Diversion)
- Seepage Management System (Mill Seepage, Central Dike Seepage, East Dike Seepage)
- Stormwater Management Pond
- Sump for WRSF and TSF contact water management
- Reclaim system to the Process Plant
- Freshwater intake and pump system
- Culverts
- Sewage treatment plant (STP)
- Pipelines and associated pump systems
- Potable WTP

As per the requirements of Water License 2AM-MEA1530 (Part E, condition 7) the Water Management Plan includes a yearly updated Water Balance according to the water management strategy and the applicable LOM.

The Water Balance is presented in Appendix A of this report. In this Water Management Plan version, revisions/modifications were made to the Water Balance for optimization purposes including:

- Fresh water consumption revision;
- Total daily mill water requirements;
- Reclaimed water volumes;
- Updated tailings deposition plan showing the deposition calendar for In-Pit Tailings Disposal;
- Water treatment and reflooding sequence and volumes updated as per the latest flooding strategy;
- Update to the seepage section.

### **3.3.1 Fresh Water from Third Portage Lake**

Fresh water from Third Portage Lake is pumped from a freshwater barge. The two primary consumers of fresh water are the mill and the camp. The amount pumped from the barge is tracked in the water balance and reported in the Annual Report as per the requirement of the Type A Water License. The freshwater withdrawal limit for Third Portage Lake as per the Type A Water License is 4,935,000 m<sup>3</sup> per year, including use for pit reflooding.

The freshwater consumed at the process plant is used as part of the milling process and is then discharged in the Portage Pit or TSF as slurry with the tailings. Depending on the time of year, 35% – 75% of the total water volume discharged into the pits is available to be recirculated back to the process plant.

The fresh water used in the camp includes laundry facilities, cleaning, cooking, and drinking water consumption. Most of the camp fresh water is returned as sewage treatment effluent to the Stormwater Management Pond, which ultimately is transferred to the TSF or Portage Pit.

### **3.3.2 Tailings Deposition Strategy and Reclaim Water**

The water management objective related to tailings deposition is to minimize the freshwater per tonne processed while maximizing the water in recirculation. This is achieved by reclaiming contact water from the tailings deposition area. More information on the tailings deposition plan can be found in the waste rock and tailings management plan.

For the remainder of mill operations, reclaim water will continue to come from the in-pit disposal pits Pit A and Pit E.

### **3.3.3 North Cell**

Water inflows in the North Cell include runoff, water from tailings deposition, and water transfers from various sumps as needed (Western Interception Sump, WEP, SD1-2, NCIS, ST-16). As per the design specifications, the level of the North Cell reclaim pond must be maintained with a two-meter freeboard with the peripheral water retaining structures, which are at 150.0 masl elevation. Therefore, the pond must respect an elevation of 148.0 masl. This strategy requires transfers from the North Cell to the South Cell generally from May to October. Following landform cover placement over the TSF and until the water quality closure objectives of the TSF are achieved, the runoff water from the North and South Cells will be collected and directed to the pits. Details on the water management for the TSF at closure are available in the Meadowbank Interim Closure and Reclamation Plan and will be further presented in the Final Mine Closure and Reclamation Plan (FCRP).

Runoff water (non-contact water) from the surrounding North Cell TSF watershed area is captured in the diversion ditches located north of the North Cell TSF. Water from the Western Diversion Ditch is conveyed to the Western Interception Sump. From there, it is pumped into the North Cell

or redirected to Third Portage Lake via the West Diversion Ditch if water quality meets the required criteria.

### **3.3.4 South Cell**

The water management strategy is to keep the water level at a minimum.

Water inflows in the South Cell include runoff, water from tailings deposition, and water transfers from the North Cell, and various sumps (SD3-4-5). As per the design specifications, the level of the South Cell reclaim pond must maintain a two-meter freeboard with the peripheral impermeable structures, which are at 145.0 masl elevation. Therefore, the pond must respect an elevation of 143.0 masl. Water is transferred from the South Cell to Pit A and water transfers are planned to comply with the freeboard requirement and to minimize water accumulation. Water management strategies within the Water Balance reflect the tailings deposition plan presented in the 2023 Mine Waste and Tailings Management Plan (Agnico, 2024).

Until the closure objectives of the cell are achieved, the strategy is to transfer the water accumulating in the South Cell to the open pits. The water transfers are included in the pit flooding process. Details on the water management for the TSF at closure are available in the Meadowbank Interim Closure and Reclamation Plan and will be further presented in the FCRP.

### **3.3.5 Portage Pit**

The Portage Pit is part of the in-pit tailings disposal facility. The water management strategy is to maximize the reclaim to the mill to maximize tailings storage capacity.

As part of the closure concept and to achieve the closure objectives, Portage Pit water will be treated, discharged in Third Portage Lake and the pit will be reflooded. The pit flooding strategy and sequence will continue to be refined until the FCRP submission based on the Water Quality Forecast completed each year (Appendix C).

The Portage Pit inflow is modelled based on measured onsite data including the Central Dike seepage water, Goose Pit transfer, pit wall inflow, runoff water, groundwater, and a contribution from the East Dike seepage water (which is pumped back to Second Portage Lake when discharge criteria are met).

It is likely that the water inflow is filling up the porosity voids of the Portage Central Dump to some extent (former Pit C and Pit D).

### **3.3.6 Goose Pit**

Goose Pit is part of the in-pit tailings disposal facility. The water management strategy is to transfer water between Goose Pit and Portage Pit to meet requirements for the deposition plan.

As part of the closure concept and to achieve the closure objectives, Goose Pit water will be treated, discharged in Third Portage Lake and the pit will be reflooded. The pit flooding strategy

and sequence will continue to be refined until the FCRP submission based on the Water Quality Forecast completed each year (Appendix C).

The Goose Pit inflow is modelled based on measured onsite data including pit wall inflow, runoff water, Pit A transfer and groundwater. It was historically observed that the pit inflow diminishes during the winter due to the freezing of the pit walls.

### **3.3.7 Vault Pits Area**

No active water management is currently occurring in the Vault Area. The current strategy to manage water is to let the area flood passively until the beginning of closure. There is the possibility of discharging water to Wally Lake using the approved discharge, but this is not currently needed as per the water balance.

As part of the closure concept and to achieve the closure objectives, Vault area will be reflooded. The pit flooding strategy and sequence will continue to be refined until the FCRP submission based on the Water Quality Forecast completed each year (Appendix C).

The Vault area natural inflow is modelled based on measured onsite data including pit inflow and runoff water.

### **3.3.8 Stormwater Management Pond**

The Stormwater Management Pond inflow includes treated sewage effluent, runoff, and transfers from trucks containing hydrocarbon contaminated water. The pond water is transferred as required to either the South Cell or the Portage Area.

### **3.3.9 Mill Seepage Collection System**

In November 2013, Agnico observed seepage discharging west of the access road in front of the Assay Lab shown on Figure 3.1. The source was determined to be a leak from internal containment structures within the mill. Third Portage Lake (3PL), approximately 200 m to the west, was identified as a possible sensitive receptor. Remedial measures were undertaken immediately, and this included construction of an impermeable interception/collection trench downstream of the seepage flow path. A comprehensive monitoring system was implemented which included installation of monitoring wells, a recovery well (MW 203) and a water sampling program. Repairs (sealing) were completed within the mill (containment structures) in 2014 to eliminate the source of contaminants.

On December 15<sup>th</sup>, 2023, Agnico observed water inflow within the Assay Road Seep South retention berm. An investigation was undertaken to identify potential sources of the water, to date the exact source of the water inflow has not been identified but no water inflow has been observed since December 26<sup>th</sup>, 2023. The water inflow was contained within the existing water management infrastructure that was built in 2014. Monitoring of the area is still ongoing.

Seepage collected in the trench and recovery well is pumped back to the mill to be used as process water. The pumping occurs in the warmer months beginning when freshet starts. The recovery well is pumped year-round when water is available.

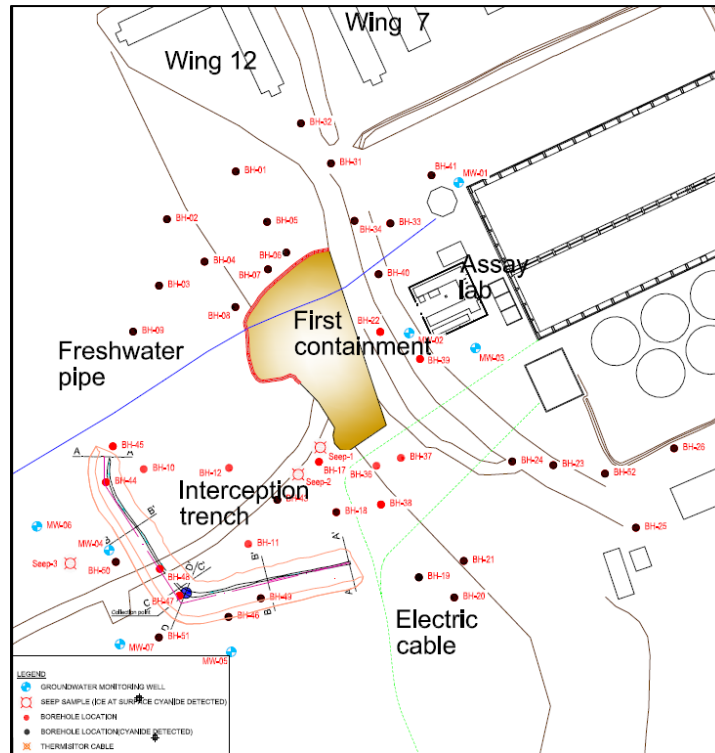


Figure 3.1: Mill seepage area

### 3.3.10 Portage RSF Water Management

The Portage Rock Storage Facility water management system consists of three sumps located behind the Portage waste dump to collect contact water (WEP-1, WEP-2, and ST-16). The location of these sumps is indicated on Figure 3.2. Water collected from WEP-1 and WEP-2 is pumped to the ST-16 sump and then transferred to either North Cell or pit A.

Low contaminant levels are still observed by the sampling program. The Freshet Action Plan (Appendix D) presents more information on the history, long term monitoring plan, and remedial actions for this location.



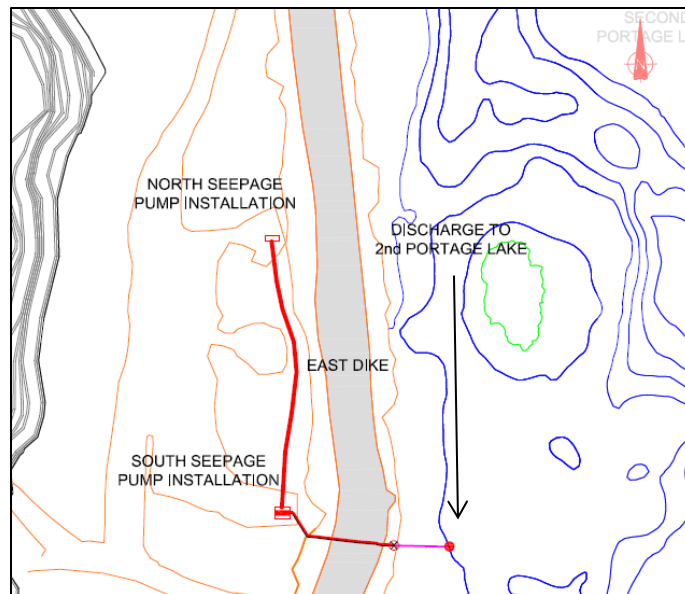
Figure 3.2: RSF seepage area



### 3.3.11 East Dike Seepage Collection

The East Dike seepage system collects the East Dike seepage from Second Portage Lake (2PL). The seepage is collected in two pumping stations (as illustrated in Figure 3.3) and is discharged, as a combined flow, through a diffuser, to 2PL (in accordance with the Water License and the MDMER criteria). When the discharge does not meet the discharge criteria (mainly because of TSS level), the seepage water is pumped to the Portage Pit area (usually at freshet and after large precipitation events in summer) specifically in the Portage Central Waste Rock area, where the water flows in the rock backfill pores towards Pit B and Pit E.

At closure, this seepage water will be an inflow contributing to the natural pit reflooding process.



**Figure 3.3: East Dike pumping system**

### 3.3.12 Central Dike Seepage

The Central Dike downstream area collects the Central Dike seepage. The source of that seepage includes water from the TSF and a regional component. The water from Central Dike downstream is pumped to either the in-pit area or the TSF (as illustrated in Figure 3.4) as to maintain the downstream seepage collection pond level within the operational levels specified in the OMS Manual.

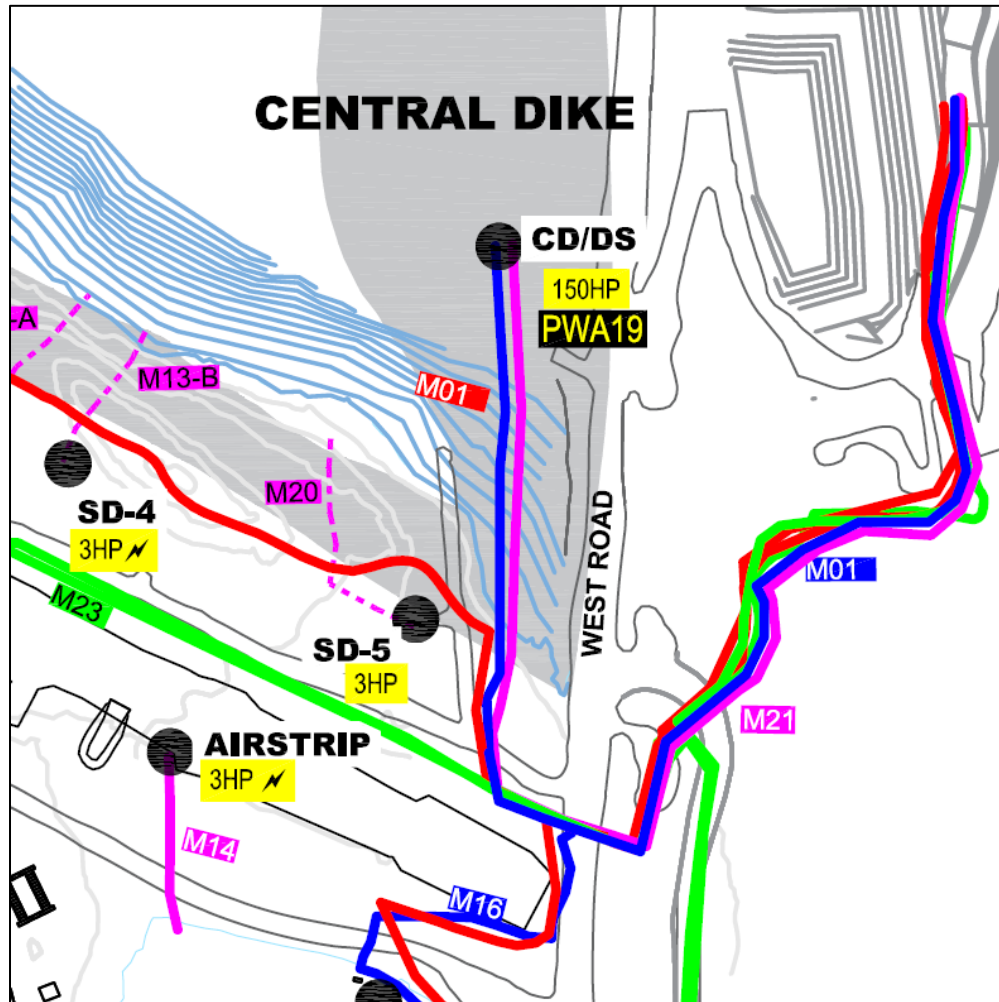


Figure 3.4: Central Dike seepage pumping system

### 3.4 PIT FLOODING – CLOSURE CONCEPT

This section presents the pit flooding concept for closure. As per the water License requirement, Agnico will provide at least 30 days' notice to the Nunavut Water Board and Inspector prior to starting the flooding of each pit from water obtained from Third Portage Lake and Wally Lake.

As prescribed in the Nunavut Water Board Water License No. 2AM-MEA1530 (Part E, Conditions 1 and 2), the use of water from Third Portage Lake, for all purposes, including flooding of the pits, shall not exceed [...] a maximum of 4,935,000 m<sup>3</sup> starting in 2018 through to the expiry of the License 2AM-MEA1530. The use of water from Wally Lake shall not exceed a total 4,185,000 m<sup>3</sup> per year starting in 2018 through the expiry of the License 2AM-MEA1530.

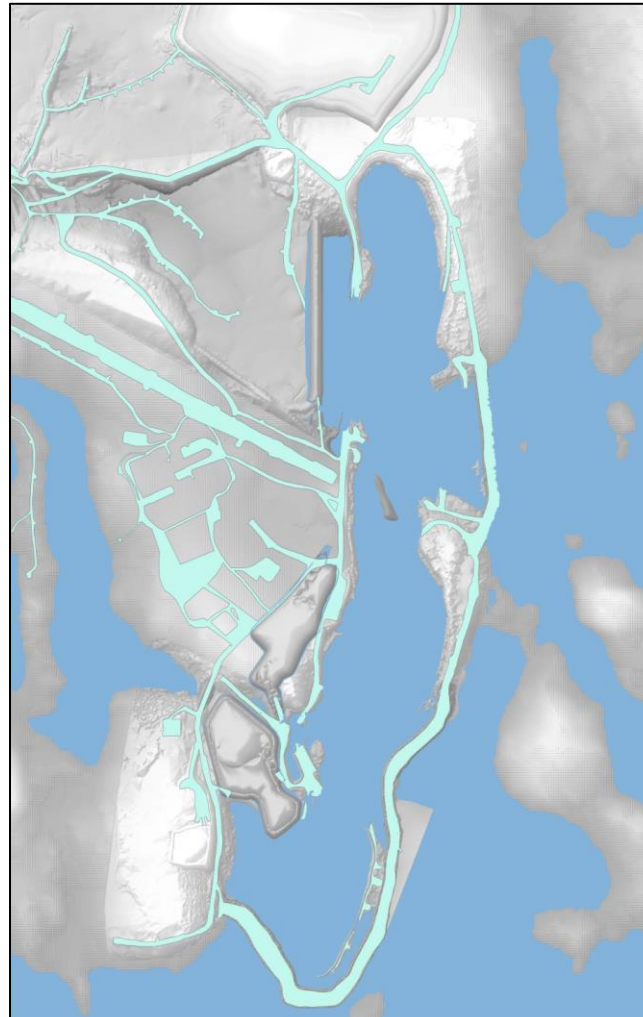
The reflooding concept for the Vault area includes passive flooding until the beginning of closure and then active flooding using water from Wally Lake.

The reflooding concept of the Portage and Goose area includes management of water from tailings deposition activity, water treatment, passive flooding, water transfers between the pits, and active flooding from Third Portage Lake. More details on the in-pit water treatment strategy and design, including the discharge location and assimilative capability of the receiver is required to advance the Portage Area flooding concept. The assimilative capacity of Third Portage Lake will be assessed with the objective of maintaining baseline or guideline/protective water quality in the lake.

Updates on the pit flooding concept will be provided in the next update of the ICRP and the final in-pit water treatment and pit flooding strategy will be submitted as part of the FCRP.

### **3.4.1 Portage and Goose Area Flooding**

The Portage and Goose area will be connected as one waterbody when the pit water level reaches approximately elevation 131.0 masl). Figure 3.5 shows a concept of the the extent of the flooded area at closure.



**Figure 3.5: Flooded Portage and Goose area at closure**

The current concept for Portage and Goose pits flooding at closure is to treat reclaim water from each pit by using a water treatment plant (WTP) and to discharge the treated water in Third Portage Lake. The pits area will then be reflooded using a combination of passive and active water inflow (from Third Portage Lake). This is a conservative assumption that will be revised in the ICRP and FCRP as further data becomes available on the water treatment design for the in-pit water. Different flooding sequence concepts are being looked at for the reflooding of the Portage and Goose Area to ensure the closure objectives will be met. The flooding sequence will be informed by the water treatment strategy that is being established. The location of the discharge, type of treatment, water quality and discharge criteria of the effluent, as well as yearly volume of water to be discharged are being assessed as part of the design of the closure strategy and will impact the pit reflooding strategy. Some of the work associated with the water quality forecast and water treatment plan design is presented in the Meadowbank Water Quality Forecasting Update Technical Note rev. 00 completed by AtkinsRéalis (AtkinsRealis, 2024). An update on the pit

flooding concept will be provided in the next ICRP update and the final design will be submitted as part of the FCRP.

Agnico is committed to update the Water Quality Forecast Model using up to date data on a yearly basis and to use this model to inform on the water treatment design and re-flooding sequence.

The final elevation of the reflooding will be the elevation of Third Portage Lake which is around 133.7 masl based on available data. The Bay-Goose Dike and South Camp Dike will be breached to allow reconnection of the area with Third Portage Lake once the closure water quality objectives for pit flooding will have been achieved, as per the condition of the Water License 2AM-MEA1530, part E, item 7. The dikes shall not be breached until the water quality in the re-flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate site-specific water quality objectives, as per the Water License. It is not planned to breach East Dike and reconnect the area with Second Portage Lake as per the current closure concept, to maintain the water level difference between Second and Third Portage Lake.

Details of the complete mechanical flooding system will be available in the Final Closure and Reclamation Plan and is currently involving syphon systems. Table 3-2 shows the main volumes for the Portage and Goose Area flooding concept.

Pit Flooding Profile – Portage and Goose Area				
Year	Treated Water Volume (m <sup>3</sup> )	Natural Inflow Water Volume (m <sup>3</sup> )	Active Flooding Water Volume (m <sup>3</sup> )	Volume of water in Pit (at end of year)
2027		898 643	0	19 962 196.00
2028	756 019	898 643	0	21 582 111.00
2029	2 999 424	836 407	0	21 032 780.00
2030	2 999 424	836 407	0	20 163 767.00
2031	2 999 424	836 407	0	19 240 753.00
2032	3 007 642	836 407	0	18 336 521.00
2033	2 999 424	836 407	0	17 440 508.00
2034	2 999 424	836 407	0	16 544 494.00
2035	2 999 424	836 407	0	15 648 480.00
2036	3 007 642	836 407	0	14 744 248.00
2037	2 999 424	836 407	0	14 024 171.00
2038	3 167 146	836 407	4 935 000	12 960 435.00
2039	0	836 407	4 935 000	19 980 845.00
2040	0	836 407	2 841 723	27 037 255.00
2041	0	836 407	0	31 982 388.00
2042	0	836 407	0	34 085 799.00
2043	0	836 407	0	36 189 209.00
2044	0	836 407	0	38 292 619.00
<b>Total</b>	<b>30 934 417</b>	<b>15 179 798</b>	<b>12 711 723</b>	<b>38 292 619.00</b>

**Table 3-2: Portage and Goose Area flooding profile**

### 3.4.2 Vault Area Flooding

The Vault Pit area is composed of many basins in the former lake (Vault Attenuation Pond) and two pits that are all linked together (Vault Pit and Phaser Pit). The flooding of the Vault Pit area will involve a combination of passive flooding (runoff) and active flooding using water from Wally Lake (while respecting the Water License limit). The concept for the reflooding system is currently including a syphon system. Table 3-3 shows the main assumptions and data for the Vault Area flooding concept.

The final elevation of the reflooding will be 139.9 masl for Phaser and Vault Lake. The Vault Dike will be breached to allow reconnection of the area with Wally Lake when the closure water quality objectives for pit flooding will have been achieved, as per the condition of the Water License 2AM-MEA1530, part E, item 7. The dikes shall not be breached until the water quality in the re-flooded area meets CCME Water Quality Guidelines for the Protection of Aquatic Life, baseline concentrations, or appropriate site-specific water quality objectives, as per the Water License.

BB Phaser Pit and Phaser Lake will be flooded exclusively from their watershed run off inflows until the target elevation of Wally is reached.

**Table 3-3: Vault Area flooding profile**

Pit Flooding Profile – Vault Area (Vault, Phaser, and BB Phaser Pits)				
Year	Treated Water Volume (m <sup>3</sup> )	Natural Inflow Water Volume (m <sup>3</sup> )	Active Flooding Water Volume (m <sup>3</sup> )	Volume of water in Pit (at end of year)
2024	0	542 442	0	1 834 712
2025	0	542 442	314 194	1 989 592
2026	0	542 442	0	2 144 471
2027	0	542 442	0	2 299 351
2028	0	542 442	0	2 454 230
2029	0	542 442	0	2 780 579
2030	0	542 442	0	3 106 928
2031	0	542 442	0	3 433 277
2032	0	542 442	0	3 759 626
2033	0	542 442	0	4 085 975
2034	0	542 442	0	6 590 778
2035	0	542 442	0	10 762 247
2036	0	542 442	0	14 933 717
2037	0	542 442	0	19 105 186
2038	0	542 442	0	23 105 186
2039	0	542 442	0	27 105 186
2040	0	542 442	0	30 438 520
<b>Total</b>	<b>0</b>	<b>9 221 514</b>	<b>314 194</b>	<b>159 929 561</b>

#### **4 MEADOWBANK WATER QUALITY FORECASTING UPDATE**

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An updated water quality forecast report is presented in Appendix C. That update is a continuation of a series of yearly water quality modelling updates, which began in 2012, and will continue until mine closure, as per the Water License part E item 7. The purposes of the report are to identify, through a mass balance approach, the contaminants of concern during the pit flooding process, and to inform water treatment design and requirements for closure activities. This update builds on the work of previous years as new monitoring data is available. Forecasted model values of the prior years are compared with the actual sample results from the following years for model accuracy purposes.

The latest water quality forecast identified that treatment may be required for aluminium, arsenic, cadmium, copper, mercury, nickel, total dissolved solids (TDS), total ammonia, pH, total suspended solids (TSS), and potentially low concentration of total cyanide as the pit water quality may exceed water quality objectives, based on the completely mixed assumption. For the Vault area, ammonia and nitrate are the parameters of concern, but no actual or forecasted concentration exceeds the Type A Water License discharge requirements for this area.

As the afore mentioned parameters may be of concern, treatment options for the pit water are being assessed as per the schedule outlined in the Meadowbank Water Quality Forecasting Update Technical Note rev. 00 (AtkinsRéalis, 2024). Updates on the pit flooding and water treatment strategy will be provided in the next ICRP update and the final design will be submitted as part of the FCRP.

As part of the ongoing work on the water treatment concept, a sampling program was performed in the fall of 2023 to sample pit water from various locations and depths within the pits including near the tailings/water interface. Tailings pore water sampling was also completed. It is planned to continue this sampling program in 2024 so that results can be used in future water quality forecast work.

Agnico is committed to implementing the following strategy related to the water quality forecast:

1. Continue the current monthly monitoring program of all inflows and outflows of the North and South Cells TSF Pond for cyanide, a complete total and dissolved metal scan, ammonia, nitrate, fluoride, chloride, sulphates, total dissolved solids (TDS) and total suspended solids (TSS). This will provide an indication of the runoff quality that accumulated in these ponds following the end of tailings deposition in these areas.
2. Considering that deposition of the tailings is now occurring in the pits, regularly monitor pit water quality (Portage and Goose), when the site can be safely accessed, and analyze for cyanide, total and dissolved metals, ammonia, nitrate, chloride, fluoride, sulphates, total dissolved solids (TDS), and total suspended solids (TSS). This information will be useful in developing and calibrating a water quality forecast model of the pit water quality based on loadings from the mill effluent, surface runoff, and possible pit



- seepages. Consider measuring the conductivity of water in the pits at different depths to detect if there is any stratification occurring in the pit lakes.
3. Once Portage and Goose Pits are hydraulically connected, it is recommended to sample the water at different points in the pit area to evaluate the mixing efficiency over the entire area. The samples should be taken at different depths over the entire area of the flooded pits before and after the filling season.
  4. Continue to sample and analyze, as per the Water License requirement, water from the Vault Pit, Vault Attenuation Pond, Phaser Pit, and Phaser Attenuation Pond.
  5. Continue bench scale water treatment tests to evaluate the contaminant removal efficiency using treatment approaches such as lime neutralization, coagulation/flocculation with aluminum sulphate or ferric sulphate, and coagulation/flocculation with proprietary coagulants designed for metal removal, as well as alternative treatment options such as biological treatment for ammonia.

Alternatives water quality modelling methodologies are actively being assessed to further refine the understanding and forecasting of water quality on site. In addition, studies are on going to define the most optimal water management strategies to improve water quality on site for closure.

## 5 REFERENCES

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3. Golder Associates Ltd. (Golder), 2003. Report on Permafrost Thermal Regime Baseline Studies, Meadowbank Project. December 18, 2003.
4. Golder (2009) – Meadowbank Gold Project Updated Water Management Plan. Golder Associates Limited. July 2009.
5. SNC (2013) – Water Management Plan 2012. SNC Lavalin. March 2013.
6. AtkinsRéalis (2024) – Meadowbank Water Quality Forecasting Update for the 2023 Water Management Plan. March 2024.



**APPENDIX A – 2023 WATER BALANCE UPDATE**

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*Note: Reported values for October, November and December are estimated based on historical values, due to time constraint to produce the water balance for the end of the year 2023.*







Q3	July-34	31	4	2 945	2945	0							0	0
	August-34	31	4	2 945	2945	0							0	0
	September-34	30	4	2 850	2850	0							0	0
Q4	October-34	31	4	2 945	2945	0							0	0
	November-34	30	4	2 850	2850	0							0	0
	December-34	31	4	2 945	2945	0							0	0
<b>2034 AVERAGES &amp; TOTALS</b>			<b>4</b>	<b>34 675</b>	<b>34675</b>	<b>0</b>							<b>0</b>	<b>0</b>
Q1	January-35	31	4	2 945	2945	0							0	0
	February-35	28	4	2 660	2660	0							0	0
	March-35	31	4	2 945	2945	0							0	0
Q2	April-35	30	4	2 850	2850	0							0	0
	May-35	31	4	2 945	2945	0							0	0
	June-35	30	4	2 850	2850	0							0	0
Q3	July-35	31	4	2 945	2945	0							0	0
	August-35	31	4	2 945	2945	0							0	0
	September-35	30	4	2 850	2850	0							0	0
Q4	October-35	31	4	2 945	2945	0							0	0
	November-35	30	4	2 850	2850	0							0	0
	December-35	31	4	2 945	2945	0							0	0
<b>2035 AVERAGES &amp; TOTALS</b>			<b>4</b>	<b>34 675</b>	<b>34675</b>	<b>0</b>							<b>0</b>	<b>0</b>
Q1	January-36	31	4	2 945	2945	0							0	0
	February-36	29	4	2 755	2755	0							0	0
	March-36	31	4	2 945	2945	0							0	0
Q2	April-36	30	4	2 850	2850	0							0	0
	May-36	31	4	2 945	2945	0							0	0
	June-36	30	4	2 850	2850	0							0	0
Q3	July-36	31	4	2 945	2945	0							0	0
	August-36	31	4	2 945	2945	0							0	0
	September-36	30	4	2 850	2850	0							0	0
Q4	October-36	31	4	2 945	2945	0							0	0
	November-36	30	4	2 850	2850	0							0	0
	December-36	31	4	2 945	2945	0							0	0
<b>2036 AVERAGES &amp; TOTALS</b>			<b>4</b>	<b>34 770</b>	<b>34770</b>	<b>0</b>							<b>0</b>	<b>0</b>
Q1	January-37	31	4	2 945	2945	0							0	0
	February-37	28	4	2 660	2660	0							0	0
	March-37	31	4	2 945	2945	0							0	0
Q2	April-37	30	4	2 850	2850	0							0	0
	May-37	31	4	2 945	2945	0							0	0
	June-37	30	4	2 850	2850	0							0	0
Q3	July-37	31	4	2 945	2945	0							0	0
	August-37	31	4	2 945	2945	0							0	0
	September-37	30	4	2 850	2850	0							0	0
Q4	October-37	31	4	2 945	2945	0							0	0
	November-37	30	4	2 850	2850	0							0	0
	December-37	31	4	2 945	2945	0							0	0
<b>2037 AVERAGES &amp; TOTALS</b>			<b>4</b>	<b>34 675</b>	<b>34675</b>	<b>0</b>							<b>0</b>	<b>0</b>
Q1	January-38	31	4	2 945	2945	0							0	0
	February-38	28	4	2 660	2660	0							0	0
	March-38	31	4	2 945	2945	0							0	0
Q2	April-38	30	4	2 850	2850	0							0	0
	May-38	31	4	2 945	2945	0							0	0
	June-38	30	4	2 850	2850	0							0	0
Q3	July-38	31	4	2 945	2945	0							0	0
	August-38	31	4	2 945	2945	0							0	0
	September-38	30	4	2 850	2850	0							0	0
Q4	October-38	31	4	2 945	2945	0							0	0
	November-38	30	4	2 850	2850	0							0	0
	December-38	31	4	2 945	2945	0							0	0
<b>2038 AVERAGES &amp; TOTALS</b>			<b>4</b>	<b>34 675</b>	<b>34675</b>	<b>0</b>							<b>0</b>	<b>0</b>





Q3	August-43	31	4	2 945	2945	0												0	0
	September-43	30	4	2 850	2850	0												0	0
Q4	October-43	31	4	2 945	2945	0												0	0
	November-43	30	4	2 850	2850	0												0	0
	December-43	31	4	2 945	2945	0												0	0
<b>2043 AVERAGES &amp; TOTALS</b>				<b>4</b>	<b>34 675</b>	<b>34675</b>	<b>0</b>											<b>0</b>	<b>0</b>
Q1	January-44	31	4	2 945	2945	0												0	0
	February-44	29	4	2 755	2755	0												0	0
	March-44	31	4	2 945	2945	0												0	0
Q2	April-44	30	4	2 850	2850	0												0	0
	May-44	31	4	2 945	2945	0												0	0
Q3	June-44	30	4	2 850	2850	0												0	0
	July-44	31	4	2 945	2945	0												0	0
	August-44	31	4	2 945	2945	0												0	0
Q4	September-44	30	4	2 850	2850	0												0	0
	October-44	31	4	2 945	2945	0												0	0
	November-44	30	4	2 850	2850	0												0	0
	December-44	31	4	2 945	2945	0												0	0
<b>2044 AVERAGES &amp; TOTALS</b>				<b>4</b>	<b>34 770</b>	<b>34770</b>	<b>0</b>											<b>0</b>	<b>0</b>























0	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			4140			1		44 307 511	-6 231 983	132.90
0	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			4278			1		44 428 245	-6 352 717	132.99
42 909	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			104772			1		44 991 774	-6 916 247	133.39
11 465	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			14341			1		45 290 270	-7 214 742	133.60
30 938	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			20587			1		45 635 283	-7 559 755	133.84
14 584	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			54976			1		45 885 252	-7 809 725	#DIV/0!
0	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			4278			1		46 020 313	-7 944 786	#DIV/0!
0	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			4140			1		46 105 997	-8 030 469	#DIV/0!
0	0	0	0	0	11 588 593	11 588 592	4 643 927	142.811			4278			1		46 168 665	-8 093 137	#DIV/0!
99 896				0							228210				0			











2 480	0	1		437 166	0	437 166	437 166	0	0	437 166	20 121 210	33.27			
2 240	0	1		429 446	0	429 446	866 612	0	0	866 612	19 691 764	44.94			
2 480	0	1		434 613	0	434 613	1 301 225	0	0	1 301 225	19 257 151	52.64			
2 400	0	1		432 909	0	432 909	1 734 134	0	0	1 734 134	18 824 242	59.04			
2 480	0	1		493 429	0	493 429	2 227 563	0	0	2 227 563	18 330 813	65.59			
53 245	0	1		779 000	0	794 328	3 021 891	0	0	3 021 891	17 536 485	73.88			
7 564	0	1		625 933	0	650 198	3 672 089	0	0	3 672 089	16 886 287	79.85			
10 720	0	1		665 473	0	671 415	4 343 504	0	0	4 343 504	16 214 872	85.56			
28 085	0	1		552 653	0	558 015	4 901 519	0	0	4 901 519	15 656 857	89.74			
2 480	0	1		505 479	0	507 938	5 409 457	0	0	5 409 457	15 148 919	93.07			
2 400	0	1		458 517	0	458 517	5 867 974	0	0	5 867 974	14 690 402	95.95			
2 480	0	1		435 545	0	435 545	6 303 519	0	0	6 303 519	14 254 857	98.60			
119054				0											
2 480	0	1		437 166	0	437 166	6 740 685	0	0	6 740 685	13 817 691	101.19			
2 240	0	1		429 446	0	429 446	7 170 131	0	0	7 170 131	13 388 245	103.65			
2 480	0	1		434 613	0	434 613	7 604 744	0	0	7 604 744	12 953 632	106.06			
2 400	0	1		432 909	0	432 909	8 037 653	0	0	8 037 653	12 520 723	108.35			
2 480	0	1		493 429	0	493 429	8 531 082	0	0	8 531 082	12 027 294	110.70			
53 245	0	1		779 000	0	794 328	9 325 410	0	0	9 325 410	11 232 966	114.20			
7 564	0	1		625 933	0	650 198	9 975 608	0	0	9 975 608	10 582 768	116.96			
10 720	0	1		665 473	0	671 415	10 647 023	0	0	10 647 023	9 911 353	119.72			
28 085	0	1		552 653	0	558 015	11 205 038	0	0	11 205 038	9 353 338	121.96			
2 480	0	1		505 479	0	507 938	11 712 976	0	0	11 712 976	8 845 400	123.94			
2 400	0	1		458 517	0	458 517	12 171 493	0	0	12 171 493	8 386 883	125.69			
2 480	0	1		435 545	0	435 545	12 607 038	0	0	12 607 038	7 951 338	127.27			
119054				0											
2 480	0	1		228 916	0	228 916	12 835 954	0	0	12 835 954	7 722 422	128.03			
2 240	0	1		18 196	0	18 196	12 854 150	0	0	12 854 150	7 704 226	128.05			
2 480	0	1		23 363	0	23 363	12 877 513	0	0	12 877 513	7 680 863	128.08			
2 400	0	1		21 659	0	21 659	12 899 172	0	0	12 899 172	7 659 204	128.11			
2 480	0	1		82 179	0	82 179	12 981 351	0	0	12 981 351	7 577 025	128.23			
53 245	0	1		367 750	0	383 078	13 364 429	0	0	13 364 429	7 193 947	128.75			
7 564	0	1		214 683	0	238 948	13 603 377	0	0	13 603 377	6 954 999	129.08			
10 720	0	1		254 223	0	260 165	13 863 542	0	0	13 863 542	6 694 834	129.44			
28 085	0	1		141 403	0	146 765	14 010 307	0	0	14 010 307	6 548 069	129.64			
2 480	0	1		94 229	0	96 688	14 106 995	0	0	14 106 995	6 451 381	129.77			
2 400	0	1		47 267	0	47 267	14 154 262	0	0	14 154 262	6 404 114	129.84			
2 480	0	1		24 295	0	24 295	14 178 557	0	0	14 178 557	6 379 819	129.87			
119054				0											
2 480	1	0		28 396	0	28 396	14 206 953	0	0	14 206 953	6 351 423	129.91			
2 240	1	0		20 436	0	20 436	14 227 389	0	0	14 227 389	6 330 987	129.94			
2 480	1	0		25 843	0	25 843	14 253 232	0	0	14 253 232	6 305 144	129.98			
2 400	1	0		24 059	0	24 059	14 277 291	0	0	14 277 291	6 281 085	130.01			
2 480	1	0		84 659	0	84 659	14 361 950	0	0	14 361 950	6 196 426	130.13			
53 245	1	0		420 995	0	436 323	14 798 273	0	0	14 798 273	5 760 103	130.73			
7 564	1	0		222 247	0	246 512	15 044 785	0	0	15 044 785	5 513 591	131.07			
10 720	1	0		264 943	0	270 885	15 315 670	0	0	15 315 670	5 242 706	131.44			
28 085	1	0		169 488	0	174 850	15 490 520	0	0	15 490 520	5 067 856	131.68			
2 480	1	0		96 709	0	99 168	15 589 688	0	0	15 589 688	4 968 688	131.82			
2 400	1	0		49 667	0	49 667	15 639 355	0	0	15 639 355	4 919 021	131.88			
2 480	1	0		26 775	0	26 775	15 666 130	0	0	15 666 130	4 892 246	131.92			
119054				0											
2 480	1	0		28 396	0	28 396	15 694 526	0	0	15 694 526	4 863 850	131.96			
2 240	1	0		20 436	0	20 436	15 714 962	0	0	15 714 962	4 843 414	131.99			
2 480	1	0		25 843	0	25 843	15 740 805	0	0	15 740 805	4 817 571	132.02			
2 400	1	0		24 059	0	24 059	15 764 864	0	0	15 764 864	4 793 512	132.06			
2 480	1	0		84 659	0	84 659	15 849 523	0	0	15 849 523	4 708 853	132.17			
53 245	1	0		420 995	0	436 323	16 285 846	0	0	16 285 846	4 272 530	132.77			
7 564	1	0		222 247	0	246 512	16 532 358	0	0	16 532 358	4 026 018	133.11			













Goose Pit														Goose Pit
Goose Inflow (m³)	Enter 1 for the discharge location				Volume Pumped from 3 <sup>rd</sup> Portage (m³)	Total Pond Volume (Ice + Water) (m³)	Tailings Deposited (t)	Cummulative Tailings Deposited (m³)	Cummulative Volume (m³)	Volume Available Remaining (m³)	Water Elevation (m)	Planned Tailing Elevation (m)	Modeled Tailing Elevation (m)	
	NC	SC	Goose	Portage										
x														
344 994					0									
307 769					0									
383 800					0									
375 300					0									
464 019					0									
89 963					0									
327 114					0									
389 350					0									
199 289					0									
15 000			1			3 085 777	0	1 773 921	4 859 698	3 014 574	110.95	89.87		110.95
14 000			1			3 099 777	0	1 773 921	4 873 698	3 000 574	111.07	89.87		111.07
12 000			1			3 111 777	0	1 773 921	4 885 698	2 988 574	111.17	89.87		111.17
15 000			1			3 126 777	0	1 773 921	4 900 698	2 973 574	111.30	89.87		error
15 000			1			3 141 777	0	1 773 921	4 915 698	2 958 574	111.42	89.87		Error
50 000			1			3 191 777	0	1 773 921	4 965 698	2 908 574	111.84	89.87		Error
28 000			1			3 219 777	0	1 773 921	4 993 698	2 880 574	112.08	89.87		112.08
15 000			1			3 234 777	0	1 773 921	5 008 698	2 865 574	112.20	89.87		112.20
42 000			1			3 276 777	0	1 773 921	5 050 698	2 823 574	112.55	89.87		112.55
24 000			1			3 300 777	0	1 773 921	5 074 698	2 799 574	112.75	89.87		112.75
6 500			2			3 313 777	0	1 773 921	5 087 698	2 786 574	112.86	89.87		112.86
17 000			1			3 330 777	0	1 773 921	5 104 698	2 769 574	113.00	89.87		113.00
253 500					0									
27 218			1			3 357 995	0	1 773 921	5 131 916	2 742 356	113.22	89.87		113.14
24 584			1			3 382 579	0	1 773 921	5 156 500	2 717 772	113.43	89.87		113.24
27 218			1			3 409 797	0	1 773 921	5 183 718	2 690 554	113.65	89.87		113.35
26 340			1			3 436 137	0	1 773 921	5 210 058	2 664 214	113.87	89.87		113.44
27 218			1			3 463 355	0	1 773 921	5 237 276	2 636 996	114.09	89.87		113.96
65 316			1			3 528 671	0	1 773 921	5 302 592	2 571 680	114.62	89.87		114.26
31 116			1			3 559 787	0	1 773 921	5 333 708	2 540 564	114.87	89.87		114.41
33 535			1			3 593 322	0	1 773 921	5 367 243	2 507 029	115.15	89.87		114.58
46 029			1			3 751 874	0	1 773 921	5 525 795	2 348 477	116.42	89.87		115.42
27 218			1			4 035 621	0	1 773 921	5 809 542	2 064 730	118.66	89.87		
26 340			1			4 132 844	0	1 773 921	5 906 765	1 967 507	119.41	89.87		
27 218			1			4 160 062	0	1 773 921	5 933 983	1 940 289	119.62	89.87		
389 350					0									
27 218			1			4 187 280	0	1 773 921	5 961 201	1 913 071	119.83	89.87		
24 584			1			4 211 864	0	1 773 921	5 985 785	1 888 487	120.02	89.87		



27 218			1		4 239 082	0	1 773 921	6 013 003	1 861 269	120.22	89.87	
26 340			1		4 265 422	0	1 773 921	6 039 343	1 834 929	120.42	89.87	
27 218			1		4 292 640	0	1 773 921	6 066 561	1 807 711	120.63	89.87	
65 316			1		4 357 956	0	1 773 921	6 131 877	1 742 395	121.11	89.87	
31 116			1		4 389 072	0	1 773 921	6 162 993	1 711 279	121.34	89.87	
33 535			1		4 422 607	0	1 773 921	6 196 528	1 677 744	121.59	89.87	
46 029			1		4 468 636	0	1 773 921	6 242 557	1 631 715	121.93	89.87	
27 218			1		4 495 854	0	1 773 921	6 269 775	1 604 497	122.12	89.87	
26 340			1		4 522 194	0	1 773 921	6 296 115	1 578 157	122.31	89.87	
27 218			1		4 549 412	0	1 773 921	6 323 333	1 550 939	122.51	89.87	
<b>389 350</b>					<b>0</b>							
27 218			1		4 576 630	0	1 773 921	6 350 551	1 523 721	122.70	89.87	
24 584			1		4 601 214	0	1 773 921	6 375 135	1 499 137	122.88	89.87	
27 218			1		4 628 432	0	1 773 921	6 402 353	1 471 919	123.07	89.87	
26 340			1		4 654 772	0	1 773 921	6 428 693	1 445 579	123.25	89.87	
27 218			1		4 681 990	0	1 773 921	6 455 911	1 418 361	123.44	89.87	
65 316			1		4 747 306	0	1 773 921	6 521 227	1 353 045	123.89	89.87	
31 116			1		4 778 422	0	1 773 921	6 552 343	1 321 929	124.11	89.87	
33 535			1		4 811 957	0	1 773 921	6 585 878	1 288 394	124.34	89.87	
46 029			1		4 857 986	0	1 773 921	6 631 907	1 242 365	124.65	89.87	
27 218			1		4 885 204	0	1 773 921	6 659 125	1 215 147	124.83	89.87	
26 340			1		4 911 544	0	1 773 921	6 685 465	1 188 807	125.01	89.87	
27 218			1		4 938 762	0	1 773 921	6 712 683	1 161 589	125.19	89.87	
<b>389 350</b>					<b>0</b>							
27 218			1		4 965 980	0	1 773 921	6 739 901	1 134 371	125.37	89.87	
24 584			1		4 990 564	0	1 773 921	6 764 485	1 109 787	125.53	89.87	
27 218			1		5 017 782	0	1 773 921	6 791 703	1 082 569	125.70	89.87	
26 340			1		5 044 122	0	1 773 921	6 818 043	1 056 229	125.86	89.87	
27 218			1		5 071 340	0	1 773 921	6 845 261	1 029 011	126.03	89.87	
65 316			1		5 136 656	0	1 773 921	6 910 577	963 695	126.41	89.87	
31 116			1		5 167 772	0	1 773 921	6 941 693	932 579	126.58	89.87	
33 535			1		5 201 307	0	1 773 921	6 975 228	899 044	126.77	89.87	
46 029			1		5 247 336	0	1 773 921	7 021 257	853 015	127.03	89.87	
27 218			1		5 274 554	0	1 773 921	7 048 475	825 797	127.17	89.87	
26 340			1		5 300 894	0	1 773 921	7 074 815	799 457	127.31	89.87	
27 218			1		5 328 112	0	1 773 921	7 102 033	772 239	127.46	89.87	
<b>389 350</b>					<b>0</b>							
27 218			1		5 355 330	0	1 773 921	7 129 251	745 021	127.60	89.87	
24 584			1		5 379 914	0	1 773 921	7 153 835	720 437	127.72	89.87	
27 218			1		5 407 132	0	1 773 921	7 181 053	693 219	127.86	89.87	
26 340			1		5 433 472	0	1 773 921	7 207 393	666 879	128.00	89.87	
27 218			1		5 460 690	0	1 773 921	7 234 611	639 661	128.13	89.87	
65 316			1		5 526 006	0	1 773 921	7 299 927	574 345	128.45	89.87	
31 116			1		5 557 122	0	1 773 921	7 331 043	543 229	128.60	89.87	

33 535			1		5 590 657	0	1 773 921	7 364 578	509 694	128.76	89.87		
46 029			1		5 636 686	0	1 773 921	7 410 607	463 665	128.98	89.87		
27 218			1		5 663 904	0	1 773 921	7 437 825	436 447	129.10	89.87		
26 340			1		5 690 244	0	1 773 921	7 464 165	410 107	129.22	89.87		
27 218			1		5 717 462	0	1 773 921	7 491 383	382 889	129.34	89.87		
<b>389 350</b>					<b>0</b>								
27 218			1		5 744 680	0	1 773 921	7 518 601	355 671	129.47			
24 584			1		5 769 264	0	1 773 921	7 543 185	331 087	129.58			
27 218			1		5 796 482	0	1 773 921	7 570 403	303 869	129.70			
26 340			1		5 822 822	0	1 773 921	7 596 743	277 529	129.81			
27 218			1		5 850 040	0	1 773 921	7 623 961	250 311	129.93			
65 316			1		5 915 356	0	1 773 921	7 689 277	184 995	130.22			
31 116			1		5 819 099	0	1 773 921	7 593 020	281 252	129.80			
33 535			1		5 725 262	0	1 773 921	7 499 183	375 089	129.38			
46 029			1		5 648 027	0	1 773 921	7 421 948	452 324	129.03			
27 218			1		5 547 872	0	1 773 921	7 321 793	552 479	128.56			
26 340			1		5 450 948	0	1 773 921	7 224 869	649 403	128.08			
27 218			1		5 350 793	0	1 773 921	7 124 714	749 558	127.57			
<b>389 350</b>					<b>0</b>								
27 218			1		5 123 265	0	1 773 921	6 897 186	977 086	126.33			
24 584			1		4 917 757	0	1 773 921	6 691 678	1 182 594	125.05			
27 218			1		4 690 229	0	1 773 921	6 464 150	1 410 122	123.50			
26 340			1		4 470 041	0	1 773 921	6 243 962	1 630 310	121.94			
27 218			1		4 242 513	0	1 773 921	6 016 434	1 857 838	120.25			
65 316			1		4 061 301	0	1 773 921	5 835 222	2 039 050	118.86			
31 116			1		3 837 672	0	1 773 921	5 611 593	2 262 679	117.10			
33 535			1		3 616 461	0	1 773 921	5 390 382	2 483 890	115.33			
46 029			1		3 415 962	0	1 773 921	5 189 883	2 684 389	113.70			
27 218			1		3 188 435	0	1 773 921	4 962 356	2 911 916	111.82			
26 340			1		2 968 247	0	1 773 921	4 742 168	3 132 104	109.94			
27 218			1		2 740 719	0	1 773 921	4 514 640	3 359 632	107.83			
<b>389 350</b>					<b>0</b>								
19 131			1		2 505 104	0	1 773 921	4 279 025	3 595 247	105.55			
19 313			1		2 294 325	0	1 773 921	4 068 246	3 806 026	103.45			
19 131			1		2 058 710	0	1 773 921	3 832 631	4 041 641	101.05			
19 131			1		1 831 313	0	1 773 921	3 605 234	4 269 038	98.68			
19 313			1		1 595 880	0	1 773 921	3 369 801	4 504 471	96.16			
60 716			1		1 410 068	0	1 773 921	3 183 989	4 690 283	94.12			
30 242			1		1 185 565	0	1 773 921	2 959 486	4 914 786	91.59			
49 297			1		980 116	0	1 773 921	2 754 037	5 120 235	89.18			
33 265			1		766 853	0	1 773 921	2 540 774	5 333 498	86.44			
19 131			1		531 239	0	1 773 921	2 305 160	5 569 112	83.18			
19 313			1		304 024	0	1 773 921	2 077 945	5 796 327	79.86			
19 131			1		68 409	0	1 773 921	1 842 330	6 031 942	76.24			

<b>327 114</b>				<b>0</b>									
19 131		1		0	0	1 773 921	1 773 921	6 100 351	75.14				
19 313		1		19 313	0	1 773 921	1 793 234	6 081 038	75.46				
19 131		1		38 444	0	1 773 921	1 812 365	6 061 907	75.76				
19 131		1		57 575	0	1 773 921	1 831 496	6 042 776	76.07				
19 313		1		79 808	0	1 773 921	1 853 729	6 020 543	76.42				
60 716		1		364 821	0	1 773 921	2 138 742	5 735 530	80.77				
30 242		1		540 441	0	1 773 921	2 314 362	5 559 910	83.31				
49 297		1		683 727	0	1 773 921	2 457 648	5 416 624	85.31				
33 265		1		769 639	0	1 773 921	2 543 560	5 330 712	86.48				
19 131		1		791 503	0	1 773 921	2 565 424	5 308 848	86.77				
19 313		1		810 816	0	1 773 921	2 584 737	5 289 535	87.03				
19 131		1		829 947	0	1 773 921	2 603 868	5 270 404	87.28				
<b>327 114</b>				<b>0</b>									
19 131		1		849 078	0	1 773 921	2 622 999	5 251 273	87.53				
19 313		1		868 391	0	1 773 921	2 642 312	5 231 960	87.79				
19 131		1		887 522	0	1 773 921	2 661 443	5 212 829	88.03				
19 131		1		906 653	0	1 773 921	2 680 574	5 193 698	88.28				
19 313		1		928 886	0	1 773 921	2 702 807	5 171 465	88.56				
60 716		1		1 213 899	0	1 773 921	2 987 820	4 886 452	91.91				
30 242		1		1 389 519	0	1 773 921	3 163 440	4 710 832	93.89				
49 297		1		1 532 805	0	1 773 921	3 306 726	4 567 546	95.47				
33 265		1		1 618 717	0	1 773 921	3 392 638	4 481 634	96.40				
19 131		1		1 640 581	0	1 773 921	3 414 502	4 459 770	96.64				
19 313		1		1 659 894	0	1 773 921	3 433 815	4 440 457	96.85				
19 131		1		1 679 025	0	1 773 921	3 452 946	4 421 326	97.05				
<b>327 114</b>				<b>0</b>									
19 131		1		1 698 156	0	1 773 921	3 472 077	4 402 195	97.26				
19 313		1		1 717 469	0	1 773 921	3 491 390	4 382 882	97.47				
19 131		1		1 736 600	0	1 773 921	3 510 521	4 363 751	97.67				
19 131		1		1 755 731	0	1 773 921	3 529 652	4 344 620	97.87				
19 313		1		1 777 964	0	1 773 921	3 551 885	4 322 387	98.11				
60 716		1		2 062 977	0	1 773 921	3 836 898	4 037 374	101.09				
30 242		1		2 238 597	0	1 773 921	4 012 518	3 861 754	102.89				
49 297		1		2 381 883	0	1 773 921	4 155 804	3 718 468	104.33				
33 265		1		2 467 795	0	1 773 921	4 241 716	3 632 556	105.18				
19 131		1		2 489 659	0	1 773 921	4 263 580	3 610 692	105.39				
19 313		1		2 508 972	0	1 773 921	4 282 893	3 591 379	105.58				
19 131		1		2 528 103	0	1 773 921	4 302 024	3 572 248	105.77				
<b>327 114</b>				<b>0</b>									
19 131		1		2 547 234	0	1 773 921	4 321 155	3 553 117	105.96				
19 313		1		2 566 547	0	1 773 921	4 340 468	3 533 804	106.15				
19 131		1		2 585 678	0	1 773 921	4 359 599	3 514 673	106.33				
19 131		1		2 604 809	0	1 773 921	4 378 730	3 495 542	106.52				

19 313			1		2 627 042	0	1 773 921	4 400 963	3 473 309	106.74		
60 716			1		2 912 055	0	1 773 921	4 685 976	3 188 296	109.43		
30 242			1		3 087 675	0	1 773 921	4 861 596	3 012 676	110.97		
49 297			1		3 230 961	0	1 773 921	5 004 882	2 869 390	112.17		
33 265			1		3 316 873	0	1 773 921	5 090 794	2 783 478	112.88		
19 131			1		3 338 737	0	1 773 921	5 112 658	2 761 614	113.07		
19 313			1		3 358 050	0	1 773 921	5 131 971	2 742 301	113.22		
19 131			1		3 377 181	0	1 773 921	5 151 102	2 723 170	113.38		
<b>327 114</b>					<b>0</b>							
19 131			1		3 396 312	0	1 773 921	5 170 233	2 704 039	113.54		
19 313			1		3 415 625	0	1 773 921	5 189 546	2 684 726	113.70		
19 131			1		3 434 756	0	1 773 921	5 208 677	2 665 595	113.85		
19 131			1		3 453 887	0	1 773 921	5 227 808	2 646 464	114.01		
19 313			1		3 476 120	0	1 773 921	5 250 041	2 624 231	114.19		
60 716			1		3 761 133	0	1 773 921	5 535 054	2 339 218	116.49		
30 242			1		3 936 753	0	1 773 921	5 710 674	2 163 598	117.89		
49 297			1		4 080 039	0	1 773 921	5 853 960	2 020 312	119.00		
33 265			1		4 165 951	0	1 773 921	5 939 872	1 934 400	119.67		
19 131			1		4 187 815	0	1 773 921	5 961 736	1 912 536	119.83		
19 313			1		4 207 128	0	1 773 921	5 981 049	1 893 223	119.98		
19 131			1		4 226 259	0	1 773 921	6 000 180	1 874 092	120.12		
<b>327 114</b>												
19 131			1		4 245 390	0	1 773 921	6 019 311	1 854 961	120.27		
19 313			1		4 264 703	0	1 773 921	6 038 624	1 835 648	120.42		
19 131			1		4 283 834	0	1 773 921	6 057 755	1 816 517	120.56		
19 131			1		4 302 965	0	1 773 921	6 076 886	1 797 386	120.70		
19 313			1		4 325 198	0	1 773 921	6 099 119	1 775 153	120.87		
60 716			1		4 610 211	0	1 773 921	6 384 132	1 490 140	122.94		
30 242			1		4 785 831	0	1 773 921	6 559 752	1 314 520	124.16		
49 297			1		4 929 117	0	1 773 921	6 703 038	1 171 234	125.13		
33 265			1		5 015 029	0	1 773 921	6 788 950	1 085 322	125.68		
19 131			1		5 036 893	0	1 773 921	6 810 814	1 063 458	125.82		
19 313			1		5 056 206	0	1 773 921	6 830 127	1 044 145	125.94		
19 131			1		5 075 337	0	1 773 921	6 849 258	1 025 014	126.05		
<b>327 114</b>					<b>0</b>							
19 131			1		5 094 468	0	1 773 921	6 868 389	1 005 883	126.16		
19 313			1		5 113 781	0	1 773 921	6 887 702	986 570	126.27		
19 131			1		5 132 912	0	1 773 921	6 906 833	967 439	126.39		
19 131			1		5 152 043	0	1 773 921	6 925 964	948 308	126.50		
19 313			1		5 174 276	0	1 773 921	6 948 197	926 075	126.62		
60 716			1		5 459 289	0	1 773 921	7 233 210	641 062	128.12		
30 242			1		5 810 845	0	1 773 921	7 584 766	289 506	129.76		
49 297			1		5 954 131	0	1 773 921	7 728 052	146 220	130.38		
33 265			1		6 040 043	0	1 773 921	7 813 964	60 308	130.75		

19 131			1		6 061 907	0	1 773 921	7 835 828	38 444	130.84		
19 313			1		6 081 220	0	1 773 921	7 855 141	19 131	130.92		
19 131			1	0	6 100 351	0	1 773 921	7 874 272	0.00	131.00		
<b>327 114</b>					<b>0</b>							
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
60 716				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
30 242				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
49 297				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
33 265				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
<b>327 114</b>					<b>0</b>							
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
60 716				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
30 242				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
49 297				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
33 265				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
<b>327 114</b>					<b>0</b>							
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
60 716				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
30 242				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
49 297				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
33 265				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		
<b>327 114</b>					<b>0</b>							
19 131				1	6 100 351	0	1 773 921	7 874 272	0	131.00		

19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
60 716			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
30 242			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
49 297			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
33 265			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
<b>327 114</b>				<b>0</b>							
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
60 716			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
30 242			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
49 297			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
33 265			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
<b>327 114</b>				<b>0</b>							
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
60 716			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
30 242			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
49 297			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
33 265			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
<b>327 114</b>				<b>0</b>							
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 131			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
19 313			1	6 100 351	0	1 773 921	7 874 272	0	131.00		
60 716			1	6 100 351	0	1 773 921	7 874 272	0	131.00		













35 614										145 378	0	0					14 820		24 265	98 299	69 305			
58 529								20 492		93 989	0	0					2 415		5 942	4 522	139 742			
31 088										52 647	0	0					4 636		5 362	6 975	88 756			
2 459										2 733	0	0					2 459		2 459	274	91 496			
0										0	0	0					0		0	0	47 267			
0										0	0	0					0		0	0	24 295			
181 187	0	0					0	0	0	70 152	521 964					0								













East Dike Seepage					East Dike Seepage	Vault Pit						Va	Vault ATP				Va	
Volume pumped	Discharge location			Volume pumped ZPL		Vault Pit Inflow (m³)	Enter 1 for the discharge location		Volume Pumped from Wally (m³)	Cummulative Volume (m³)	Volume Available Remaining (m³)		Water Elevation (m)	Vault ATP Inflow (m³)	Volume Pumped from Wally (m³)	Cummulative Volume (m³)		Water Elevation (m)
	ZPL	Pit E	Pit A				Vault Pit	Vault ATP										
x				-x														
36 537				0	0			0				0	0					
207 466				141 392	101 617			0				123 925	0					
208 047				169 585	111 336			0				631 435	0					
179 567				179 548	54 964			0				-31 131	0					
194 954				99 731	149 876			0				74 702	0					
213 221				155 869	116 338			0				67 302	0					
151 208				21 482	154 880			0				216 100	0					
162 967				89 497	154 880			0				216 100	0					
134 165				34 440	154 880			0				216 100	0					
6 138	0.96	0.04	0	5 896	0	1		464 639	29 135 252	(7.4)		0		1 277 839	137.0			
7 746	0	1	0	0	0	1		464 639	29 135 252	(7.4)		0		1 277 839	137.0			
6 913	0	1	0	0	0	1		464 639	29 135 252	(7.4)		0		1 277 839	137.0			
6 178	0.76	0.24	0	4 713	0	1		464 639	29 135 252	(7.4)		0		1 277 839	137.0			
5 047	0	1	0	0	0	1		464 639	29 135 252	(7.4)		0		1 277 839	137.0			
4 187	0	1	0	0	66 526	1		531 165	29 068 726	(5.2)		118 708		1 396 547	137.2			
29 597	0	1	0	0	17 775	1		548 940	29 050 951	(4.6)		6 053		1 402 600	137.2			
32 010	0	1	0	0	47 967	1		596 907	29 002 984	(3.0)		60 667		1 463 267	137.4			
32 417	0	1	0	0	22 611	1		619 518	28 980 373	(2.4)		30 672		1 493 939	137.4			
32 271	0	1	0	0	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
22 647	0.13	0.87	0	2 974	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
8 753	1.00	0.00	0	8 753	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
193 904				22 336	154 880			0				216 100	0					
8 619	1	0	0	8 619	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
7 548	1	0	0	7 548	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
7 466	1	0	0	7 466	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
5 108	0.9561	0.043	0	4 884	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
6 450	0	1	0	0	0	1		619 518	28 980 373	(2.4)		0		1 493 939	137.4			
17 180	0	1	0	0	66 526	1		686 044	28 913 846	(0.6)		118 708		1 612 647	137.7			
32 192	0	1	0	0	17 775	1		703 820	28 896 071	(0.1)		6 053		1 618 700	137.7			
30 357	0	1	0	0	47 967	1		751 786	28 848 104	1.2		60 667		1 679 367	137.8			
31 688	0	1	0	0	22 611	1		774 398	28 825 493	1.8		30 672		1 710 039	137.9			
8 928	1	0	0	8 928	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
8 640	1	0	0	8 640	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
8 928	1	0	0	8 928	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
173 104				55 013	154 880			0				216 100	0					
8 928	1			8 928	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
8 352	1			8 352	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
8 928	1			8 928	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
8 640	1			8 640	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
8 928	1			8 928	0	1		774 398	28 825 493	1.8		0		1 710 040	137.9			
8 640	1			8 640	66 526	1		840 924	28 758 967	3.6		118 708		1 828 748	138.1			
8 928	1			8 928	17 775	1		858 699	28 741 192	4.1		6 053		1 834 801	138.1			
8 928	1			8 928	47 967	1		906 666	28 693 225	5.1		60 667		1 895 468	138.2			
8 640	1			8 640	22 611	1		929 277	28 670 614	5.6		30 672		1 926 140	138.3			

8 928	1		8 928	0	1		0	929 277	28 670 614	5.6		0		1 926 140	138.3
8 640	1		8 640	0	1		0	929 277	28 670 614	5.6		0		1 926 140	138.3
8 928	1		8 928	0	1			929 277	28 670 614	5.6		0		1 926 140	138.3
<b>105 408</b>			<b>105 408</b>	<b>154 880</b>			<b>0</b>					<b>216 100</b>	<b>0</b>		
8 928	1		8 928	0	1			929 277	28 670 614	5.6		0		1 926 140	138.3
8 064	1		8 064	0	1			929 277	28 670 614	5.6		0		1 926 140	138.3
8 928	1		8 928	0	1			929 277	28 670 614	5.6		0		1 926 140	138.3
8 640	1		8 640	0	1			929 277	28 670 614	5.6		0		1 926 140	138.3
8 928	1		8 928	0	1			929 277	28 670 614	5.6		0		1 926 140	138.3
8 640	1		8 640	66 526	1			995 803	28 604 087	7.0		118 708		2 044 848	138.5
8 928	1		8 928	17 775	1			1 013 579	28 586 312	7.4		6 053		2 050 901	138.5
8 928	1		8 928	47 967	1			1 061 545	28 538 345	8.4		60 667		2 111 568	138.6
8 640	1		8 640	22 611	1			1 084 157	28 515 734	8.8		30 672	314 194	2 456 434	139.1
8 928	1		8 928	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
8 640	1		8 640	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
8 928	1		8 928	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
<b>105 120</b>			<b>105 120</b>	<b>154 880</b>			<b>0</b>					<b>216 100</b>	<b>314 194</b>		
8 928	1		8 928	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
8 064	1		8 064	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
8 928	1		8 928	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
8 640	1		8 640	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
8 928	1		8 928	0	1			1 084 157	28 515 734	8.8		0		2 456 434	139.1
8 640	1		8 640	66 526	1			1 150 683	28 449 208	10.2		118 708		2 575 142	139.2
8 928	1		8 928	17 775	1			1 168 458	28 431 433	10.6		6 053		2 581 195	139.2
8 928	1		8 928	47 967	1			1 216 425	28 383 466	11.5		60 667		2 641 862	139.3
8 640	1		8 640	22 611	1			1 239 036	28 360 855	11.9		30 672		2 672 534	139.3
8 928	1		8 928	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
8 640	1		8 640	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
8 928	1		8 928	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
<b>105 120</b>			<b>105 120</b>	<b>154 880</b>			<b>0</b>					<b>216 100</b>	<b>0</b>		
8 928	1		8 928	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
8 064	1		8 064	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
8 928	1		8 928	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
8 640	1		8 640	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
8 928	1		8 928	0	1			1 239 036	28 360 855	11.9		0		2 672 534	139.3
8 640	1		8 640	66 526	1			1 305 562	28 294 328	13.2		118 708		2 812 793	139.4
8 928	1		8 928	17 775	1			1 323 338	28 276 553	13.5		6 053		2 838 525	139.5
8 928	1		8 928	47 967	1			1 371 304	28 228 586	14.4		60 667		2 952 297	139.6
8 640	1		8 640	22 611	1			1 393 916	28 205 975	14.8		30 672		3 008 002	139.6
8 928	1		8 928	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
8 640	1		8 640	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
8 928	1		8 928	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
<b>105 120</b>			<b>105 120</b>	<b>154 880</b>			<b>0</b>					<b>216 100</b>	<b>0</b>		
8 928		1	0	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
8 352		1	0	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
8 928		1	0	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
8 640		1	0	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
8 928		1	0	0	1			1 393 916	28 205 975	14.8		0		3 008 002	139.6
8 640		1	0	66 526	1			1 460 442	28 139 449	16.0		118 708		3 200 363	139.8
8 928		1	0	17 775	1			1 478 217	28 121 674	16.3		6 053		3 226 095	139.8
8 928		1	0	47 967	1			1 526 184	28 073 707	17.2		60 667		3 339 867	139.9

8 640	1		0	22 611	1		1 548 795	28 051 096	17.6	30 672		3 395 572	139.9
8 928	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
8 640	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
8 928	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
<b>105 408</b>			<b>0</b>	<b>154 880</b>		<b>0</b>				<b>216 100</b>	<b>0</b>		
14 964	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
14 964	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
14 964	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
14 964	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
14 964	1		0	0	1		1 548 795	28 051 096	17.6	0		3 395 572	139.9
14 964	1		0	66 526	1		1 688 974	27 910 917	19.8			3 395 572	139.9
14 964	1		0	17 775	1		1 726 428	27 873 463	20.4			3 395 572	139.9
14 964	1		0	47 967	1		1 827 500	27 772 391	21.9			3 395 572	139.9
14 964	1		0	22 611	1		1 875 144	27 724 747	22.6			3 395 572	139.9
14 964	1		0	0	1		1 875 144	27 724 747	22.6			3 395 572	139.9
14 964	1		0	0	1		1 875 144	27 724 747	22.6			3 395 572	139.9
14 964	1		0	0	1		1 875 144	27 724 747	22.6	0		3 395 572	139.9
<b>179 567</b>			<b>0</b>	<b>154 880</b>		<b>0</b>				<b>0</b>	<b>0</b>		
14 964	1		0	0	1		1 875 144	27 724 747	22.6	0		3 395 572	139.9
14 964	1		0	0	1		1 875 144	27 724 747	22.6	0		3 395 572	139.9
14 964	1		0	0	1		1 875 144	27 724 747	22.6	0		3 395 572	139.9
14 964	1		0	0	1		1 875 144	27 724 747	22.6	0		3 395 572	139.9
14 964	1		0	66 526	1		2 015 323	27 584 568	24.7			3 395 572	139.9
14 964	1		0	17 775	1		2 052 777	27 547 114	25.2			3 395 572	139.9
14 964	1		0	47 967	1		2 153 849	27 446 042	26.5			3 395 572	139.9
14 964	1		0	22 611	1		2 201 493	27 398 398	27.0			3 395 572	139.9
14 964	1		0	0	1		2 201 493	27 398 398	27.0	0		3 395 573	139.9
14 964	1		0	0	1		2 201 493	27 398 398	27.0	0		3 395 573	139.9
14 964	1		0	0	1		2 201 493	27 398 398	27.0	0		3 395 573	139.9
<b>179 567</b>			<b>0</b>	<b>154 880</b>		<b>0</b>				<b>0</b>	<b>0</b>		
14 964	1		0	0	1		2 201 493	27 398 398	27.0	0		3 395 573	139.9
14 964	1		0	0	1		2 201 493	27 398 398	27.0	0		3 395 573	139.9
14 964	1		0	0	1		2 201 493	27 398 398	27.0	0		3 395 573	139.9
14 964	1		0	0	1		2 201 493	27 398 398	27.0	0		3 395 573	139.9
14 964	1		0	66 526	1		2 341 672	27 258 219	28.7			3 395 573	139.9
14 964	1		0	17 775	1		2 379 126	27 220 765	29.1			3 395 573	139.9
14 964	1		0	47 967	1		2 480 198	27 119 693	30.3			3 395 573	139.9
14 964	1		0	22 611	1		2 527 842	27 072 049	30.9			3 395 573	139.9
14 964	1		0	0	1		2 527 842	27 072 049	30.9			3 395 573	139.9
14 964	1		0	0	1		2 527 842	27 072 049	30.9	0		3 395 573	139.9
14 964	1		0	0	1		2 527 842	27 072 049	30.9	0		3 395 573	139.9
<b>179 567</b>			<b>0</b>	<b>154 880</b>		<b>0</b>				<b>0</b>	<b>0</b>		
14 964	1		0	0	1		2 527 842	27 072 049	30.9	0		3 395 573	139.9
14 964	1		0	0	1		2 527 842	27 072 049	30.9	0		3 395 573	139.9
14 964	1		0	0	1		2 527 842	27 072 049	30.9	0		3 395 573	139.9
14 964	1		0	0	1		2 527 842	27 072 049	30.9	0		3 395 573	139.9
14 964	1		0	0	1		2 527 842	27 072 049	30.9	0		3 395 573	139.9
14 964	1		0	66 526	1		2 668 021	26 931 870	32.4			3 395 573	139.9
14 964	1		0	17 775	1		2 705 475	26 894 416	32.8			3 395 573	139.9

14 964	1		0	47 967	1		2 806 547	26 793 344	33.8			3 395 573	139.9
14 964	1		0	22 611	1		2 854 191	26 745 700	34.3			3 395 573	139.9
14 964	1		0	0	1		2 854 191	26 745 700	34.3			3 395 573	139.9
14 964	1		0	0	1		2 854 191	26 745 700	34.3	0		3 395 573	139.9
14 964	1		0	0	1		2 854 191	26 745 700	34.3	0		3 395 573	139.9
179 567			0	154 880		0				0	0		
14 964	1		0	0	1		2 854 191	26 745 700	34.3	0		3 395 573	139.9
14 964	1		0	0	1		2 854 191	26 745 700	34.3	0		3 395 573	139.9
14 964	1		0	0	1		2 854 191	26 745 700	34.3	0		3 395 573	139.9
14 964	1		0	0	1		2 854 191	26 745 700	34.3	0		3 395 573	139.9
14 964	1		0	0	1		2 854 191	26 745 700	34.3	0		3 395 573	139.9
14 964	1		0	66 526	1		2 994 370	26 605 521	35.7			3 395 573	139.9
14 964	1		0	17 775	1		3 031 824	26 568 067	36.0			3 395 573	139.9
14 964	1		0	47 967	1		3 132 896	26 466 995	37.0			3 395 573	139.9
14 964	1		0	22 611	1		3 180 540	26 419 351	37.5			3 395 573	139.9
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
179 567			0	154 880		0				0	0		
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
14 964	1		0	0	1		3 180 540	26 419 351	37.5	0		3 395 573	139.9
14 964	1		0	333 333	1		3 587 526	26 012 365	41.2			3 395 573	139.9
14 964	1		0	333 333	1		3 940 538	25 659 352	44.3			3 395 573	139.9
14 964	1		0	333 333	1		4 326 976	25 272 914	47.3			3 395 573	139.9
14 964	1		0	333 333	1		4 685 343	24 914 548	49.8			3 395 573	139.9
14 964	1		0	333 333	1		5 018 676	24 581 214	52.1			3 395 573	139.9
14 964	1		0	333 333	1		5 352 010	24 247 881	54.3	0		3 395 573	139.9
14 964	1		0	333 333	1		5 685 343	23 914 548	56.4	0		3 395 573	139.9
179 567			0	2 333 333		0				0	0		
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14 964	1		0	333 333	1		6 352 010	23 247 881	60.5	0		3 395 573	139.9
14 964	1		0	333 333	1		6 685 343	22 914 548	62.5	0		3 395 573	139.9
14 964	1		0	333 333	1		7 018 676	22 581 214	64.4	0		3 395 573	139.9
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14 964	1		0	333 333	1		7 758 995	21 840 895	68.4			3 395 573	139.9
14 964	1		0	333 333	1		8 112 008	21 487 883	70.1			3 395 573	139.9
14 964	1		0	333 333	1		8 498 446	21 101 445	72.0			3 395 573	139.9
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179 567			0	4 000 000		0				0	0		
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14 964	1		0	333 333	1		10 523 479	19 076 412	81.3	0		3 395 573	139.9
14 964	1		0	333 333	1		10 856 812	18 743 078	82.8	0		3 395 573	139.9
14 964	1		0	333 333	1		11 190 146	18 409 745	84.2	0		3 395 573	139.9
14 964	1		0	333 333	1		11 523 479	18 076 412	85.6			3 395 573	139.9
14 964	1		0	333 333	1		11 930 465	17 669 426	87.3			3 395 573	139.9

14 964	1		0	333 333	1		12 283 477	17 316 413	88.7			3 395 573	139.9
14 964	1		0	333 333	1		12 669 915	16 929 975	90.1			3 395 573	139.9
14 964	1		0	333 333	1		13 028 282	16 571 609	91.5			3 395 573	139.9
14 964	1		0	333 333	1		13 361 615	16 238 275	92.7			3 395 573	139.9
14 964	1		0	333 333	1		13 694 949	15 904 942	93.9	0		3 395 573	139.9
14 964	1		0	333 333	1		14 028 282	15 571 609	95.2	0		3 395 573	139.9
179 567			0	4 000 000			0			0	0		
14 964	1		0	333 333	1		14 361 615	15 238 275	96.3	0		3 395 573	139.9
14 964	1		0	333 333	1		14 694 949	14 904 942	97.5	0		3 395 573	139.9
14 964	1		0	333 333	1		15 028 282	14 571 609	98.7	0		3 395 573	139.9
14 964	1		0	333 333	1		15 361 615	14 238 275	99.9	0		3 395 573	139.9
14 964	1		0	333 333	1		15 694 949	13 904 942	101.0			3 395 573	139.9
14 964	1		0	333 333	1		16 101 934	13 497 956	102.5			3 395 573	139.9
14 964	1		0	333 333	1		16 454 947	13 144 944	103.6			3 395 573	139.9
14 964	1		0	333 333	1		16 841 385	12 758 506	104.9			3 395 573	139.9
14 964	1		0	333 333	1		17 199 751	12 400 139	106.1			3 395 573	139.9
14 964	1		0	333 333	1		17 533 085	12 066 806	107.3			3 395 573	139.9
14 964	1		0	333 333	1		17 866 418	11 733 473	108.4	0		3 395 573	139.9
14 964	1		0	333 333	1		18 199 751	11 400 139	109.4	0		3 395 573	139.9
179 567			0	4 000 000			0			0	0		
14 964	1		0	333 333	1		18 533 085	11 066 806	110.4	0		3 062 239	139.7
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14 964	1		0	333 333	1		21 199 751	8 400 139	118.3	30 672		395 572	134.0
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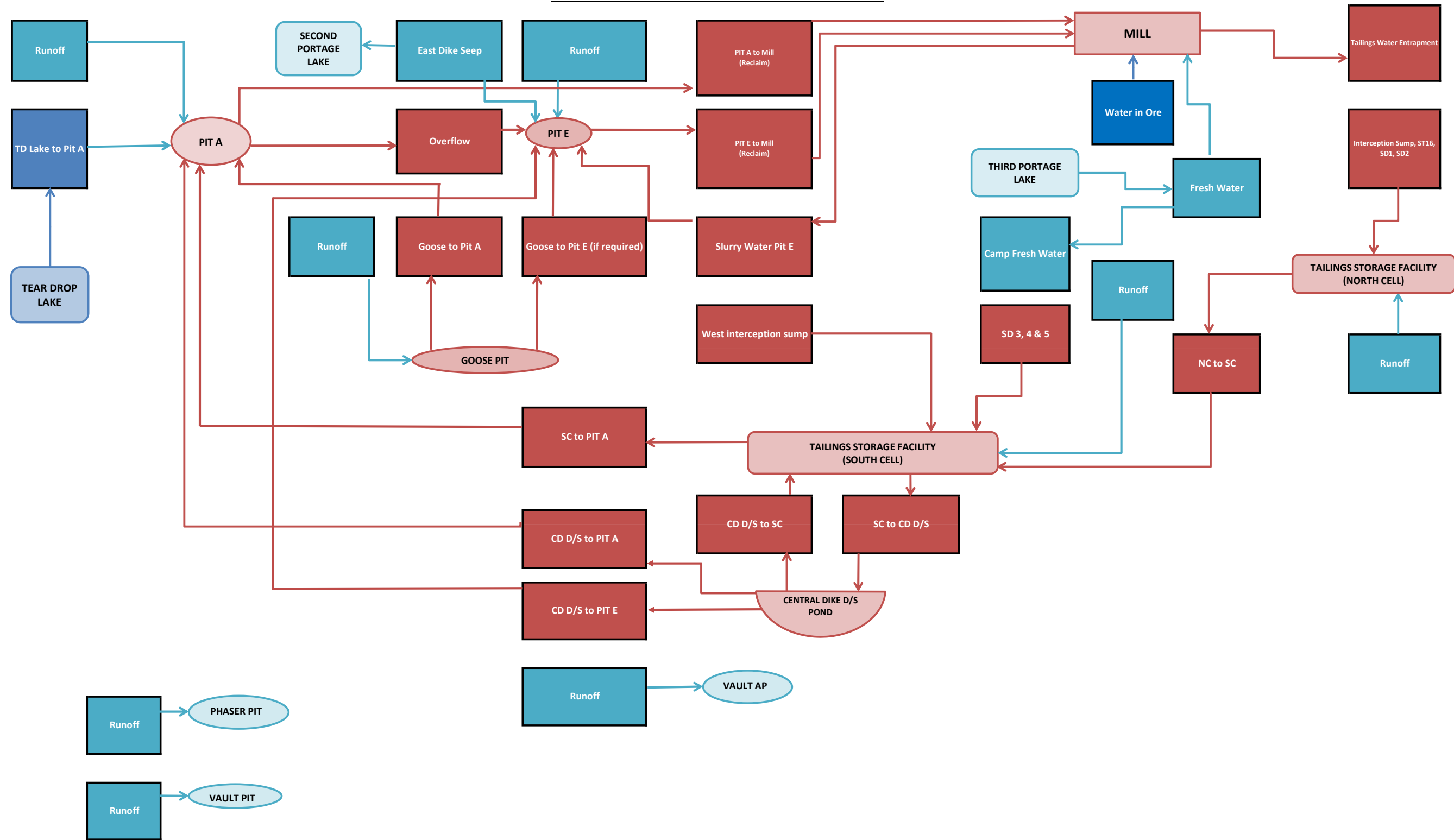


MEADOWBANK GOLD MINE  
2023 WATER MANAGEMENT PLAN

**APPENDIX B – WATER MANAGEMENT SCHEMATIC FLOWSHEETS**

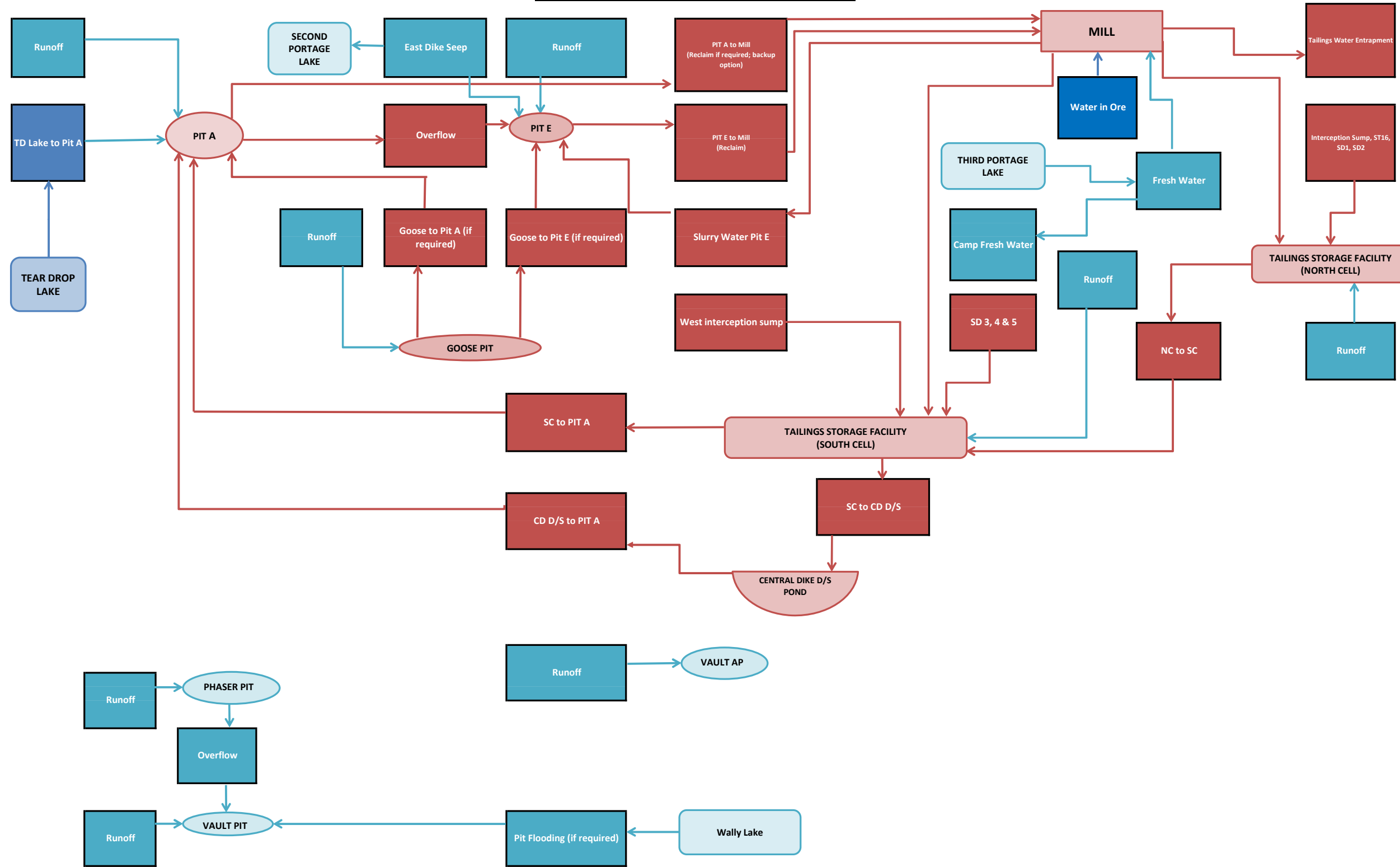
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### General Water Movement - 2021 to 2023



\*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

### General Water Movement - 2024 to 2027

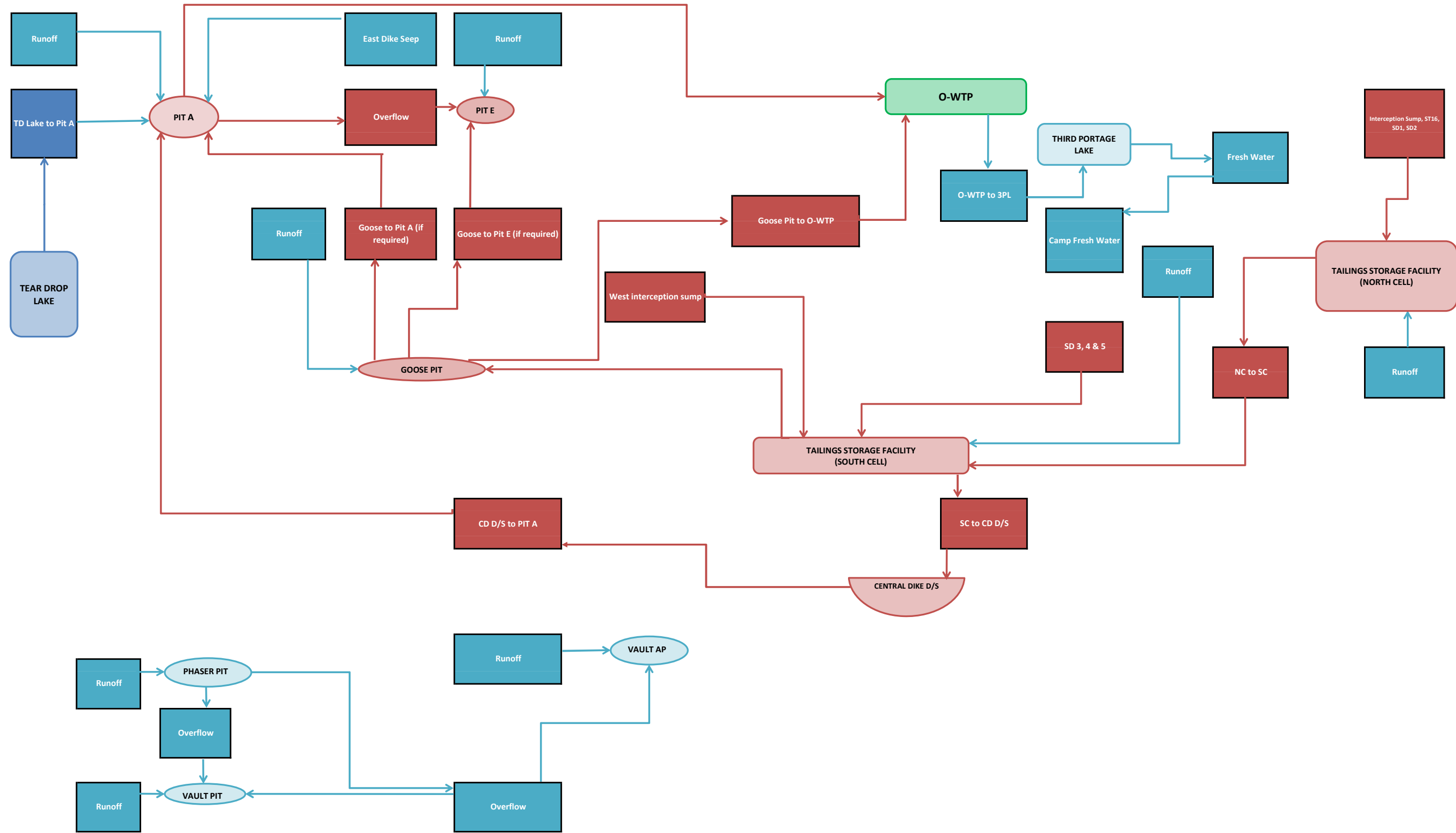


**Legend**

- Fresh water
- Contact water
- Mill contaminated water

\*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

**General Water Movement - 2028 to 2036**

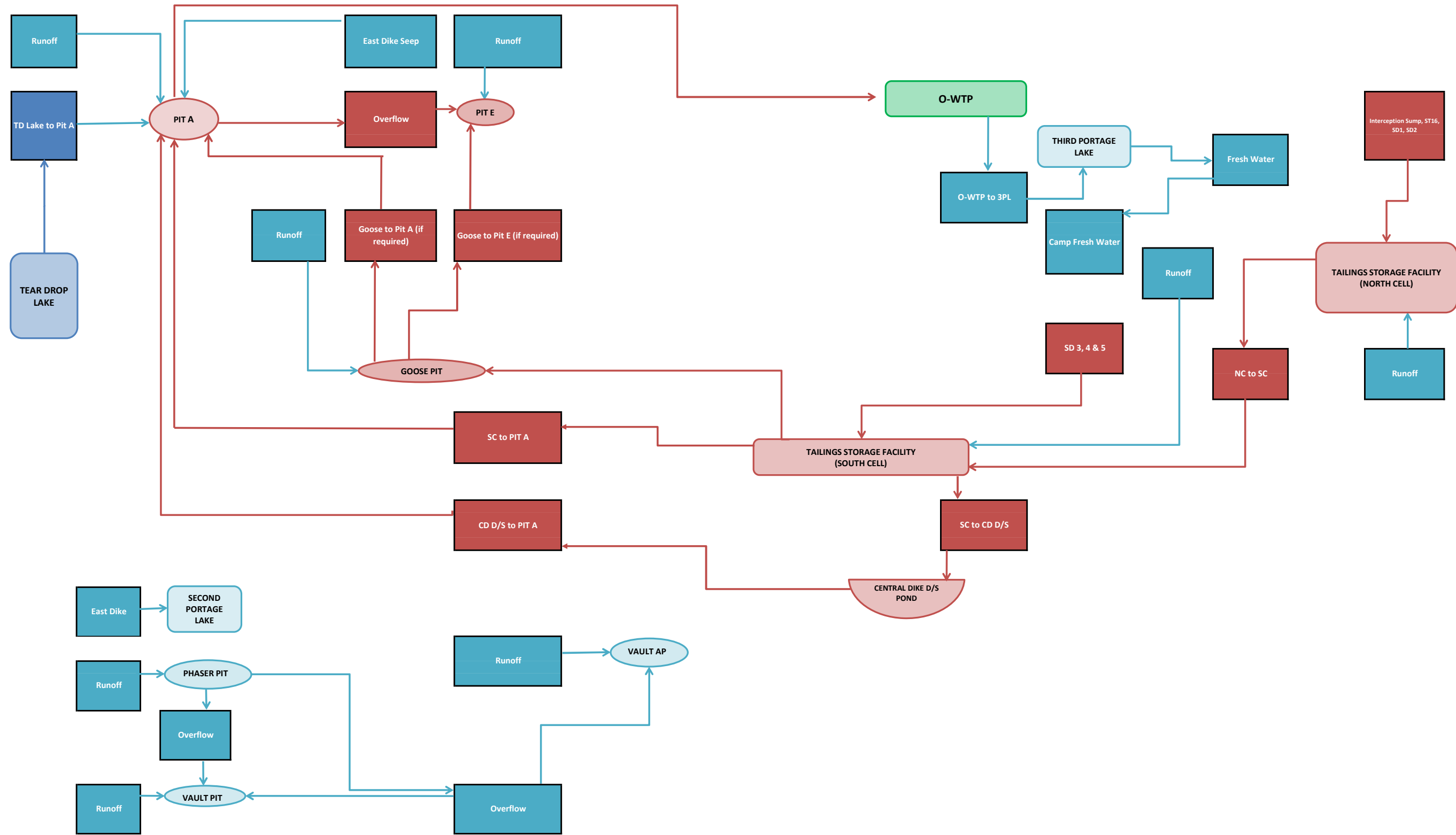


**Legend**

- Fresh water
- Contact water
- Mill contaminated water

\*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

**General Water Movement - 2037 to 2038**

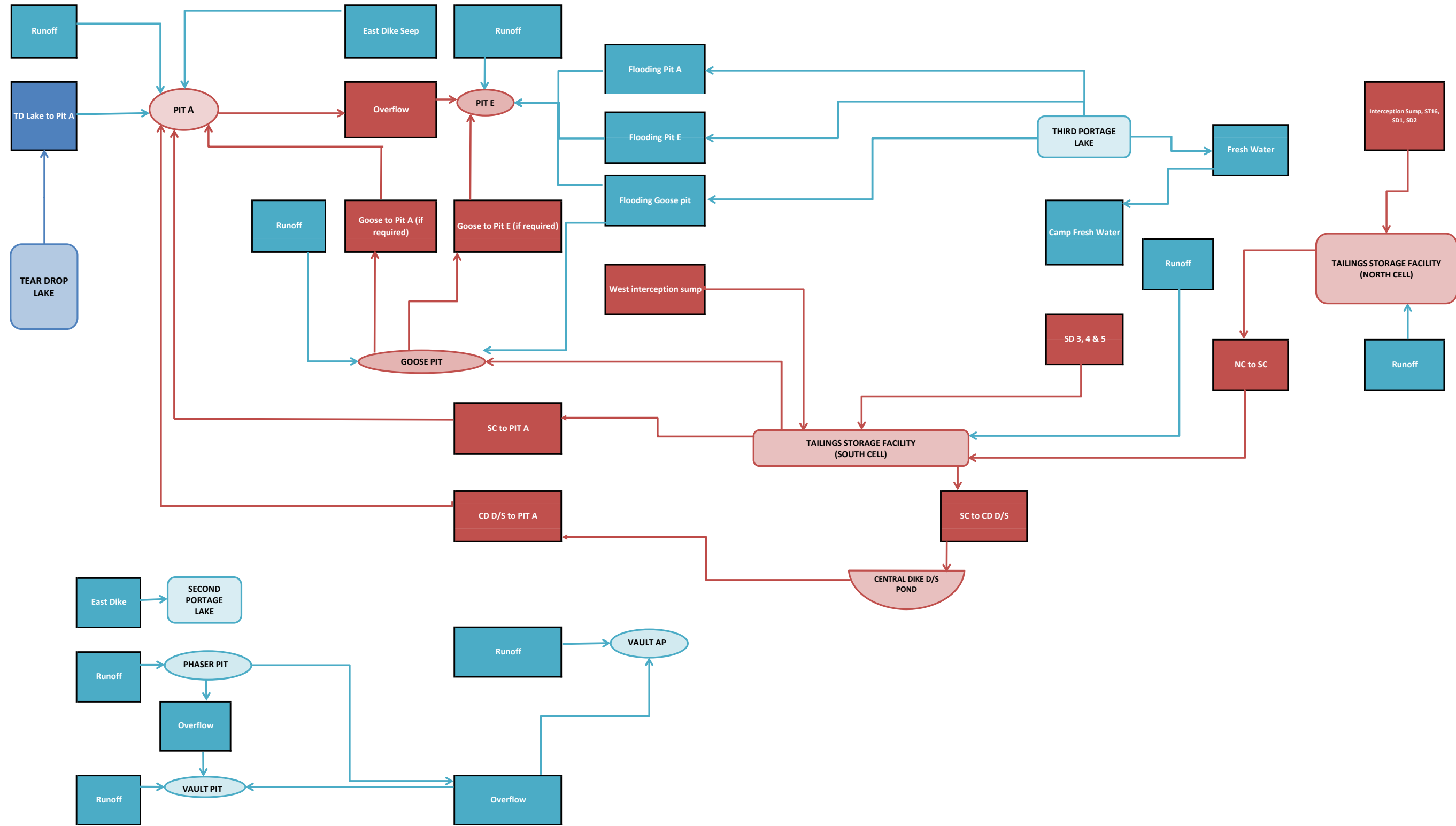


**Legend**

- Fresh water
- Contact water
- Mill contaminated water

\*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

### General Water Movement - 2039 to 2044

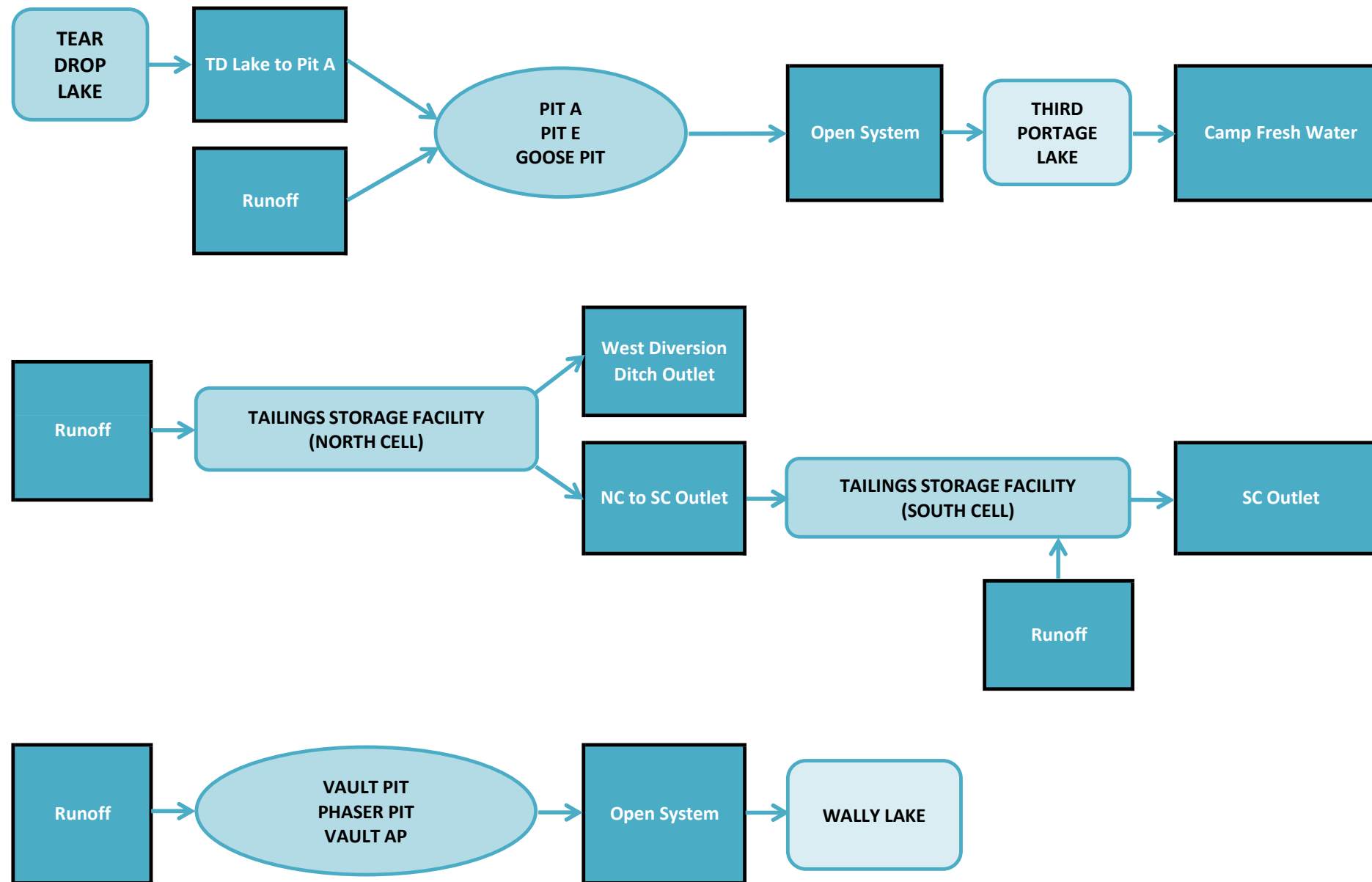


**Legend**

- Fresh water
- Contact water
- Mill contaminated water

\*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

## General Water Movement - Post-Closure



### Legend

- Fresh water
- Contact water
- Mill contaminated water

\*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.




MEADOWBANK GOLD MINE  
2023 WATER MANAGEMENT PLAN

**APPENDIX C – 2023 MEADOWBANK WATER QUALITY FORECASTING UPDATE**

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	<b>TECHNICAL NOTE</b> Meadowbank Water Quality Forecasting Update for the 2023 Water Management Plan		
	<b>Document No :</b> 699141-1000-40ER-0001	<b>Rev.</b> 00	<b>Date :</b> March 26, 2024

**Title of document:**        **MEADOWBANK WATER QUALITY FORECASTING UPDATE FOR THE 2023 WATER MANAGEMENT PLAN**

**Client:**                    **AGNICO EAGLE MINES**

**Project:**                    **MEADOWBANK GOLD PROJECT**

*Prepared by:*            Rachid Amrou, M.Sc.  
*(under ICS<sup>1</sup>)*                #OIQ: 5095767

*Revised by:*             Anh-Long Nguyen, Eng., M.Sc.  
#OIQ: 122858, #NAPEG: L2716

*Approved by:*            Anh-Long Nguyen, Eng., M.Sc.  
#OIQ: 122858, #NAPEG: L2716

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<sup>1</sup> ICS: Immediate control and supervision.  
In terms of supervising the engineering activities and supervision of people who are not engineers or junior engineers, the Ordre des ingénieurs du Québec uses a term often used in its regulation: Immediate control and supervision (ICS). In other words, an engineer must be involved in a continuous and active manner throughout the reserved tasks entrusted to him, and not just before or after.

	<b>TECHNICAL NOTE</b> Meadowbank Water Quality Forecasting Update for the 2023 Water Management Plan		
	<b>Document No :</b> 699141-1000-40ER-0001	<b>Rev.</b> 00	<b>Date :</b> March 26, 2024


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	<b>TECHNICAL NOTE</b> Meadowbank Water Quality Forecasting Update for the 2023 Water Management Plan		
	<b>Document No :</b> 699141-1000-40ER-0001	<b>Rev.</b> 00	<b>Date :</b> March 26, 2024


### List of Revisions

#	Prep.	Rev.	App.	Date	Pages	Remarks
PA	RA	ALN	ALN	Mar. 4, 2024	All	Issue for internal comments
PB	RA	ALN	ALN	Mar. 8, 2024	All	Issue for client's comments
00	RA	ALN	ALN	Mar. 26, 2024	All	Final


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# 1.0 Introduction

## 1.1 Mandate

AtkinsRéalis was mandated by Agnico Eagle Mines (Agnico) to review and update the water quality forecasting model developed in 2012 and updated yearly using the Water Balance reported in the 2023 Water Management Report and Plan (2023 WMP) to be submitted in March 2024 for Agnico.

## 1.2 Study Objectives and Content

This Technical Note presents the water quality forecast model updated for the Meadowbank Gold Project, based on the Water Balance 2023 (WB 2023) of Agnico (latest revision provided on January 18th, 2024). The WB 2023 was developed according to the updated Life of Mine (LOM) (Meadowbank 2023 Waste Management Plan) and to the mine development sequence provided by Agnico and summarized in [Table 1-1](#). The updated water quality forecast model applies to the North and South Cell Tailings Storage Facility (TSF) Reclaim Ponds, Portage and Goose Pits, and Vault Pit.

The objective of this Technical Note is to forecast the concentration of the selected parameters of concern within the North and South Cell TSF Reclaim Ponds and the Portage and Goose Pits until closure, verify last year’s assumptions and results, update the model, if necessary, and develop recommendations and assess water treatment requirements.


For the Vault Pit, no treatment is planned during the re-flooding of the pit since there is no tailings disposal facility at the Vault site. The Vault Attenuation Pond only receives mine pit runoff water and fresh water. This will be confirmed through regular monitoring required by the Type A Water Licence 2AM-MEA1530. The first modelling of the Vault area was realized in 2016, based on the 2014 and 2015 data, and updated on a yearly basis using sampling data collected for that year. For this year’s report, the measurements taken in 2023 for this monitoring campaign were analyzed and are presented in [Section 5.0](#).

## 1.3 Water Balance

The Water Balance 2023 (WB 2023) was developed by Agnico (Agnico 2024). The water balance examined the water transfers required for the water management infrastructure during the active LOM under average hydrologic conditions.

The WB 2023 was based on the revised mining schedule presented in [Table 1-1](#) below for Meadowbank and Vault areas.




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**Table 1-1: Water Management Phases (Based on Meadowbank 2023 Waste Management Plan)**

ACTIVITY	UPDATED START DATE <sup>1</sup>	UPDATED END DATE <sup>1</sup>
<b>Pits Mining</b>		
Portage Pit	January 2010	June 2019
North (Pit A)	January 2010	June 2018
Central (Pit B, C D)	January 2010	April 2013
South (Pit E)	January 2010	June 2019
Goose Pit	April 2012	May 2015
Vault Pit	January 2014	September 2018
Phaser and BB Phaser Pit	July 2018	September 2018
Whale Tail Project Pits (and underground)	July 2019	December 2025
<b>Tailings Storage Facility Operations</b>		
North Cell	January 2010	June 2026
South Cell	November 2014	June 2026
Goose Pit (in pit tailings deposition)	July 2019	August 2020
Portage (in pit tailings deposition)	August 2020	June 2026
<b>Rock Storage Facility (RSF) Operations</b>		
Portage RSF	January 2009	October 2019
Vault RSF	January 2014	September 2018
<b>Attenuation/Reclaim Pond Water Management</b>		
Attenuation Pond (South Cell) <sup>2</sup>	January 2009	November 2014
Attenuation/Phaser Ponds Vault Lake	January 2014	September 2018
<b>Other Key Activities</b>		
Mill Operations	January 2010	June 2026
Dewatering of Vault Lake	June 2013	July 2014
Dewatering of Phaser Lake	July 2016	October 2016
Flooding of Vault Pit <sup>4</sup>	June 2019	August 2040
Flooding of Phaser and BB Phaser Pits <sup>4</sup>	-	-
Reclaim Water Treatment <sup>5, 6</sup> – Goose Pit	July 2028	January- 2031
Reclaim Water Treatment <sup>5, 6</sup> – Portage Pit	January 2031	December 2038
North and South Cell TSF Cover Construction	January 2026	December 2027
Flooding of Portage and Goose Pits <sup>3, 5</sup>	January 2031	July 2041
Breaching of dikes <sup>5</sup>	n/a	August 2041 only if water criteria are met

**Notes:**

1. Periods are given from the beginning of the starting month to the end of the ending month.
2. After November 2014, the Reclaim Pond is relocated to the South Cell TSF. After this date, there is no Attenuation Pond.
3. Artificial flooding only with a combination of pumps and siphons, natural run-off inflow as part of re-flooding not accounted for in this table.
4. Vault and Phaser pits and lakes are expected to will mostly be flooded passively (run-offs) due to the small flooding volume required to re-establish the initial elevation combined with its large watershed.
5. Tentative dates. Water treatment at Meadowbank may be required to meet approved effluent criteria and to allow cover construction if deemed necessary. Schedule will be modified if required based on monitoring and water quality results. The closure schedule for the overall project is based on the preliminary closure methods and strategies discussed in the Meadowbank ICRP. It is anticipated that the schedule will be refined throughout the project life as the designs are advanced, and as the closure methods and strategies are further developed.
6. In-pit tailings cover may be required in Goose and Portage Pits based on monitoring results and feasibility assessment.

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## 2.0 Review of Water Balance and Water Quality Data for 2023

### 2.1 Documents Reviewed

A review of the available water balance and water quality data measured in 2023 was undertaken by AtkinsRéalis and compiled with previous data measured since 2012. This includes a review of the following documents:

- WB 2023 based on the Meadowbank 2023 Waste Management Plan.
- Water quality chemical analysis results from the Portage Area for 2023. The chemical analysis results of interest for this Technical Note are presented in **Section 8.0** of the 2023 Annual Report and were integrated in the data previously obtained, specifically:
  - North Cell TSF Reclaim Pond (ST-21) from January 2014 to October 2023;
  - South Cell TSF Reclaim Pond (ST-21) (former South Cell TSF Attenuation Pond ST-18) from June 2014 to October 2023;
  - Mill effluent metal and cyanide concentrations from January 2013 to November 2023;
  - Monthly grab samples of Mill Effluent taken in 2023;
  - Portage North Pit (ST-17, Pit A) from May 2015 to November 2023 and for Portage South Pit (ST-19, Pit E) from November 2014 to November 2023;
  - Goose Pit (samples taken in the sump pit and in the lake, ST-20) from March 2014 to October 2023;
  - Central Dike seepages collected in the downstream collection pond (ST-S-5) sampled in 2023;
  - East Dike (ST-1) seepage and Saddle Dam 3 (ST-32) sump sampled in 2023;
  - Saddle Dam 1 downstream sump (ST-S-2) and Portage Rock Storage Facility seepage (RSF) (ST-16) sampled from 2015 to 2023;
  - Results of shake flask extraction (SFE) tests conducted in 2023 on the tailings.
- Water quality chemical analysis results for the Vault Area for 2023, specifically:
  - Vault Pit lake (ST-26);
  - Vault RSF (ST-24);
  - Vault Attenuation Pond (ST-25);
  - Phaser Pit (ST-41);
  - Phaser Attenuation Pond (ST-43).

It is important to remember that the review of the Meadowbank water quality data was undertaken to gain a better understanding of the water quality in the Portage Area, particularly as it affects the TSF Reclaim Ponds and the tailings in-pit deposition, and to provide a basis for the development and update of the water quality forecast mass balance model.

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An analysis of the Vault water quality data was undertaken to gain a better understanding of the water quality in this area.


## 2.2 Updates to the Water Balance

The initial WB was developed in 2012. It has been updated on a yearly basis based on actual water transfers conducted on site, field survey of the different pond levels and updates to the LOM. **Table 2-1** summarizes the main differences between the WB from 2012 to 2023.


The WB 2023 integrates the extension of the LOM of Meadowbank Mine through the construction and operation of the Whale Tail Pit, a satellite deposit located on the Whale Tail property, and by continuing mine operations and milling at Meadowbank. It also integrates in-pit deposition of tailings in Goose and Portage Pits.

**Table 2-1: Updates to the Water Balance**


WB YEAR	FORECASTED END OF DEPOSITION	MAIN DIFFERENCES
2012	February 2018	Initial WB model based on the 2012 WMP. Tailings' deposition started in the North Cell TSF and continued until March 2015, and was then transferred to the South Cell TSF until February 2018. Reclaim Water was then transferred to the pits. It was anticipated that there would be approximately 6 Mm <sup>3</sup> of non-contact water already accumulated in each pit at that time.
2013	September 2017	In this WB, the LOM included the deposition of tailings in North and South Cell TSF in 2014 and 2015. Deposition in the North Cell TSF was planned to end in October 2015 and to continue in the South Cell TSF until September 2017. Furthermore, it was anticipated that South Cell TSF Reclaim Water would be transferred as of 2015 to the pits when there would be very little water in the pits. This was done while tailings deposition in South Cell TSF was ongoing. Runoff water will then be allowed to flow into the pit and mix with the South Cell Reclaim Water.
2014	September 2017	In this WB, tailings were deposited in the North and South Cell TSF in 2014 and 2015. Deposition in the South Cell TSF started in November 2014. Deposition in the North Cell TSF was planned to end in September 2015 and to continue in the South Cell TSF. Based on the volume of Reclaim Water in the North Cell TSF and South Cell TSF Ponds, it was anticipated that South Cell Reclaim Water would be transferred to Portage Pit starting August 2017. No Reclaim Water was to be transferred to Goose Pit. Furthermore, the percentage of tailings water/ice entrapment was also updated in 2014 WMP to better reflect what was currently observed on site.
2015	September 2018	From January to July 2015, tailings were deposited in the South Cell TSF. Deposition in the North Cell TSF continued from July to October 2015. As of October 2015, the deposition of

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WB YEAR	FORECASTED END OF DEPOSITION	MAIN DIFFERENCES
		<p>tailings continued only in the South Cell TSF until the end of the LOM. The LOM was extended compared to WB 2014, where tailings deposition was planned to end in September 2017.</p> <p>The transfer of Reclaim Water to the Portage Pit was postponed for one year due to the longer LOM and was planned to start in September 2018.</p> <p>No Reclaim Water will be transferred to Goose Pit other than the 50,431 m<sup>3</sup> transferred from the Central Dike Downstream Pond (CDDP), which has a similar water quality than the South Cell Reclaim Pond. Those transfers were proposed by the Meadowbank Dike Review Board (MDRB) to further assess the Central Dike seepage (ST-S-5) that was identified that same year.</p>
2016	September 2018	<p>The tailings deposition and water transfer schedule are similar to the WB 2015.</p> <p>Water in sumps from Saddle Dam 3-4-5 was added as a new input to the South Cell TSF Reclaim Pond. Furthermore, the transfer of seepages and runoff water from the North Cell interception sump, RSF and Saddle Dam 1 to the North Cell TSF continued past 2018 until closure.</p> <p>Portage and Goose Pit filling rates were also adjusted in this WB.</p>
2017	September 2018	<p>The tailings deposition and water transfer schedule are similar to the WB 2016.</p> <p>The actual volumes of water transferred and of tailings deposited in 2017 were entered into the model. About 332,177 m<sup>3</sup> of pond water was transferred to Goose Pit from the CDDP between August and October 2017 to reduce the hydraulic gradient between the South Cell and ST-S-5. This strategy was presented to the MDRB as part of an action plan on Central Dike. The updated water balance does not plan for any other pond water transfer during tailings deposition in 2018. Portage and Goose Pit flooding rates were also adjusted.</p> <p>A different percentage of tailings water/ice entrapment for North and South Cell TSF was also used in the WB 2017 to better characterize the difference of ice entrapment cover between the two, partly due to the continuing water inflow from the mill effluent in the South Cell TSF.</p>
2018	December 2021	<p>The tailings deposition and water transfer schedule were extended until December 2021. Tailings will be deposited in the North Cell and South Cell TSF. The additional tailings come from the continuation of the milling of ore produced from the Whale Tail Pit at the Whale Tail site.</p> <p>The actual volumes of water transferred and of tailings deposited in 2018 were entered into the model.</p> <p>In 2018, no Reclaim Water was transferred from CDDP or South Cell TSF to Goose Pit. In the Vault area, there was no discharge to Wally Lake as well.</p>
2019	July 2022	<p>The tailings deposition and water transfer schedule were extended until July 2022. Tailings were deposited in the South Cell TSF and North Cell until April 2019 and July 2019, respectively. Tailings were then deposited in Goose and Portage pits. In-pit deposition started in Goose Pit in July 2019. The additional tailings came from the continuation of the milling of ore produced from the Whale Tail pit operation.</p>

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WB YEAR	FORECASTED END OF DEPOSITION	MAIN DIFFERENCES
		<p>The actual volumes of water transferred and of tailings deposited in 2019 were integrated into the model.</p> <p>In 2019, Reclaim Water was transferred from South Cell TSF Reclaim Pond to Goose Pit. Reclaim Water from CDDP was transferred back to SC Reclaim Pond or to Portage North Pit (Pit A). In the Vault area, there was no discharge to Wally Lake in 2019. Natural pit flooding was allowed to begin in the Vault area.</p>
2020	June 2026	<p>The tailings deposition and water transfer schedule were extended until June 2026.</p> <p>In-pit deposition occurred in Goose Pit from July 2019 until August 2020. In-pit deposition continued in Portage Pit starting in August 2020 and is projected to end in June 2026. The additional tailings come from the continuation of the milling of ore produced from the Whale Tail Pit, IVR Pit and underground mine operation at the Whale Tail site.</p> <p>The actual volumes and quantity of water transferred and of tailings deposited in 2020 were integrated into the model.</p> <p>In 2020, Reclaim Water was transferred from South Cell TSF Reclaim Pond to Portage Pit. Reclaim Water from CDDP was transferred back to SC Reclaim Pond or to Portage South Pit (Pit E). Reclaim Water was pumped from South Cell TSF and Portage North Pit (Pit A) to the mill.</p> <p>In the Vault area, natural pit flooding was allowed to continue.</p> <p>Following in-pit deposition, the Interim Closure and Reclamation Plan (ICRP) includes the treatment of the Reclaim Water in Portage and Goose Pits. The treated effluent shall be discharged to Third Portage Lake. Once treatment is completed, if necessary, cover construction over the tailings in the pits will begin, followed by re-flooding of the pits with natural runoff and water transfer from Third Portage Lake. Note that the cover requirement will be reviewed based on monitoring results and the feasibility of building the cover will be evaluated and updated in the closure plan.</p>
2021	December 2026	<p>The tailings deposition and water transfer schedule were extended until December 2026.</p> <p>In-pit deposition occurred in Goose Pit from July 2019 until August 2020. In-pit deposition continued in Portage Pit starting in August 2020 and is projected to end in December 2026. The additional tailings come from the continuation of the milling of ore produced from the Whale Tail Pit, IVR Pit and underground mine operation at the Whale Tail site. In 2021, tailings were deposited in the North Cell TSF in July and August.</p> <p>The actual volumes and quantity of water transferred and of tailings deposited in 2021 were integrated into the model.</p> <p>In 2021, Reclaim Water was transferred from South Cell (SC) TSF Reclaim Pond to Portage North Pit (A). Reclaim Water from CDDP was transferred back to SC Reclaim Pond or to Portage North Pit (Pit A). Reclaim Water was pumped from Portage South Pit (Pit E) to the mill and to Portage North Pit (Pit A).</p> <p>In the Vault area, natural pit flooding was allowed to continue.</p>

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WB YEAR	FORECASTED END OF DEPOSITION	MAIN DIFFERENCES
		<p>Following in-pit deposition, the ICRP includes the treatment of the Reclaim Water in Portage and Goose Pits. The treated effluent shall be discharged to Third Portage Lake. Once treatment is completed, if necessary, cover construction over the tailings in the pits will begin, followed by re-flooding of the pits with natural runoff and water transfer from Third Portage Lake. Note that the cover requirement will be reviewed based on monitoring results and the feasibility of building the cover will be evaluated and updated in the closure plan.</p>
2022	December 2026	<p>The tailings deposition and water transfer schedule are still forecasted to continue until December 2026.</p> <p>The actual volumes and quantity of water transferred and of tailings deposited in 2022 were integrated into the model.</p> <p>In 2022, Reclaim Water was transferred from South Cell (SC) TSF Reclaim Pond to Portage North Pit (A). Reclaim Water from CDDP was transferred back to SC Reclaim Pond or to Portage North Pit (Pit A). Reclaim Water was pumped mainly from Portage South Pit (Pit E) to the mill. Water was also transferred from Portage South Pit (Pit E) to Portage North Pit (Pit A).</p> <p>In the Vault area, natural pit flooding was allowed to continue.</p> <p>There are no changes to the current closure plan. At closure, if necessary, Reclaim Water in Portage and Goose Pits shall be treated and discharged to Third Portage Lake. Once treatment is completed, if necessary, cover construction over the tailings in the pits will begin, followed by re-flooding of the pits with natural runoff and water transfer from Third Portage Lake. Note that the cover requirement will be reviewed based on monitoring results and the feasibility of building the cover will be evaluated and updated in the closure plan.</p>
2023	June 2026	<p>The tailings deposition and water transfer schedule are forecasted to continue until June 2026.</p> <p>The actual volumes and quantity of water transferred and of tailings deposited in 2023 were integrated into the model.</p> <p>Since 2022, Reclaim Water was transferred from South Cell (SC) TSF Reclaim Pond to Portage North Pit (A). Reclaim Water from CDDP was transferred back to SC Reclaim Pond or to Portage North Pit (Pit A). Reclaim Water was pumped mainly from Portage South Pit (Pit E) and Portage North Pit (Pit A) to the mill. Water was also transferred from Portage North Pit (Pit A) to Goose Pit in 2023.</p> <p>In the Vault area, natural pit flooding was allowed to continue.</p> <p>There are no changes to the current closure plan. At closure, if necessary, Reclaim Water in Portage and Goose Pits shall be treated and discharged to Third Portage Lake. Once treatment is completed, if necessary, cover construction over the tailings in the pits will begin, followed by re-flooding of the pits with natural runoff and water transfer from Third Portage Lake. Note that the cover requirement will be reviewed based on monitoring results and the feasibility of building the cover will be evaluated and updated in the closure plan.</p>

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## 2.3 Parameters of Concern

A review of the chemical analysis for water samples collected in the North Cell (Station ST-21-N now transferred to the South Cell) and South Cell TSF Reclaim Ponds (Station ST-21-S) and in Portage and Goose Pits (ST-17/19 and ST-20) was undertaken by AtkinsRéalis to identify contaminants that could be above the discharge criteria as stipulated in the Metal and Diamond Mining Effluent Regulations (MDMER), the Canadian Council of Ministers of the Environment (CCME) guidelines and the Water Licence, Part F.

In the current LOM, Reclaim Water collected from the North Cell and South Cell TSF and the CDDP is currently transferred to Portage Pit until the end of in-pit deposition. The Reclaim Water is then pumped back to the mill for re-use. There is no discharge of Reclaim Water to the environment during operations. At closure, the Reclaim Water stored in Portage and Goose Pits shall be treated and discharged to the environment. The pits will then be reflooded with natural runoff and water transfer from Third Portage Lake.

For the purpose of this analysis, the following parameters of concern, which are listed in the Water Licence, shall be reviewed, specifically:


- Total Cyanide
- Total Aluminum
- Total Arsenic
- Total Cadmium
- Total Nickel
- Total Zinc
- Total dissolved solids
- Total Aluminum
- Total Mercury
- Chloride
- Total Ammonia
- Nitrate

Furthermore, the water quality review from past studies also identified the following parameters in the Reclaim Water that should be monitored since they could represent a potential long-term contamination risk:

- Total Iron
- Total Selenium
- Fluoride
- Sulphate

It is understood that the MDMER and the Water Licence criteria apply to mining effluents discharged to the environment and are as such not applicable to the North Cell, South Cell TSF Reclaim Ponds and Portage and Goose Pits since no effluent is discharged from these areas to the environment during operations. However, the MDMER, the Water Licence criteria, as well as the CCME guidelines are used as a guide to identify potential parameters of concern at the start of closure activities.

It should be noted that the parameters of concern were only determined based on the chemical analyses provided by Agnico. **Table 2-2** presents the MDMER, the Water Licence 2AM-MEA1530 at ST-9 (Nunavut Water Board Licence, 2020) discharge criteria and the CCME discharge guidelines for the parameters of concern. For the water **ATKINSREALIS - Sensitive**

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quality forecast report, the British Columbia guidelines for sulphate for the protection of aquatic life were used as a benchmark for reference only. However, final site-specific closure limits will be developed through review of the closure plan by regulatory agencies.


**Table 2-2: Discharge Criteria and CCME Guidelines for the Parameters Evaluated**

PARAMETER	DISCHARGE CRITERIA & WATER QUALITY GUIDELINES		
	MDMER <sup>1</sup>	Water Licence <sup>2</sup> (Part F)	CCME <sup>3</sup> (Issue Date)
<b>Cyanide (CN)</b>	0.5 mg/L (as total CN)	0.5 mg/L (as total CN)	0.005 mg/L (as free CN) (1987)
<b>Aluminum (Al)</b>	<i>no criteria</i>	1.5 mg/L	0.16 mg/L <sup>8</sup> (2021)
<b>Arsenic (As)</b>	0.3 mg/L	0.3 mg/L	0.005 mg/L (1997)
<b>Cadmium (Cd)</b>	<i>no criteria</i>	0.002 mg/L	0.00004 mg/L <sup>9</sup> (2014)
<b>Copper (Cu)</b>	0.3 mg/L	0.1 mg/L	0.002 mg/L <sup>4</sup> (1987)
<b>Iron (Fe)</b>	<i>no criteria</i>	<i>no criteria</i>	0.3 mg/L (1987)
<b>Lead (Pb)</b>	0.1 mg/L	0.1 mg/L	0.001 mg/L <sup>9</sup> (1987)
<b>Mercury (Hg)</b>	<i>no criteria</i>	0.0004 mg/L	0.000026 mg/L (2003)
<b>Nickel (Ni)</b>	0.5 mg/L	0.2 mg/L	0.025 mg/L <sup>9</sup> (1987)
<b>Selenium (Se)</b>	<i>no criteria</i>	<i>no criteria</i>	0.001 mg/L (1987)
<b>Zinc (Zn)</b>	0.5 mg/L	0.4 mg/L	0.013 mg/L <sup>9</sup> (2018)
<b>Total Ammonia (NH<sub>3</sub>)</b>	<i>no criteria</i>	16 mg N/L	1.83 mg N/L <sup>5</sup> (2001)
<b>Un-ionized ammonia</b>	0.5 mg N/L	n/a	0.019 mg N/L (2001)
<b>Nitrate (NO<sub>3</sub>)</b>	<i>no criteria</i>	20 mg N/L	2.94 mg N/L <sup>7</sup> (2012)
<b>Total Dissolved Solids</b>	<i>no criteria</i>	1,400 mg/L	<i>no criteria</i>
<b>Chloride (Cl)</b>	<i>no criteria</i>	1,000 mg/L	120 mg/L <sup>6</sup> (2011)
<b>Sulphate (SO<sub>4</sub>)</b>	<i>no criteria</i>	<i>no criteria</i>	128 mg/L <sup>10</sup> (2013)
<b>Fluoride (F)</b>	<i>no criteria</i>	<i>no criteria</i>	0.12 mg/L (2002)

**Notes:**

1. Current MDMER criteria (as of December 2021) corresponding to the maximum average monthly concentration (schedule 4, table 2).
2. Water Licence (Part F) criteria for Third Portage Lake (ST-9) corresponding to the maximum average concentration (2020).
3. CCME criteria as per the Water Quality Guidelines for the Protection of Aquatic Life for freshwater and long-term exposure. Criteria referenced from www.ccme.ca in 2021.
4. The copper discharge criterion depends on hardness. A Third Portage Lake hardness level is approx. 12 mg/L as CaCO<sub>3</sub>. For hardness between 0 to 82 mg/L CaCO<sub>3</sub>, the copper limit is set at 2 µg/L.
5. The ammonia concentration limit depends on temperature and pH (an increase in temperatures and pH leads to a more stringent ammonia concentration limit). In this case, 2.22 mg/L of NH<sub>3</sub>, or 1.83 mg N/L, was determined based on an average pH of 7.5 in Third Portage Lake and a maximum measured temperature of approx. 15°C.
6. This is the long-term chloride concentration limit. The short-term concentration limit is 640 mg/L.
7. This is the long-term nitrate concentration limit (13 mg/L as NO<sub>3</sub>). The short-term concentration limit is 550 mg/L.
8. Aluminum criterion in fresh water is calculated using the equation described in Appendix B of the Federal Environmental Quality Guidelines (FWQG). The FWQG equation is valid between hardness 10 and 430 mg/L, pH 6 and 8.7, and dissolved organic carbon (DOC) 0.08 and 12.3 mg/L. The Al criterion is calculated based on the Third Portage Lake water quality (hardness of 12 mg/L CaCO<sub>3</sub>, pH 7.09 and DOC 1.47 mg/L).
9. Cadmium, lead, nickel, and zinc discharge criteria depend on hardness. Third Portage Lake hardness level is approx. 12 mg/L as CaCO<sub>3</sub>. For hardness between 0 to 17 mg/L CaCO<sub>3</sub>, the limit is set at 0.04 µg/L for cadmium. For hardness between 0 to 60 mg/L CaCO<sub>3</sub>, the limit is set at 0.001 mg/L for lead and 0.025 mg/L for nickel. For hardness of 12 mg/L as CaCO<sub>3</sub>, the limit for zinc is 0.013 mg/L.
10. Threshold value for sulphate based on BC Environment guidelines for the protection of aquatic life for very soft water (0-30 mg/L) (April 2013).



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## 2.4 North and South Cell TSF Reclaim Ponds

At the start of operations, tailings were deposited in the North and South Cell TSF. Reclaim Water was collected in the North and South Cell TSF Reclaim Ponds and transferred back to the mill for re-use. Since 2019, tailings are no longer deposited constantly in these cells and the contact water collected in these areas is transferred to Portage Pit. In 2021, tailings were deposited in the North Cell TSF in July and August. In 2023, no tailings were deposited in the North Cell TSF, while 293,227 tons of tailings were deposited in the South Cell TSF.

**Figure 2-1** to **Figure 2-3** present the concentration of the parameters of concern measured in the North and South Cell TSF Reclaim Ponds from January 2013 to December 2023. Also shown in these figures are the forecasted concentrations from the Water Quality Forecasting Update based on the planned water transfers described in the 2022 Water Management Plan (SNC-Lavalin, 2023). For the metal parameters, total concentration values are shown in the figures in this year’s report since the discharge criteria and CCME water quality guidelines are based on total concentration measurements.



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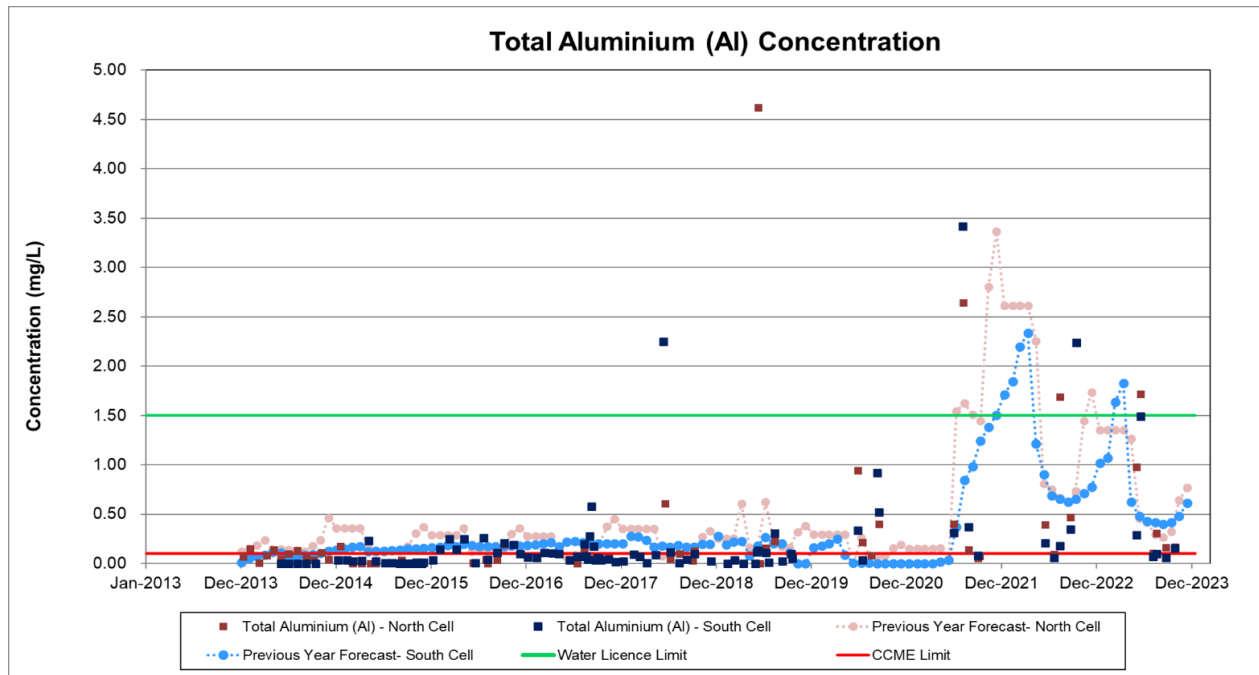
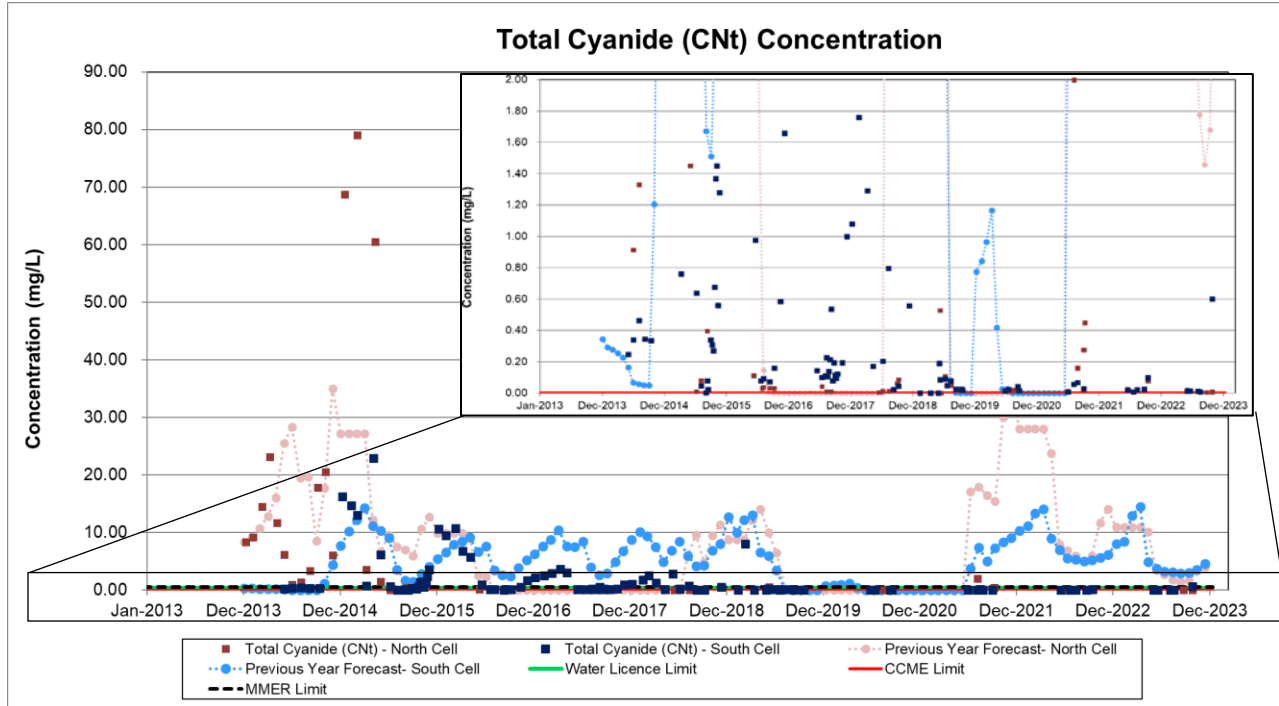
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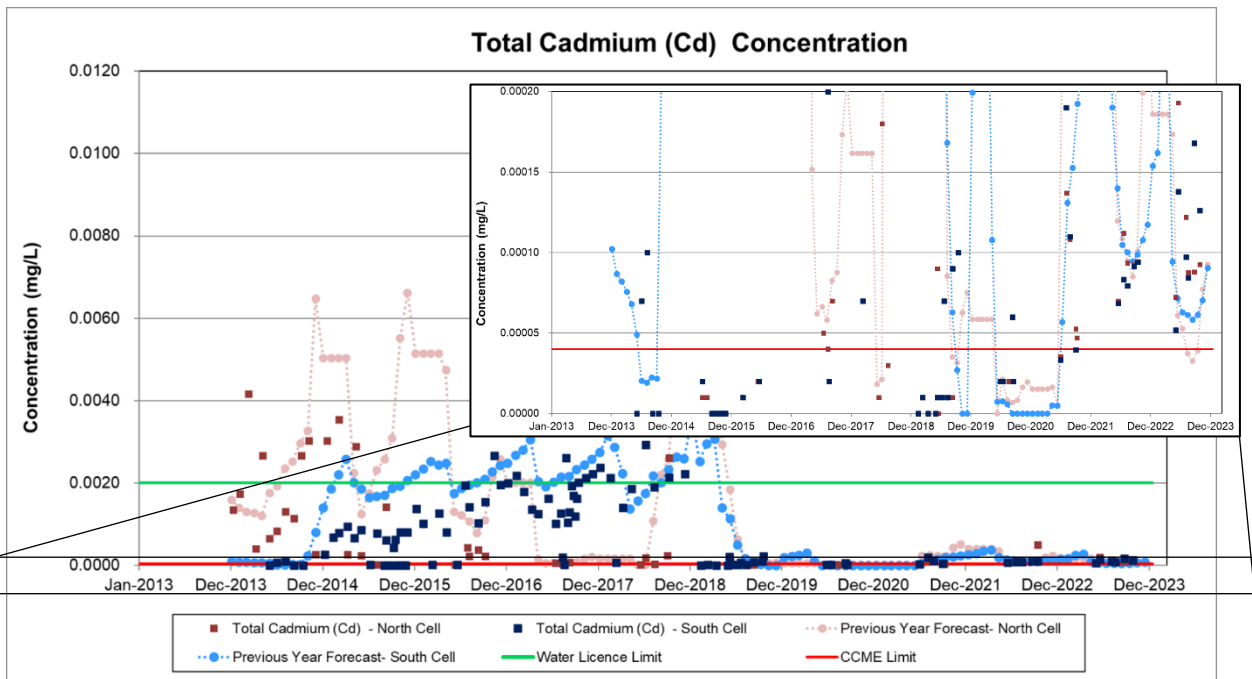
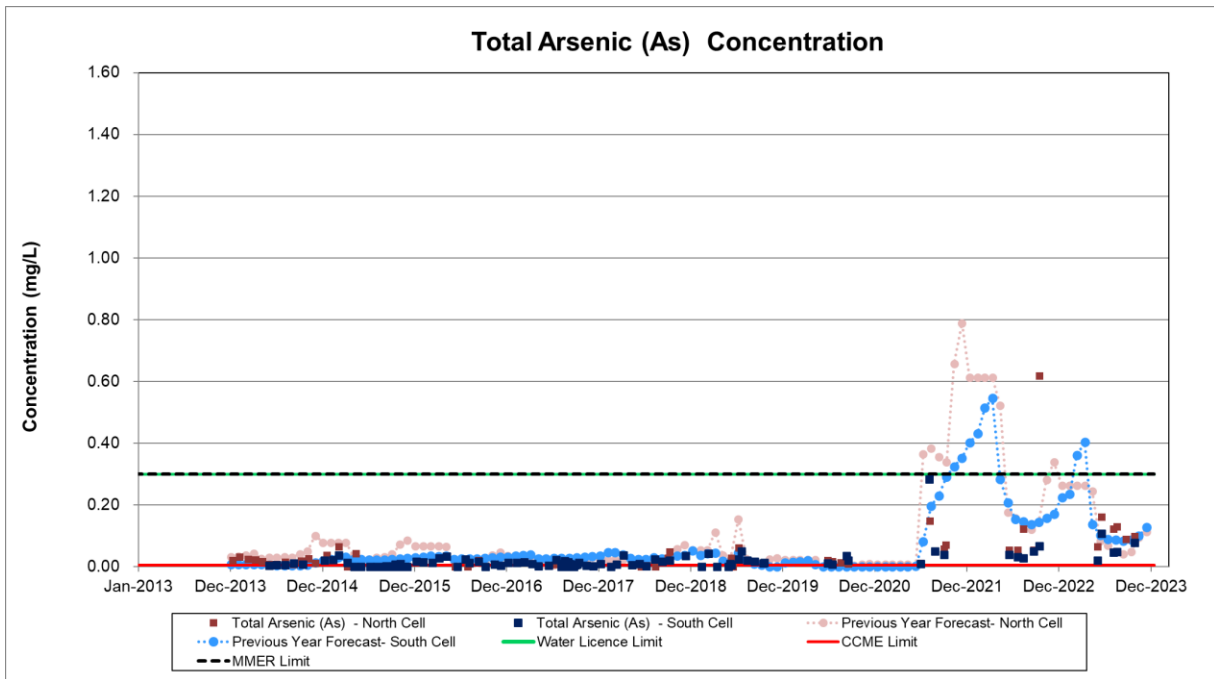
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**Figure 2-1: Concentrations North and South Cell TSF Reclaim Ponds – Total Cyanide & Metals**



**Figure 2-1: (continued) Concentrations North and South Cell TSF Reclaim Ponds – Total Cyanide & Metals**



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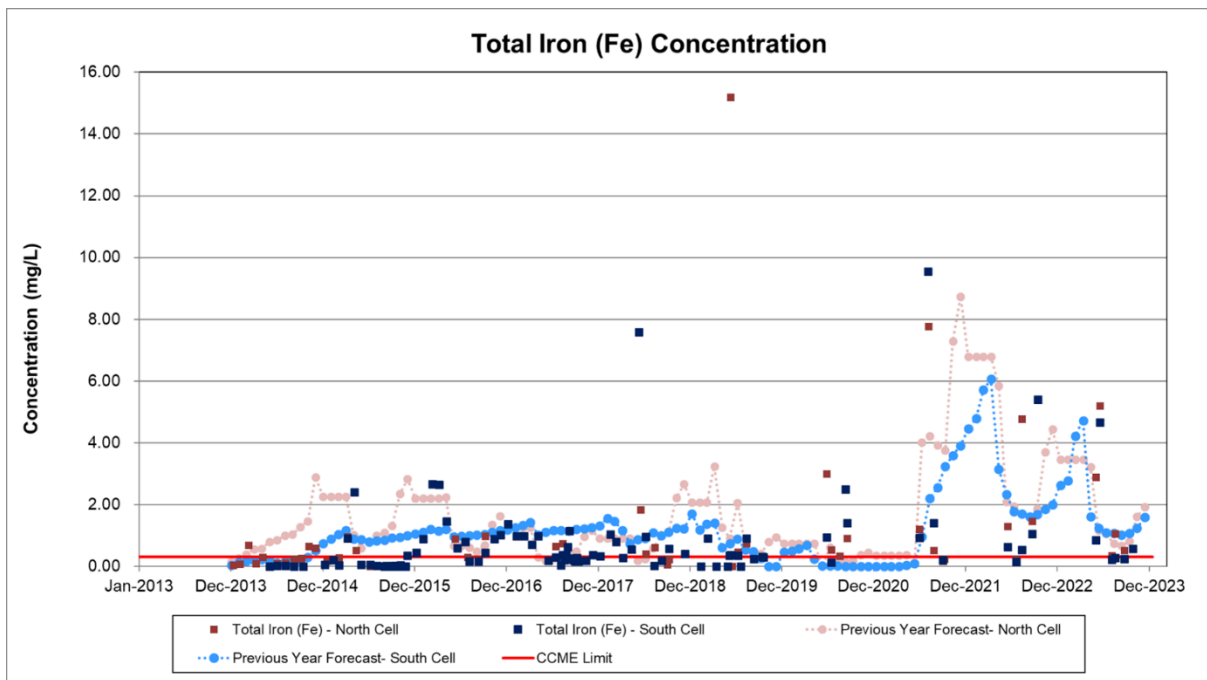
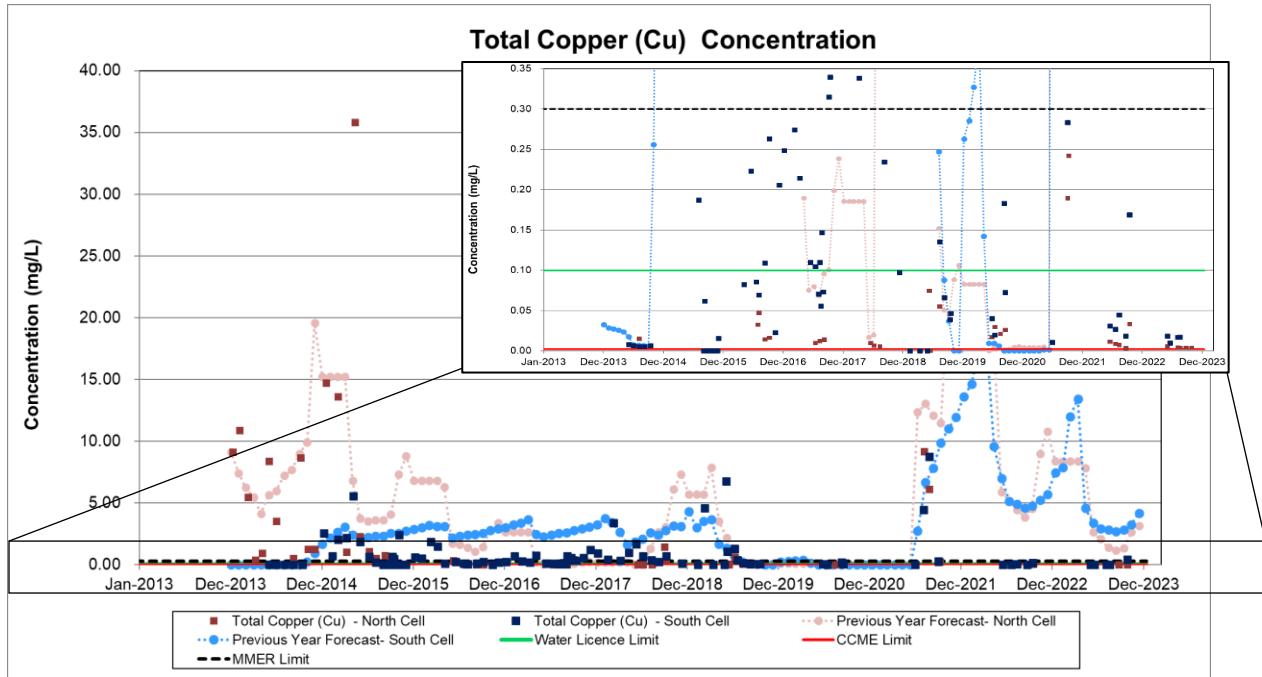


Figure 2-1: (continued) Concentrations North and South Cell TSF Reclaim Ponds – Total Cyanide & Metals



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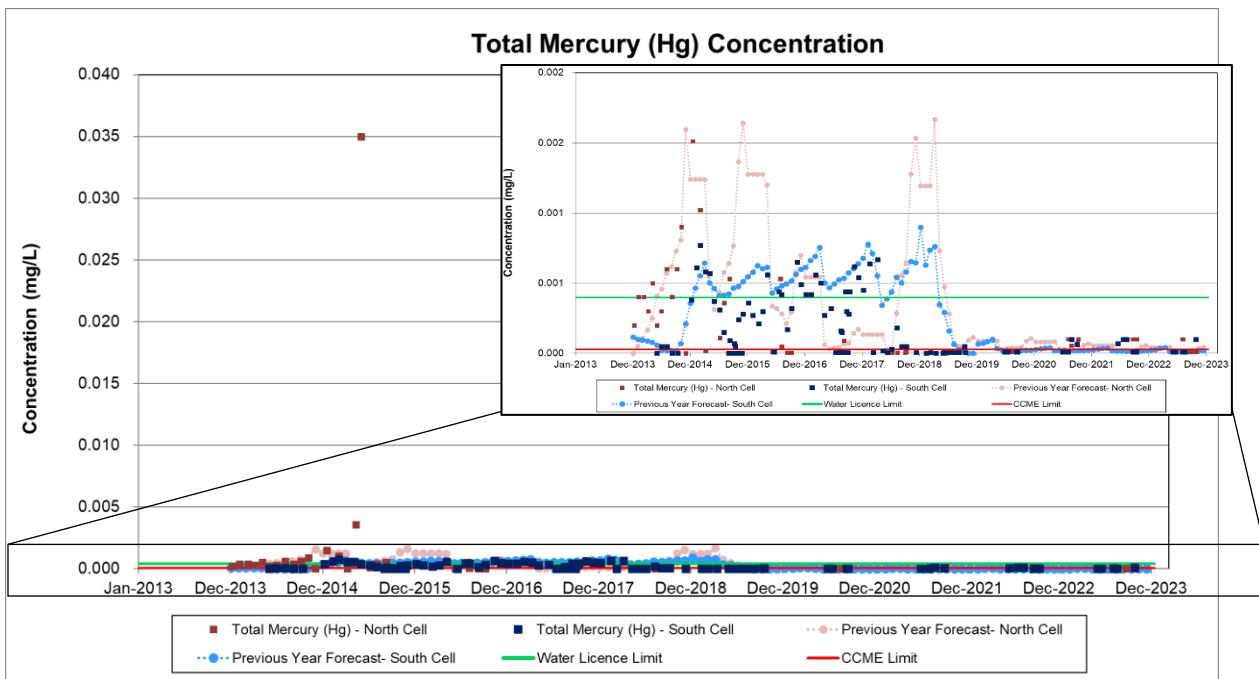
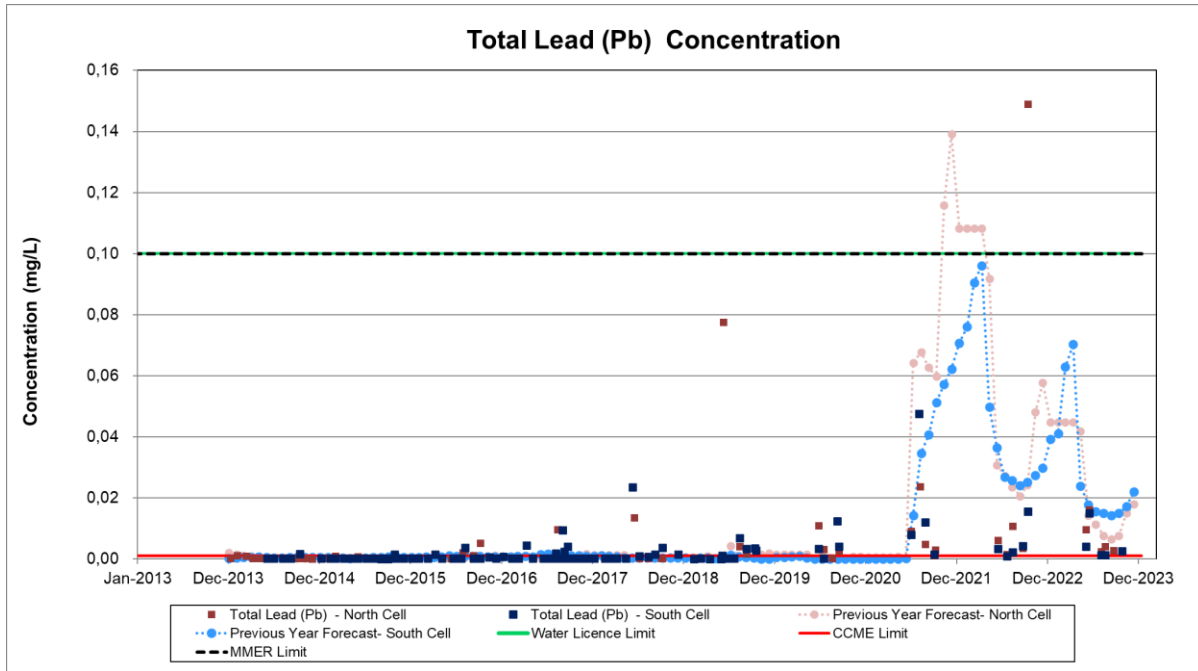


Figure 2-1: (continued) Concentrations North and South Cell TSF Reclaim Ponds – Total Cyanide & Metals



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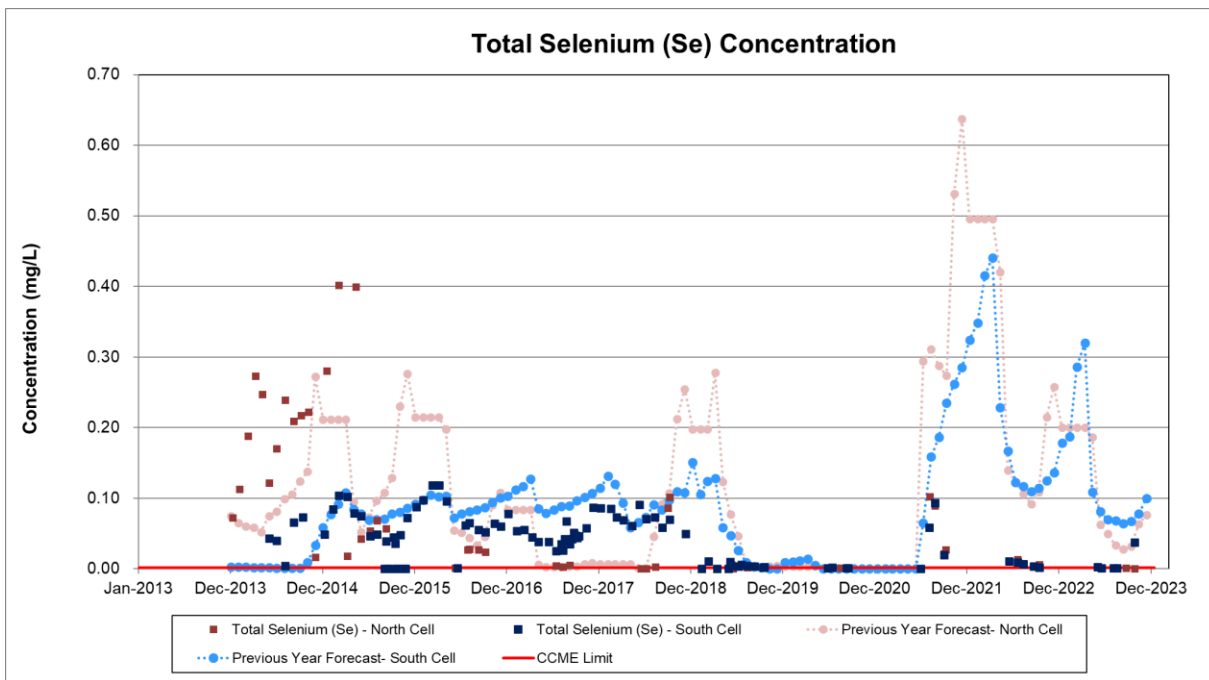
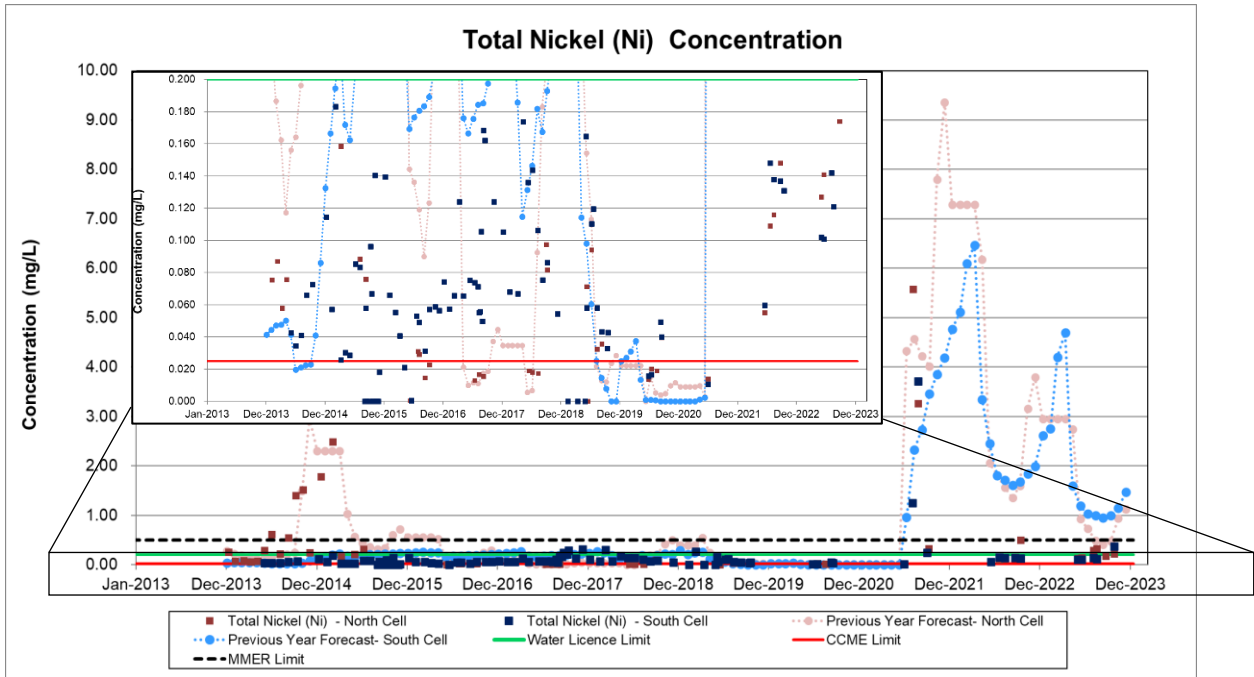


Figure 2-1: (continued) Concentrations North and South Cell TSF Reclaim Ponds – Total Cyanide & Metals



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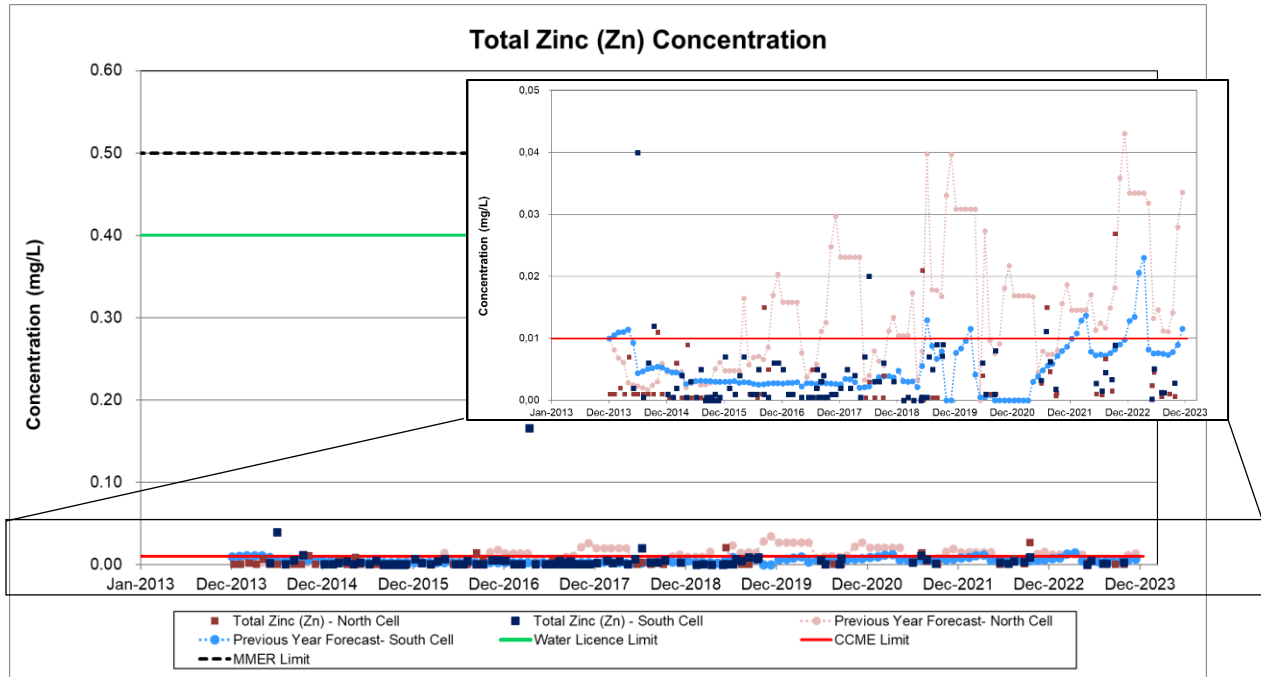


Figure 2-1: (continued) Concentrations North and South Cell TSF Reclaim Ponds – Total Cyanide & Metals



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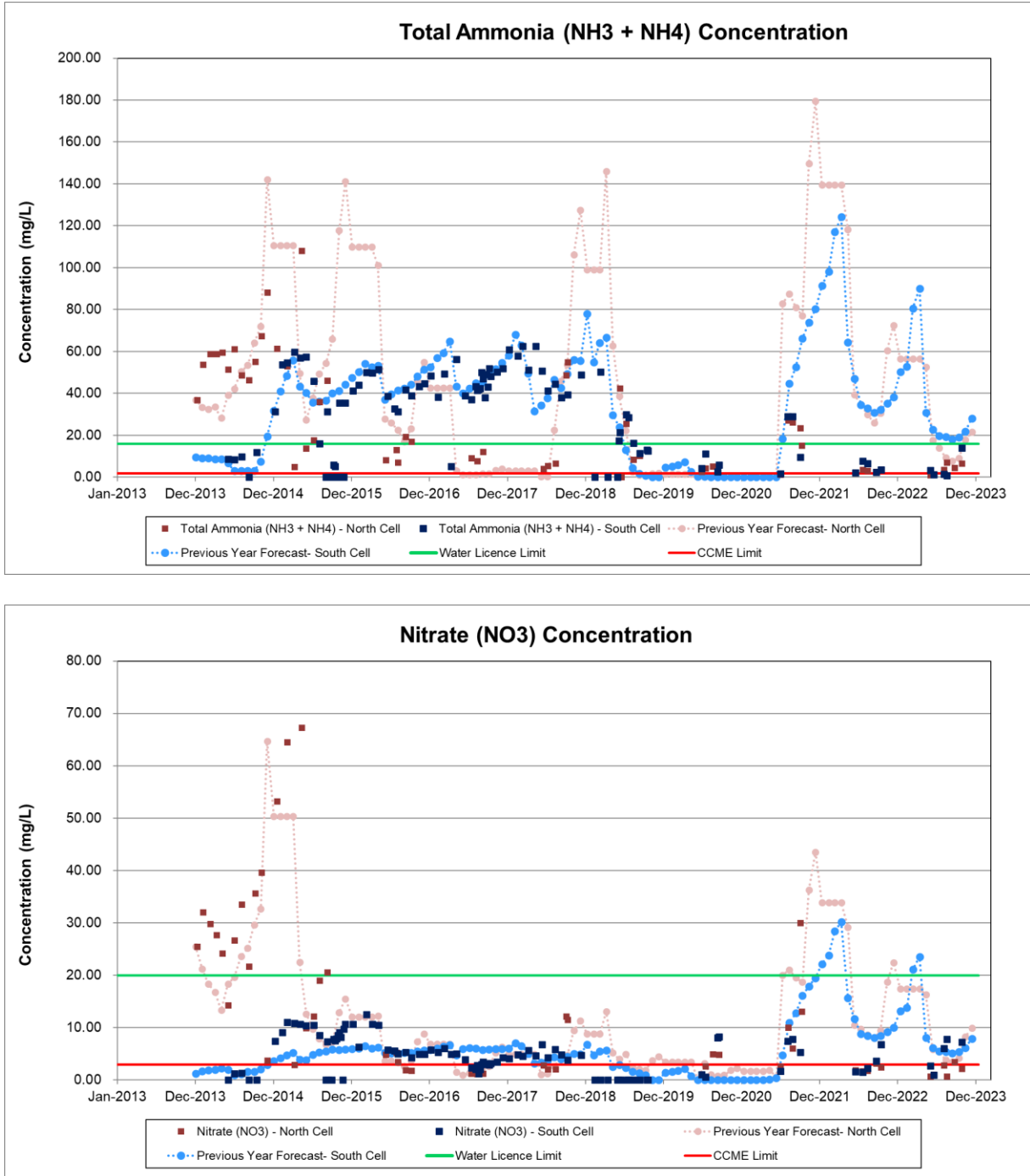


Figure 2-2: Concentrations North and South Cell TSF Reclaim Ponds – Ammonia & Nitrate





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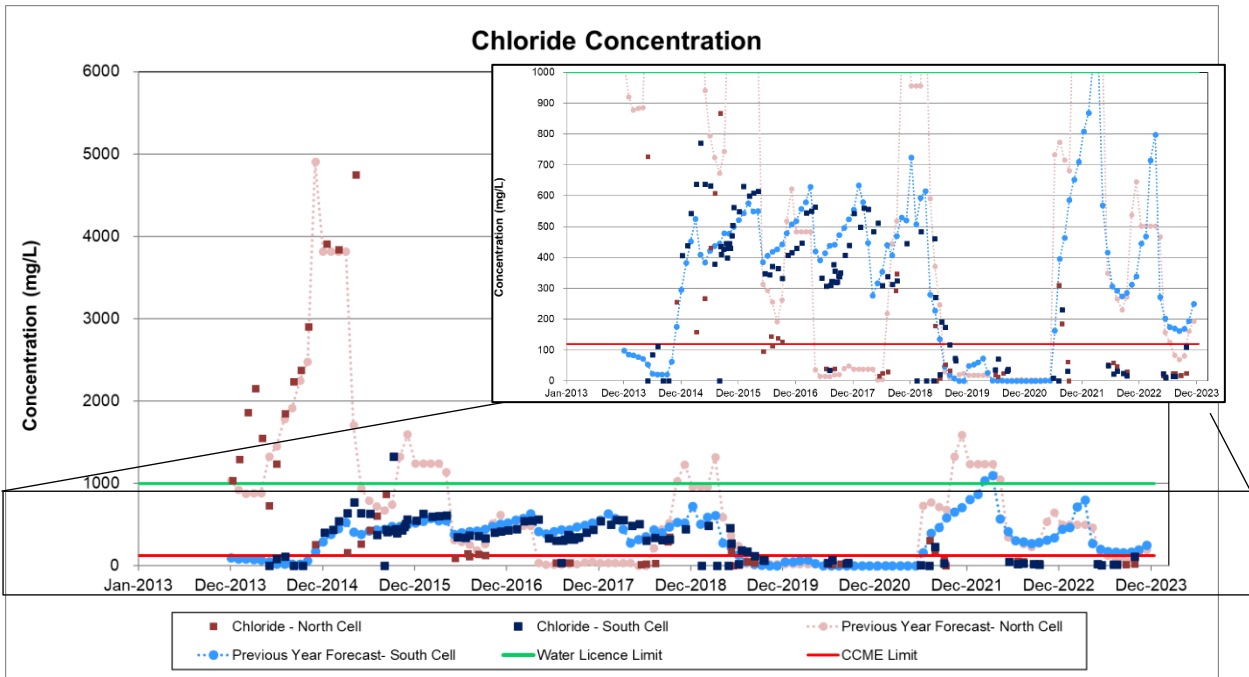
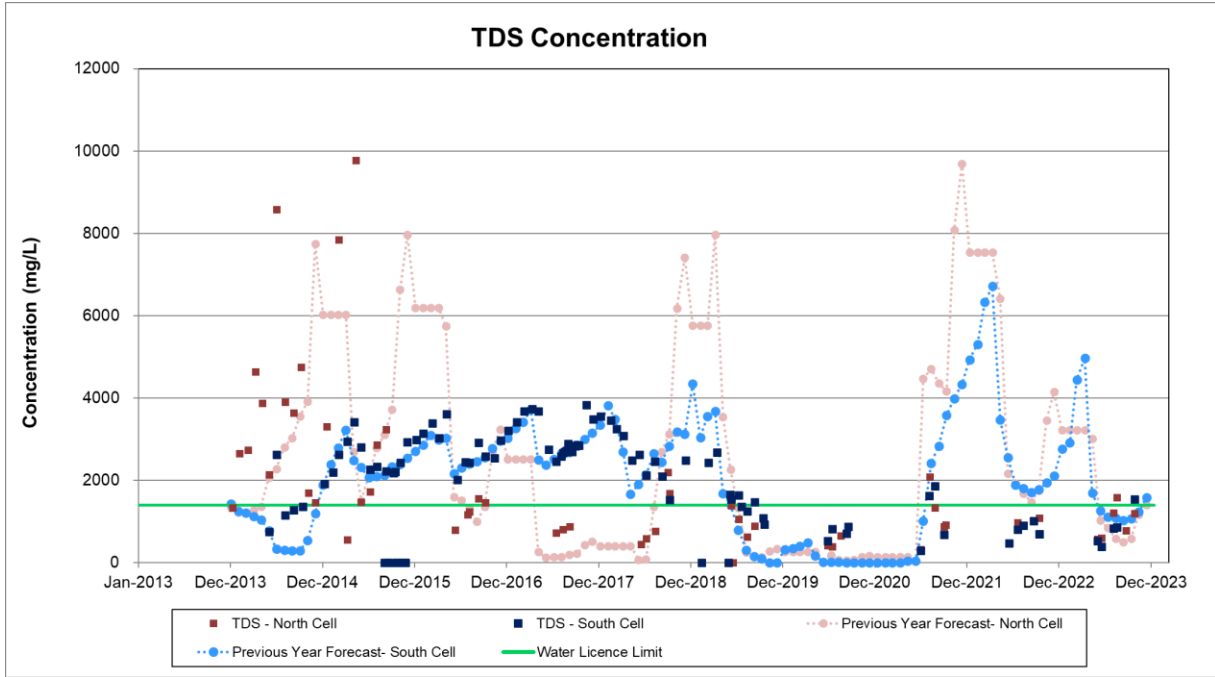


Figure 2-3: Concentrations North and South Cell TSF Reclaim Ponds – TDS & Anions



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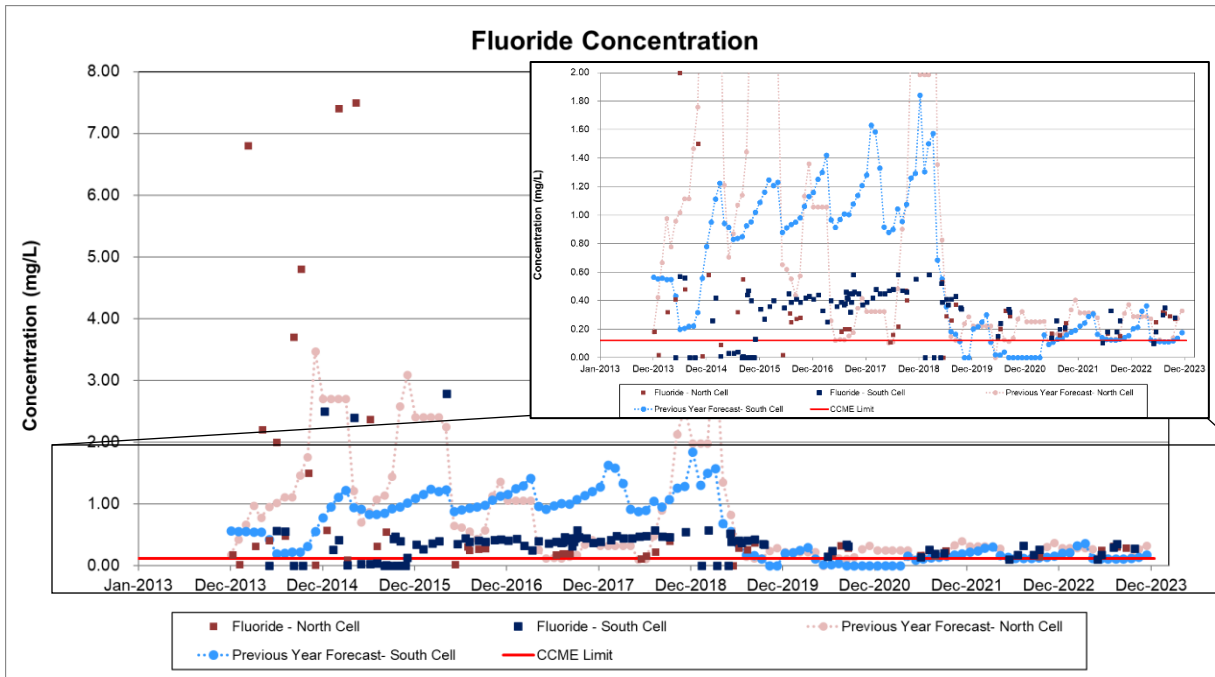
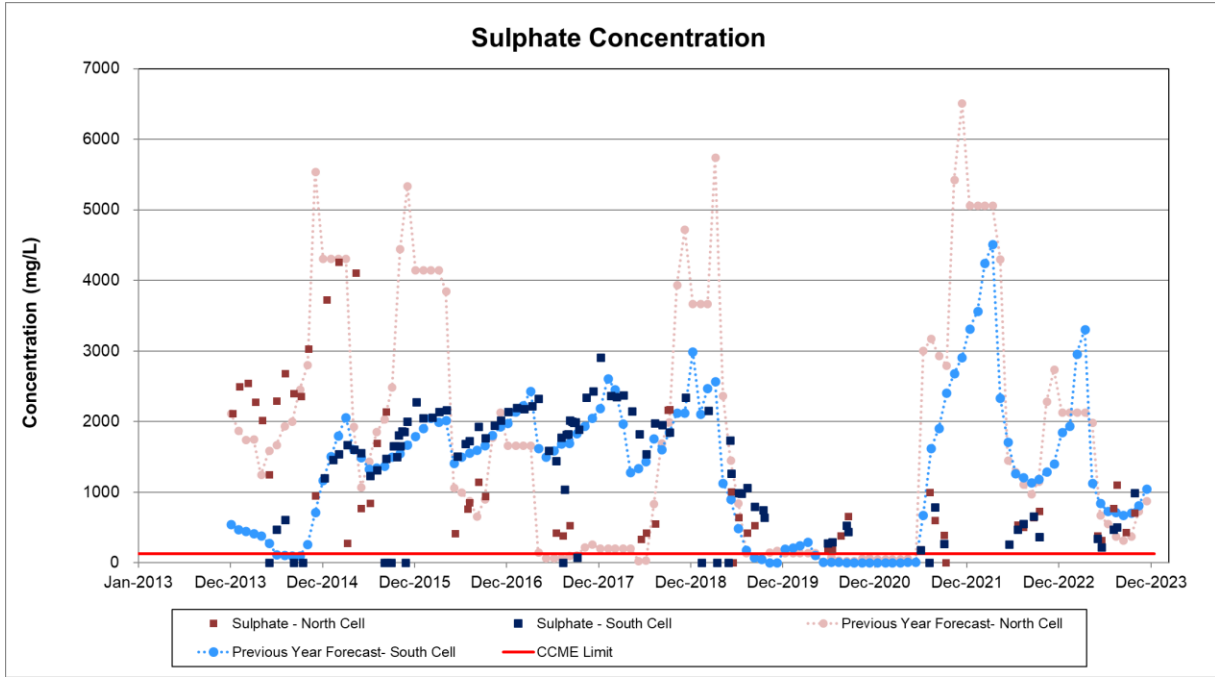




Figure 2-3: (continued) Concentrations North and South Cell TSF Reclaim Ponds – TDS & Anions

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**Table 2-3** summarizes the observations that can be made based on the measured values and forecasted concentrations as shown in **Figure 2-3**. For some parameters, the graphs observations have been divided into North Cell TSF Reclaim Pond (NC) and South Cell TSF Reclaim Pond (SC). The forecasted values are based on the previous model (SNC-Lavalin, 2023).

**Table 2-3: Observations from Measured and Forecasted Concentrations in NC and SC TSF Reclaim Ponds**


PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Cyanide (CN)	<p><b>NC &amp; SC:</b> Since the end of deposition of tailings in NC and SC in 2019, the CN concentrations are very low.</p> <p>For comparison purposes only, concentrations were below MDMER and Water Licence criterion for all the analyzed samples. The concentrations are generally above the CCME limit.</p> <p>However, tailings were deposited in 2021 in NC, and the CN concentration did increase slightly in NC and SC compared to 2020. No deposition occurred in 2022 and CN concentration decreased. In 2023, limited deposition of tailings occurred in SC, but CN concentration remains low.</p>	<p><b>NC &amp; SC:</b> In 2019, as there was no tailings deposition in both North Cell (after April) and South Cell (after August) between 2019 and 2020, cyanide volatilizes in the summer and its concentration slowly reduces in the cell with time. This was confirmed with the monitored data.</p> <p>In 2021, tailings were deposited in the NC, which was not included in the previous year’s forecast.</p> <p>In 2022, it was forecasted that the concentration would decrease in both cells, with a slight increase at the end of the year in the NC. The forecasted values were above the measured values indicating that the forecast model is conservative.</p> <p>In 2023, forecasted concentrations decreased in both cells, with a slight increase at the end of the year in both cells. The forecasted values were above the measured values indicating that the forecast model is conservative.</p>
Total Metals (general)	See specific parameters for details.	<p>The current forecasting model was based on a mass balance using the water balance around the site and does not consider possible geochemical reactions that could help precipitate the metals out of the water column phase at equilibrium. For this reason, some of the forecasted values can be higher than the measured values.</p> <p>Furthermore, for both NC and SC: Deposition of tailings in 2021 in the NC was accounted for in the forecast. Forecasted concentration indicated an increase in concentration in 2021 in both cells followed by a decrease in 2022 and 2023. The measured values generally followed this trend.</p> <p>See specific parameters for additional details.</p>

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Aluminum	<p><b>NC &amp; SC:</b> Measured concentrations decreased in 2022 compared to previous years since no tailings deposition occurred at this location. However, there were some peak concentrations that were higher than the Water Licence discharge criterion.</p> <p>Measured concentrations continued to decrease in 2023. However, some values slightly increased towards the end of the year. Almost all concentrations are below the Water Licence discharge criterion.</p>	<p><b>NC &amp; SC:</b> Prior to the deposition of tailings in NC, the measured values were higher than the forecasted values. This indicates that natural runoff into the NC and SC were carrying suspended solids that contain metal particulates.</p> <p>The forecasted model integrated the tailings deposition in the NC in 2021. Forecasted concentration indicated an increase in concentration in 2021 in both cells followed by a decrease in 2022 and 2023. The measured values generally followed this trend.</p>
Total Arsenic	<p><b>NC &amp; SC:</b> Measured concentrations were in the same range/trend as last year.</p> <p>In general for 2023, concentrations decreased compared to 2022 and were above CCME limits and lower than the Water Licence discharge criterion.</p>	See notes on Total Metals.
Total Cadmium	<p><b>NC &amp; SC:</b> Measured concentrations were relatively low.</p> <p>For comparison purposes only, all the collected samples showed concentrations below the Water Licence criterion and slightly above the CCME limit.</p>	<b>NC &amp; SC:</b> Forecasted concentration was expected to be close to the CCME limit.
Total Copper	<p><b>NC &amp; SC:</b> Measured concentrations decreased in 2022 compared to previous years. This was expected since no tailings were deposited in the NC. In 2023, measured concentrations continued to decrease.</p> <p>Concentrations were near the CCME limit, but remained below the Water Licence discharge criterion.</p>	See notes on Total Metals.
Total Iron	<p><b>NC &amp; SC:</b> Measured concentrations decreased in 2022 and 2023 between January and June compared to previous years. In July and August concentrations started to increase slightly, coinciding with runoff season.</p> <p>In 2023, 50% of concentrations exceeded the CCME limit, while the remaining concentrations were below or near the CCME limit.</p>	Forecasted concentration was expected to be approaching the CCME limit. In the summer period, certain measured values were higher.

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Lead	<p><b>NC &amp; SC:</b> Measured concentrations increased in 2022 during the summer months. This increase could be due to runoff scouring the surface of the tailings. Nevertheless, measured concentrations decreased in 2023.</p> <p>However, concentrations were lower than the Water Licence discharge criterion, but above the CCME limit.</p>	<p><b>NC &amp; SC:</b> Forecasted concentrations were expected to be close to the CCME limit. The deposition of tailings in the NC in 2021 led to an increase in concentrations that are above the CCME limit but below the Water Licence discharge criterion. This trend continued in 2022. However, in 2023, forecasted concentrations were expected to decrease and to be close to the CCME limit, but below the Water Licence discharge criterion.</p>
Total Mercury	<p><b>NC &amp; SC:</b> Measured concentrations in 2022 are similar compared to previous years. This was due to the deposition of tailings in NC in July and August of 2021. Measured concentrations in 2023 are similar to values measured in the previous year.</p> <p>However, all concentrations were lower than the Water Licence discharge criterion, but almost all of them were below or close to the CCME limit.</p>	<p><b>NC &amp; SC:</b> Forecasted concentrations were expected to be close to the CCME limit. Despite the deposition of tailings in both cells, the forecasted concentrations in 2023 remained close to the CCME limit.</p>
Total Nickel	<p><b>NC &amp; SC:</b> Measured concentrations decreased in 2022 compared to 2021 since no deposition was going in the NC. Compared to 2022, measured concentrations increased slightly in 2023.</p> <p>In 2022, all concentrations were between the CCME limit and Water Licence discharge criterion. In 2023, almost all concentrations were between the CCME limit and Water Licence discharge criterion, but lower than the MDMER limit.</p>	See notes on Total Metals.
Total Selenium	<p><b>NC &amp; SC:</b> Measured concentrations decreased in 2022 compared to 2021. A possible geochemical reaction may contribute to a decrease in the concentration of selenium. As in 2022, measured concentrations continued to decrease more in 2023.</p> <p>Almost all concentrations were below the CCME limit.</p>	See notes on Total Metals.

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Zinc	<p><b>NC &amp; SC:</b> Concentration values in 2023 were similar when compared to previous years.</p> <p>All concentrations remain below the Water Licence criterion and the CCME limit.</p>	<p><b>NC &amp; SC:</b> Forecasted concentration was expected to be close to the CCME limit. In 2021, despite the deposition of tailings in the NC, the forecasted concentrations remained below the CCME limit for SC and above the same limit for NC after August. Compared to 2022, in 2023, almost all forecasted concentrations were expected to be below the CCME limit for both cells.</p>
Total Ammonia	<p><b>NC &amp; SC:</b> Measured concentrations decreased in 2022 compared to 2021. However, they continued to decrease until the midpoint of 2023, then increased until the end of the year. This was due to the deposition of tailings in August and September 2023 in SC.</p> <p>Concentrations were lower than the Water Licence criterion but, slightly above CCME limit.</p>	<p><b>NC &amp; SC:</b> Forecasted concentrations in 2023 were expected to decrease initially and then increase slightly. Generally, the forecasted concentrations of NC are still below the Water Licence criterion and close to the CCME limit. However, the forecasted concentrations of SC were above the Water Licence criterion and close to the CCME limit. Measured values were below this forecast.</p>
Nitrate	<p><b>NC &amp; SC:</b> As in 2022, measured concentrations increased in 2023. This was due to the deposition of tailings in August and September 2023 in SC.</p> <p>Concentrations were lower than the Water Licence criterion for both cells, and close to the CCME limit for NC.</p>	<p><b>NC &amp; SC:</b> Compared to 2022, forecasted concentrations in 2023 were expected to increase slightly but remained below the Water Licence criterion and close to the CCME limit.</p>
TDS	<p><b>NC &amp; SC:</b> Measured concentrations increased slightly in 2023 compared to 2022.</p> <p>Most of the concentrations were below the Water Licence criterion.</p>	<p><b>NC &amp; SC:</b> Forecasted concentrations in 2023 were expected to decrease until the midpoint of the year, followed by a slight increase until the end of the year. Most of the measured values for SC were below the forecasted values. However, most of the measured values for NC were slightly above the forecasted values.</p>
Chloride	<p>The primary source of chloride found in the TSF Reclaim Ponds was most likely from the use of calcium chloride in the winter months as an anti-freeze solution on the ore and a dust suppressant in the Mill dome.</p> <p><b>NC &amp; SC:</b> Despite the deposition of tailings in the NC in 2021, the concentrations decreased slightly in 2022 compared to 2021 and remained below the water license criteria and the CCME limit. In 2023, concentrations remained generally stable for NC. Towards the end of the year, there was a slight increase observed for SC. Measured values were below the Water License criterion and the CCME limit.</p>	<p><b>NC &amp; SC:</b> Generally, forecasted concentrations in 2023 were expected to decrease more than in 2022 and were expected to range between the CCME limit and the Water Licence criterion. Measured values were below the forecasted values.</p>

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Sulphate	<p><b>NC &amp; SC:</b> As in 2022, measured concentrations slightly increased in 2023. This was due to the deposition of tailings in July and August in 2023.</p> <p>Concentrations were generally higher than the adopted limit for this criterion.</p>	<p><b>NC &amp; SC:</b> As in 2022, forecasted concentrations in 2023 were expected to decrease more and to be slightly above the BC Environmental limit for this parameter. Measured values were below the forecasted values.</p>
Fluoride	<p><b>NC &amp; SC:</b> Fluoride concentrations were more or less constant and low during the year, despite the deposition of tailings in the NC in 2021. For comparison purposes only, the concentrations were generally slightly above the CCME limit.</p>	<p><b>NC &amp; SC:</b> Forecasted concentrations in 2023 were expected to increase until the midpoint of the year, followed by a slight decrease until the end of the year while remaining close to the CCME limit. The forecasted values trended approximately with the measured data.</p>

## 2.5 Portage and Goose Pits

In 2020, in-pit tailings deposition continued in Goose Pit from January to August 2020 and was then transferred to South Portage Pit (Pit E).

In Goose Pit, Reclaim Water and natural runoff from its sub-catchment area were allowed to accumulate in the pit. Water was then transferred to Portage North (Pit A) between May to September 2020 and in May and June 2021. There was no water transfer in 2022. In 2023, about 439,935 m<sup>3</sup> of reclaim water from Portage North (Pit A) was transferred to Goose Pit.

In Portage Pit E, Reclaim Water (as of August 2020) and natural runoff from its sub-catchment area also accumulated in the pit. No water transfer occurred in 2020. Water was transferred to Portage North Pit (Pit A) from October to December 2021, between January to December 2022, and between January to December 2023. Reclaim water was also pumped from Pit E to the Mill.

North Portage Pit (Pit A) continues to receive its natural runoff from its sub-catchment area, as well as water transfer from East Dike Seepage, South Cell TSF, CDDP, Portage Pit E, and Storm Water Management Pond. Water from Pit A was also pumped to the Mill to be reused as Reclaim Water intermittently: from June 2020 to the end of 2021; from January to April 2022 and July to October 2022; and from June to September 2023.

Water quality analysis of samples taken from the pit lakes formed in Portage Pit A (ST-17) and Pit E (ST-19), and in Goose Pit (ST-20) in 2023 are tabulated in Section 8.0 of AEM's 2023 Annual Report.

**Figure 2-4** to **Figure 2-6** present the concentration of the parameters of concern measured in the Portage and Goose Pits from 2013 to 2023. Based on the graphs shown in **Figure 2-4** to **Figure 2-6**, observations from measured and forecasted concentrations in Portage and Goose Pits are summarized in **Table 2-4**. To facilitate the reading, Portage Pit has been abbreviated as PP and Goose Pit as GP.



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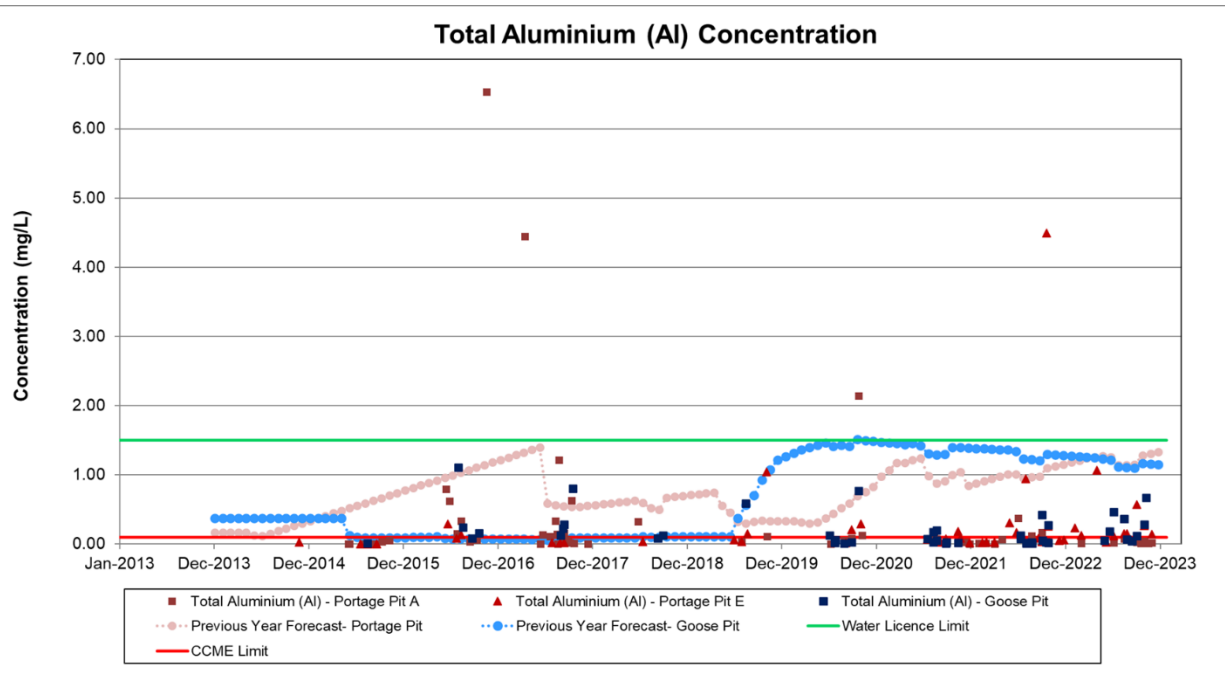
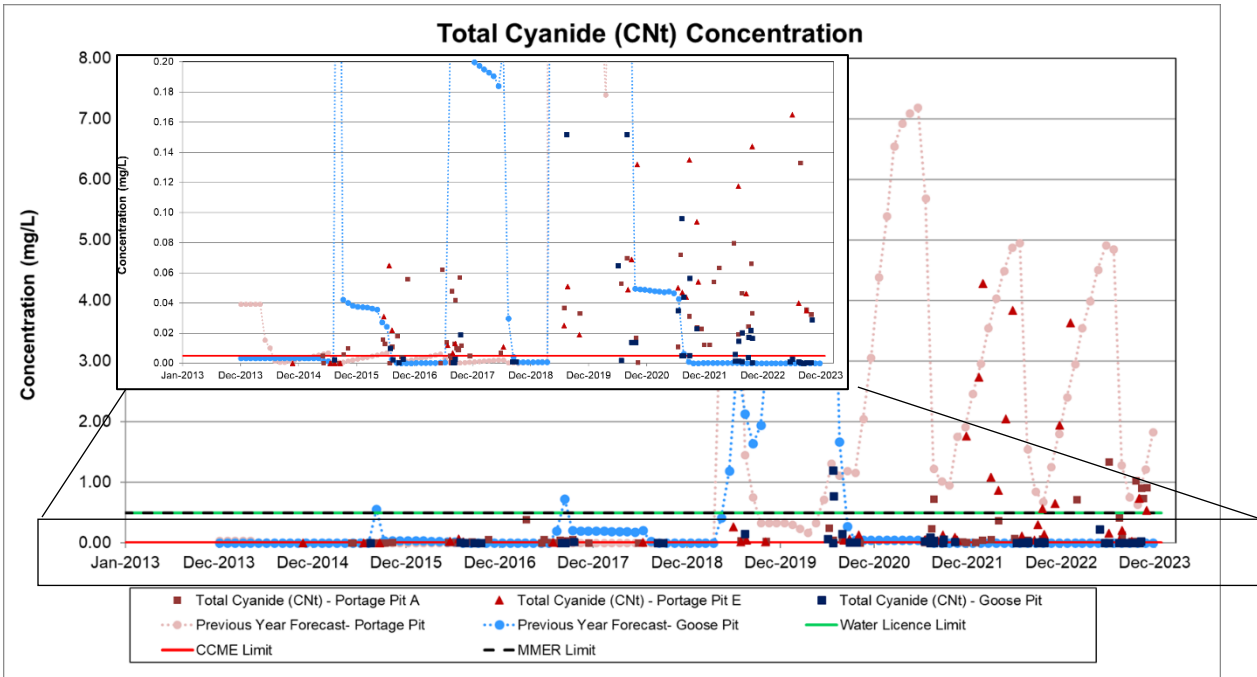


Figure 2-4: Concentrations Portage Pit and Goose Pit – Total Cyanide & Metals





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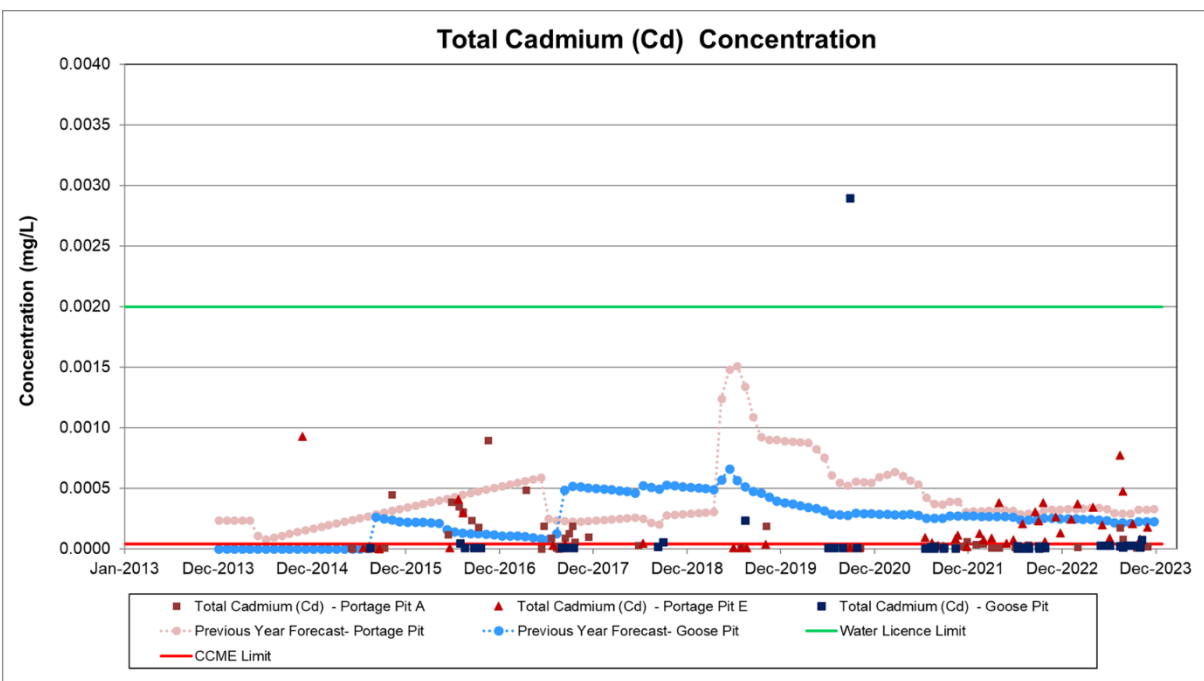
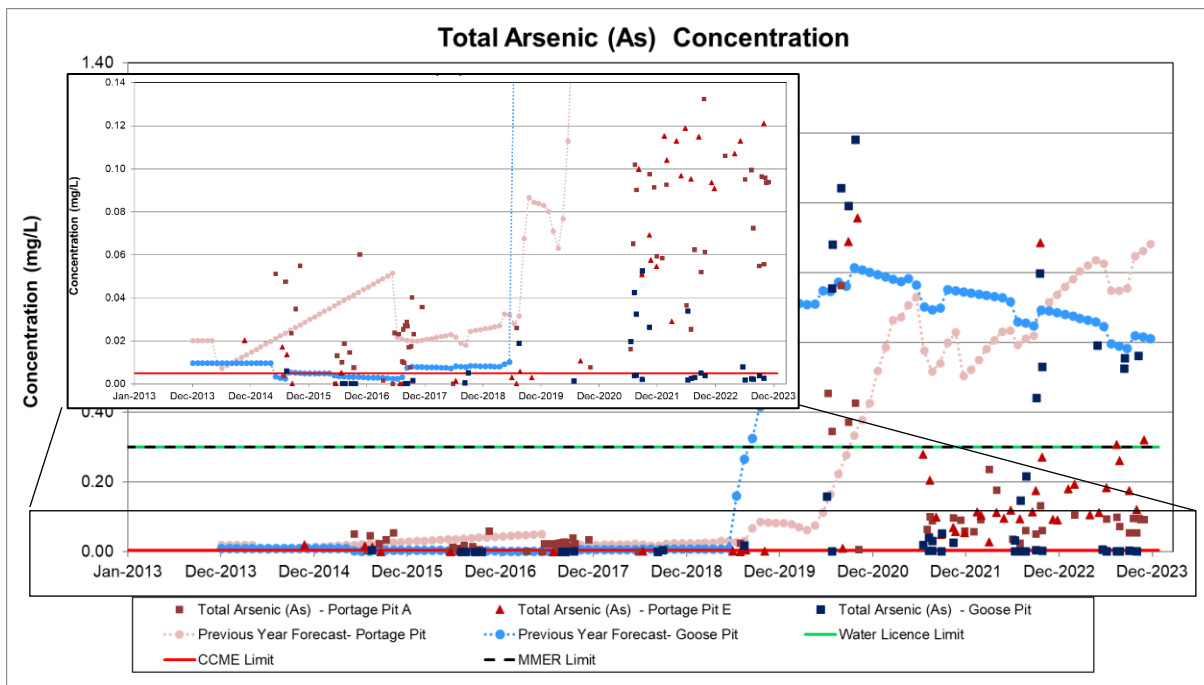


Figure 2-4: (continued) Concentrations Portage Pit and Goose Pit – Total Cyanide & Metals



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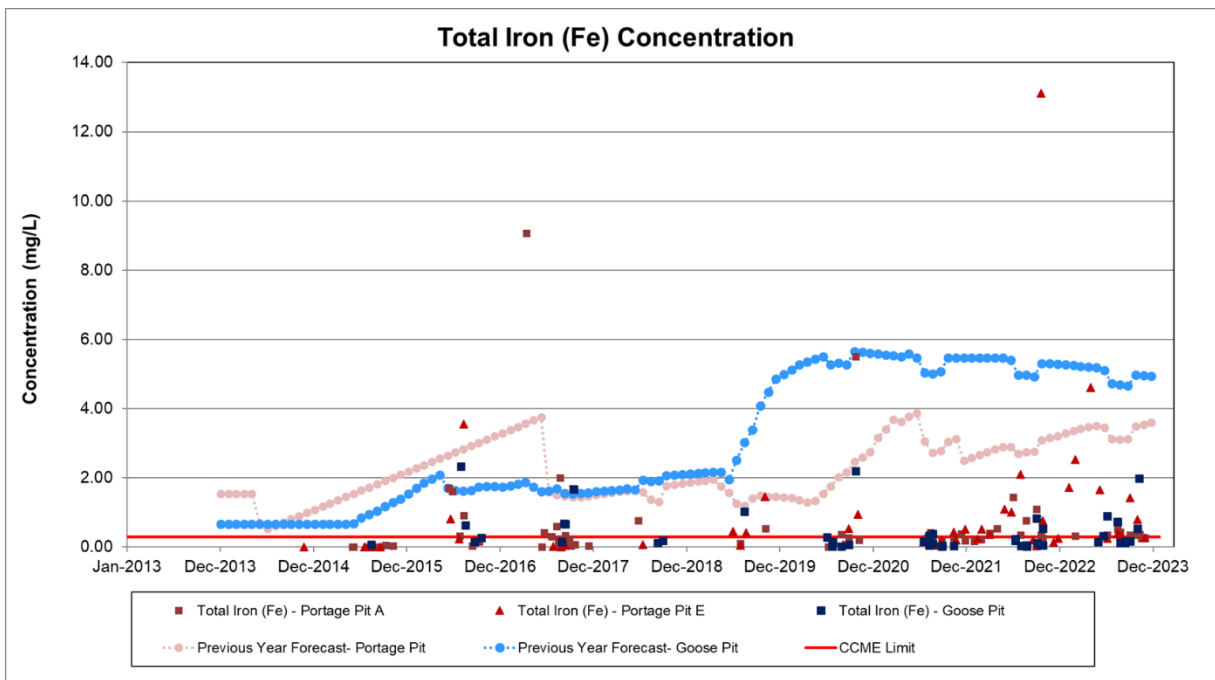
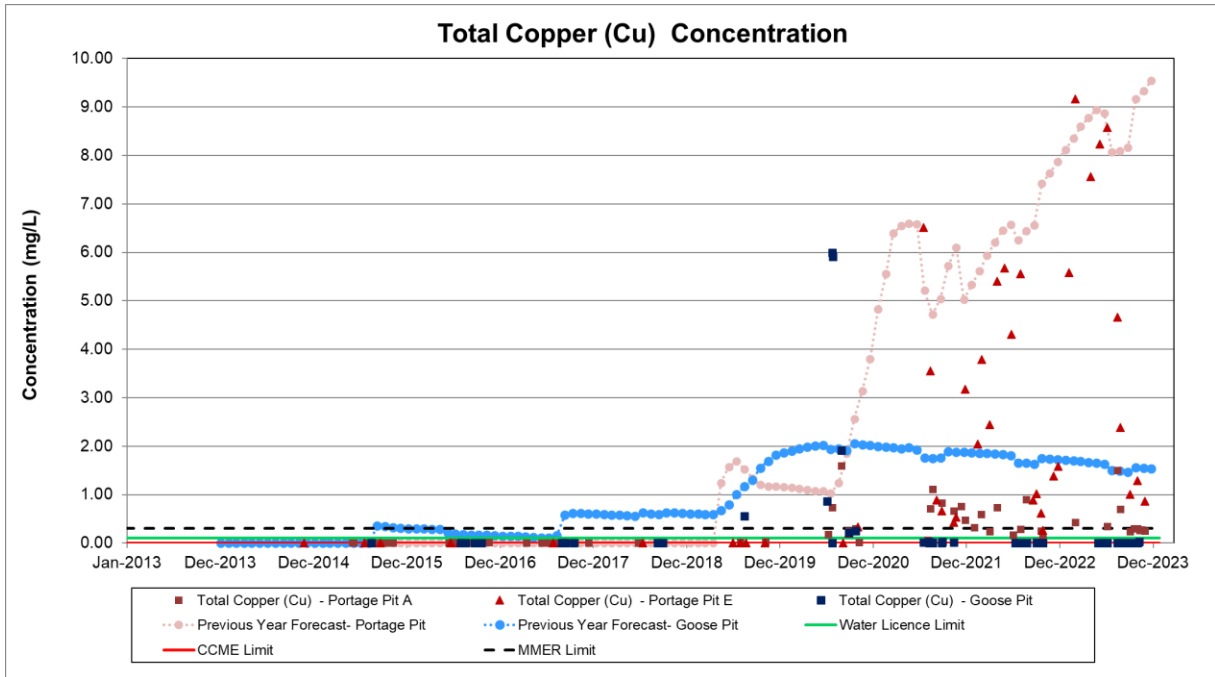


Figure 2-4: (continued) Concentrations Portage Pit and Goose Pit – Total Cyanide & Metals



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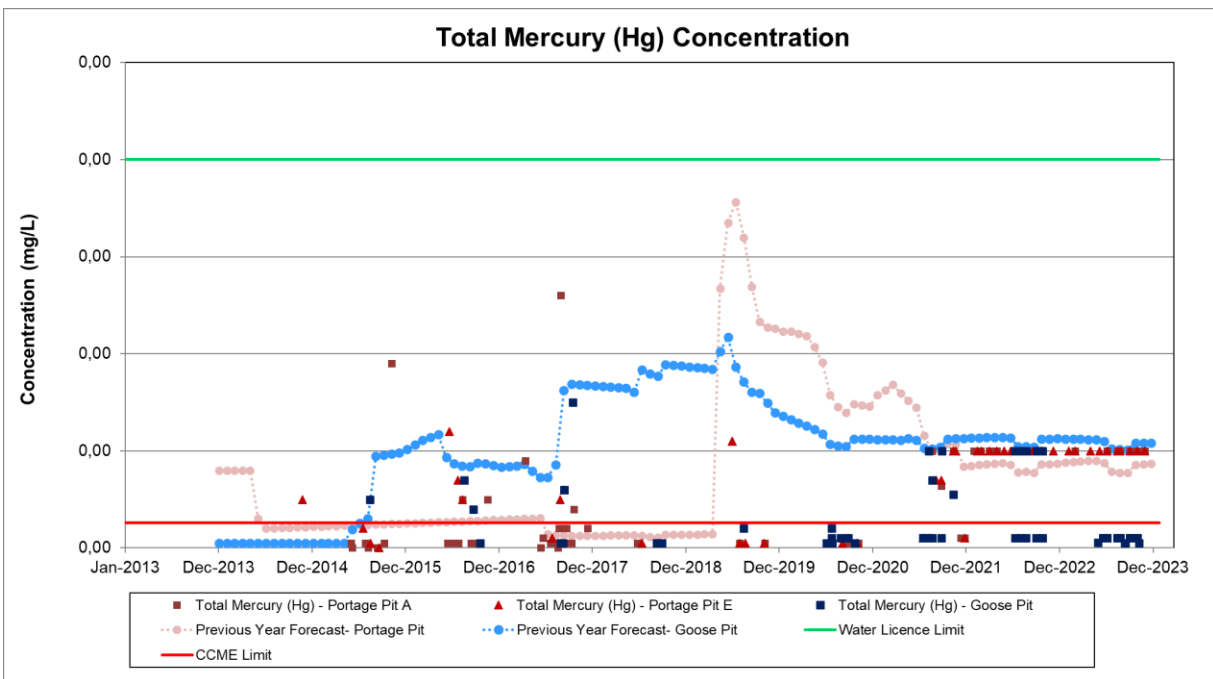
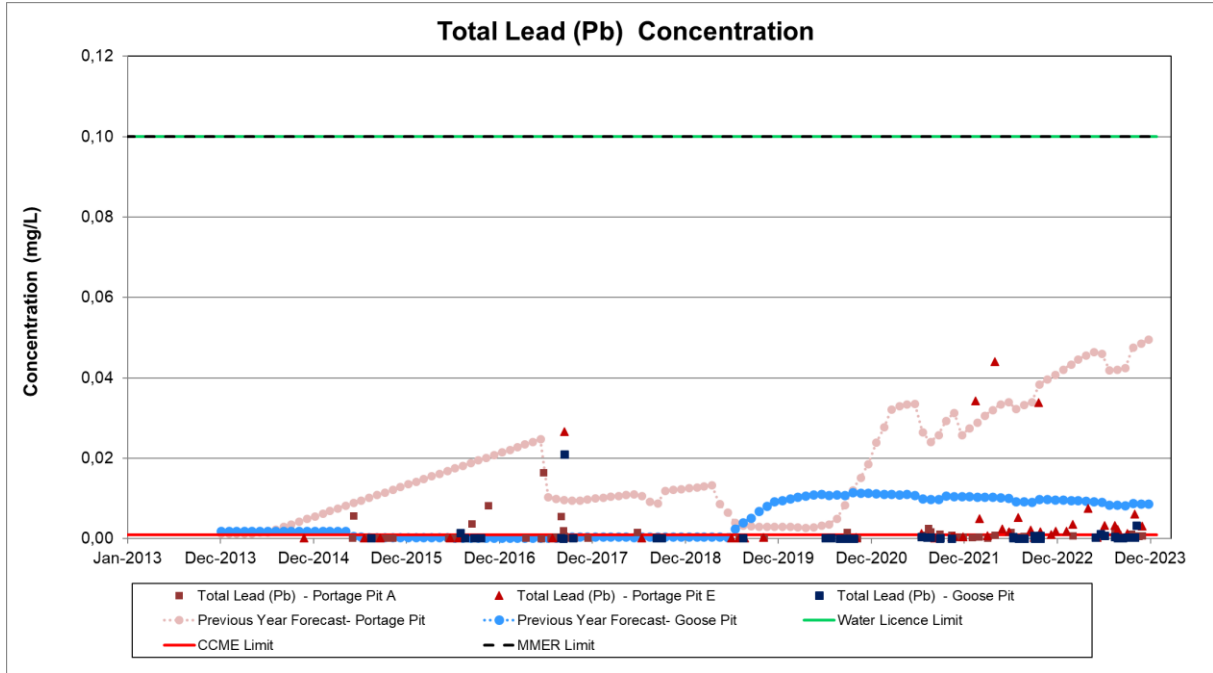


Figure 2-4: (continued) Concentrations Portage Pit and Goose Pit – Total Cyanide & Metals



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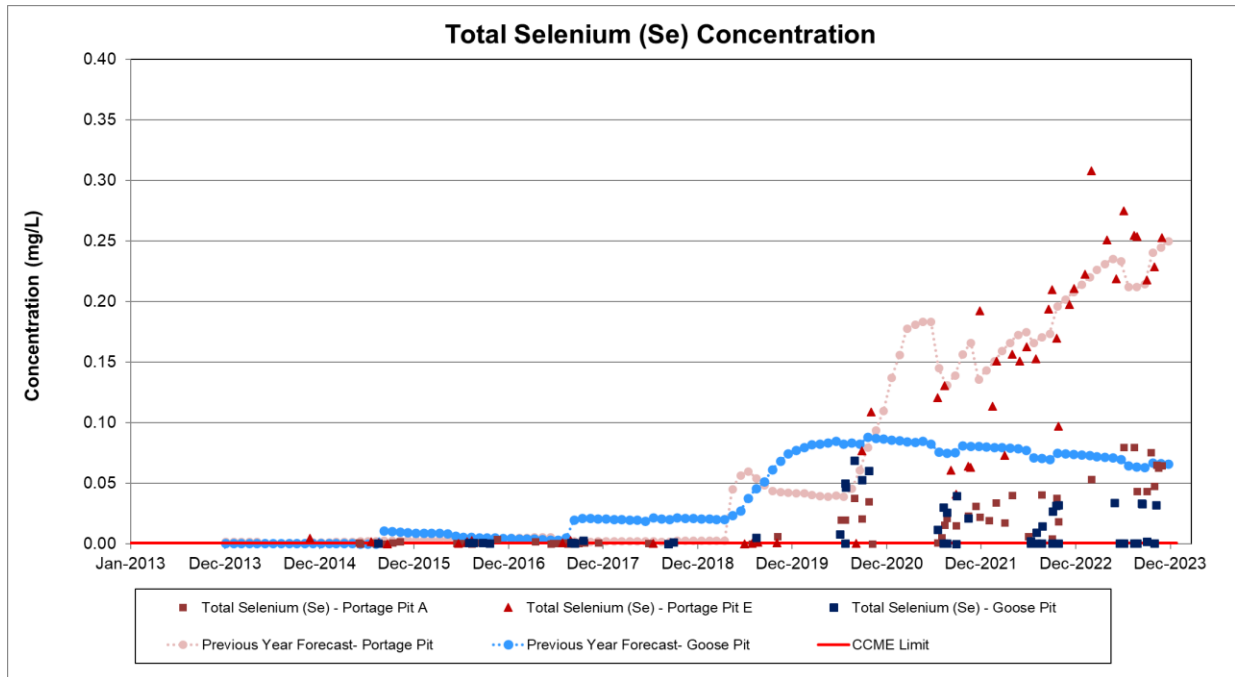
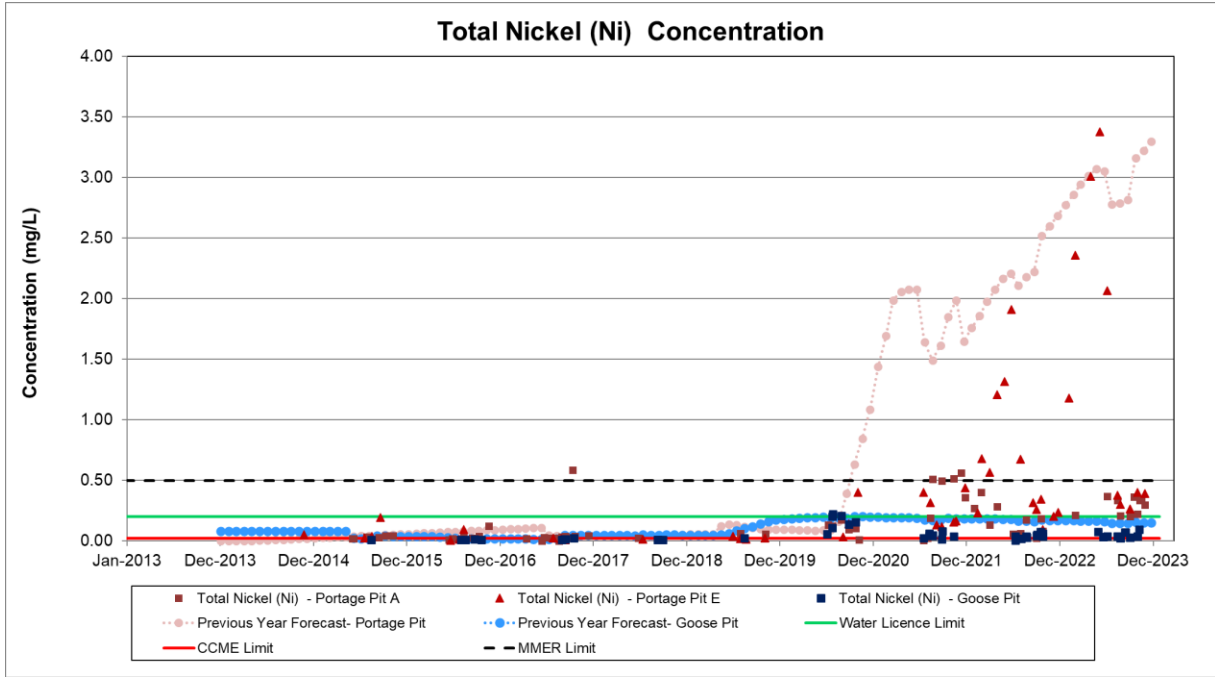


Figure 2-4: (continued) Concentrations Portage Pit and Goose Pit – Total Cyanide & Metals



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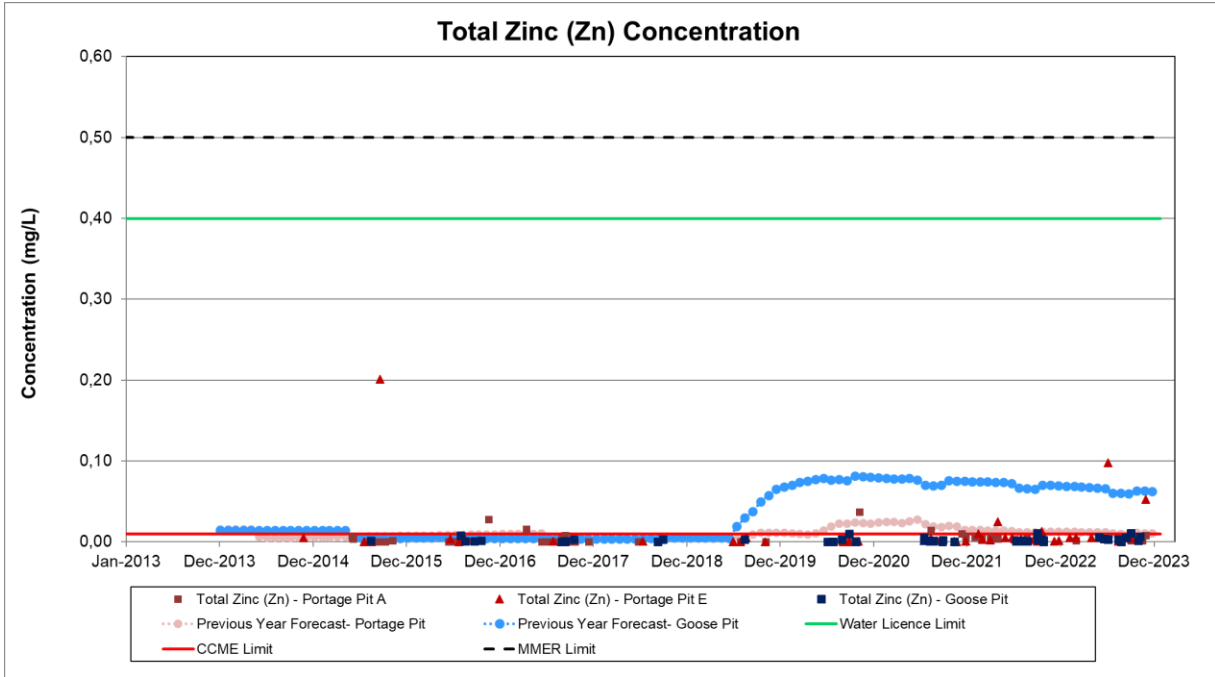


Figure 2-4: (continued) Concentrations Portage Pit and Goose Pit – Total Cyanide & Metals



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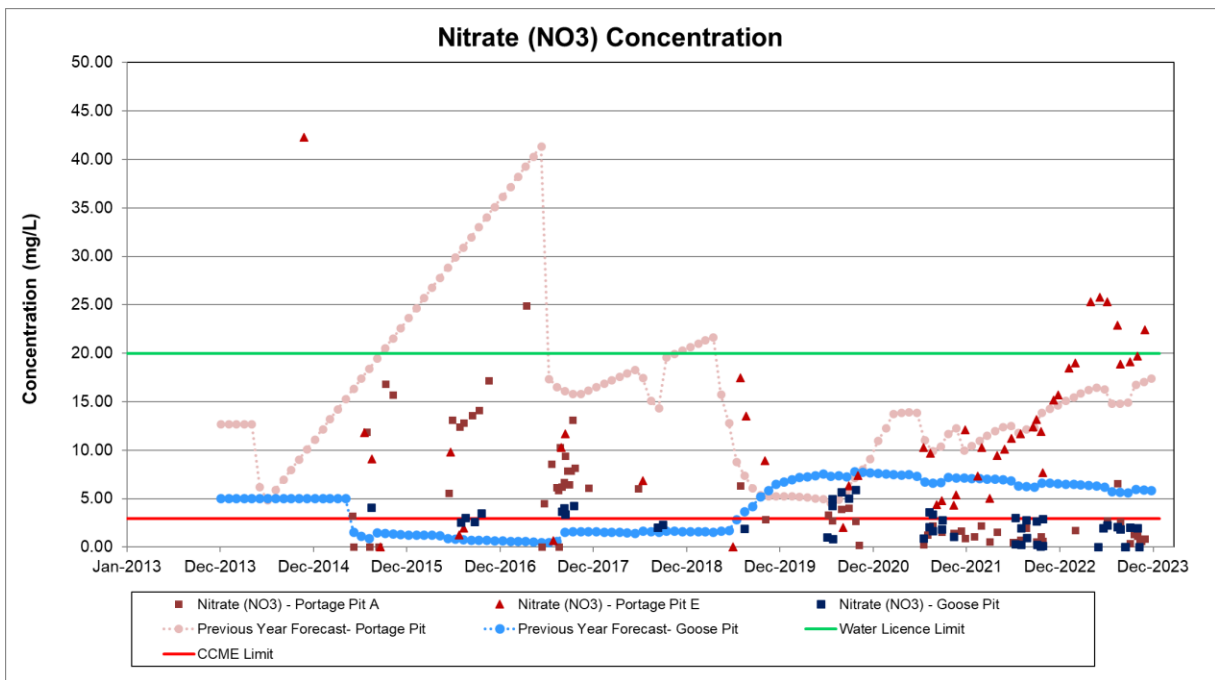
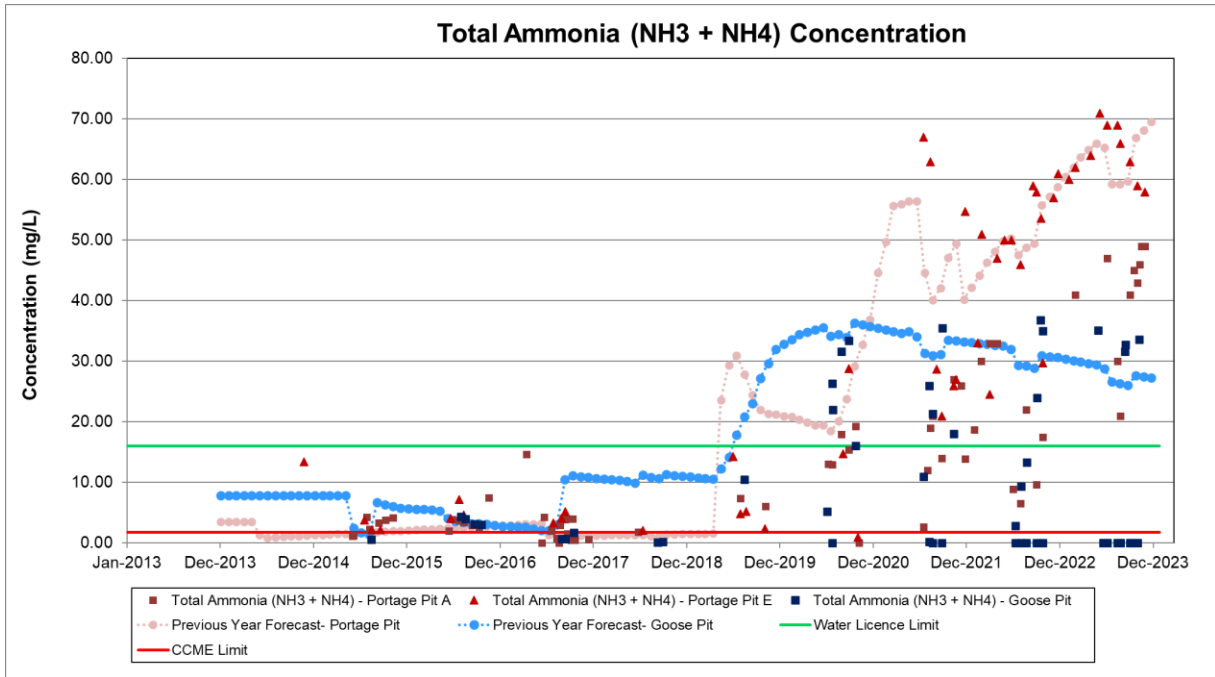


Figure 2-5: Concentrations Portage Pit and Goose Pit – Ammonia & Nitrate



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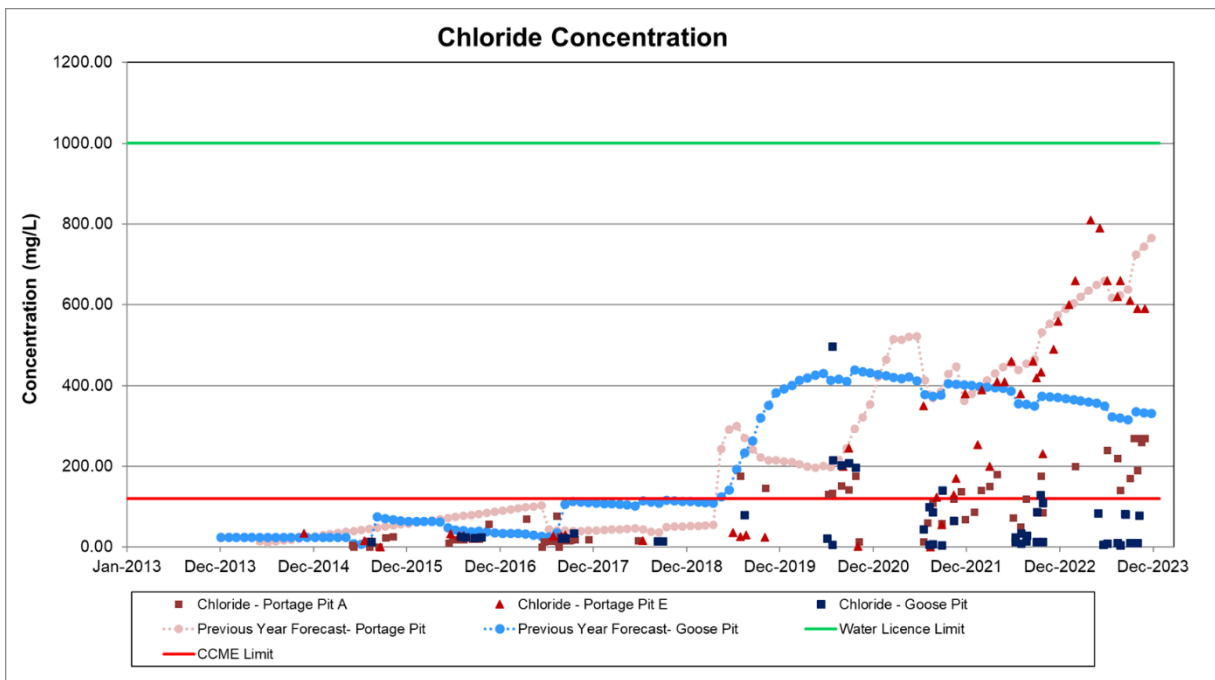
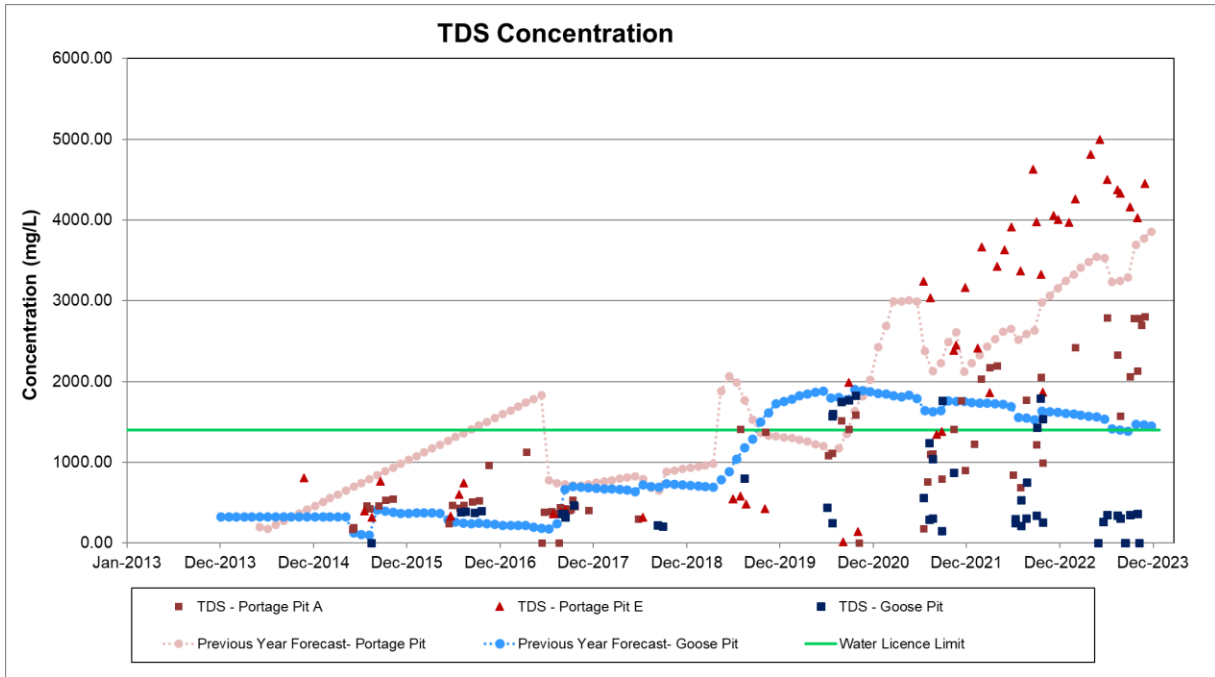


Figure 2-6: Concentrations Portage Pit and Goose Pit – TDS & Anions



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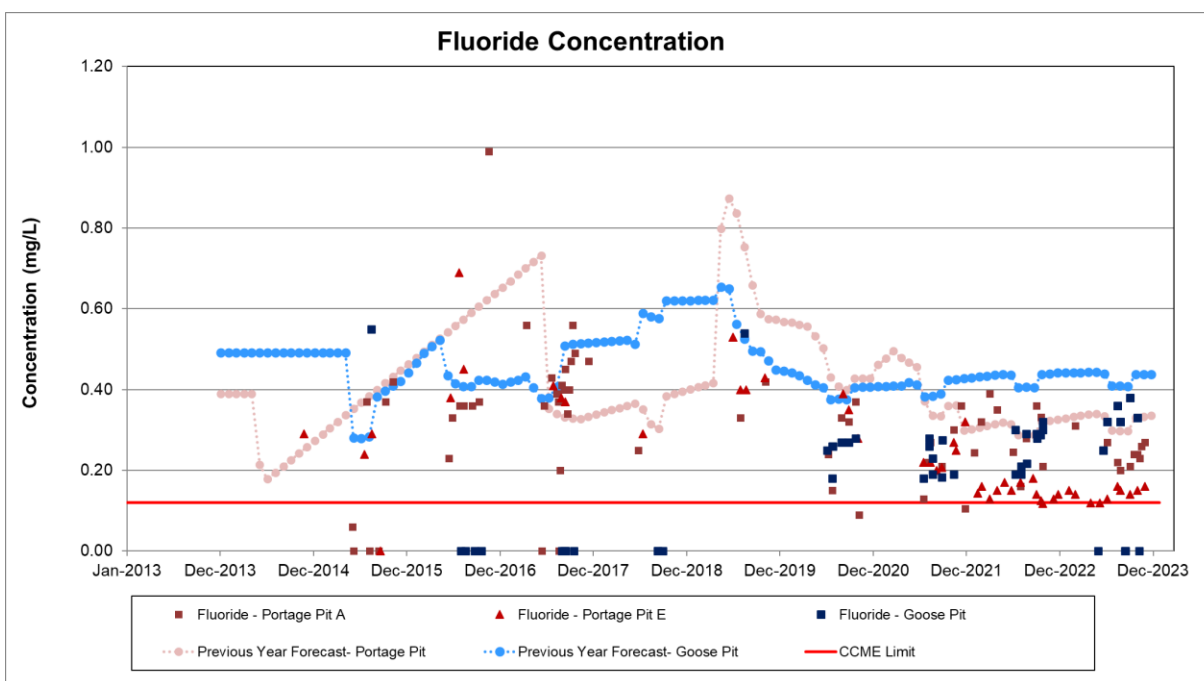
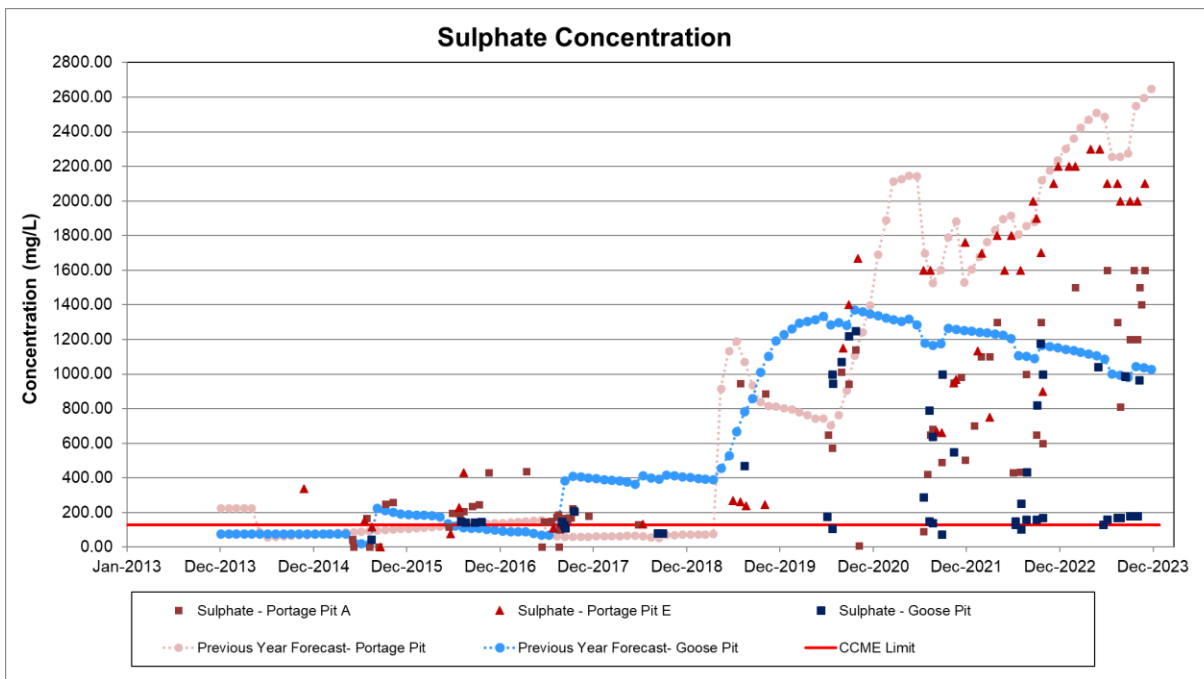


Figure 2-6: (continued) Concentrations Portage Pit and Goose Pit – TDS & Anions






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Table 2-4: Observations from Measured and Forecasted Concentrations in Portage and Goose Pits


PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total cyanide	<p><b>PP:</b> Measured values continued to increase in 2022 since deposition of tailings started in PP Pit E. For comparison purposes only, the measured concentrations of Pit E and Pit A were generally below Water Licence and MDMER limits during the summer months and increased above these limits in winter. The concentrations remained above the CCME limit.</p> <p>In 2023, measured values of Pit A decreased. However, the measured concentrations of Pit E continued to increase, albeit slightly compared to the previous year. Measured concentrations were below 2 mg/L, and generally, below the Water Licence and MDMER limits for Pit E, while exceeding these limits in autumn for Pit A. The concentrations remained above the CCME limit.</p> <p><b>GP:</b> Measured concentrations were very low since no deposition occurred in this pit. For comparison purposes only, the measured concentrations were below MDMER and Water Licence limits and were slightly above the CCME limit. In 2023, with the exception of one concentration (~0,03 mg/L), the trend of measured concentrations was similar to that of 2022.</p>	<p><b>PP:</b> The forecast model predicted an increase in total cyanide values since tailings deposition started in this pit. In 2022, the measured concentrations were higher than the forecasted values. However, in 2023, the forecasted values were higher than the measured concentrations.</p> <p><b>GP:</b> Forecasted values for 2022 and 2023 were lower than measured concentrations, suggesting that the model slightly overestimated the impact of natural degradation occurring in the pit lake, but the concentration remains low (&lt; 0.02 mg/L).</p> <p>Forecasted values for PP are expected to be above the Water Licence limits, and below the limits for GP.</p>
Total Aluminum	<p><b>PP:</b> In 2022, measured values were similar to those in 2021. For comparison purposes only, all values were below the Water Licence limit and were slightly above the CCME limit. The transfer of Reclaim Water to Pit A from Pit E and the deposition of tailings in Pit E did not contribute to increase the concentration for this parameter.</p> <p>In 2023, measured concentrations of both Pit E and Pit A were below the Water Licence limit and slightly above and close to the CCME limit for Pit E.</p> <p><b>GP:</b> Measured values decreased slightly until summer 2023 and then increased in the fall. For comparison purposes only, the concentrations were generally below the Water Licence limit and slightly above and close to the CCME limit.</p>	<p><b>PP &amp; GP:</b> The forecasted concentrations were generally higher than the measured concentrations and continued to increase slightly for PP and to decrease slightly for GP, suggesting that the load for this constituent assumed in the model is conservative. The lower measured concentration could also be explained by a good settling of suspended particles in these pits. Forecasted concentrations were expected to be lower than the Water Licence limit.</p>

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Arsenic	<p><b>PP:</b> Measured concentrations in 2023 are relatively lower compared to last year's data. For comparison purposes only, most of the measured values were below MDMER and Water Licence limits but remained above the CCME limit.</p> <p><b>GP:</b> As of 2022, measured concentrations increased after the summer. Concentrations increased from 0,005 to approximately 0,55 mg/L.</p> <p>For comparison purposes only, 40% of concentrations were slightly above the MDMER and Water Licence limits, but the majority were below these limits and close to the CCME limit.</p>	<p><b>PP:</b> As of 2022, forecasted values of 2023 indicated a slight increase in concentrations during tailings deposition, which was observed based on the measured data. However, the forecasted values are higher than the measured values, which suggest that the load assumed for this constituent in the model is conservative. Furthermore, the model assumes a constant loading for this constituent from the mill effluent over time and does not consider any variability in mill effluent chemistry over the year, resulting in a conservative assessment. Also, the model considers that the solid fraction associated with Arsenic remains in suspension, again resulting in a conservative assessment.</p> <p><b>GP:</b> As of 2022, forecasted values indicated a slight decrease until the summer in 2023, followed by an increase in autumn. This trend was observed based on the measured data. The forecasted values are higher than the measured values, which suggest that the load assumed for this constituent in the model is conservative.</p>
Total Cadmium	<p><b>PP:</b> Measured concentrations were generally below the detection limit. For comparison purposes only, the concentrations were below the limits for Pit A. For Pit E, measured values were below the Water Licence limit and generally slightly above the CCME limit. Concentrations values decreased.</p> <p><b>GP:</b> Measured concentrations were generally below the detection limit and demonstrate a slight decrease. For comparison purposes only, the concentrations were generally below the limits.</p>	<p><b>PP and GP:</b> In general, forecasted values were higher than the measured ones, which suggest that the load assumed for this constituent in the model is conservative. Based on measured data, forecasted values continued to decrease slightly.</p>

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Copper	<p><b>PP:</b> In contrast to 2022, measured concentrations decreased for both Pits in 2023, which could be due to a better settling of the Cu in the pits or a lower use of Cu in the mill. For comparison purpose only, values were higher than the MDMER and Water Licence limits.</p> <p><b>GP:</b> Measured concentrations in 2023 remain low since no tailings deposition took place in this pit. For comparison purposes only, measured values were lower than the MDMER and Water Licence limits and slightly above and close to the CCME limit.</p>	<p><b>PP:</b> Forecasted values indicated a decrease in concentrations until summer and an increase starting in the fall. The measured values did follow this trend in winter, but decreased in the summer months. Most measured values remain below the forecasted values, suggesting that the load for this constituent assumed in the model is conservative. The lower measured concentration could also be explained by a good settling of suspended particles in these pits.</p> <p><b>GP:</b> Forecasted values indicated a decrease in concentration. The measured values do follow this trend, but remain well below the forecasted values, suggesting that the load for this constituent assumed in the model is conservative. The lower measured concentration could also be explained by a good settling of suspended particles in these pits.</p>
Total Iron	<p><b>PP:</b> Measured concentrations were relatively low in 2023. However, almost all of these concentrations were above the CCME limit.</p> <p><b>GP:</b> Measured concentrations were generally low until summer 2023 and increased in the fall. For comparison purposes only, 50% of values were below or close to the CCME limit.</p>	<p><b>PP &amp; GP:</b> Forecasted values were much higher than the measured values, suggesting that the load for this constituent assumed in the model is conservative. The lower measured concentration could also be explained by a good settling of suspended particles in these pits.</p>
Total Lead	<p><b>PP &amp; GP:</b> Measured concentrations in 2023 were relatively low. For comparison purposes only, most values of Pit A and Goose Pit were below the Water Licence limit and close to the CCME limit. However, most values of Pit E were slightly above the CCME limit.</p>	<p><b>PP &amp; GP:</b> Forecasted values were generally higher than the measured values, suggesting that the load for this constituent assumed in the model is conservative. The lower measured concentration could also be explained by a good settling of suspended particles in these pits.</p>
Total Mercury	<p><b>PP:</b> Measured concentrations were at the detection limit for 2023. For comparison purposes only, concentration values were below the Water Licence discharge criterion and slightly above the CCME limit.</p> <p><b>GP:</b> Measured concentrations were generally at the detection limit for 2023 and showed a similar trend. For comparison purposes only, all values were below limits.</p>	<p><b>PP &amp; GP:</b> Concentrations were forecasted to remain below the Water Licence discharge criterion. Forecasted concentrations values were higher than the measured values, suggesting that the load for this constituent assumed in the model is conservative. The lower measured concentration could also be explained by a good settling of suspended particles in these pits.</p>

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Nickel	<p><b>PP:</b> Measured concentrations decreased until the summer 2023, then increased in autumn, which was expected since deposition of tailings continued in these pits. For comparison purposes only, except for some concentrations of Pit E, which were exceeding the MMER limit, all measurements of both Pits were below the MMER limit and most of them were above the Water Licence and CCME limits.</p> <p><b>GP:</b> Measured concentrations in 2023 were generally similar compared to last year. This was expected since no deposition took place in this pit. For comparison purposes only, measured concentrations were below the Water Licence limit and slightly above the CCME limit.</p>	<p><b>PP:</b> Forecasted values indicated an increase in concentration as tailings deposition continued in this pit. In 2023, one of the measured values was higher than the forecasted value. Since the model assumes a constant load for this constituent to the pit, it does not consider any variability of the mill effluent water chemistry over the year.</p> <p><b>GP:</b> Forecasted values were slightly higher than the measured values, suggesting that the load for this constituent assumed in the model is conservative. The lower measured concentration could also be explained by a good settling of suspended particles in these pits.</p>
Total Selenium	<p><b>PP:</b> Measured concentrations decreased during the summer 2023, then increased in autumn, due to tailings deposition. For comparison purposes only, the measured values were above the CCME limit.</p> <p><b>GP:</b> Compared to 2022, measured concentrations in 2023 decreased during the summer and increased in the fall. For comparison purposes only, 40% of measured values were slightly above the CCME limit.</p>	<p><b>PP:</b> Forecasted values projected a similar trend of measured data. Some of the measured values were higher than the forecasted values. Since the model assumes a constant load for this constituent to the pit, it does not consider the variability of the mill effluent water chemistry over the year.</p> <p><b>GP:</b> Forecasted values projected a decrease in concentration and were generally higher than measured ones, suggesting that the load for this constituent assumed in the model is conservative.</p>
Total Zinc	<p><b>PP &amp; GP:</b> Measured concentrations in both pits were low in 2023. For comparison purposes only, measured values remained below Water Licence limits and were generally below or close to the CCME limit. Concentrations values decreased during the summer then increased in autumn.</p>	<p><b>PP &amp; GP:</b> Forecasted concentrations in the previous model projected an increasing trend for PP this year due to the deposition of tailings. In GP, the model projected a slight decreasing trend. The measured values are much lower than the forecasted values, suggesting that the load for this constituent assumed in the model is conservative.</p>

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Total Ammonia	<p><b>PP:</b> In Pit A, measured concentrations in 2023 decreased slightly during the summer, then increased due to the transfer of Reclaim Water from Pit E. In Pit E, measured data increased during the year due to tailings deposition in this pit. For comparison purposes only, all of the measured concentrations exceeded the Water Licence criterion.</p> <p><b>GP:</b> Measured concentrations in 2023 were relatively similar compared to the last year. Concentrations varied during the season, with a lower concentration measured at the start of the summer and then increasing in the fall. For comparison purposes only, in general, most measurements were below the Water Licence criterion early in the summer and then were above it in the fall.</p>	<p><b>PP:</b> Forecasted concentrations in the previous model projected a generally increasing trend this year due to the deposition of tailings in Pit E. The measured values reflect this trend. However, some measured values of Pit E are higher than the forecasted values. Since the model assumes a constant load for this constituent to the pit, it does not consider any variability of the mill effluent water chemistry over the year.</p> <p><b>GP:</b> Forecasted concentrations projected a continuing decreasing trend. This was observed based on the measured values. Almost all of the measured values were lower than the forecasted values except for some samples, suggesting that the load for this constituent assumed in the model is conservative.</p>
Nitrate	<p><b>PP:</b> During the summer 2023, measured concentrations continued to increase due to tailings deposition in the Pits. Most of the measured concentrations were above the Water Licence criterion for Pit E and below the CCME limit for Pit A.</p> <p><b>GP:</b> Measured concentrations in 2023 were relatively similar compared to last year. For comparison purposes only, most of the measurements were below the Water Licence criterion and the CCME limit.</p>	<p><b>PP:</b> Forecasted concentrations in the previous model projected an increasing trend this year due to the deposition of tailings. The measured values reflect this trend. However, measured values in Pit E are higher than the forecasted values.</p> <p><b>GP:</b> Forecasted concentrations projected a slight decreasing trend. This was observed based on the measured values. The measured values were lower than the forecasted values.</p>
TDS	<p><b>PP:</b> During the summer 2023, measured concentrations increased due to tailings deposition in Pit E. However, in Pit A, measured values decreased during the summer, then increased in the fall following the transfer of water from Pit E. For comparison purposes only, measured concentrations were above the Water Licence criterion.</p> <p><b>GP:</b> Compared to the previous year, measured values in 2023 decreased and were below the Water Licence criterion.</p>	<p><b>PP:</b> Forecasted concentrations in the previous model projected an increasing trend this year due to the deposition of tailings. The measured values reflect this trend. Since the model assumes a constant load for this constituent to the pit, it does not consider any variability of the mill effluent water chemistry over the year. Measured values in both pits were higher than the forecasted values.</p> <p><b>GP:</b> Compared to the previous year, forecasted concentrations projected a decreasing trend. This observation was based on the measured values. The measured values were much lower than the forecasted values, suggesting that the load for this constituent assumed in the model is conservative.</p>

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PARAMETER	MEASURED VALUES OBSERVATIONS	FORECASTED VALUES OBSERVATIONS
Chloride	<p><b>PP:</b> In Pit E, measured concentrations in 2023 increased slightly during winter due to tailings deposition in the Pit. Then, measured values decreased during the summer and in autumn. Conversely, in Pit A, the trend of measured values was opposite of that observed in Pit E. Measured concentrations were lower than the Water Licence criterion but remained above or close to the CCME limit.</p> <p><b>GP:</b> Measured concentrations in 2023 are generally lower than for previous years and relatively similar compared to the previous year. For comparison purposes only, measured concentrations were below the Water Licence criterion and the CCME limit.</p>	<p><b>PP:</b> Forecasted concentrations in the previous model projected an increasing trend this year due to the deposition of tailings. The measured values reflect this trend. Some measured values of Pit E are higher than the forecasted values.</p> <p><b>GP:</b> Compared to the three previous years, forecasted concentration projected a continuing decreasing trend. This was observed based on the measured values. The measured values were lower than the forecasted values, suggesting that the load for this constituent assumed in the model is conservative.</p>
Sulphate	<p><b>PP:</b> Compared to the previous year, measured concentrations in 2023 increased due to tailings deposition in Pit E. Generally, three trends were observed for both Pits. Measured values increased during winter and fall and decreased during the summer. For comparison purposes only, measured values were higher than the threshold value for sulphate based on BC Environment guidelines for the protection of aquatic life for very soft water.</p> <p><b>GP:</b> Measured concentrations in 2023 are relatively similar in comparison to the concentrations of the previous year. For comparison purposes only, measured values were slightly above or close to the threshold value for sulphate based on BC Environment guidelines for the protection of aquatic life for very soft water.</p>	<p><b>PP:</b> Forecasted concentrations in the previous model projected an increasing trend this year due to the deposition of tailings. The measured values reflect this trend.</p> <p><b>GP:</b> Forecasted concentrations projected a decreasing trend. This was observed based on the measured values. Some measured values were much lower than the forecasted values, while others were close to the forecasted values, suggesting that the load for this constituent assumed in the model is conservative.</p>
Fluoride	<p><b>PP &amp; GP:</b> Measured concentrations were generally lower than 0.4 mg/L. For comparison purposes only, the measured values of Pit E were close to the CCME limit. However, in Pit A and Goose Pit, the measured concentrations were above the CCME limit.</p>	<p><b>PP and GP:</b> Forecasted values were higher than the measured values, suggesting that the load for this constituent assumed in the model is conservative.</p>

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## 2.6 Mill Effluent


### 2.6.1 Mill Effluent Measurements

A review of the chemical analysis for the Mill Effluent was undertaken by AtkinsRéalis to identify the impact of the Mill Effluent water quality on the water quality observed in the North and South Cell TSF Reclaim Ponds as well as in both Portage and Goose pits. The Mill Effluent is tested twice daily for gold (solid and dissolved), iron (dissolved), copper (dissolved) and cyanide (CN-WAD) using the on-site lab, which is not accredited for environmental water quality chemical analysis. These chemical analyses were provided to AtkinsRéalis between January 2013 and November 2023.

**Figure 2-7** shows the monthly average dissolved metal concentrations and cyanide (CN-WAD) in the Mill Effluent sampled at the final tailings sampling point 360-SA-008 for the last six (6) years. This figure illustrates the following:

- Dissolved iron and copper concentrations were present in the Mill Effluent. Thus, the main source of iron and copper in the Reclaim Water comes from the Mill Effluent.
- There is a relationship between copper and cyanide concentrations in the Mill Effluent. The two trends behaved similarly in 2021, less so in 2022. However, in 2023, this similar trend was not observed. A very low concentration of CN-WAD was generally associated with less cyanide (average of 1.9 mg/L) required to extract the gold in certain ore types, resulting in less copper catalyst (average of 8.2 mg/l) required in the cyanide destruction.

Compared to the values of 2017, the peaks observed in 2018, 2019, 2020, 2021 and 2022 for copper and CN-WAD were generally higher, as shown in **Figure 2-7**. This figure also shows that the concentrations measured in 2021 were still the highest compared to the other years. Compared to the previous years, the peak of copper decreased to less than 13 mg/L and the measured concentrations of CN-WAD were very low.

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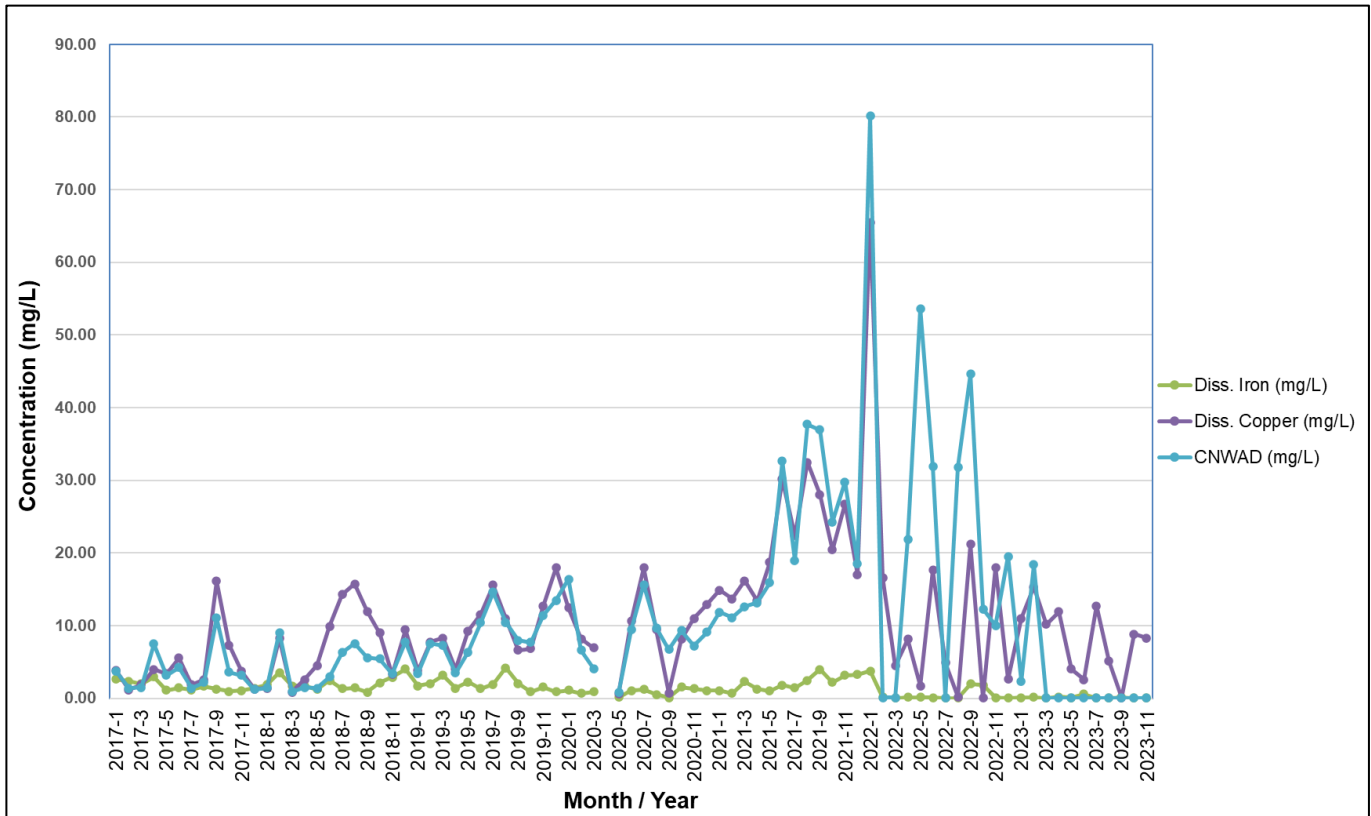


Figure 2-7: Mill Effluent Monthly Average 2017 to 2023: Iron, Copper and Cyanide (CN-WAD)

## 2.6.2 Additional Mill Effluent Water Quality Results

Agnico analyzed the water fraction of Mill Effluent after cyanide destruction on a monthly basis to obtain representative data of the tailings water being discharged to the Portage Pit in 2023. The water quality analysis was completed by an external accredited laboratory. Parameters of concern are plotted on [Figure 2-8](#) and [Figure 2-9](#).





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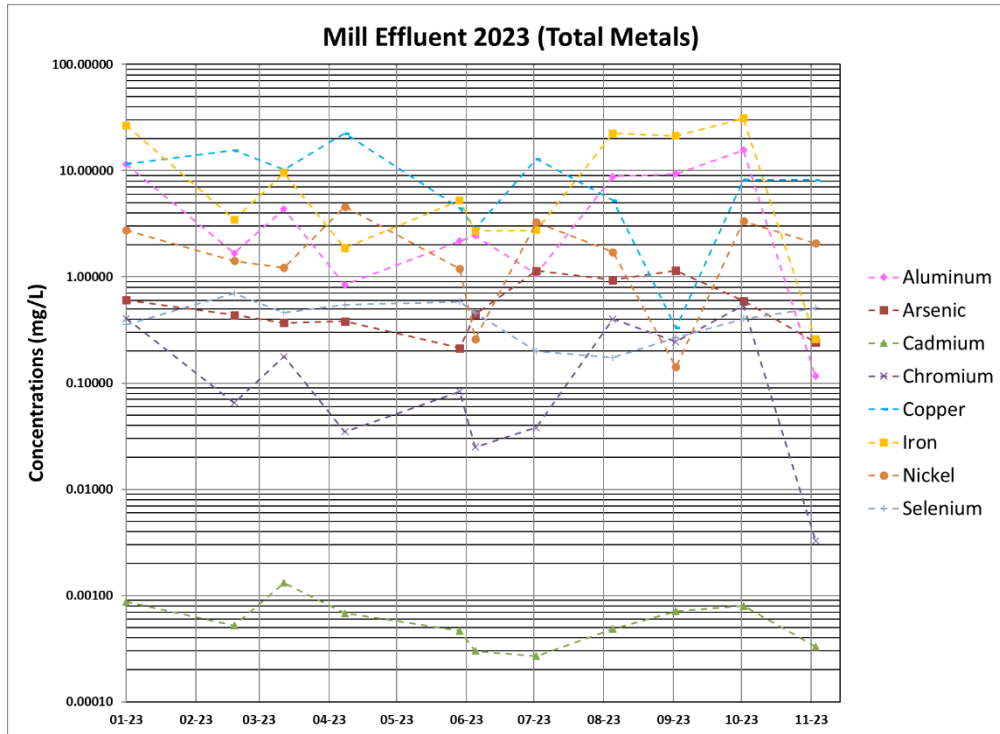

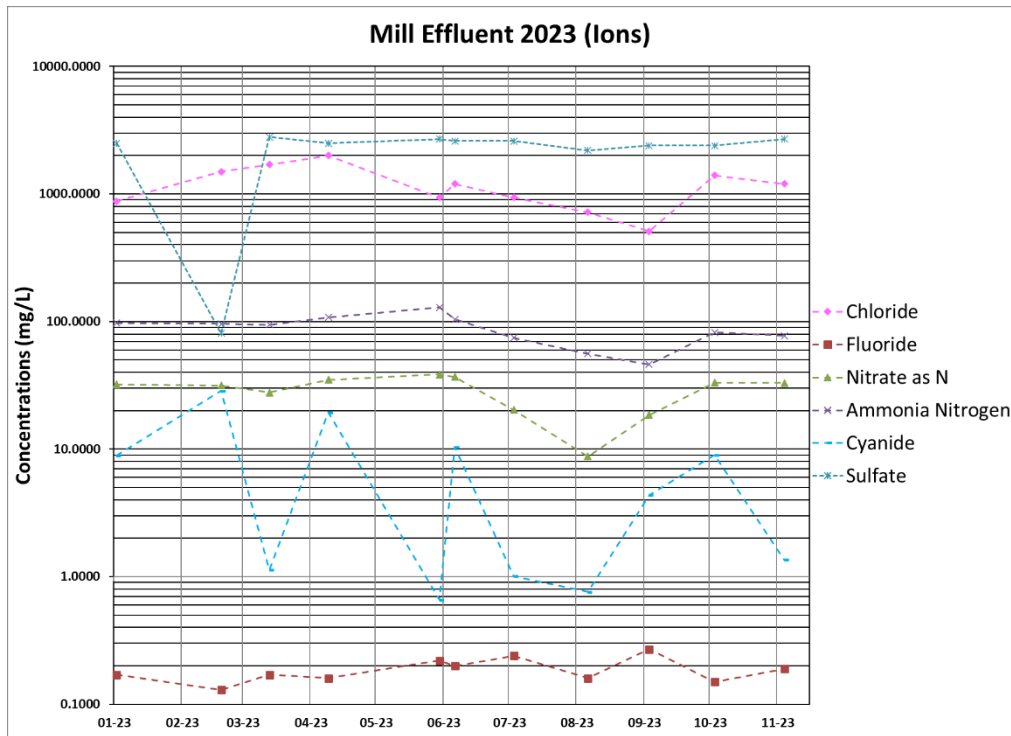


Figure 2-8: Mill Effluent Concentrations Sampled in 2023 – Total Metals

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**Figure 2-9: Mill Effluent Concentrations Sampled in 2023 – Major Ions**


Samples of Mill Effluent were taken and analyzed throughout the year to compare the concentration of key parameters.

**Table 2-5** compares the yearly average Mill Effluent samples between 2015 and 2023 for some parameters of concern.

Since 2020, only ore from the Whale Tail pit was processed at the Mill. When comparing with the measured values taken from 2022 to 2023, the measured concentrations are mostly similar, except for cyanide, copper, and nickel, which were low and aluminum, cadmium, chromium, iron, ammonia, and nitrate, which were higher.

In 2023, as in 2022, the measured data confirmed some of the differences observed in the measurements taken in 2019 regarding the Mill Effluent quality produced when processing Portage/Vault ore versus Whale Tail ore:

- Aluminum, copper, iron, ammonia, nitrate, and chloride were slightly higher to one order of magnitude higher on the Mill Effluent when processing Whale Tail ore;
- Arsenic, cadmium, selenium, and chromium were one to two orders of magnitude higher in the Mill Effluent when processing Whale Tail ore;
- Cyanide and nickel concentrations were similar when processing both types of ores; and

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- Fluoride was about 30% lower with the Whale Tail ore.

**Table 2-5: Mill Effluent Concentrations Sampled from 2015 to 2023**

PARAMETER	Average 2015	Average 2016	Average 2017	Average 2018	Average 2019 w/o Whale Tail	Average 2019 Whale Tail only	Average 2020 Whale Tail only	Average 2021 Whale Tail only	Average 2022 Whale Tail only	Average 2023 Whale Tail only
<b>Total Cyanide (CNT)</b>	18.2	9.3	20.4	6.2	11.7	11.8	24.6	23.8	37.4	7.78
<b>Total Aluminum (Al)</b>	0.629	0.326	1.541	2.2	0.394	109.5**	1.73	0.59	2.32	5.26
<b>Total Arsenic (As)</b>	0.036	0.026	0.018	0.025	0.034	9.0**	0.72	0.93	0.46	0.59
<b>Total Cadmium (Cd)</b>	0.0020	0.0003	0.0072	0.0004	0.0002	0.0035	0.017	0.0003	0.0004	0.001
<b>Total Chromium (Cr)</b>	0.002	0.001	0.009	0.005	0.002	3.5	0.654	0.026	0.090	0.18
<b>Total Copper (Cu)</b>	11.0	3.6	5.3	0.161	3.925	9.1**	6.4	8.3	18.92	9.25
<b>Total Iron (Fe)</b>	5.9	2.8	6.9	6.5	5.6	401.7**	5.6	1.9	6.05	11.57
<b>Total Nickel (Ni)</b>	0.423	0.024	0.982	0.026	2.7	7.7	2.8	6.8	6.62	1.99
<b>Total Selenium (Se)</b>	0.131	0.166	0.076	0.131	0.007	0.143	0.144	0.189	0.30	0.42
<b>Ammonia (NH<sub>3</sub>-NH<sub>4</sub>)</b>	127	105	79	84	64	75	65	60	74.4	87.76
<b>Nitrate (NO<sub>3</sub>)</b>	15.9	13.3	12.7	8.9	10.0	12.9	9.2	12.0	20.01	28.69
<b>Chloride (Cl)</b>	775	558	630	515	660	767	411	861	1247	1180.91
<b>Fluoride (F)</b>	0.545	0.645	0.335	0.680	0.565	0.297	0.28	0.20	0.18	0.19

Note:

\*\* Samples taken in 2019 when treating Whale Tail ore contained much higher suspended solids compared to the following years.

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## 2.7 Central Dike Downstream Pond

### 2.7.1 General


From December 2015 to April 2019, Agnico has been depositing tailings into the South Cell (formerly Attenuation Pond) as per their water management plan. As expected, the operating water level in the South Cell increased as tailings' deposition progressed in the South Cell. Due in part to the higher hydraulic gradient, seepage flows were being observed downstream of Central Dike, located to the east of the South Cell TSF. The water was accumulating at the base of Central Dike and being mixed with snowmelt runoff water and possible underground water resurgence. In order to compensate for this unexpected accumulation, Agnico recirculated the accumulated water downstream of Central Dike back to the South Cell Reclaim Pond from 2015 to 2019 to control the pond of water accumulated at the base of Central Dike to an elevation of 115 masl, per the action plan on the Central Dike. Some seepage water accumulated downstream was also transferred to Goose and Portage Pits in 2019.

Since 2020, no continuous tailings deposition was occurring in the SC TSF. Only natural runoff coming from the NC TSF and SC TSF catchment area was collected in the SC Reclaim Pond and transferred to North Portage Pit (i.e., Pit A). In 2021, tailings were deposited in the NC and the resulting Reclaim Water was transferred to the SC TSF and eventually to Portage Pit A. In 2023, tailings were deposited in SC. Water accumulation downstream of the Central Dike was still observed from 2020 to 2023 and was transferred to Portage Pit A.

In September 2015, approximately 50,431 m<sup>3</sup> of pond water was transferred to Goose Pit as part of the water management plan around the Central Dike Downstream Pond (CDDP). This steady state test proved the 1:1 ratio used in the water balance, meaning that if the D/S pond was recirculated, there was globally no net loss of water in the South Cell. As of 2016, Agnico continued to recirculate the accumulated water downstream of Central Dike back to the South Cell TSF Reclaim Pond in order to maintain a constant water elevation at approximately 115 masl in the downstream pond. Water from the CDDP was also transferred to either Goose Pit, South Portage Pit (Pit E) or North Portage Pit (A):

- Between August and October 2017, about 332,177 m<sup>3</sup> of pond water was transferred to Goose Pit from the CDDP.
- In 2018, no reclaim water was transferred from CDDP to Goose Pit.
- Between May and November of 2019, water downstream of Central Dike was discharged to the Portage Pit (i.e., North Portage Pit [Pit A]). Additionally, 358,156 m<sup>3</sup> of reclaim water were transferred from the CDDP to Goose Pit between May and July 2019.
- Between February and June of 2020, water from the CDDP was discharged to the South Portage Pit (Pit E). From July to December of 2020, water was then discharged to North Portage Pit (Pit A).
- As of 2021, water from CDDP was discharged mainly to Portage Pit A.

Water samples from the CDDP were routinely collected during the year (sampling point ST-S-5) as per the Water Licence requirement.

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## 2.7.2 Water Balance


Table 2-6 presents the estimated monthly inflows and outflows around the CDDP for 2023 based on:

- the seepage volume from the South Cell TSF to the CDDP estimated by Agnico;
- the total volume pumped back to the South Cell TSF;
- the total volume transferred to Portage Pits (Pit A and Pit E).

The volume of seepage estimated in 2023 from South Cell TSF to CDDP was about 25% higher compared to the previous year and approximately 24% lower compared to 2021. This increase in 2023 was expected since some tailings were deposited in the South Cell, which increased the volume of Reclaim Water stored in the South Cell TSF Reclaim Pond. In 2023, no volume of water was transferred from CDDP to South Cell TSF.

**Table 2-6: Estimated Monthly Inflows and Outflows to Central Dike D/S Pond for 2023**

Date	Estimated Seepage Flow from South Cell TSF to Central Dike D/S Pond	Volume of Water Transferred from Central Dike D/S Pond to South Cell TSF	Volume of Water Transferred from Central Dike D/S Pond to Goose Pit or Portage Pit (Pit A or Pit E)
	m <sup>3</sup> /month	m <sup>3</sup> /month	m <sup>3</sup> /month
Jan-23	14,029	0	14,029
Feb-23	13,564	0	13,564
Mar-23	13,920	0	13,920
Apr-23	11,031	0	11,031
May-23	112,254	0	112,254
Jun-23	112,254	0	112,254
Jul-23	67,718	0	67,718
Aug-23	59,453	0	59,453
Sep-23	109,331	0	109,331
Oct-23	91,496	0	91,496
Nov-23	47,267	0	47,267
Dec-23	24,295	0	24,295
<b>Total 2023</b>	<b>677,047</b>	<b>0</b>	<b>677,047</b>
<b>Total 2022</b>	<b>510,579</b>	<b>13,852</b>	<b>510,579</b>
<b>Total 2021</b>	<b>890,218</b>	<b>0</b>	<b>890,218</b>
<b>Total 2020</b>	<b>702,031</b>	<b>54,734</b>	<b>685,541</b>
			<b>739,915</b>
<b>Total 2019</b>	<b>2,294,063</b>	<b>754,347</b>	<b>1,368,676</b>
			<b>2,123,023</b>
<b>Total 2018</b>	<b>2,171,246</b>	<b>2,300,416</b>	
<b>Total 2017</b>	<b>4,636,032</b>	<b>4,366,869</b>	<b>332,177</b>

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### 2.7.3 Water Quality

The water analysis taken from the CDDP is tabulated and presented in Section 8.0 of the 2023 Annual Report. [Table 2-7](#) summarizes the data for key parameters of concern and compares the measurements to the average values measured in the South Cell TSF Reclaim Pond in 2023.

The data confirms that one of the main inflows to the CDDP was from the South Cell TSF Reclaim Pond. The water in the CDDP has detectable concentrations of all the key parameters of concern found in the South Cell TSF Reclaim Pond.


The average measured values in the South Cell TSF were higher than the values measured in the CDDP for all parameters but not for total arsenic, iron, ammonia, chloride, fluoride, and sulphate.

The lower concentration detected for these parameters in the CDDP may indicate that either some of the parameters were subject to a natural degradation process, precipitating out of solution in the Central Dike D/S Pond or were being reduced through anaerobic microbial reaction as the water seeps through the Central Dike. Furthermore, under anaerobic condition, iron reducing bacteria could be reducing the ferric oxide in the soil to a soluble ferrous hydroxide, thus increasing the total iron concentration in the Central Dike D/S Pond.

The higher concentration measured in the pond for parameters such as total arsenic, ammonia, chloride, sulphate, and fluoride could originate from the pore water in the tailings flowing towards the pond.

**Table 2-7: Water Quality in Central Dike D/S Pond for 2023**

PARAMETER	Central Dike Downstream Pond (ST-S-5) (mg/L)			South Cell TSF Reclaim Pond (ST-21-S) (mg/L)		
	Min	Mean	Max	Min	Mean	Max
Total Cyanide (CNt)	0.006	0.040	0.077	0.007	0.130	0.603
Aluminum (Al)	0.006	0.044	0.154	0.069	0.421	1.490
Arsenic (As)	0.047	0.096	0.138	0.021	0.060	0.108
Cadmium (Cd)	0.00001	0.00004	0.00017	0.0000519	0.00010	0.00014
Chromium (Cr)	0.00045	0.0020	0.0050	0.0018	0.0154	0.0551
Copper (Cu)	0.0004	0.0010	0.0025	0.0010	0.0974	0.421
Iron (Fe)	1.350	2.186	2.910	0.225	1.3182	4.660
Nickel (Ni)	0.0020	0.00808	0.01761	0.101	0.168	0.374
Selenium (Se)	0.00018	0.00048	0.00141	0.0009	0.0086	0.0375
Total Ammonia-Nitrogen (mg N/L)	14.0	20.0	23.0	0.8	4.1	14.0
Nitrate (NO <sub>3</sub> ) (mg N/L)	0.1000	0.311	0.970	0.960	4.948	7.80
Chloride (Cl)	70	131	190	11	34	110
Fluoride (F)	0.330	0.469	0.530	0.100	0.242	0.350
Sulphate (SO <sub>4</sub> )	770	1191	1400	220	504	990

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## 2.8 Ammonia Loading to Environment at Meadowbank

Ammonia that is found in the TSF Reclaim Water at Meadowbank originates mainly from the hydrolysis of cyanate which is the by-product produced following cyanide destruction. To a lesser extent, ammonia also comes from un-reacted ammonium nitrate-based explosive used in Portage, Goose and Vault pits and from the treated effluent from the mine site sewage treatment plant, which is discharged to the Stormwater Management Pond. This latter is pumped twice yearly to the South Cell TSF.

In 2023:

- Approximately 1,683,638 m<sup>3</sup> of pond water from the South Cell TSF Reclaim Pond were transferred to North Portage Pit (Pit A). The average concentration measured in 2023 in the SC TSF Reclaim Pond was approximately 4.1 mg N/L. Thus, using this average concentration value of ammonia, the total load of ammonia transferred to Portage Pit A in 2023 is evaluated at approximately 6,896 kg of ammonia (expressed as N).
- Approximately 677,047 m<sup>3</sup> of pond water from the Central Dike D/S Pond were transferred to North Portage Pit (Pit A). The average concentration measured was approximately 20 mg N/L. Thus, using this average concentration value of ammonia, the total load of ammonia transferred to the North Portage Pit in 2023 is evaluated at approximately 13,541 kg of ammonia (expressed as N). This additional load of ammonia in the North Portage Pit is taken into account in this year's forecasting model.
- Approximately 3,653,292 m<sup>3</sup> of Reclaim Water is transferred with the tailings in South Portage Pit (Pit E). Approximately 48% of this volume is entrapped in the pore water of the tailings, leaving 1,899,712 m<sup>3</sup> in the pit. The average concentration measured in the mill effluent was approximately 87.76 mg N/L, resulting in a total load evaluated at approximately 165,841 kg of ammonia (expressed as N).

This additional load of ammonia to Portage Pit A and Pit E is considered in this year's forecasting model.

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## 3.0 Updated Mass Balance Model

### 3.1 Description

The water quality updated mass balance model presented in this Technical Note was developed to help forecast trends in water quality in the Portage Area of Meadowbank for different parameters of interest. The starting date for the model was arbitrarily set for January 2014 in order to keep in-line with the previous models.

For this year, the end date of the model is set at the end of pit reflooding, which is projected to be in July 2041. Per the Meadowbank ICRP 2019 update, the Reclaim Water stored in the pits shall be treated and discharged to Third Portage Lake. Once the cover will be installed on the tailings if deemed required, pit flooding will commence with natural runoff and transfer of water from Third Portage Lake.

The main objectives for this year's model are to:

- Forecast the Reclaim Water quality at the end of in-pit deposition to help define the water treatment system that shall be required at the start of closure;
- Forecast the water quality following pit reflooding.


This mass balance model was based on the following:

- Flows and volumes provided in the Water Balance – 2023-IPD Plan (Agnico 2023);
- Assumptions presented below in [Section 3.2](#);
- Chemical analyses for ST-21 (North and South Cell TSF Reclaim Pond) (2014-2023);
- Chemical analyses for Third Portage Lake (2015);
- Chemical analyses for the Mill Effluent (samples taken in 2023);
- Chemical analyses for Portage North Pit (ST-17, Pit A) and Portage South Pit (ST-19, Pit E) (from 2013 to 2023);
- Chemical analysis for Goose Pit (samples taken in the sump pit and in the lake, ST-20) (from 2013 to 2023);
- East Dike (ST-1) seepage and Saddle Dam 3 (ST-32) sumps sampled in 2023;
- Stormwater management pond water sampled in 2018;
- Saddle Dam 1 seepage (ST-S-2) and Portage RSF runoff (ST-16) (2015 to 2023);
- Portage Pit A and Pit E seepage water quality sampled from 2017 to 2020 and Goose Pit seepage water quality sampled from 2017 to 2019.

Furthermore, this year's water quality forecast mass balance model will also include the following changes:

- Deposition of Whale Tail pit tailings in Goose Pit (2019) and Portage Pit E;
- End of tailings deposition projected for June 2026.




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## 3.2 Assumptions


**Table 3-1** summarizes the assumptions used in the development of the water quality forecast model for the Meadowbank site.

**Table 3-1: Water Quality Forecast Model Assumptions**

PARAMETERS	ASSUMPTIONS
<b>Water quality forecast model</b>	<ul style="list-style-type: none"> <li>▪ Mass balance model.</li> <li>▪ Assume completely mixed system.</li> <li>▪ Ponds to model: North and South Cell TSF Reclaim Pond, Goose Pit and North Portage Pit (Pit A) and South Portage Pit (Pit E).</li> <li>▪ Portage Pit E and Pit A are hydraulically connected through the waste rock deposited between both pits. For simplification of the model, the parameters are assumed to be inert: they do not degrade or react with other elements in the system, with the exception of cyanide.</li> </ul>
<b>Model time period</b>	<ul style="list-style-type: none"> <li>▪ Start: January 2014.</li> <li>▪ End: July 2041 (projected end date of pit reflooding).</li> </ul>
<b>Input Source Terms: Mill Effluent / Pore Water</b>	<ul style="list-style-type: none"> <li>▪ Mill Effluent is the main source terms for metal contaminants, cyanide, sulphate, chloride, ammonia and nitrate in the Reclaim Pond.</li> <li>▪ Mill Effluent quality is assumed to be constant over time for all parameters. <ul style="list-style-type: none"> <li>▫ Assumed two different types of Mill Effluent quality: <ul style="list-style-type: none"> <li>– One when Portage/Vault ore is processed: 2014 to June 2019;</li> <li>– One when Whale Tail ore is processed: July 2019 to June 2026.</li> </ul> </li> <li>▫ From 2015 to June 2019, the average Mill Effluent quality measured for that year was considered in the model, based on the processing of Portage/Vault ore.</li> <li>▫ From July 2019 to the end of the model, the average Mill Effluent quality measured for that year was considered in the model, based on the processing of Whale Tail ore. Adjustment factors were applied for certain parameters so that the forecasted values followed a similar trend to that of the measured values.</li> </ul> </li> <li>▪ As of April 2021, consider additional brine (i.e., chloride and TDS) loading the pore water contained in the underground ore mined at the Whale Tail site.</li> <li>▪ At closure, the pore water released from tailings consolidations is expected to be very low since consolidation occurs rapidly during operation. In the model, the volume of reclaim water released from the tailings due to consolidation is taken into account each month when tailings are actively deposited in the NC and SC TSF and in the pits.</li> </ul>

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PARAMETERS	ASSUMPTIONS
<b>Other Input Source Terms</b>	<ul style="list-style-type: none"> <li>▪ The following source terms are considered in the model, based on measured water quality data: <ul style="list-style-type: none"> <li>▫ Mill effluent;</li> <li>▫ Portage Pit E and Pit A transfer;</li> <li>▫ Goose Pit transfer;</li> <li>▫ Stormwater Management Pond;</li> <li>▫ Portage RSF;</li> <li>▫ Saddle Dam 1 sump;</li> <li>▫ Saddle Dam 3 sump;</li> <li>▫ East Dike seepage.</li> </ul> </li> <li>▪ Precipitation runoff loading: <ul style="list-style-type: none"> <li>▫ Assumed negligible loading and to have similar water characteristics as Third Portage Lake water.</li> </ul> </li> <li>▪ Assumed constant water quality for each stream.</li> </ul>
<b>Input Source Terms: Pit seepage loading</b>	<ul style="list-style-type: none"> <li>▪ Seepage flow considered into Goose Pit and Portage Pit based on the hydrogeological modelling results conducted for the in-pit deposition project (SNC-Lavalin, 2018b).</li> <li>▪ Seepage quality based on the average water quality measured from the seepages sampled in the pits.</li> <li>▪ Assumed constant water quality for each seepage stream.</li> </ul>
<b>Input Source Terms: North and South Cell TSF after Closure</b>	<ul style="list-style-type: none"> <li>▪ Assumed that the water accumulated in closed North and South Cell TSF is transferred to Portage Pit and will have a water quality similar to non-contact runoff water once closure work is completed.</li> </ul>
<b>Cyanide modelling</b>	<ul style="list-style-type: none"> <li>▪ The total cyanide in the TSF Reclaim Pond is comprised of free cyanide and metal-cyanide complexes (weak and strong metal cyanide complexes). As per discussions with Agnico, most of the iron and metal-cyanide complexes are precipitated in the mill. However, since the reaction is not complete or perfect, some dissolved iron- and metal-cyanide complexes are expected to remain in the Mill Effluent. Therefore, it was assumed that 10% of the total cyanide concentration was bound as strong iron-cyanide complexes, and that another 10% of the total cyanide concentration was present as weak metal-cyanide complexes (cyanide bound with copper, zinc, and nickel). The balance is presented as free cyanide (i.e., HCN and CN<sup>-</sup>). This agrees with values observed at other gold mine tailings sites (Simovic, 1984). These same proportions are assumed to apply to the cyanide at the Mill Effluent.</li> <li>▪ For this model, natural cyanide degradation is only considered for the summer months.</li> </ul>


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PARAMETERS	ASSUMPTIONS
<b>Water treatment</b>	<ul style="list-style-type: none"> <li>▪ For this analysis, it is assumed that no treatment will take place at the North or South Cell TSF Reclaim Pond or at the Portage or Goose Pits during in-pit deposition.</li> <li>▪ During the closure, Reclaim Water will be pumped to a water treatment plant and discharged to the environment.</li> <li>▪ Projected water treatment period of the Reclaim Water in the pits: <ul style="list-style-type: none"> <li>▫ Portage Pits: January 2031 to December 2038;</li> <li>▫ Goose Pit: July 2028 to January 2031.</li> </ul> </li> <li>▪ Water treatment to be done to meet approved effluent criteria and to allow cover construction if deemed necessary.</li> <li>▪ The closure schedule for the overall Project is based on the preliminary closure methods and strategies discussed in the Meadowbank ICRP. Schedule may be modified based on monitoring and water quality results.</li> <li>▪ It is anticipated that the schedule will be refined throughout the Project life as the designs are advanced, and the closure methods and strategies are further developed.</li> </ul>
<b>Pit reflooding</b>	<ul style="list-style-type: none"> <li>▪ Pits shall be reflooded by natural runoff from the site and active transfer of water from Third Portage Lake.</li> <li>▪ Period of pit reflooding: January 2039 to July 2041.</li> </ul>

### 3.3 Limitations

The limitations of the Meadowbank water quality mass balance model and ensuing results and conclusions presented in this Technical Note are listed below:

1. In order to simplify the model, the mass balance model assumes that the pond and pits are completely mixed systems. Consequently, the results from this model provide an indication of the concentrations in the ponds and pits and should not be considered as an absolute value at this time. Future monitoring results both for flows and water quality will provide for a better indication of concentrations of contaminants.
2. The mass balance model is based on the water quality analysis results provided by Agnico.
3. The model does make some allowances for the impact that changes in the TSF will have on the TSF Reclaim Pond water quality over time (i.e., water body surface area on natural cyanide degradation in the summer months, free water volume in the pond on the forecasted concentration measurements).
4. The model is based on a monthly time step and the resulting concentrations provided represent monthly values.
5. It should be noted at this point that the model should be used to evaluate at a high level the impact of Mill Effluent on the future water quality in the North and South Cell TSF Reclaim Pond and Portage and Goose Pits. The model provides only an order of magnitude forecast of the concentration trends in these areas.
6. Furthermore, this model is intended as a mass balance model for the Portage Area and should be updated and calibrated on a yearly basis as additional water quality data, pond volumes, and flows in the Portage Area become available. Refer to [Section 6.2](#) for recommendations on improving the mass balance.

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## 3.4 Input Parameters

### 3.4.1 General

The mass balance model for the Meadowbank site was developed originally in 2012 to forecast the long-term concentration of cyanide, copper, iron, ammonia, nitrate and chloride in the North and South Cell TSF Reclaim Pond and in Portage and Goose Pits. Since 2015, the report also evaluated a broader selection of parameters: alkalinity, hardness, aluminum, silver, arsenic, barium, cadmium, chromium, manganese, mercury, molybdenum, nickel, lead, selenium, zinc, fluoride, sulphate and total dissolved solids (TDS).


The mass balance model is based on the assumptions presented in [Section 3.2](#) and on the following input parameters:

- Mill effluent concentration (refer to [Section 3.4.2](#) for more details);
- SFE leaching test results conducted in 2019 on tailings from ores from Vault and Portage Pit and test results conducted in 2023 from ores from Whale Tail Pit (concentration in the liquid portion) were used to compute the loading coming from the leaching of the tailings.
- Initial concentration in the North and South Cells TSF Reclaim Pond;
- Initial concentration in the Portage and Goose Pits;
- Runoff from the Portage RSF;
- Sumps from Saddle Dam 1 (ST-S-2), Saddle Dam 3 (ST-32) and East Dike seepage (ST-8);
- Runoff water quality similar to Third Portage Lake;
- Stormwater Management Pond concentration used to compute the influent loading to the TSF Reclaim Pond;
- Goose Pit and Portage Pit seepage estimated water flow and water quality data; and
- Agnico 2023 Water Balance which defines all of the input and output flows in the North and South Cell TSF, CDDP, Portage Pit and Goose Pit.

### 3.4.2 Mill Effluent Concentration

The Mill Effluent concentrations considered for the input parameters of the mass balance are divided into three types:

- Type 1: Based on the ore produced from Portage/Goose/Vault pits for model years between 2014 and June 2019. For each model year, the characteristics of the Mill Effluent are based on the yearly average measured concentrations for samples taken for that year. The average concentrations considered in the model between 2015 and 2019 are presented in [Table 2-5](#).
- Type 2: Based on the ore produced from Whale Tail pit as of 2019. For each model year, the characteristics of the Mill Effluent are based on the yearly average measured concentrations for samples taken that year. The average concentrations considered in the model between 2019 and 2023 are also presented in [Table 2-5](#).
- Type 3: For the future modelling years from 2023 to 2026, the same adjusted Mill Effluent quality considered for the model year 2023 was used.

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Please note the items below on the parameters used for the Mill Effluent when processing Meadowbank Mine site ore for the updated water quality forecast model based on the 2023 WMP:

- Mill Effluent adjustment factors:
  - Adjustment factors were applied to some constituents measured in the Mill Effluent to obtain forecasted concentrations that are in the same order of magnitude as the measured values.
- Ammonia, Chloride, Sulphate and TDS are present in the Mill Effluent due to the following processes in the mill:
  - Ammonia is present due to the hydrolysis of cyanate to ammonia. The concentration of cyanate is proportional to the concentration of cyanide removed in the cyanide destruction system;
  - Chloride is present due to the continued use of calcium chloride as a dust suppressant in the mill and crusher;
  - Sulphates are present due to the oxidation of sulphide produced in the ore; and
  - The overall TDS of the Mill Effluent will continue to increase due to the increase in ammonia, chloride, and sulphate.
- Copper, Nitrate, Total Cyanide and Chloride in the North Cell:
  - Higher concentrations of the listed parameters were considered for the Mill Effluent when tailings were deposited in the North Cell TSF in 2014. These values were selected based on the measured values from the North Cell TSF Reclaim Pond.


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Table 3-2 presents the adjusted Mill Effluent concentration considered in the model from July 2019 to the end of the LOM.


**Table 3-2: Mill Effluent Concentration Selected for Mass Balance Model from July 2019 to end of LOM**

Parameters (mg/L)	Model Year 2019	Model Year 2020	Model Year 2021	Model Year 2022	Model Year 2023-2026
Alkalinity	77	86	68	83	78
Hardness	1658	1511	1392	1750	1940
Total Dissolved Solids (TDS)	3460	3544	5908	6809	8084
Aluminum (Al)	1.0953	1.7270	0.5684	2.3224	5.2596
Silver (Ag)	0.0018	0.0024	0.0080	0.0033	0.0028
Arsenic (As)	2.7020	0.3619	0.4670	0.2333	0.2962
Barium (Ba)	0.6147	0.0987	0.1219	0.1378	0.1299
Cadmium (Cd)	0.0035	0.0170	0.0003	0.0004	0.0006
Chromium (Cr)	0.3496	0.6540	0.0261	0.0901	0.1833
Copper (Cu)	9.1487	6.3693	8.2979	18.9212	9.2593
Iron (Fe)	4.0173	2.7862	0.9676	3.0234	5.7881
Manganese (Mn)	0.2910	0.2351	0.1064	0.2118	0.4082
Mercury (Hg)	0.00001	0.00001	0.00002	0.00001	0.00011
Molybdenum (Mo)	0.0972	1.0134	0.1244	0.1260	0.1498
Nickel (Ni)	7.6640	2.8217	6.8443	6.6183	1.9984
Lead (Pb)	0.8460	0.0205	0.0075	0.0245	0.0541
Selenium (Se)	0.1432	0.1436	0.1886	0.2983	0.4240
Strontium (Sr)	1.3833	1.5081	1.9413	3.4075	4.1745
Thallium (Tl)	0.00183	0.00005	0.00002	0.00004	0.00009
Uranium (U)	0.0381	0.0563	0.0252	0.0298	0.0414
Zinc (Zn)	0.2723	0.1431	0.0041	0.0082	0.0186
Chloride	767	411	646	935	886
Fluoride (F)	0.30	0.28	0.20	0.18	0.19
Sulphate (SO <sub>4</sub> )	2185	1800	1967	2958	2316
Total Cyanide (CNT)	12	25	24	37	35
Total Ammonia (NH <sub>3</sub> -NH <sub>4</sub> )	75	65	60	112	123
Nitrate (NO <sub>3</sub> )	13	9	12	28	46

*Notes:*

*Grey highlighted cells indicate values that were increased with an adjustment factor to obtain forecasted concentrations that are in the same order of magnitude as the measured values.*

*Green highlighted cells indicate values that were decreased with an adjustment factor to obtain forecasted concentrations that are in the same order of magnitude as the measured values.*

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### 3.4.3 Concentrations Used in the Model

As noted previously, the mass balance model arbitrarily begins in January 2014 to fit the previous models. The initial concentrations selected for the following streams are based on the following:


- North Cell TSF Reclaim Pond corresponds to the January 8th, 2014 chemical analysis results from station ST-21.
- Concentrations selected for the South Cell TSF Reclaim Pond (former Attenuation Pond) correspond to the twelve (12) months (2014) average concentrations' results from station ST-18 (current Attenuation Pond). When there was no or little data available, the average values from 2010 to 2014 were used. In general, the concentrations observed in the Attenuation Pond had little variation from one month to the other.
- The initial concentrations of all parameters in the Portage and Goose Pits were assumed to be the average of 2013. For Portage Pit, the average concentrations measured in 2013 in Pit E (ST-19) were used. For Goose Pit, the average concentrations measured in 2013 in the Goose Pit sump (ST-20) were used.

For the other water inputs, the water quality was based on the following:

- Runoff from the Portage RSF is based on the average concentration measured in 2015 to 2023 at sampling station ST-16.
- Saddle Dam 1 sump that is transferred to the North Cell is based on the average concentration measured from 2015 to 2023 at sampling station ST-S-2.
- Saddle Dam 3 sump that is transferred to the South Cell is based on the average concentration measured from 2016 to 2023 at sampling station ST-32.
- East dike seepage quality is based on the average concentrations measured in 2015 to 2023 at sampling stations ST-8 and ST-S-1.
- Stormwater Management Pond quality is based on the value measured in July 2018.
- Surface runoff water is assumed to be of similar quality to that of Third Portage Lake. The water quality for Third Portage Lake is based on the average concentration obtained in summer 2015 in the East Basin.

The average leaching rate inferred from the results obtained from the SFE Leach Tests conducted on the tailings produced from Portage and Vault ore bodies in 2019 were used to account for possible leaching of contaminants from the tailings. The SFE Leach Tests conducted on the tailings produced from the Whale Tail ore bodies in 2023 were used to account for possible leaching of contaminants from this type of tailings.

**Table 3-3** summarizes the leaching rates used in the model while **Table 3-4** summarizes the water quality characteristics for various input source streams used in the water quality forecast model based on total metals. Measurements that are higher than CCME guidelines for Protection of Aquatic Life are also highlighted in **Table 3-4**, which are used for comparison purposes only.

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**Table 3-3: Leaching Rate Used in Water Quality Forecast Model**

PARAMETERS	UNITS	LEACHING OF TAILS FROM PORTAGE/VAULT (kg/ton)	LEACHING OF TAILS FROM WHALE TAIL PIT (kg/ton)	LEACHING OF TAILS FROM WHALE TAIL PIT (kg/ton)
		From SFE Leach Test- Avg 2019 tests	From SFE Leach Test- Avg 2022 tests	From SFE Leach Test- Avg 2023 tests
Alkalinity	mg CaCO <sub>3</sub> /L	3.90E-02	2.57E-02	4.02E-02
Hardness	mg CaCO <sub>3</sub> /L	1.89E-01	2.23E-01	2.58E-01
Total Dissolved Solids (TDS)	mg/L	0 (1)	0 (1)	0 (1)
Total Aluminum (Al)	mg/L	8.67E-05	6.25E-05	4.59E-05
Total Silver (Ag)	mg/L	2.50E-08	2.02E-07	1.85E-07
Total Arsenic (As)	mg/L	1.26E-05	6.76E-04	3.22E-04
Total Barium (Ba)	mg/L	1.13E-05	3.99E-05	4.03E-05
Total Cadmium (Cd)	mg/L	0 (1)	6.07E-08	6.15E-08
Total Chromium (Cr)	mg/L	1.20E-04	1.83E-07	9.00E-08
Total Copper (Cu)	mg/L	1.54E-06	2.79E-06	2.15E-05
Total Iron (Fe)	mg/L	1.34E-04	1.55E-04	1.20E-04
Total Manganese (Mn)	mg/L	1.57E-05	1.25E-05	6.98E-05
Total Mercury (Hg)	mg/L	6.67E-09	5.00E-09	5.45E-09
Total Molybdenum (Mo)	mg/L	4.63E-05	4.11E-05	3.38E-05
Total Nickel (Ni)	mg/L	1.13E-06	1.58E-05	6.07E-05
Total Lead (Pb)	mg/L	6.67E-08	1.33E-07	1.48E-07
Total Selenium (Se)	mg/L	1.43E-06	2.39E-05	2.20E-05
Total Strontium (Sr)	mg/L	2.44E-04	4.50E-04	5.35E-04
Total Thallium (Tl)	mg/L	9.00E-09	6.68E-09	1.09E-08
Total Uranium (U)	mg/L	9.30E-07	2.86E-07	6.78E-07
Total Zinc (Zn)	mg/L	1.00E-06	1.00E-06	1.18E-06
Chloride	mg/L	0 (1)	0 (1)	0 (1)
Fluoride (F)	mg/L	3.40E-04	1.63E-04	1.63E-04
Sulphate (SO <sub>4</sub> )	mg SO <sub>4</sub> /L	2.30E-01	2.94E-01	3.26E-01
Total Cyanide (CNT)	mg/L	0 (1)	0 (1)	0 (1)
Total Ammonia (NH <sub>3</sub> + NH <sub>4</sub> )	mg N/L	3.10E-03	3.89E-03	3.89E-03
Nitrate (NO <sub>3</sub> )	mg N/L	3.00E-04	1.53E-03	1.53E-03

Note:

1. No data available. Assume negligible.



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**Table 3-4: Input Source Stream Concentrations used in the Water Quality Forecast Model**

PARAMETERS	UNITS	RECLAIM ST-21 NORTH CELL	ATTEN. POND / SOUTH CELL	PORTAGE RSF TO NORTH CELL	SADDLE DAM 1 SUMP TO NORTH CELL	SADDLE DAM 3 SUMP TO SOUTH CELL	EAST DIKE SEEPAGE TO PORTAGE	STORM WATER MGMT POND	THIRD PORTAGE LAKE	PORTAGE PIT ST-19	GOOSE PIT ST-20	CCME GUIDELINES	WATER LICENCE MEADOWBANK MAX. AVG. CONC.
		Initial condition for model January-08-14	Initial condition for model Average 2014	Average 2015 to 2023 sampled at ST-16	Average 2015 to 2023 sampled at ST-S-2	Average 2016 to 2023 sampled at ST-32	Average 2015 to 2023 sampled at ST-8 and ST-S-1	July 2018	Average-East Basin Summer 2015	Initial Condition for Model Average 2013	Initial Condition for Model Average 2013	Long Term Based on 3PL quality	Part F of License
Alkalinity	mg CaCO <sub>3</sub> /L	135	106	68	55	132	36	129	9.1	72.2	129.8	n/a	n/a
Hardness	mg CaCO <sub>3</sub> /L	1329	362	143	268	220	79	134	12	274	130	n/a	n/a
Total Dissolved Solids (TDS)	mg/L	1329	1437	215	374	343	131	293	22	320	326	n/a	1400
Total Aluminum (Al)	mg/L	0.119 <sup>1</sup>	0.010 <sup>1</sup>	0.295	0.537	1.876	0.04416	0.229	0.0075	0.1720	0.3708	0.16 <sup>7</sup>	1.5
Total Silver (Ag)	mg/L	0.0001 <sup>1</sup>	0.0001 <sup>1</sup>	0.0001	0.0001	0.0001	0.00099	0.0001	0.000005	0.00005	0.00005	0.00025	n/a
Total Arsenic (As)	mg/L	0.032 <sup>1</sup>	0.008 <sup>1</sup>	0.022	0.024	0.024	0.00107	0.004	0.0005	0.0202	0.0099	0.005	0.3
Total Barium (Ba)	mg/L	0.094 <sup>1</sup>	0.051 <sup>1</sup>	0.016	0.032	0.060	0.16151	0.020	0.0037	0.0110	0.0219	n/a	n/a
Total Cadmium (Cd)	mg/L	0.00160	0.00010	0.00003	0.00004	0.00004	0.00023	0.00001	0.000003	0.000240	0.000000	0.00004	0.002
Total Chromium (Cr)	mg/L	0.0008	0 <sup>4</sup>	0.003	0.006	0.017	0.02259	0.002	0.0001	0.0027	0.0026	0.001	n/a
Total Copper (Cu)	mg/L	9.135	0.033 <sup>1</sup>	0.014	0.007	0.017	0.00129	0.003	0.0006	0.0042	0.0069	0.002	0.1
Total Iron (Fe)	mg/L	0.140 <sup>1</sup>	0.047 <sup>1</sup>	0.763	1.246	3.869	0.62951	0.880	0.017	1.5	0.7	0.3	n/a

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PARAMETERS	UNITS	RECLAIM	ATTEN.	PORTAGE	SADDLE	SADDLE	EAST DIKE	STORM	THIRD	PORTAGE	GOOSE PIT	CCME	WATER
		ST-21 NORTH CELL	POND / SOUTH CELL	RSF TO NORTH CELL	DAM 1 SUMP TO NORTH CELL	DAM 3 SUMP TO SOUTH CELL	SEEPAGE TO PORTAGE	WATER MGMT POND	PORTAGE LAKE	PIT ST-19	PIT ST-20	GUIDELINES	MEADOWBA NK MAX. AVG. CONC.
		Initial condition for model January-08- 14	Initial condition for model Average 2014	Average 2015 to 2023 sampled at ST-16	Average 2015 to 2023 sampled at ST-S-2	Average 2016 to 2023 sampled at ST-32	Average 2015 to 2023 sampled at ST-8 and ST- S-1	July 2018	Average- East Basin Summer 2015	Initial Condition for Model Average 2013	Initial Condition for Model Average 2013	Long Term Based on 3PL quality	Part F of License
Total Manganese (Mn)	mg/L	0.065 <sup>1</sup>	2.898 <sup>1</sup>	0.801	0.187	0.583	0.09390	0.410	0.002	0.257	0.108	0.23	n/a
Total Mercury (Hg)	mg/L	0.000000	0.000117	0.010263	0.000097	0.000016	0.00001	0.000005	0.000003	0.000080	0.000005	0.000026	0.0004
Total Molybdenum (Mo)	mg/L	0.596 <sup>1</sup>	0.026 <sup>1</sup>	0.014	0.011	0.007	0.03057	0.004	0.0002	0.0664	0.0082	0.073	n/a
Total Nickel (Ni)	mg/L	0.277 <sup>1</sup>	0.041 <sup>1</sup>	0.017	0.034	0.073	0.00092	0.011	0.00059	0.00394	0.07973	0.025	0.2
Total Lead (Pb)	mg/L	0.002 <sup>2</sup>	0.000 <sup>1</sup>	0.001	0.003	0.004	0.00051	0.0002	0.00003	0.00131	0.00192	0.001	0.1
Total Selenium (Se)	mg/L	0.075 <sup>1</sup>	0.003 <sup>1</sup>	0.001	0.001	0.001	0.00260	0.003	0.00003	0.00183	0.00080	0.001	n/a
Total Strontium (Sr)	mg/L	0.743 <sup>3</sup>	0 <sup>4</sup>	0.151	0 <sup>4</sup>	0 <sup>4</sup>	0 <sup>4</sup>	0.29	0.0132	0 <sup>4</sup>	0 <sup>4</sup>	n/a	n/a
Total Thallium (Tl)	mg/L	0.005 <sup>3</sup>	0 <sup>4</sup>	0.001	0.001	0 <sup>4</sup>	0.00070	0.0004	0.000005	0.0020	0.0016	0.0008	n/a
Total Uranium (U)	mg/L	0.010 <sup>3</sup>	0 <sup>4</sup>	0.005	0 <sup>4</sup>	0 <sup>4</sup>	4	0.002	0.000049	0 <sup>4</sup>	0 <sup>4</sup>	0.015	n/a
Total Zinc (Zn)	mg/L	0.010 <sup>1</sup>	0.010 <sup>1</sup>	0.004	0.088	0.017	0.00353	0.005	0.002	0.016	0.015	0.01	0.4
Chloride	mg/L	1035	98	5	7	15	7.83739	52	0.793	26.117	24.978	120	1000
Fluoride (F)	mg/L	0.180	0.565	0.184	0.193	0.292	0.12146	0.860	0.0793	0.3900	0.4922	0.12	n/a
Sulphate (SO <sub>4</sub> )	mg SO <sub>4</sub> /L	2115	542	65	212	126	9.44783	30	5	224	77	128 <sup>5</sup>	n/a

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PARAMETERS	UNITS	RECLAIM ST-21 NORTH CELL	ATTEN. POND / SOUTH CELL	PORTAGE RSF TO NORTH CELL	SADDLE DAM 1 SUMP TO NORTH CELL	SADDLE DAM 3 SUMP TO SOUTH CELL	EAST DIKE SEEPAGE TO PORTAGE	STORM WATER MGMT POND	THIRD PORTAGE LAKE	PORTAGE PIT ST-19	GOOSE PIT ST-20	CCME GUIDELINES	WATER LICENCE MEADOWBA NK MAX. AVG. CONC.
		Initial condition for model January-08- 14	Initial condition for model Average 2014	Average 2015 to 2023 sampled at ST-16	Average 2015 to 2023 sampled at ST-S-2	Average 2016 to 2023 sampled at ST-32	Average 2015 to 2023 sampled at ST-8 and ST- S-1	July 2018	Average- East Basin Summer 2015	Initial Condition for Model Average 2013	Initial Condition for Model Average 2013	Long Term Based on 3PL quality	Part F of License
Total Cyanide (CNT)	mg/L	8	0.346	0.002	0.010	0.012	0.0025	0.002	0.0005	0.0393	0.0033	0.005	0.5
Total Ammonia (NH <sub>3</sub> + NH <sub>4</sub> )	mg N/L	37	10	0.216	0.362	1.852	0.30490	1.320	0.015	3.6	7.9	1.83	16
Nitrate (NO <sub>3</sub> )	mg N/L	26	1	4	7	10	0.28322	0.06	0.0331	12.7	5.1	2.94 <sup>6</sup>	20

**Notes:**

1. No total concentration value measured. Estimated using dissolved concentration value divided by the ratio of dissolved/total concentration values from sample taken on July 1, 2014 from the North Cell.
2. Used dissolved concentration value when the value is higher than the total concentration measured.
3. No data available for sample taken on January 8, 2014. Used data sampled on July 1, 2014.
4. No data. Assume negligible.
5. Threshold value for sulphate based on BC Environment guidelines for the protection of aquatic life for very soft water (0-30 mg/L) (April 2013).
6. Value based on the threshold concentration for classification of an oligotrophic lake in terms of nutrient concentrations (Numberg 1996).
7. Aluminum criterion in fresh water is calculated using the equation described in Appendix B of the Federal Environmental Quality Guidelines (FWQG).
8. Pink cells indicate values higher than CCME Guidelines (Long Term), or other criterion, based on Third Portage Lake water quality. Provided as a guide to help identify potential parameters of concern.

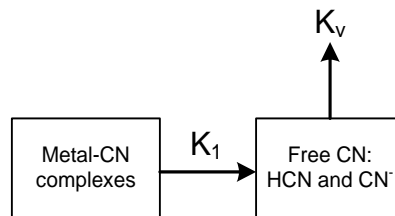
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### 3.5 Cyanide Decay

The water quality model developed during this study takes natural cyanide degradation into account: the most important mechanism in the natural degradation of cyanide is the volatilization of hydrogen cyanide (HCN). In fact, tests carried out on tailings in Canada found that volatilization of HCN accounted for 90% of cyanide removed from solution in a tailing’s impoundment (Botz and Mudder, 2000). Oxidation of cyanide ions (CN-) to orthocyanate (OCN) with atmospheric oxygen is possible but extremely slow when compared to HCN volatilization. Similarly, the probability of microbial degradation of cyanide to carbon dioxide, ammonia, nitrite, and nitrate is low due to the limited presence of microorganisms and low nutrient levels in tailings water.

Cyanide volatilization can be summarized as a two (2) step process presented in **Figure 3-1** below:


- First, metal-cyanide complexes dissociate to free cyanide (HCN and CN-) based on a first-order decay constant ( $k_1$ ). Note that: (1) equilibrium between HCN and CN- is based on pH; (2) a first order decay constant signifies that the final concentration ( $C_f$ ) can be estimated as  $C_f = C_i e^{-kt}$ , where  $k$  is the first order decay constant.
- It is then followed by HCN volatilization based on a first-order decay constant ( $k_v$ ).
- Both decay constants  $k_1$  and  $k_v$  depend on the presence of UV light (sun) and air (wind), and water temperature and pH. The volatilization decay constant,  $k_v$ , also depends on the surface area to volume ratio of the pond.



**Figure 3-1: Cyanide Volatilization Process**

Since both constants depend to a great extent on temperature, UV light and air, separate constants were determined for summer (May to October) and winter (November to April) conditions. The decay constants were based on laboratory values recorded by Simovic (1984). The assumptions made for the development of the cyanide decay constants were the following:

- Summer conditions: An average water temperature of 10 °C, presence of air and UV light. Furthermore, since metal-CN dissociation and HCN volatilization by air and UV is particularly important in the summer months, the decay constant factors in the physical property of the tailing’s impoundment, represented by the open surface area to volume ratio. Multiplying the decay constant by this ratio takes into account the accelerated reaction due to a large exposed surface area of the Reclaim Pond.
- Winter conditions: No natural cyanide degradation occurs.

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- The pH in the Reclaim Pond is maintained constant at 8.0, which means that most (94%) of the free cyanide will be present as HCN. Note that as the pH decreases, the proportion of free cyanide as HCN increases, which increases cyanide degradation through volatilization.

As stated in **Section 3.2**, it was assumed that 10% of the total cyanide concentration was bound as iron-cyanide complexes, another 10% as metal (copper, nickel and zinc) cyanide complexes, and 80% as free cyanide. This agrees with values observed at other gold mine tailings impoundments.

It should be noted that these decay constants (referred to as  $k_0$ ) were established based on an hourly time step and were not deemed reliable for longer time periods (i.e., months). Therefore, the summer and winter decay constants obtained based on volatilization conditions and assumptions were calibrated to represent more accurately and conservatively the expected cyanide concentrations on a monthly time step.

**Table 3-5** presents the assumptions and cyanide decay constants used in the water quality model.

**Table 3-5: Natural Cyanide Degradation – Assumptions and Constants**


DECAY CONSTANT	DESCRIPTION	WINTER CONDITIONS			SUMMER CONDITIONS		
		Conditions	$k_0$	Calibrated value (k)	Conditions	$k_0$	Calibrated value (k)
$K_1$	Metal-CN dissociation	4° No air No UV	n/a	n/a	10° Air (wind) UV (sunlight)	0.01443/ hr	2.11/month
$K_v$	HCN volatilization		n/a	n/a		2.382 cm/hr	58.0 m/month

## 3.6 Portage and Goose Pit Groundwater Seepage Loading

Loadings from groundwater seepages to Portage and Goose Pits shall be estimated based on the following information:


- In the hydrogeological modelling of the groundwater flow in Goose Pit and Portage Pit, the seepage flow entering each pit was estimated at: 196 m<sup>3</sup>/day in Portage Pit and 423 m<sup>3</sup>/day in Goose Pit (AtkinsRéalis 2018b). This seepage flow is assumed to be constant over the modelling period;
- The average concentration measured from samples taken of the pit seepages in each pit between 2017 and 2019 shall be used to estimate the loadings to each pit assuming a constant seepage flow rate.

**Table 3-6** presents the average concentration considered for seepages reporting to Goose Pit and Portage Pit in the water quality forecast model.

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**Table 3-6: Pit Seepage Water Quality Considered in the Model**

Parameters	Units	Portage Pit Seepage	Goose Pit Seepage
		Average Data from 2017-2020	Average Data from 2017-2019
Alkalinity	mg CaCO <sub>3</sub> /L	69.8	80.3
Hardness	mg CaCO <sub>3</sub> /L	523	81
Total Dissolved Solids (TDS)	mg/L	813	175
Total Aluminum (Al)	mg/L	0.63	0.127
Total Silver (Ag)	mg/L	0.0000355	0.00005
Total Arsenic (As)	mg/L	0.0217	0.0022
Total Barium (Ba)	mg/L	0.0318	0.0417
Total Cadmium (Cd)	mg/L	0.000251	0.000013
Total Chromium (Cr)	mg/L	0.0002	0.0001
Total Copper (Cu)	mg/L	0.0011	0.0020
Total Iron (Fe)	mg/L	1.6	5.1
Total Manganese (Mn)	mg/L	0.357	0.043
Total Mercury (Hg)	mg/L	0.000005	0.000171
Total Molybdenum (Mo)	mg/L	0.0801	0.0093
Total Nickel (Ni)	mg/L	0.05101	0.00682
Total Lead (Pb)	mg/L	0.0114	0.00015
Total Selenium (Se)	mg/L	0.00257	0.00071
Total Strontium (Sr)	mg/L	0.74650	0.22333
Total Thallium (Tl)	mg/L	0.00023	0.00035
Total Uranium (U)	mg/L	0.06960	0.00333
Total Zinc (Zn)	mg/L	0.003	0.007
Chloride (Cl)	mg/L	45.5	16.2
Fluoride (F)	mg/L	0.2720	0.8333
Sulphate (SO <sub>4</sub> )	mg SO <sub>4</sub> /L	48	0
Total Cyanide (CN <sub>t</sub> )	mg/L	0.0119	0.0023
Total Ammonia (NH <sub>3</sub> + NH <sub>4</sub> )	mg N/L	1.1	0.3
Nitrate (NO <sub>3</sub> )	mg N/L	17.9	0.1

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## 4.0 Water Quality Forecast Results

### 4.1 Results


The results of the mass balance model around the North and South Cell TSF Reclaim Ponds, Portage and Goose Pits are presented in [Figure 4-1](#) to [Figure 4-17](#) for the following parameters of concern that were identified in [Section 2.3](#).

- |                   |                            |
|-------------------|----------------------------|
| 1. Total Cyanide  | 10. Total Selenium         |
| 2. Total Aluminum | 11. Total Zinc             |
| 3. Total Arsenic  | 12. Total Ammonia          |
| 4. Total Cadmium  | 13. Nitrate                |
| 5. Total Copper   | 14. Total dissolved solids |
| 6. Total Iron     | 15. Chloride               |
| 7. Total Lead     | 16. Sulphate               |
| 8. Total Mercury  | 17. Fluoride               |
| 9. Total Nickel   |                            |

The graphs show the forecasted monthly concentrations of the parameters from 2014 to the end of in-pit tailings deposition in 2026 for the North and South Cell TSF Reclaim Ponds, and until the end of pit reflooding in 2041 for Portage and Goose Pits. A total of two (2) graphs are presented per parameter: the first shows the forecasted concentrations in the North and South Cells TSF Reclaim Ponds and the second shows the forecasted concentrations in the Portage and Goose Pits.

For comparison purposes only, the Water Licence, MDMER and CCME limits (refer to [Table 2-1](#)) were also included in the figures, where applicable.

Again, it is important to remember that the results presented in the figures in [Section 4.0](#) of this report are based on the input parameters presented in [Section 3.0](#). These results must be reviewed while keeping in mind the assumptions and limitations described in [Sections 3.2](#) and [3.3](#). It is also important to note that the results from this model assume that treatment of the Reclaim Pond effluent shall be undertaken following the end of in-pit deposition and that the treated water shall be discharged to the environment.

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## 4.2 Discussions

### 4.2.1 Key Dates

The mass balance model presented in this Technical Note is based on the WB 2023. The following key dates are important to keep in mind while reviewing the forecasted concentration data presented in [Figure 4-1](#) to [Figure 4-17](#):

- November 2014: The former Attenuation Pond becomes the South Cell and TSF Reclaim Pond;
- May 2015: Start of natural re-flooding of Goose Pit with surface runoff water only;
- September 2015: Transfer of 50,431 m<sup>3</sup> of CDDP water to Goose Pit;
- October 2015: End of deposition in the North Cell TSF;
- July 2017: Allow runoff water and ground water to accumulate in the North Portage Pit (Pit A);
- August to October 2017: Approximately 332,177 m<sup>3</sup> of pond water is transferred from CDDP to Goose Pit;
- August to October 2018: Deposition in North and South Cell TSF;
- April 2019: Deposition end in South Cell TSF;
- April to July 2019: Deposition resumes in North Cell TSF;
- May to July 2019: Approximately 358,156 m<sup>3</sup> of pond water is transferred from CDDP to Goose Pit;
- July 2019: End of processing ore from Portage/Goose/Vault pits at the mill. Start of processing of ore from Whale Tail;
- July 2019: Start of deposition of tailings from Whale Tail Pit;
- July 2019 to August 2020: Deposition of tailings in Goose Pit;
- August 2020 to June 2026: Deposition of tailings in Portage Pit E;
- Reclaim Water from Portage Pit E is returned to the mill or transferred to Portage Pit A;
- Reclaim Water from Portage Pit A is also returned to the mill or transferred to Portage Pit E or Goose Pit;
- Reclaim Water from Goose Pit is transferred to Portage Pit A;
- Allow East Dike Seepage to discharge to Second Portage Lake as long as discharge criteria are met. If not, East Dike Seepage is transferred to Portage Pit A or Pit E;
- July 2020: Start of water transfer from South Cell TSF Reclaim Pond to Portage Pit A;
- As of 2020: North Cell TSF Reclaim Pond is almost completely empty. The pond is maintained empty in the subsequent years by transferring the accumulated runoff water to the South Cell TSF Reclaim Pond;
- September 2020: South Cell TSF Reclaim Pond is almost completely empty. The pond is maintained empty in the subsequent years by transferring the accumulated runoff water to Portage Pit A;
- April 2021: Start of processing at the mill of some ore that comes from the underground mine at Whale Tail. Only a fraction of the ore shall come from the underground mine while the balance shall come from the pit operation at Whale Tail;
- June 2026: End of in-pit tailings deposition;
- July 2026 Start of closure activities;



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- July 2028 to December 2038: Treatment of Reclaim Water in Portage and Goose Pits. Water treatment to be done to meet approved effluent criteria and to allow cover construction if deemed necessary. The closure schedule for the overall Project is based on the preliminary closure methods and strategies discussed in the Meadowbank ICRP. It is anticipated that the schedule will be refined throughout the Project life as the designs are advanced, and the closure methods and strategies are further developed;
- January 2039 to July 2041: Active pit reflooding of Portage and Goose Pits;
- August 2041: End of closure (only if water criteria are met).

## 4.2.2 Forecasted Concentrations in the North and South Cell TSF Reclaim Pond


The forecasted concentrations in the North and South Cell TSF Reclaim Pond are presented in [Figure 4-1](#) to [Figure 4-17](#).

Based on the model for forecasting concentrations in the North and South Cell TSF Reclaim Pond, the following notes and observations can be made:

1. For the metal parameters, the fluctuations observed from 2014 to 2019 and from 2021 to 2023 are primarily due to seasonal variability (runoff from nearby areas, snow and ice melt, temperature, etc.). Furthermore, the forecasted concentrations are generally more conservative than the field measurements.
2. Natural degradation of cyanide during summer plays a significant role in reducing the measured concentration of total cyanide in the TSF Reclaim Ponds and it is considered in the forecasting model. The forecasted concentrations are generally more conservative than the field measurements, in particular the ones from 2014 to 2016 and from 2021 to 2023.
3. For ammonia, it is important to note that:
  - a. The mass balance model developed here does not include seasonal variability (sunlight, microbial or algae degradation of ammonia, etc.); and
  - b. Ammonia concentrations can vary significantly depending on temperature, pH, sunlight, algae activity, etc. Ammonia concentrations may be lower in the summer and higher in the winter. The forecasted concentrations in the South Cell TSF Reclaim Pond between 2014 and 2019 are more conservative than the measured values. From 2021 to 2023, ammonia concentrations decreased compared to previous years and the forecasted concentrations are more conservative than the measured values.
4. Similarly, for nitrate, it is important to remember that:
  - a. The mass balance model developed here does not include seasonal variability; and
  - b. Ammonia decomposes to nitrate; therefore, nitrate concentrations can vary significantly depending on temperature, pH, sunlight, algae activity, etc. Nitrate concentrations may be lower in the summer and higher in the winter. The forecasted values from 2014 to 2019 and from 2021 to 2023 are in the same range as the measured values in both cells Cell. From 2016 to 2019, nitrate concentrations decreased compared to previous years. Forecasted values are more conservative than the measured values.

5. Guidelines:

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- a. For comparison purposes, the forecasted concentrations in the North and South Cells TSF Reclaim Ponds for almost all the parameters are above the Water Licence discharge criteria when tailings depositions were occurring in this area, except for aluminum, arsenic (from 2014 to mid-2021), cadmium (from 2018 to mid-2024), lead, zinc, nitrate (from 2014 to mid-2024) and chloride (from 2016 to 2028). Following the end of tailings deposition, the forecasted values drop below the Water Licence limits.
- b. For comparison purposes, almost all forecasted concentrations in the North and South Cells TSF Reclaim Ponds for the parameters of concern are also above the CCME guidelines for the protection of aquatic life during tailings depositions. Following deposition, the forecasted concentration drops close to or below the CCME guidelines.
- c. However, it is important to note that no water in the TSF Reclaim Pond during tailings deposition is discharged to the environment. Thus, the Water Licence discharge criteria are not applicable but are rather used as a comparison herein. Also, the dikes around Portage and Goose Pits will only be breached if the water quality in those pits meets the selected discharge closure criteria.

### 4.2.3 Forecasted Concentration in Portage and Goose Pits


**Table 4-1** presents the forecasted concentration of all parameters for Portage and Goose Pits at the end of in-pit deposition (IPD) projected to be in June 2026 and at the end of pit reflooding projected to be in July 2041.

Based on the model for forecasting of the concentrations in Portage and Goose Pits, the following notes and observations can be made:

1. The water quality forecast considers the extension of the Life of Mine at Meadowbank which adds the processing of ore body coming from the Whale Tail Pit, IVR Pit and the underground mine at the Whale Tail site. The ore body from Whale Tail Pit has a different geochemical behavior when compared to the Portage/Goose/Vault ore bodies. It has a higher potential to leach certain metals, such as arsenic, copper, and nickel.
2. The forecasted concentrations at the end of in-pit deposition are compared to the current Water Licence discharge criteria since the Reclaim Water shall be treated and discharged to the environment prior to pit reflooding. The following observations can be made for each of the parameters of concern:
  - a. Total Cyanide                      Forecasted total concentration is projected to be higher than the Water Licence limit in Portage Pit E and Pit A and lower than this limit in Goose Pit.
  - b. Total Aluminum                      Forecasted total concentration is projected to be higher than the Water Licence limit in Portage Pit E and Pit A and lower than this limit in Goose Pits.
  - c. Total Arsenic                          Forecasted total concentration is projected to be higher than the Water Licence limit at the end of IPD in Portage and Goose Pits. The main source terms for this constituent are from the mill effluent and the pit seepages reporting to the pits.
  - d. Total Cadmium                        Forecasted total concentration is projected to be higher than the Water Licence limit in Portage Pits and close to this limit in Goose Pit.

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- e. Total Copper  
Forecasted total concentration is projected to be higher than the Water Licence limit at the end of IPD in Portage and Goose Pits. The main source terms for this constituent are from the mill effluent and the pit seepages reporting to the pits.
- f. Total Iron  
Elevated forecasted total concentration is projected in Portage Pit and Goose Pit. The main source terms for this constituent are from the mill effluent, surface runoff and the pit seepages reporting to the pits.
- g. Total Lead  
Forecasted total concentration is projected to be close to the Water Licence limit in Goose Pit at the end of deposition and lower than this limit in Portage Pits.
- h. Total Mercury  
Forecasted total concentration is projected to be lower than the Water Licence limit in Goose Pit and in Portage Pits.
- i. Total Nickel  
Forecasted total concentration is projected to be higher than the Water Licence limit at the end of IPD in Portage and Goose Pits. The main source term for this constituent is from the mill effluent reporting to the pits.
- j. Total Selenium  
There is no specific Water Licence limit for this constituent. However, total forecasted concentration remains higher than the CCME guidelines in Portage and Goose Pits. An increase is observed once IPD has started, suggesting that the main source term for this constituent is from the mill effluent reporting to the pits.
- k. Total Zinc  
Forecasted total concentration is projected to be lower than the Water Licence limit in Portage and Goose Pits.
- l. Total Ammonia  
Ammonia forecasted concentrations are higher than the Water Licence limit in Portage and Goose Pits at the end of IPD. A higher load of ammonia is forecasted in the pits due to the additional ammonia load coming from the mill effluent reporting to the pits (i.e., from cyanate hydrolysis).
- m. Nitrate  
Forecasted total concentration is projected to be higher than the Water Licence limit in Portage Pit E and lower than this limit in Goose Pit and Portage Pit A.
- n. Total Dissolved Solids  
Higher forecasted total concentration than the Water Licence limit is projected in Portage Pit E since tailings deposition is mainly occurring in this pit from 2019 to 2027. For Portage Pit A, reclaim water transferred from Pit E as well as natural runoff are allowed to accumulate in the pit, explaining the decrease in concentration. In that same period, for Goose Pit, natural runoff is allowed to accumulate in the pit, explaining the decrease in concentration.

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o. Chloride Forecasted concentration in Portage Pit at the end of IPD is projected to be higher than the Water Licence limit for this constituent. However, the forecasted value in Goose Pit is projected to be lower than this limit.

Since 2019, the sulphate forecasted concentrations are compared against a threshold value based on BC Environment guidelines for the protection of aquatic life for very soft water (0-30 mg/L) (April 2013). There is no specific Water Licence limit for this constituent.


p. Sulphate Forecasted concentration in Portage Pit and Goose Pit was projected to be higher than this guideline. An increase in sulphate concentration is observed once IPD has started, suggesting that the main load for this constituent comes from the mill effluent. Concentration of sulphate is expected to increase in Portage Pits (Pit A and E) due to continued deposition of tailings and decrease in Goose Pit due to water transfer to Portage Pit A.

q. Fluoride There is no specific Water Licence limit for this constituent. However, total forecasted concentration remains higher than the CCME guidelines in Portage and Goose Pits. The fluoride load to the pits comes from the mill effluent and from pit seepages.

3. Based on the forecasted concentrations at the end of IPD, the new water treatment plant required at closure should be designed to treat and manage the following parameters of concern: **aluminum, arsenic, cadmium copper, mercury, nickel, lead, chloride, nitrate, TDS, total ammonia, and total cyanide**. The new water treatment plant should also be designed to meet **pH** and **total suspended solids** requirements.
4. The assimilative capacity of Third Portage Lake will be assessed with the objective of maintaining a baseline or guideline/protective water quality in the lake. Treated effluent discharge water criteria will be assessed based on this objective.
5. Water quality forecast at the end of pit reflooding:
  - a. Pit reflooding shall begin once the Reclaim Water has been treated and discharged to the environment. Pit reflooding shall be done via natural reflooding and active transfer of water from Third Portage Lake.

It is important to note that once the water elevation in the pits reaches a level above 131 m, both Portage and Goose Pits will be hydraulically connected. For this reason, only the forecasted concentrations in the mixed Portage and Goose Pits are considered in the model.

- b. As shown in **Table 4-1**, when assuming complete mixing of both pits, most of the parameters are below the CCME guidelines. However, some total metals and elements such as aluminum, silver, arsenic, cadmium, chromium, nickel, lead, selenium, total nitrogen and total ammonia were above or close to these guidelines. As for copper and mercury concentrations, they are higher than the Water Licence limit.
- c. Total copper is higher than the Water Licence limit but is expected to be lower once the particulates are allowed to settle out in the pits.

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- d. For comparative purposes only, the total nitrogen equivalent concentration (i.e., sum of ammonia and nitrate) is higher than the threshold concentration for classification of an oligotrophic lake (i.e., a lake characterized by a low accumulation of dissolved nutrient salts, supporting but a sparse growth of algae and other organisms, and having a high oxygen content owing to the low organic content) in terms of nutrient concentration (Nurnberg 1996). However, the mass balance model does not consider any natural nitrogen degradation cycle that could occur over the summer months.

In summary, the forecasted values presented in this section provide an indication of the type of effluent that shall be managed and treated at the end of in-pit deposition and following pit reflooding. This information can be used to initiate the assessment of the type of water treatment system required for closure and initiate planning for water treatability testing. All of the parameters listed in [Table 4-1](#) shall be monitored in the pits and used to re-evaluate next year’s water quality forecast model.

#### 4.2.4 Comparison of Forecasted Values

As of 2019, in-pit tailings deposition has started in Goose Pit and Portage Pit instead of the North and South Cell TSF. For this reason, comparison of the model results shall focus on the trends forecasted in Portage and Goose Pits.

Chloride and sulphate shall be used to compare the model results since these constituents are likely to accumulate over time in the reclaim water and not precipitate out of solutions.

[Figure 4-18](#) and [Figure 4-19](#) compare the forecasted value based on the Water Balance (WB) 2019, WB 2020, WB 2021, WB 2022, and WB 2023. Measured values for chloride and sulphate sampled in the pits are also presented.

Based on these figures, the following notes and observations can be made:

- The water quality forecast model based on WB 2019 overestimated the forecasted concentration for chloride in Goose and Portage Pits. The WB from 2020 to 2023 models and the current model correct the forecast to be more in line with the measured values.
- The water quality forecast model based on WB 2019 underestimated the forecasted concentration for sulphate in Goose and Portage Pits. The WB from 2020 to 2023 models and the current model correct the forecast to be more in line with the measured values.

The site Water Balance and Water Quality Forecast model will continue to be updated on a yearly basis, using the actual volumes and measured concentrations to calibrate the models.

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**Table 4-1: Summary of Forecasted Concentrations at the End of Deposition and After Pit Reflooding**

PARAMETERS	UNITS	WATER LICENCE at ST-9 (3)	CCME GUIDELINES	3rd PORTAGE LAKE	END OF DEPOSITION (JUN. 2026)					END OF PIT FLOODING (JUL. 2041)
					NORTH CELL	SOUTH CELL	PORTAGE PIT E	PORTAGE PIT A	GOOSE PIT	PORTAGE AND /GOOSE PITS (MIXED PITS)
pH (assumed)	---	---	---	---	---	---	---	---	---	---
Alkalinity	mg CaCO <sub>3</sub> /L	n/a	n/a	9.1	18	113	166	193	62	16
Hardness	mg CaCO <sub>3</sub> /L	n/a	n/a	12.05	136	188	2801	1288	670	85
Total Dissolved Solids (TDS)	mg/L	1400	n/a	22.1	370	293	7682	3634	1598	237
Total Aluminum (Al)	mg/L	1.5	0.10	0.0075	0.263	1.589	4.446	1.890	0.626	0.153
Total Silver (Ag)	mg/L	n/a	0.00025	0.000005	0.00012	0.00009	0.00288	0.00188	0.00152	0.00012
Total Arsenic (As)	mg/L	0.3	0.005	0.0005	0.017	0.020	0.770	0.346	0.511	0.010
Total Barium (Ba)	mg/L	n/a	n/a	0.0037	0.012	0.052	0.180	0.097	0.139	0.013
Total Cadmium (Cd)	mg/L	0.002	0.00004	0.000003	0.00003	0.00004	0.00076	0.00065	0.00306	0.00003
Total Chromium (Cr)	mg/L	n/a	0.001	0.0001	0.00706	0.01471	0.15613	0.07339	0.16174	0.00518
Total Copper (Cu)	mg/L	0.1	0.002	0.0006	0.322	0.014	8.021	3.941	3.063	0.229
Total Iron (Fe)	mg/L	n/a	0.30	0.0173	0.392	3.28	5.16	2.73	2.73	0.26
Total Manganese (Mn)	mg/L	n/a	0.23	0.0016	0.043	0.493	0.631	0.809	0.117	0.066
Total Mercury (Hg)	mg/L	0.0004	0.000026	0.000003	0.00003	0.000014	0.000183	0.000300	0.000075	0.000123
Total Molybdenum (Mo)	mg/L	n/a	0.073	0.0002	0.007	0.006	0.190	0.106	0.205	0.006
Total Nickel (Ni)	mg/L	0.2	0.025	0.0006	0.081	0.062	2.058	1.538	1.912	0.072
Total Lead (Pb)	mg/L	0.1	0.001	0.00003	0.002	0.00356	0.048	0.025	0.144	0.0015
Total Selenium (Se)	mg/L	n/a	0.001	0.00003	0.01479	0.0011	0.3826	0.1457	0.0591	0.0090



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PARAMETERS	UNITS	WATER LICENCE at ST-9 (3)	CCME GUIDELINES	3rd PORTAGE LAKE	END OF DEPOSITION (JUN. 2026)					END OF PIT FLOODING (JUL. 2041)
					NORTH CELL	SOUTH CELL	PORTAGE PIT E	PORTAGE PIT A	GOOSE PIT	PORTAGE AND /GOOSE PITS (MIXED PITS)
Total Strontium (Sr)	mg/L	n/a	n/a	0.0132	0.155	0.002	4.294	1.694	0.749	0.113
Total Thallium (Ti)	mg/L	n/a	0.0008	0.000005	0.00014	0.000001	0.00012	0.00013	0.00042	0.00005
Total Uranium (U)	mg/L	n/a	0.015	0.000049	0.001	0.00001	0.0417	0.0377	0.0225	0.0011
Total Zinc (Zn)	mg/L	0.4	0.010	0.0015	0.015	0.014	0.024	0.026	0.073	0.003
Chloride	mg/L	1000	120	0.7925	45	13	1242	484	258	34
Fluoride (F)	mg/L	n/a	0.12	0.07925	0.094	0.26	0.46	0.31	0.41	0.10
Sulphate (SO <sub>4</sub> )	mg SO <sub>4</sub> /L	n/a	128 <sup>2</sup>	5.1	117	107	2646	1721	822	63
Total Cyanide (CNt)	mg/L	0.5	0.005	0.0005	1.14	0.01	22.45	2.01	0.00009	0.00002
Total Ammonia	mg N/L	16.0	1.83	0.0145	4	2	114	66	29	2.7
Nitrate (NO <sub>3</sub> )	mg N/L	20.0	2.94	0.03305	3	9	41	17	5	1.3
Total N equivalent	mg N/L	n/a	0.35 <sup>1</sup>	0.04755	7	10	155	83	34	4.1

Notes:

- Value based on the threshold concentration for the classification of an oligotrophic lake in terms of nutrient concentrations (Nurnberg 1996).
- Threshold value for sulphate based on BC Environment guidelines for the protection of aquatic life for very soft water (0-30 mg/L) (April 2013).
- Mass balance forecasted concentration higher than current Water Licence limits at ST-9. For comparison purposes only.
- Mass balance forecasted concentration higher than CCME limits. For comparison purposes only.



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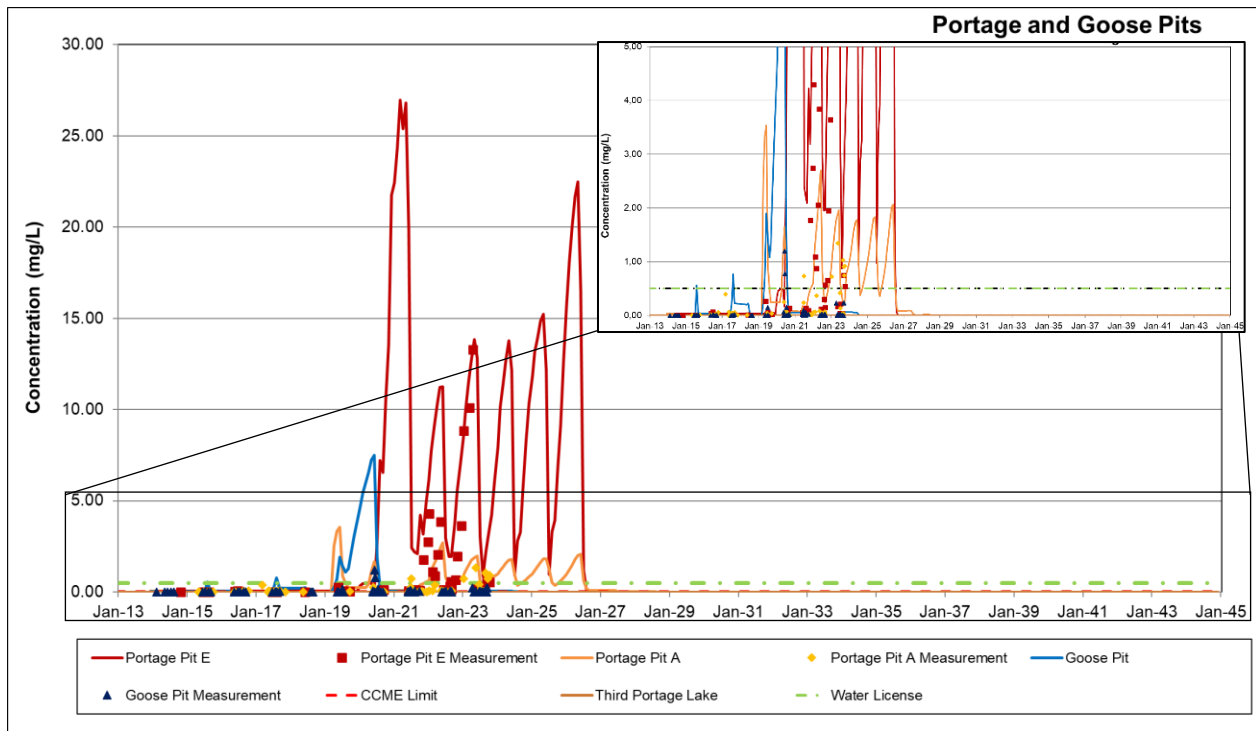
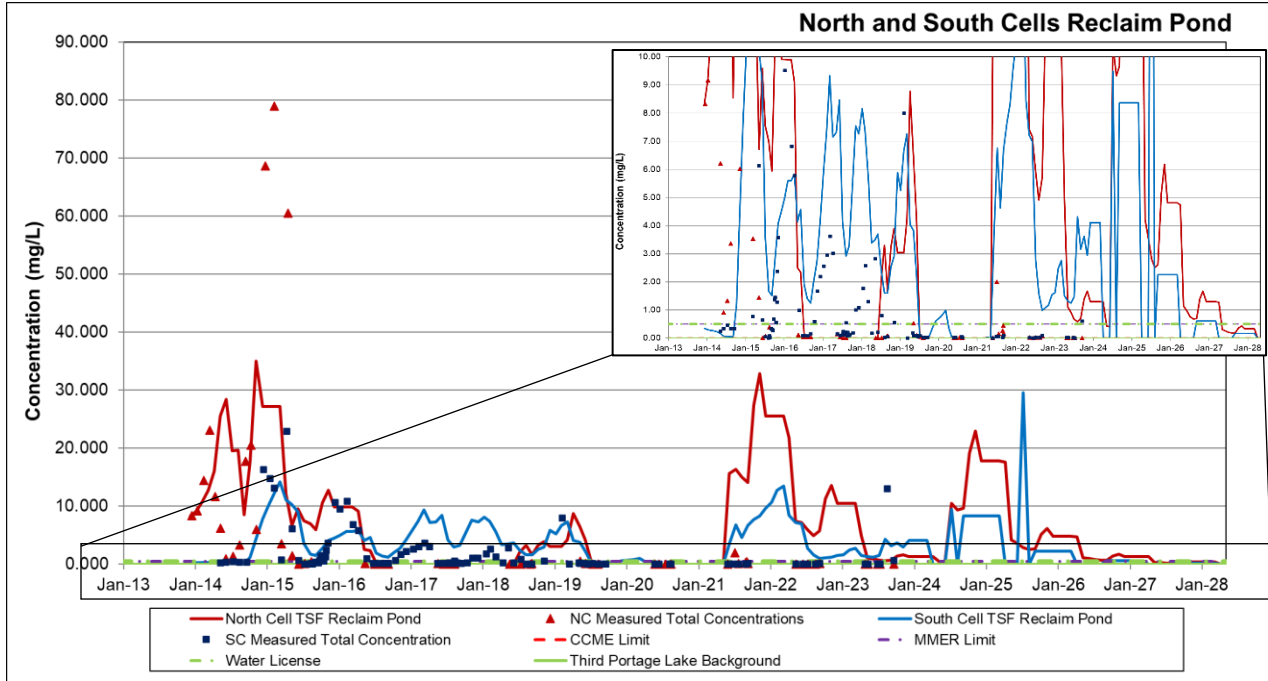


Figure 4-1: Total Cyanide Forecasted Concentration





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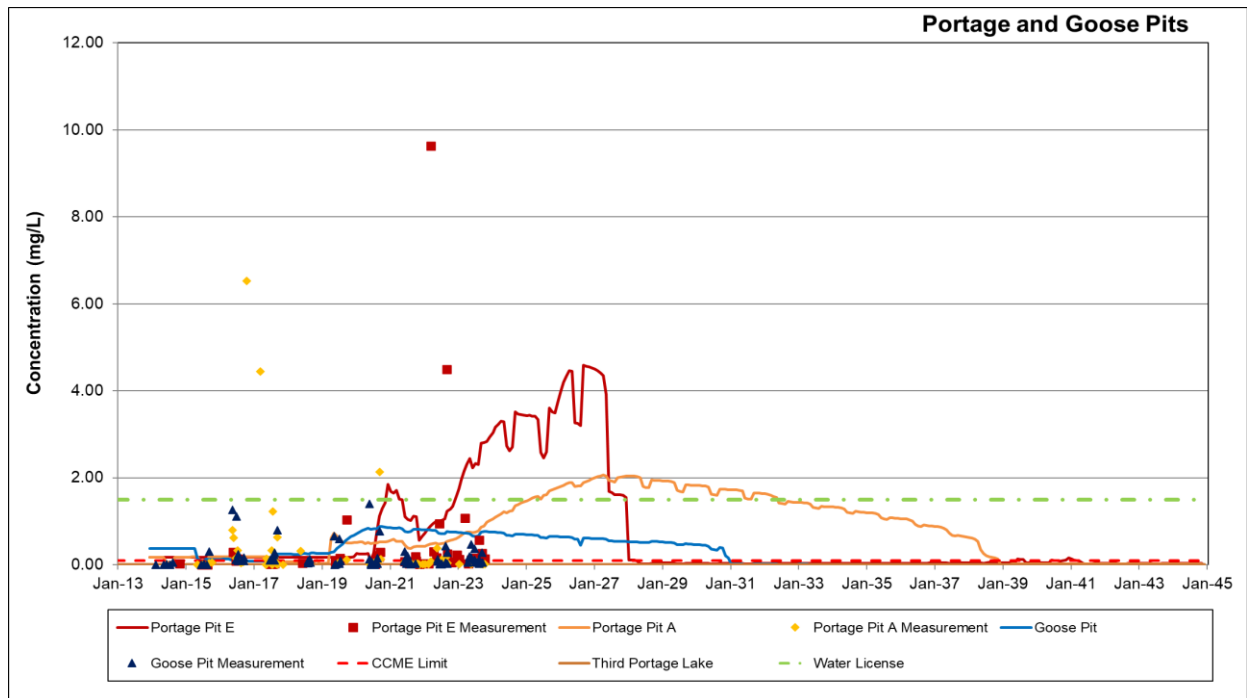
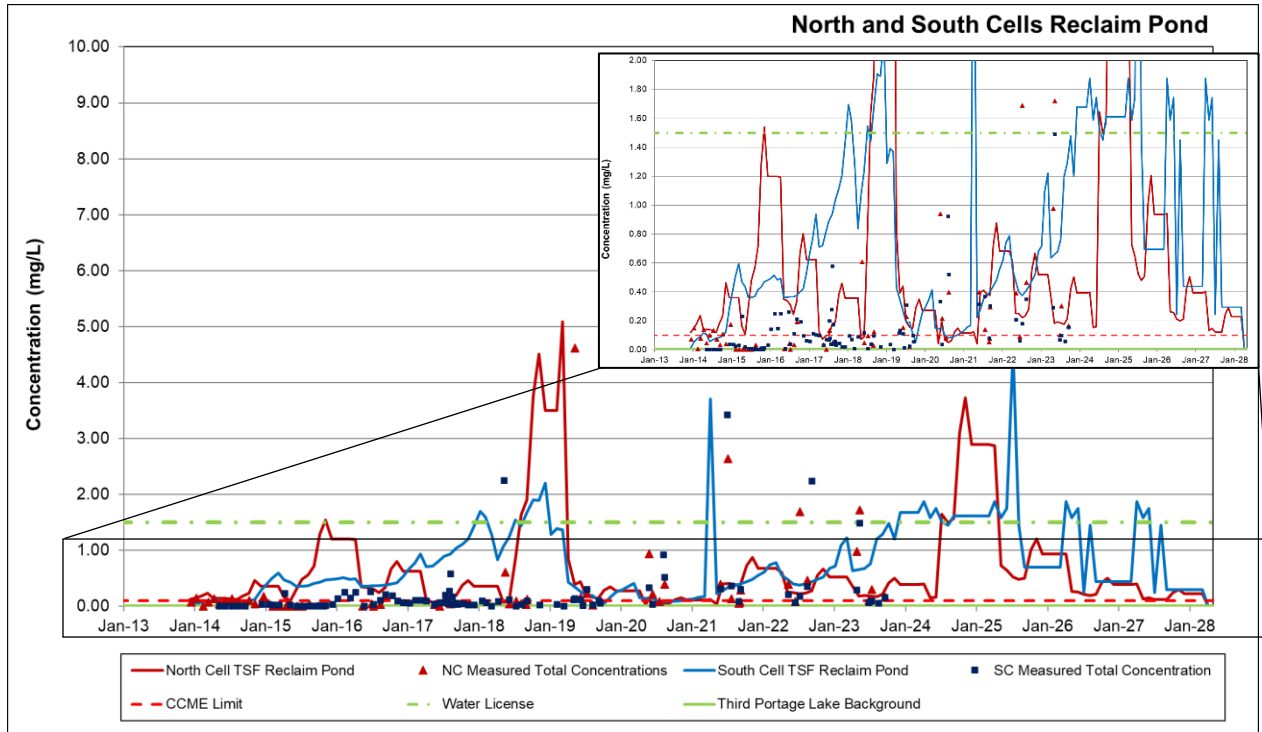


Figure 4-2: Total Aluminum Forecasted Concentration

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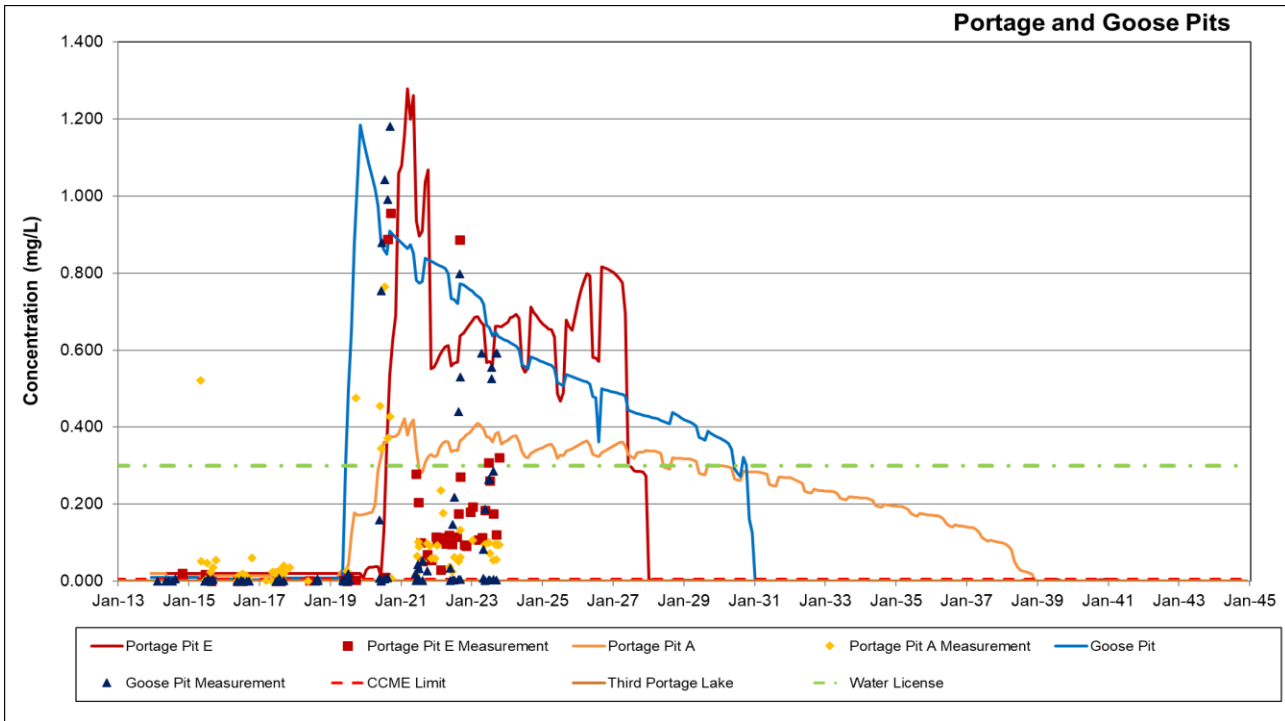
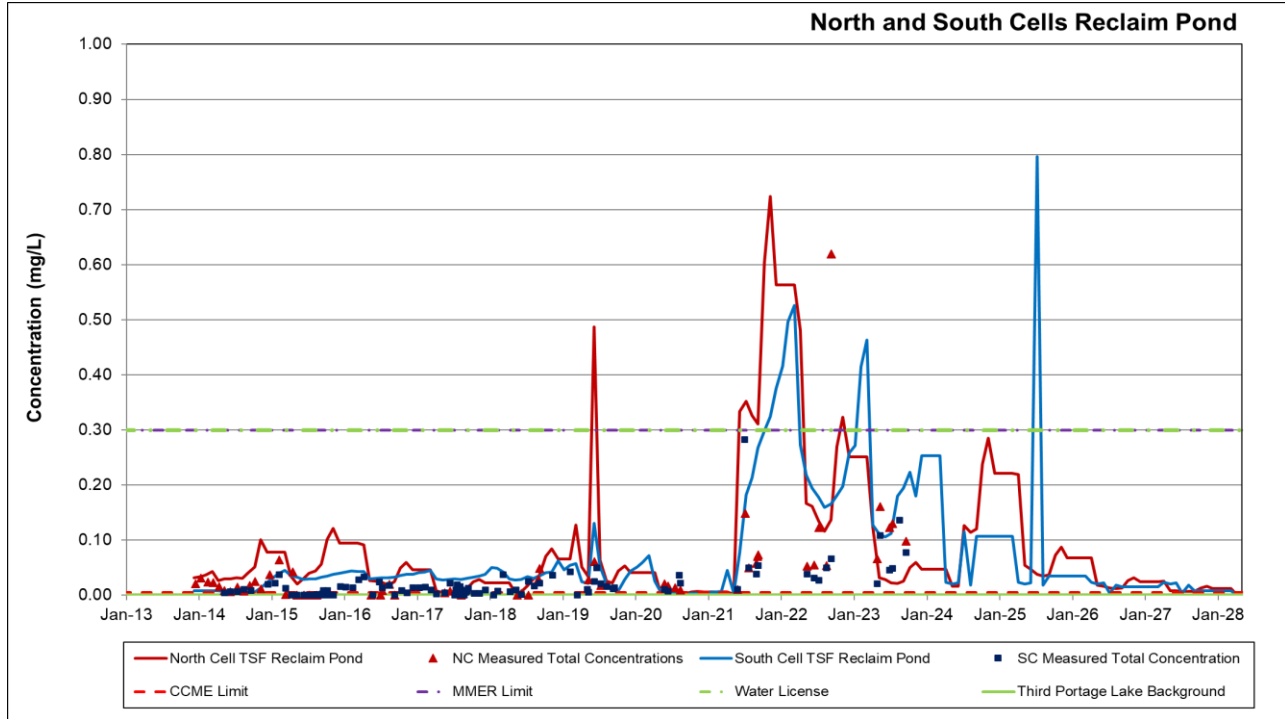


Figure 4-3: Total Arsenic Forecasted Concentration  
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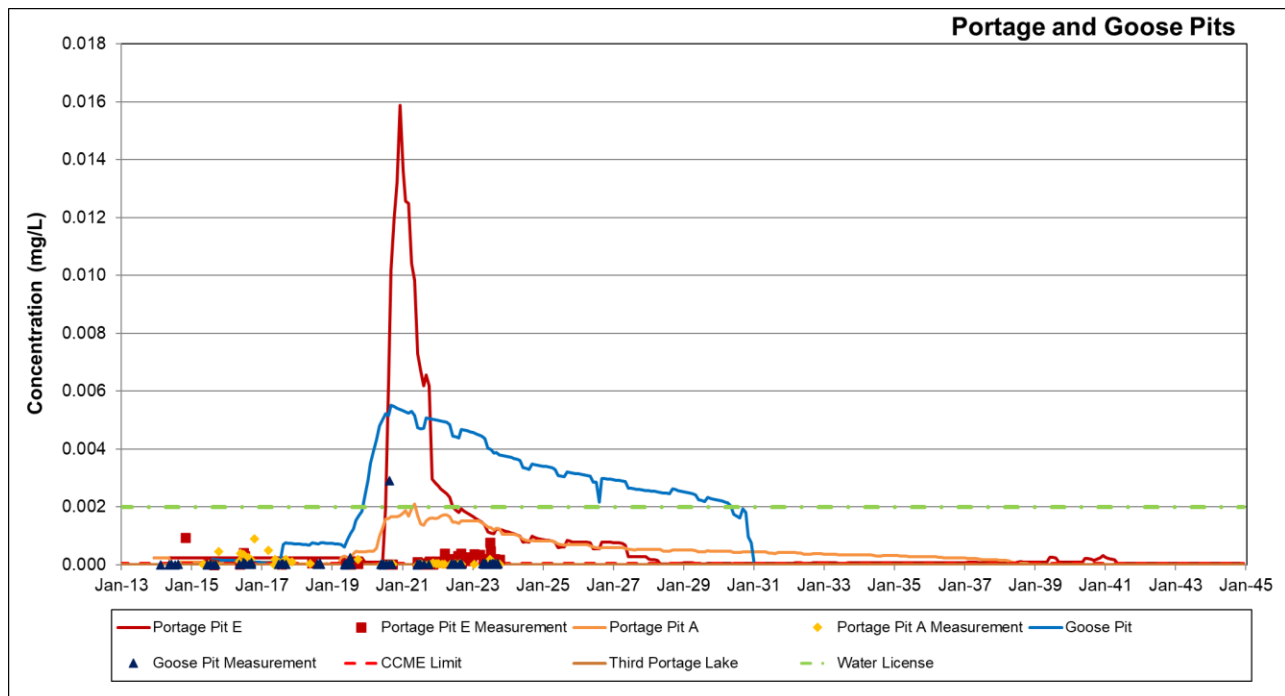
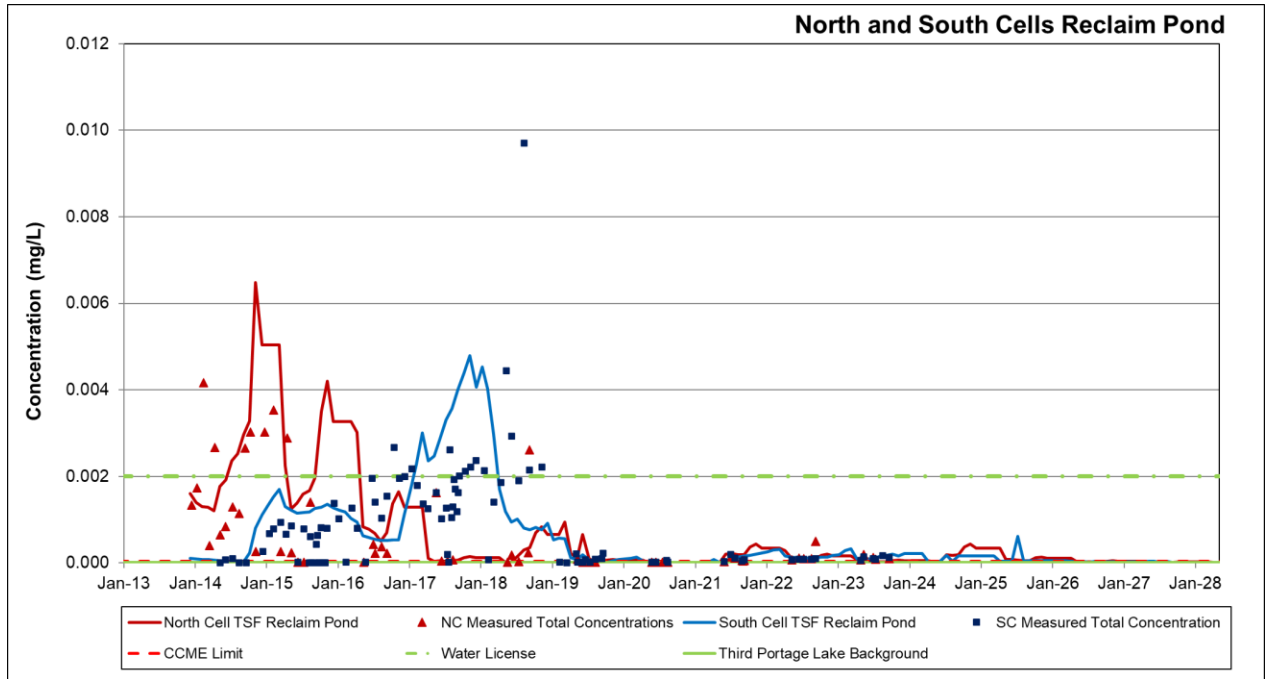


Figure 4-4: Total Cadmium Forecasted Concentration



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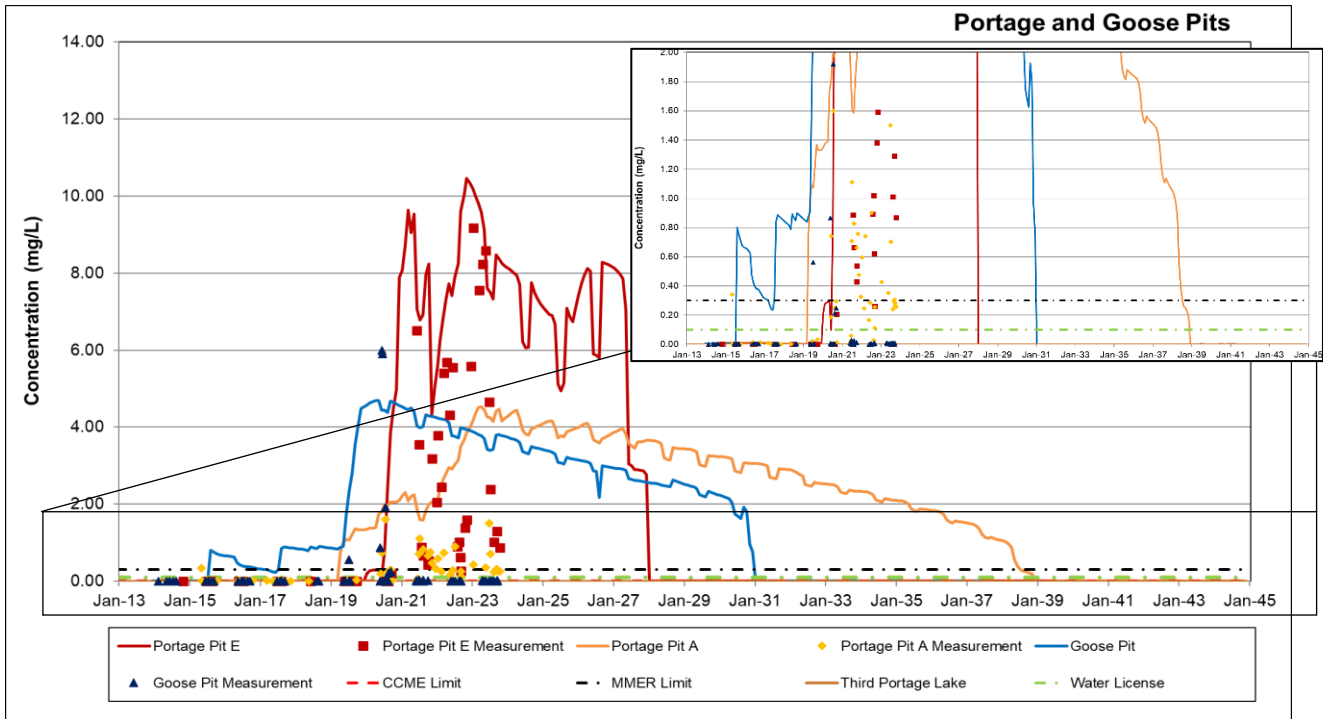
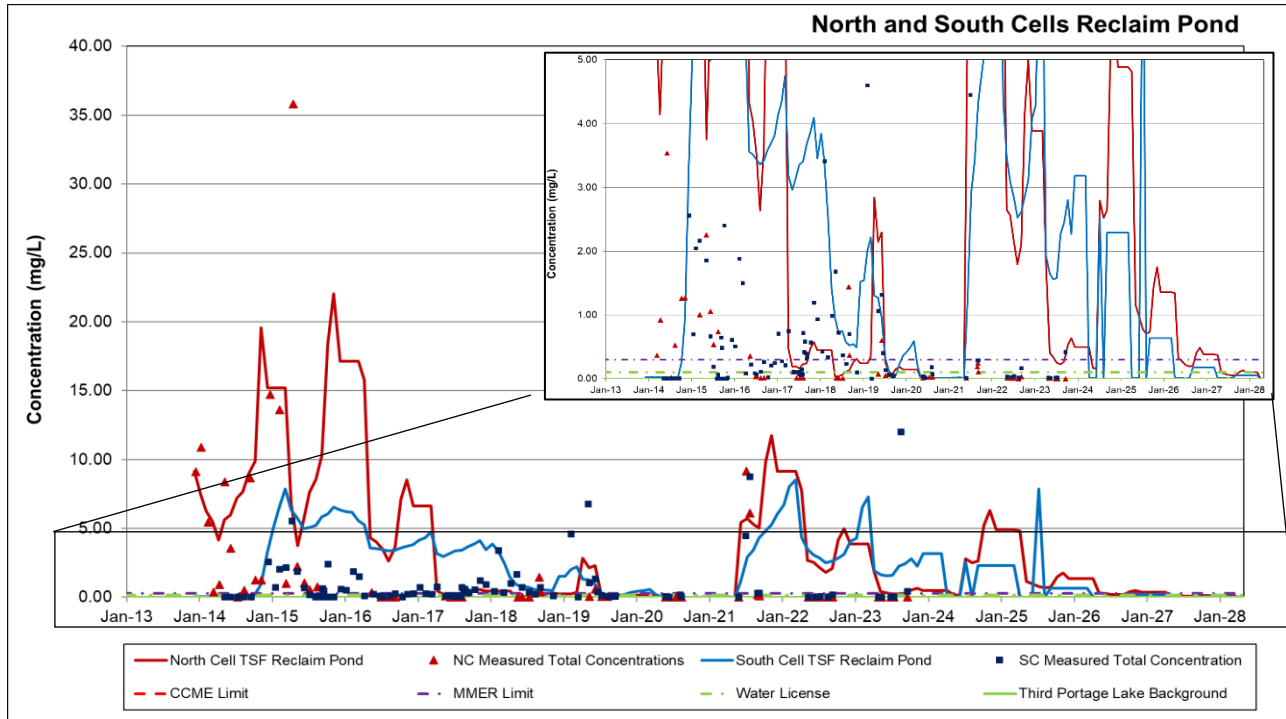


Figure 4-5: Total Copper Forecasted Concentration  
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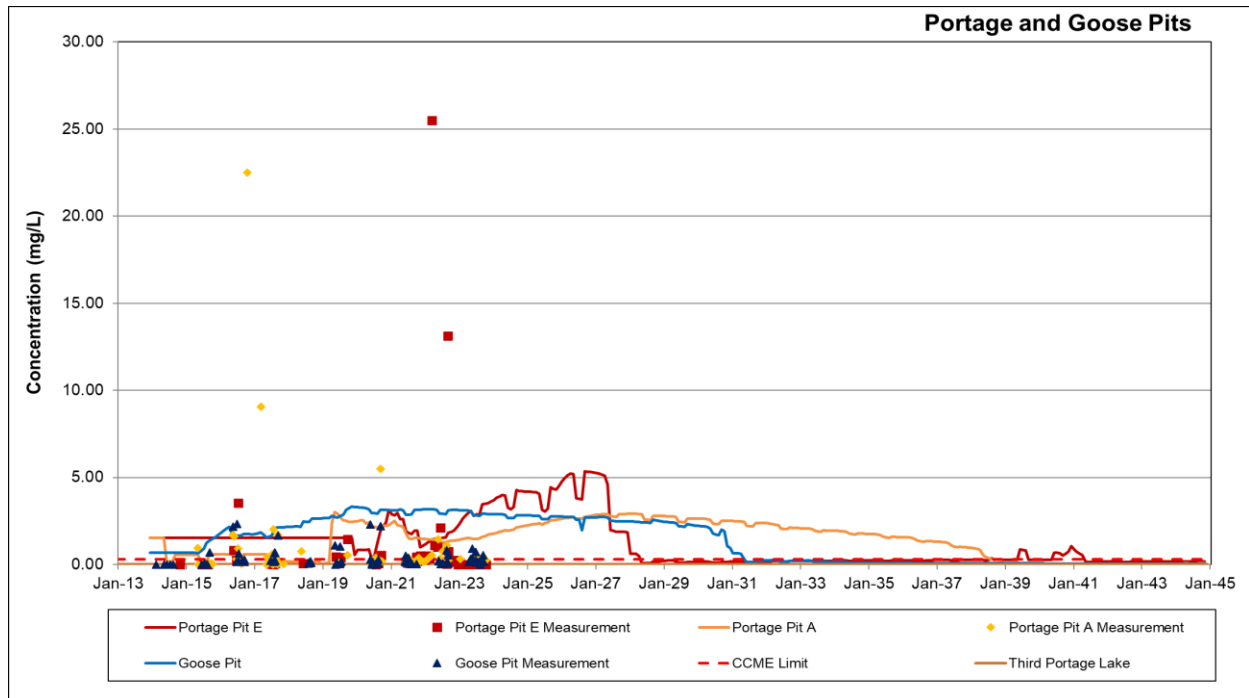
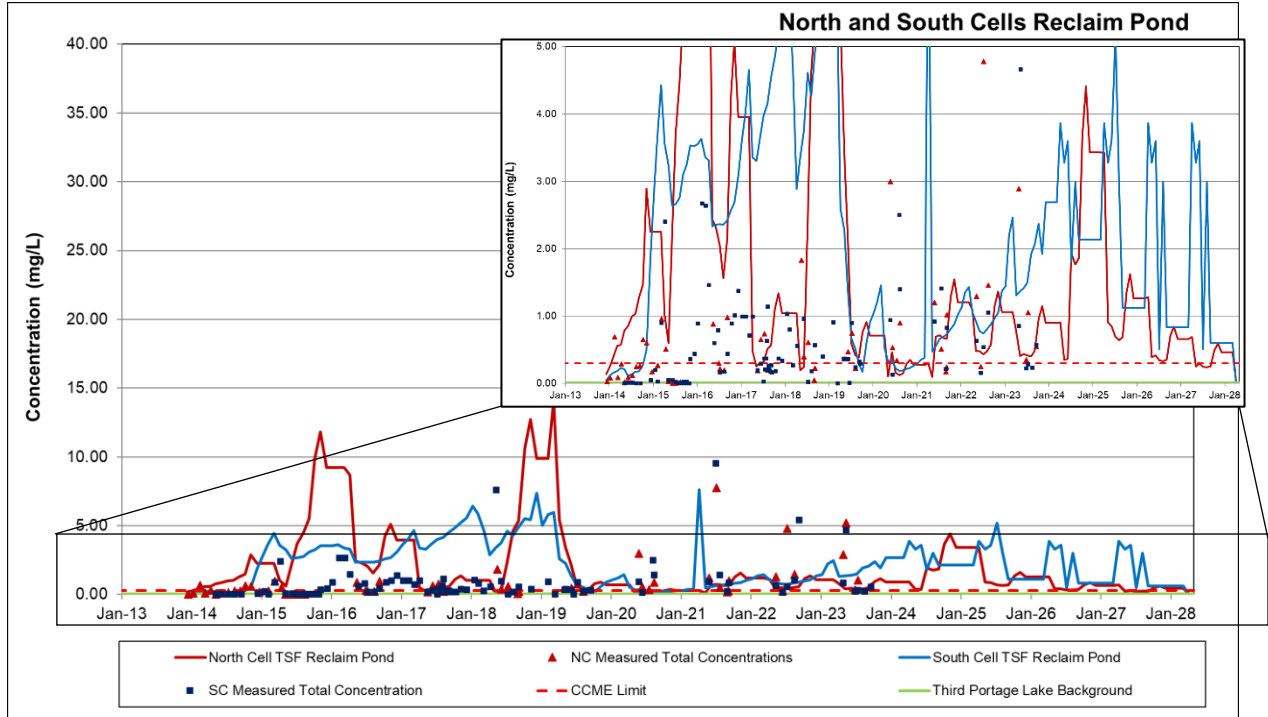


Figure 4-6: Total Iron Forecasted Concentration



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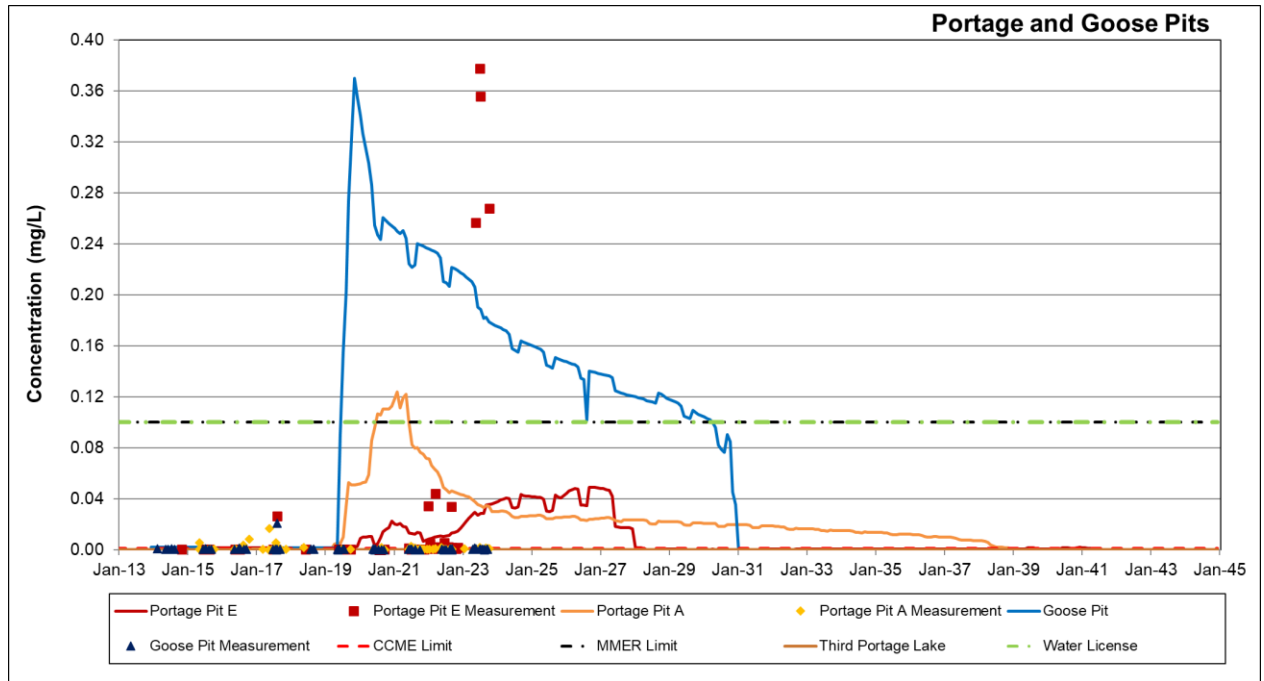
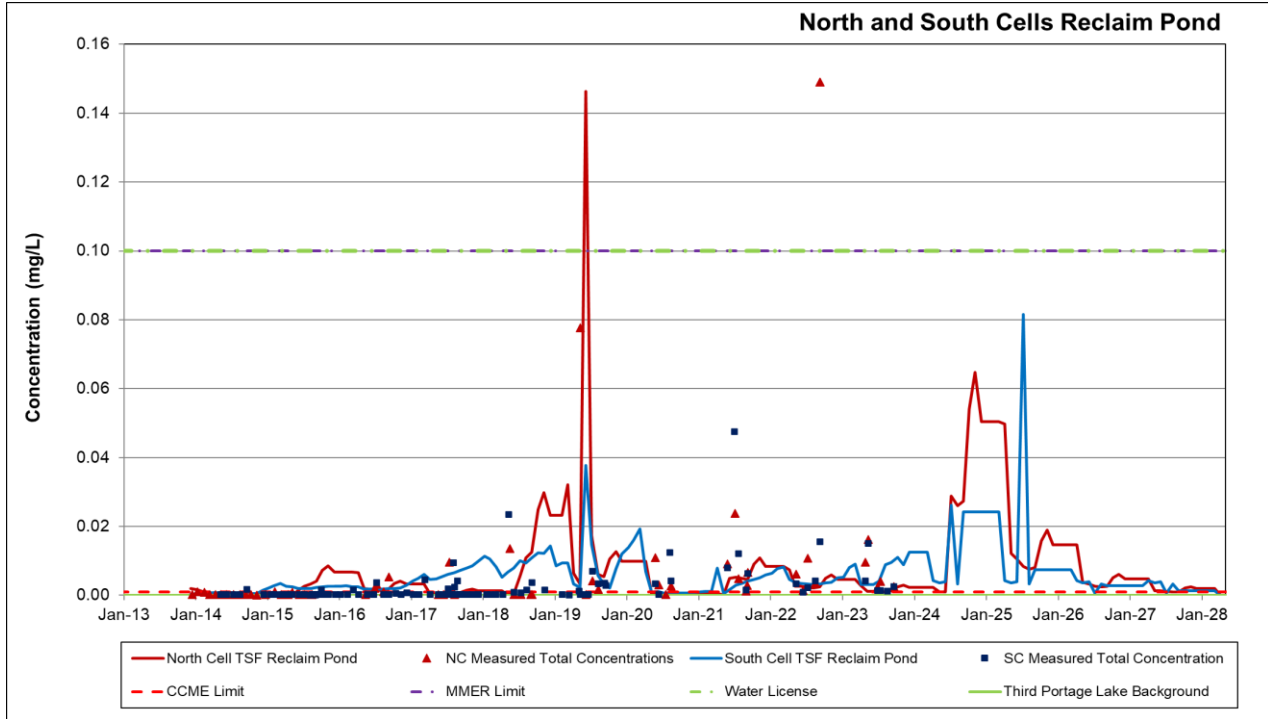


Figure 4-7: Total Lead Forecasted Concentration



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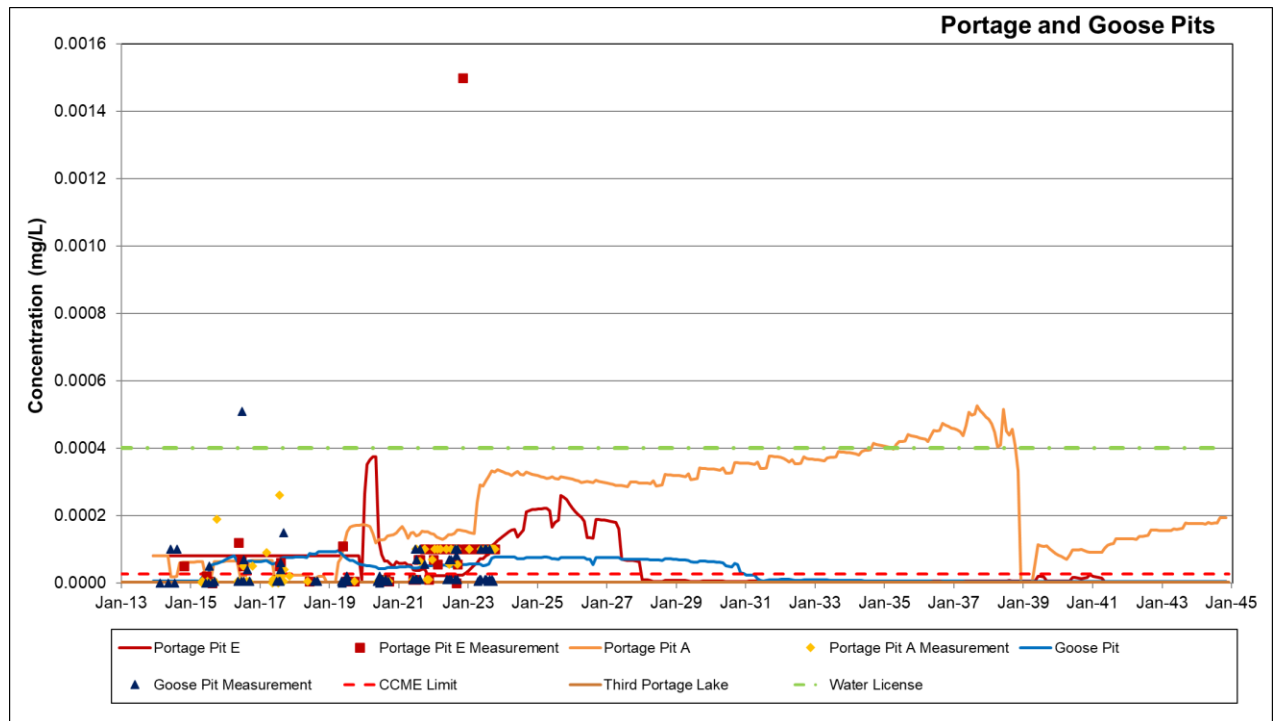
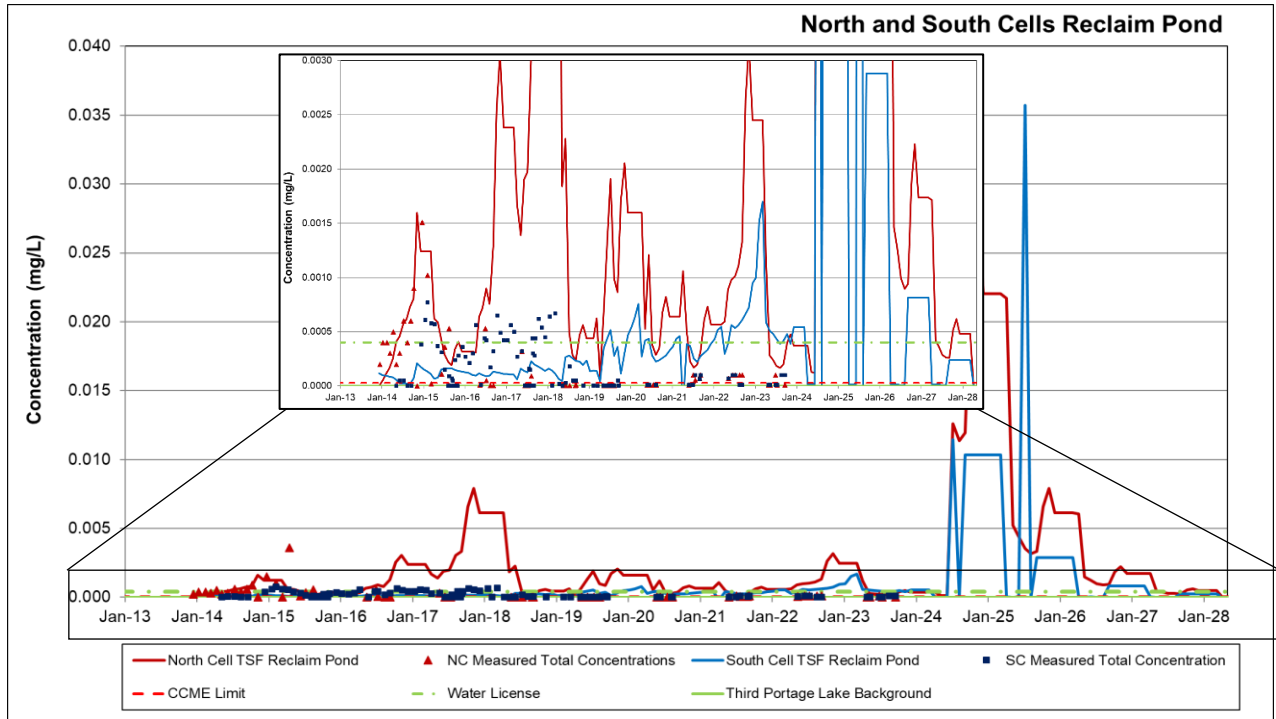


Figure 4-8: Total Mercury Forecasted Concentration  
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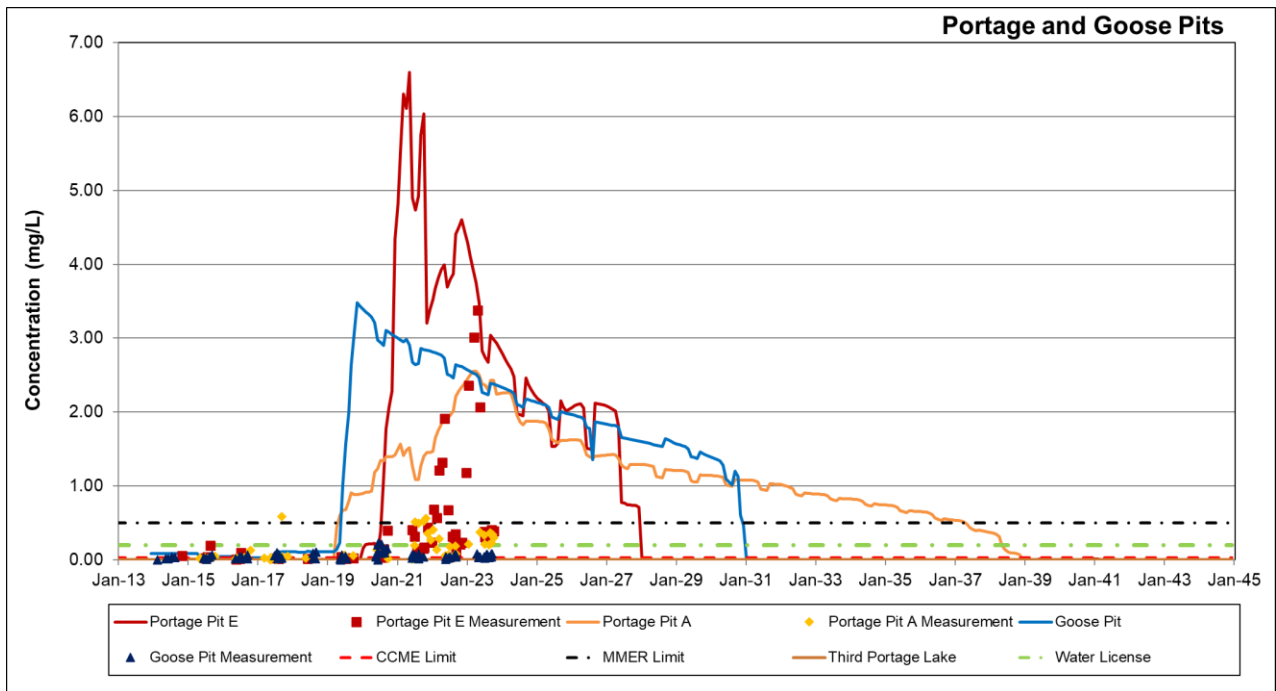
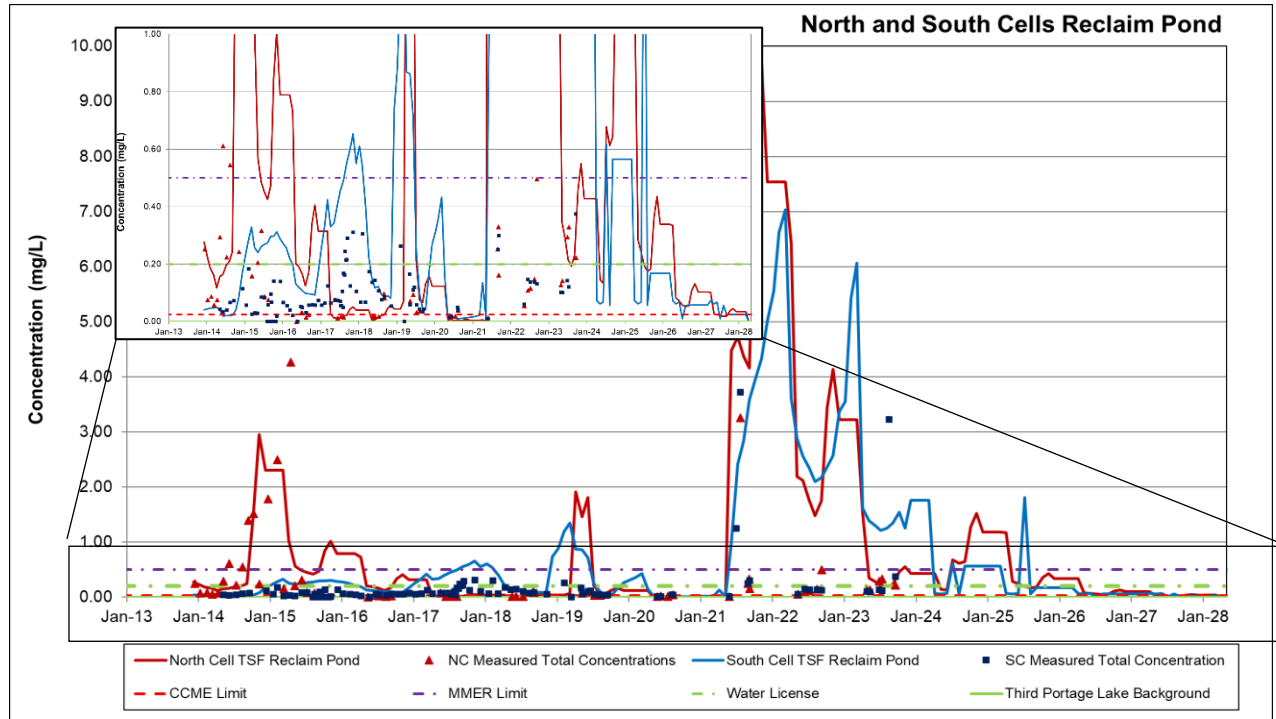


Figure 4-9: Total Nickel Forecasted Concentration





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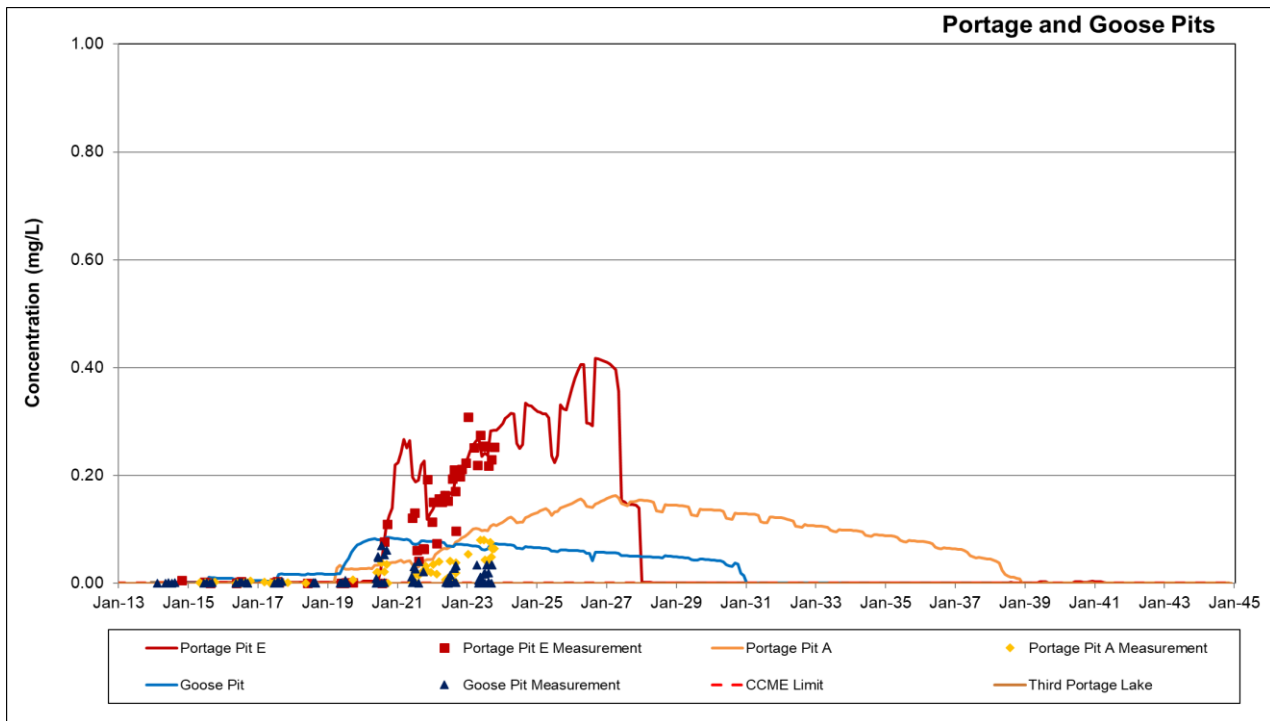
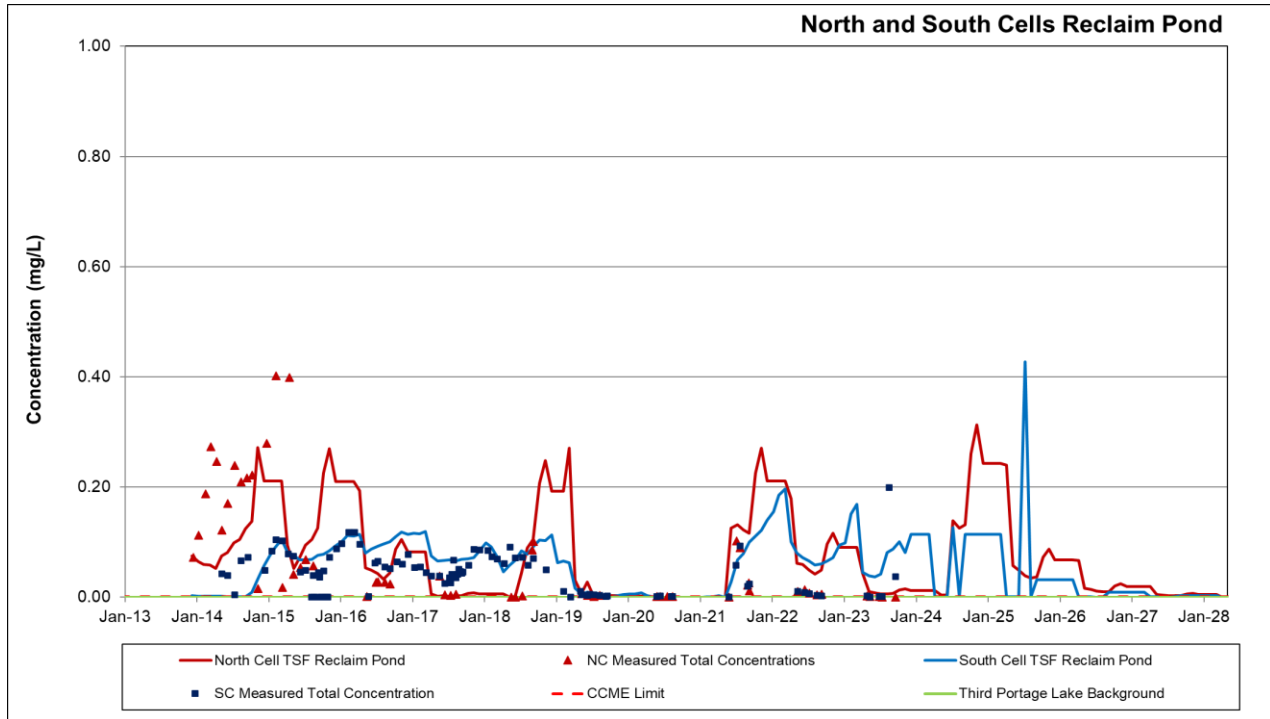


Figure 4-10: Total Selenium Forecasted Concentration  
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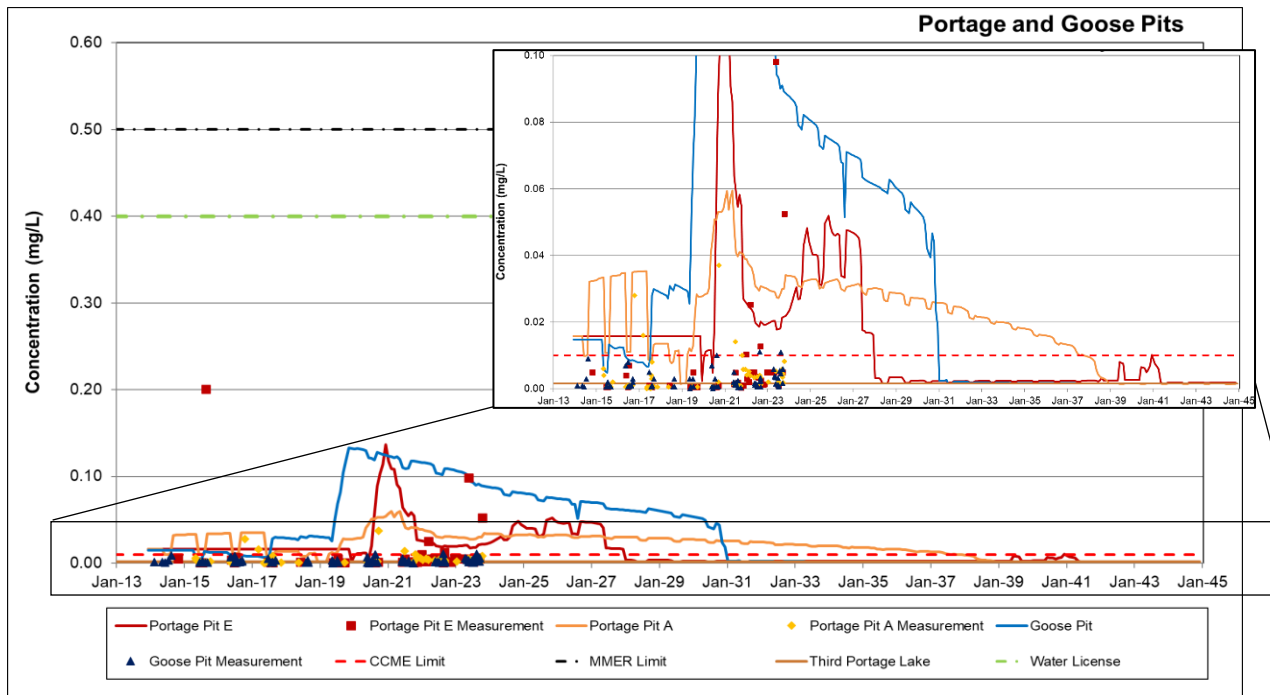
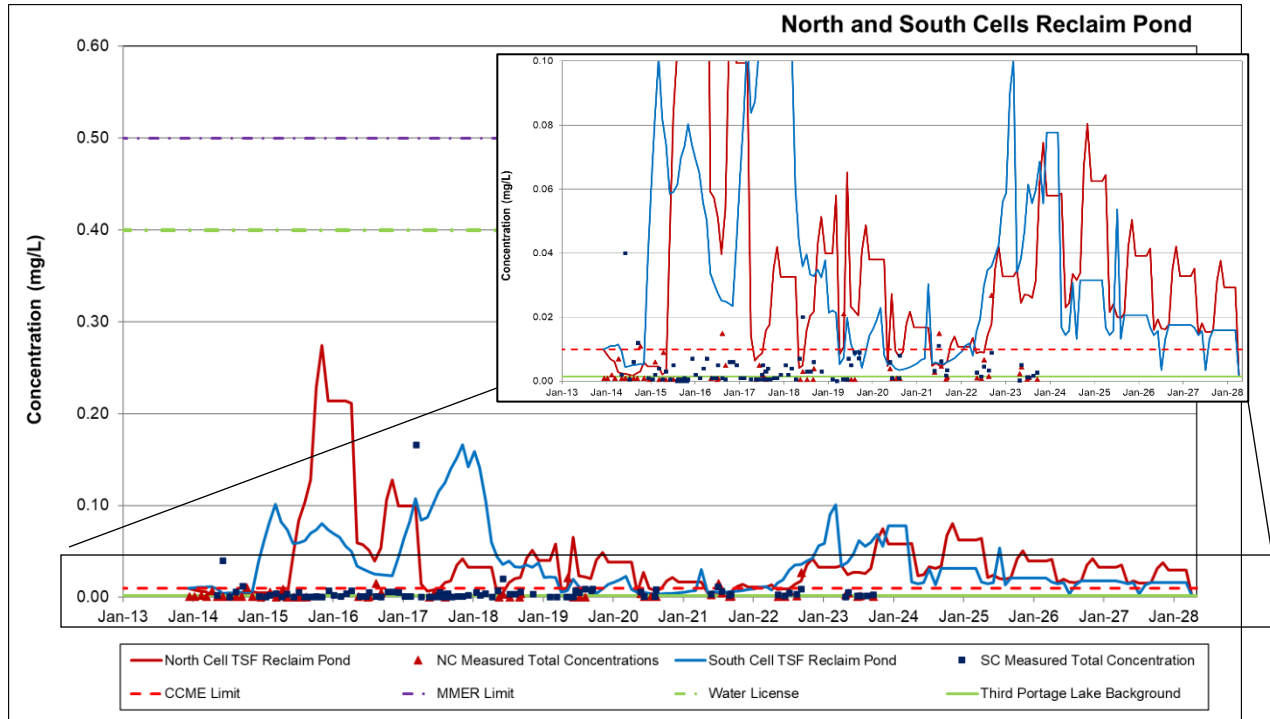


Figure 4-11: Total Zinc Forecasted Concentration



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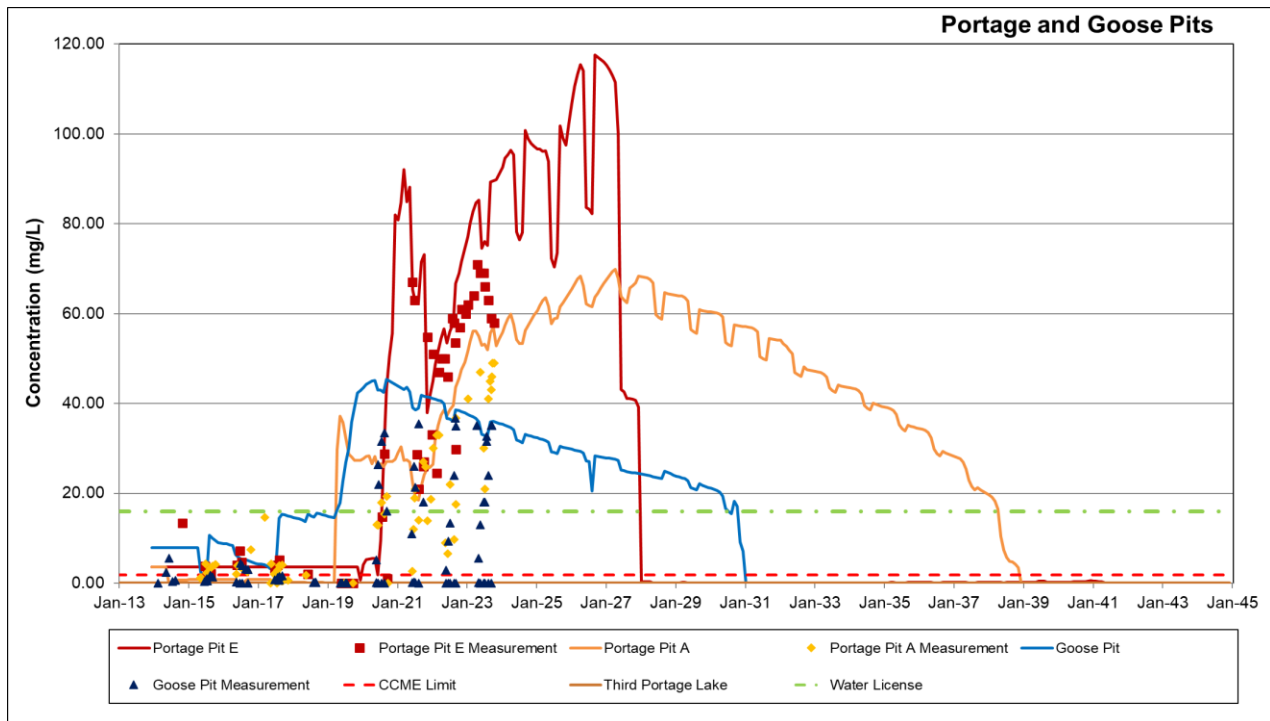
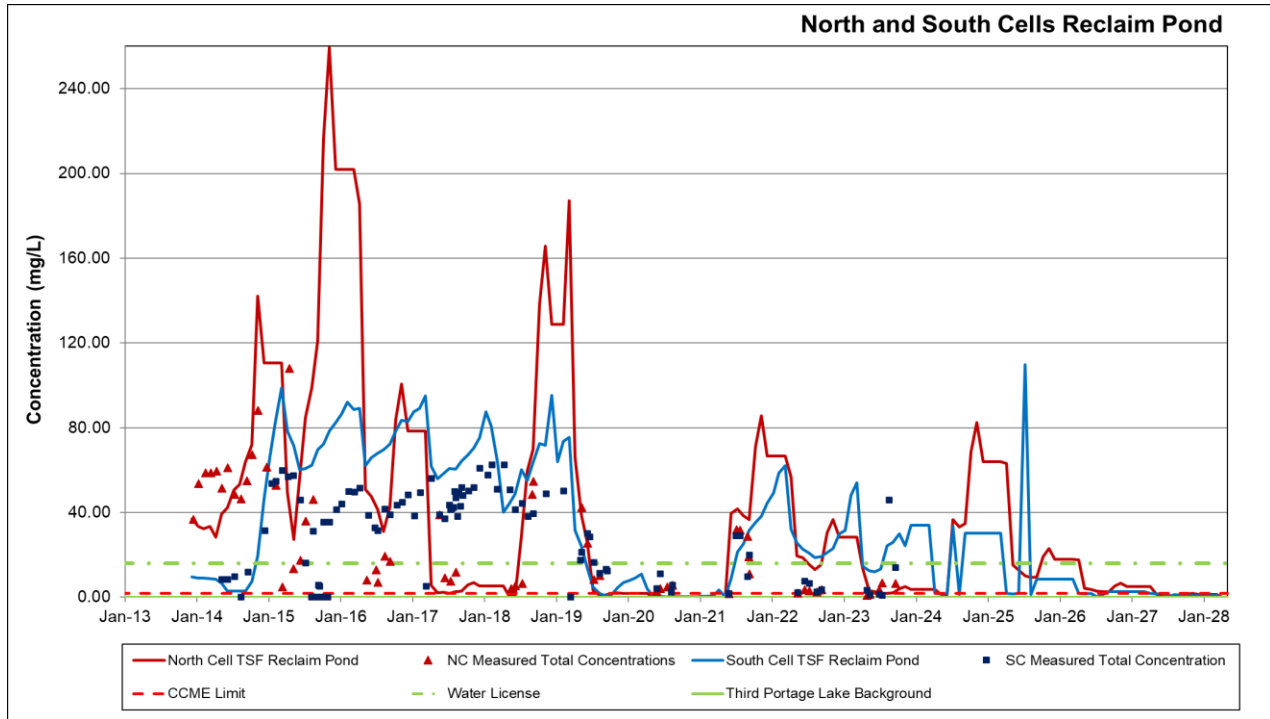


Figure 4-12: Total Ammonia Forecasted Concentration  
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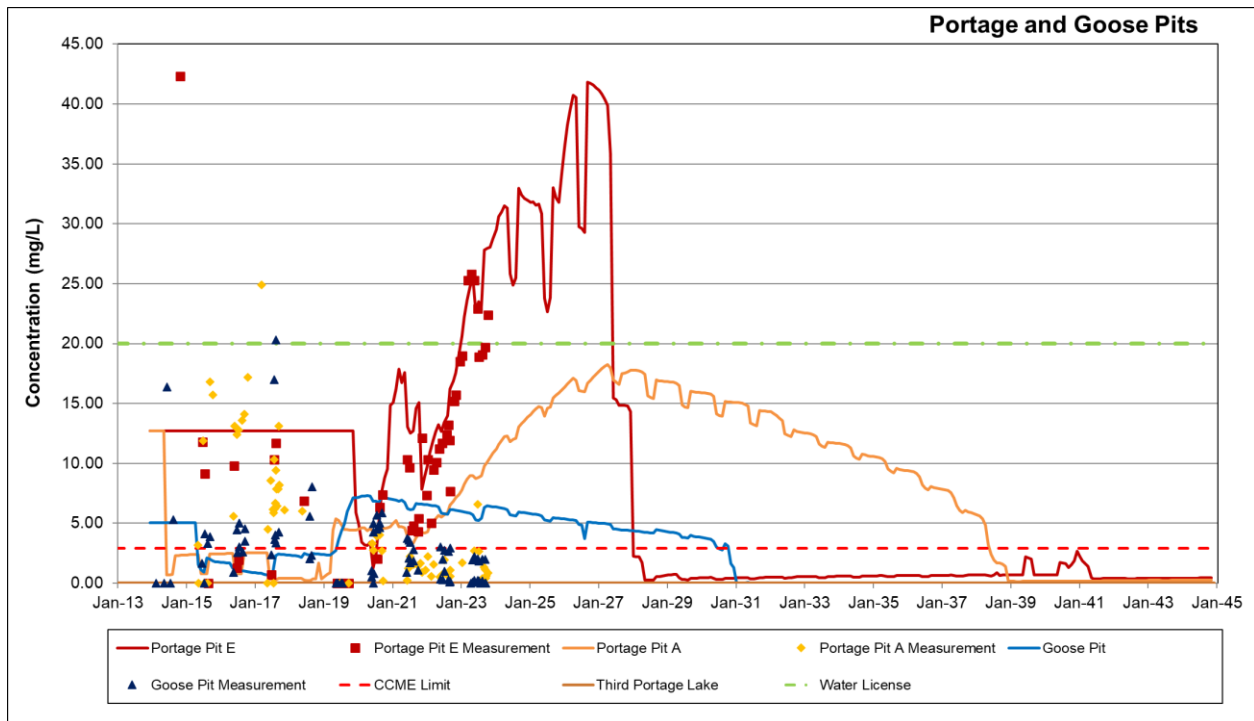
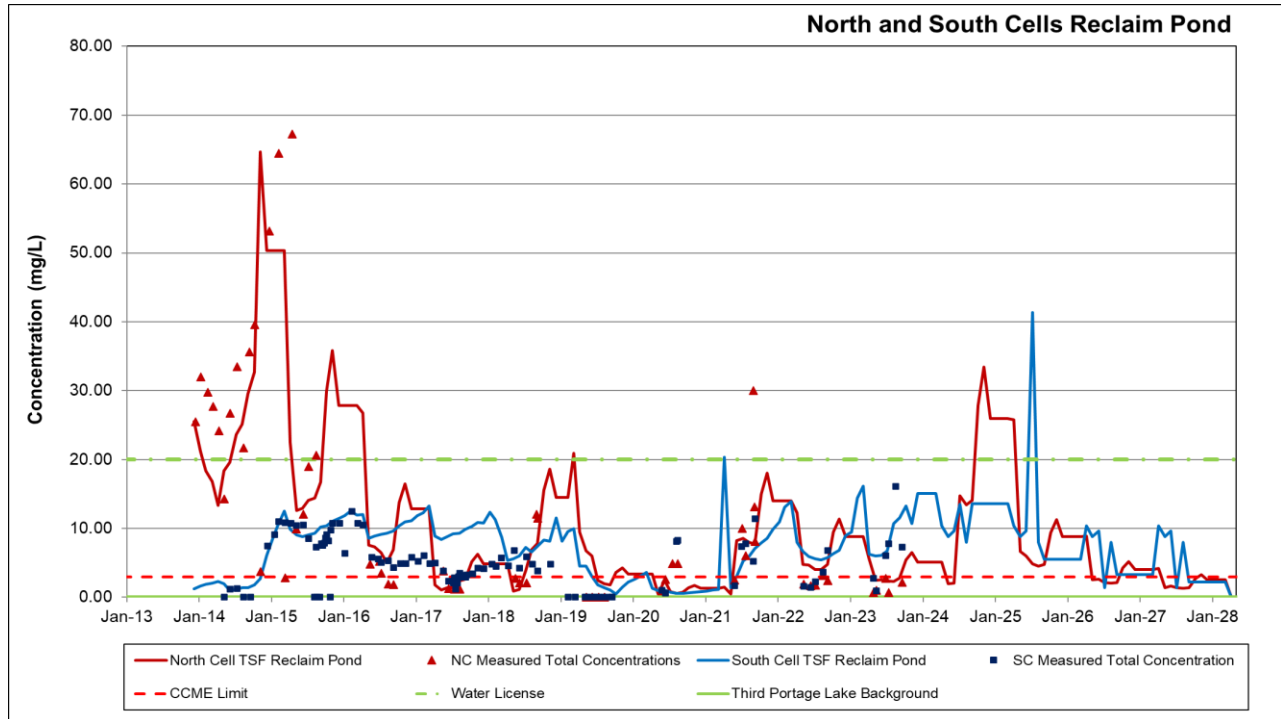


Figure 4-13: Nitrate Forecasted Concentration  
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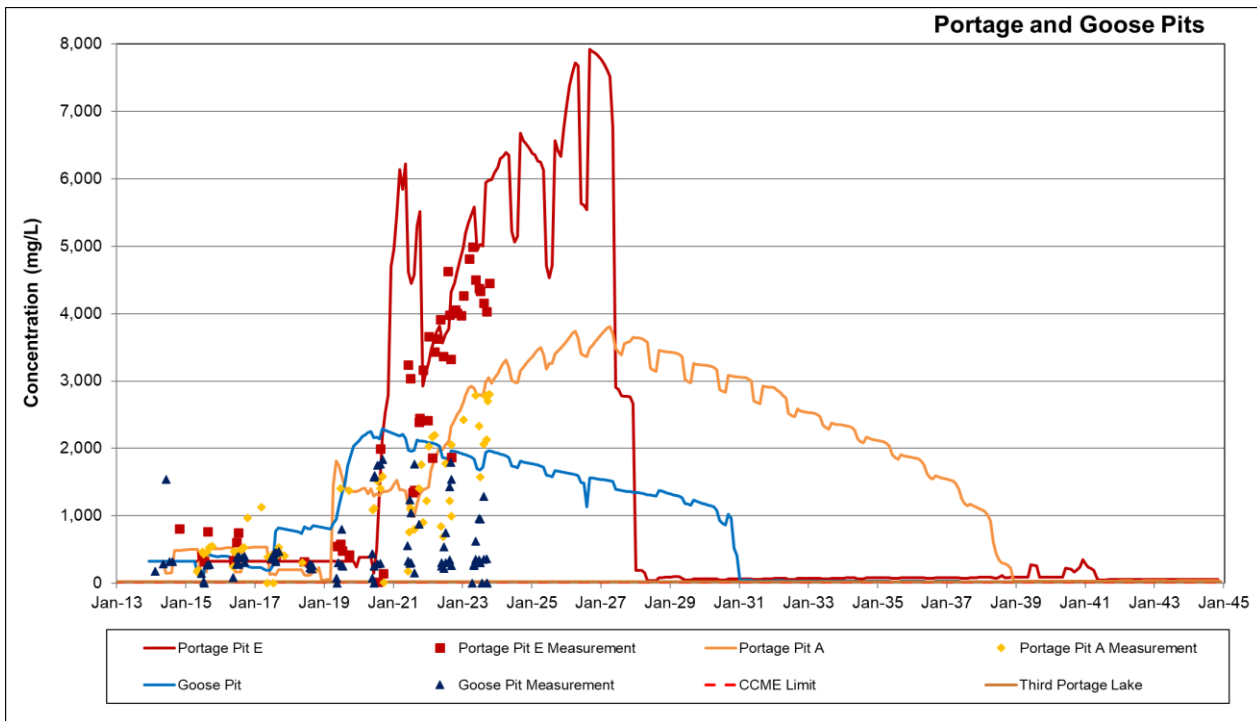
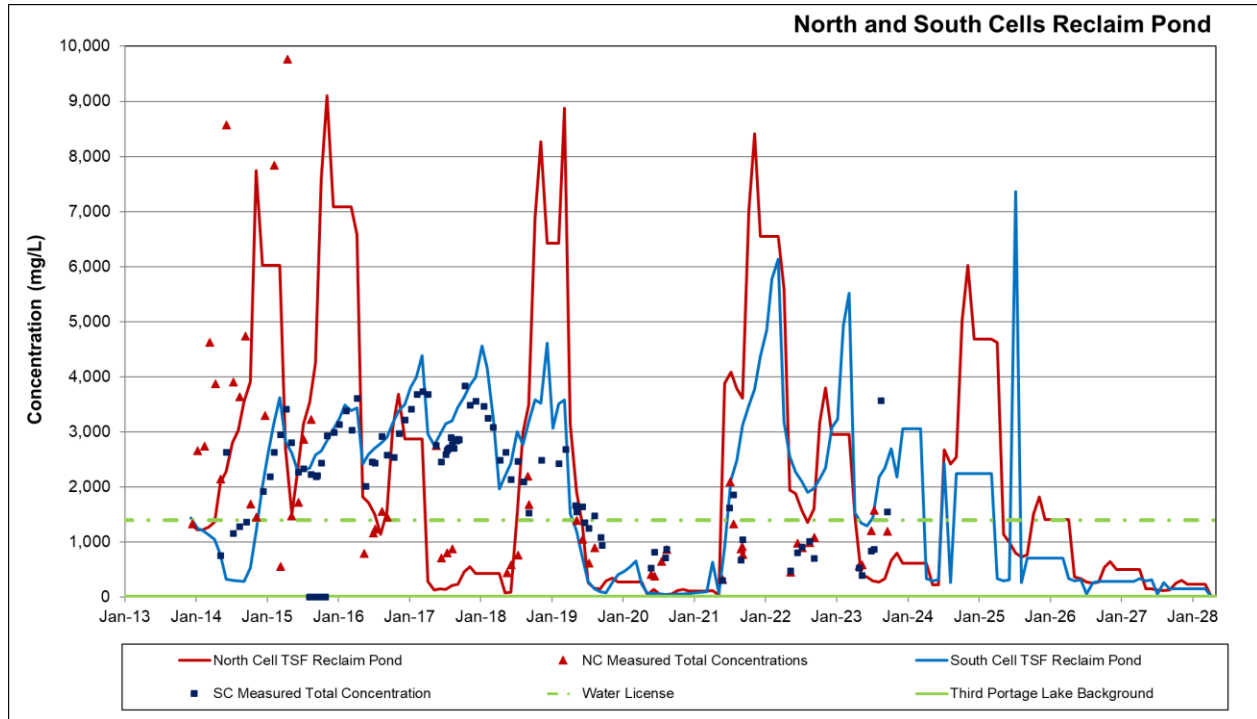


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**Figure 4-14: Total Dissolved Solids Forecasted Concentration**

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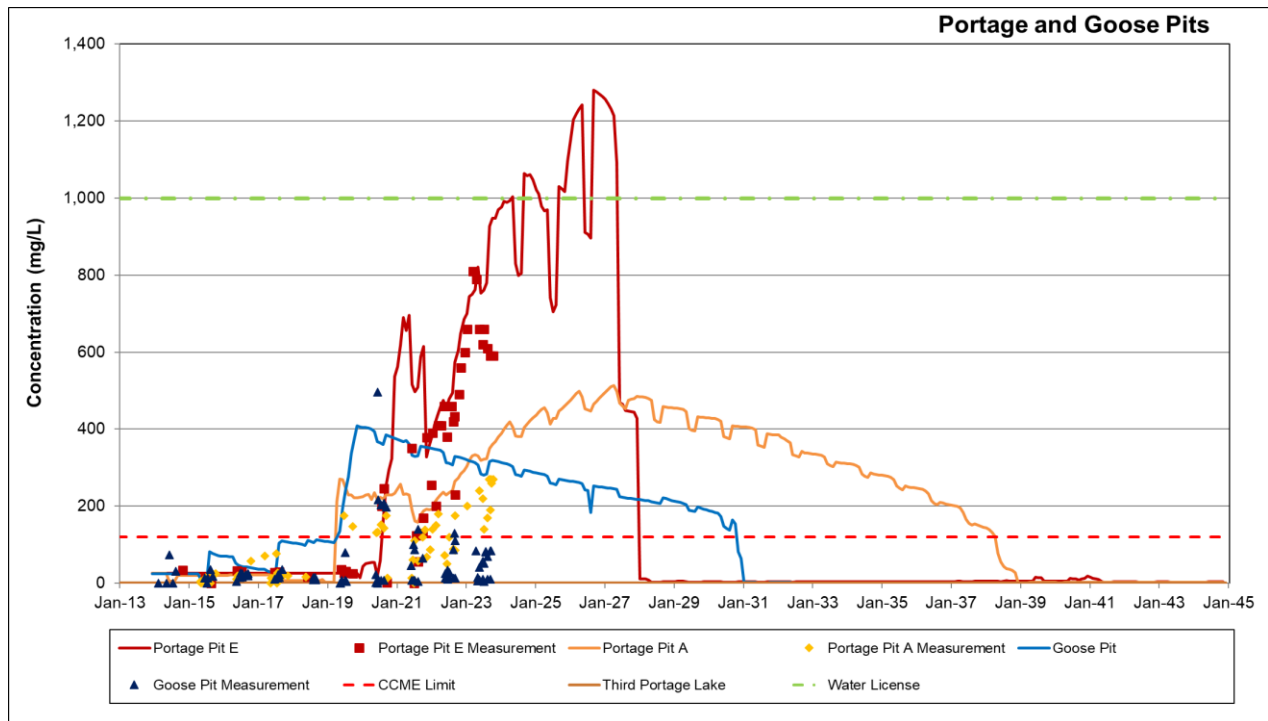
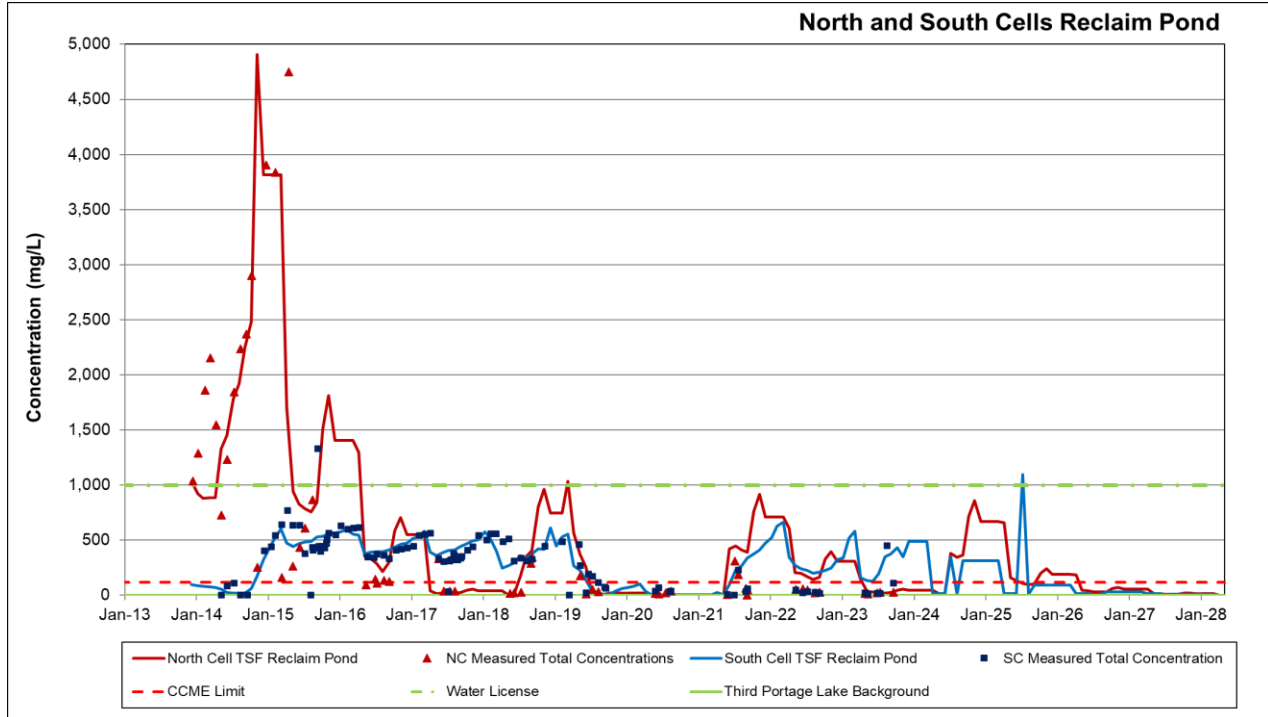


Figure 4-15: Chloride Forecasted Concentration  
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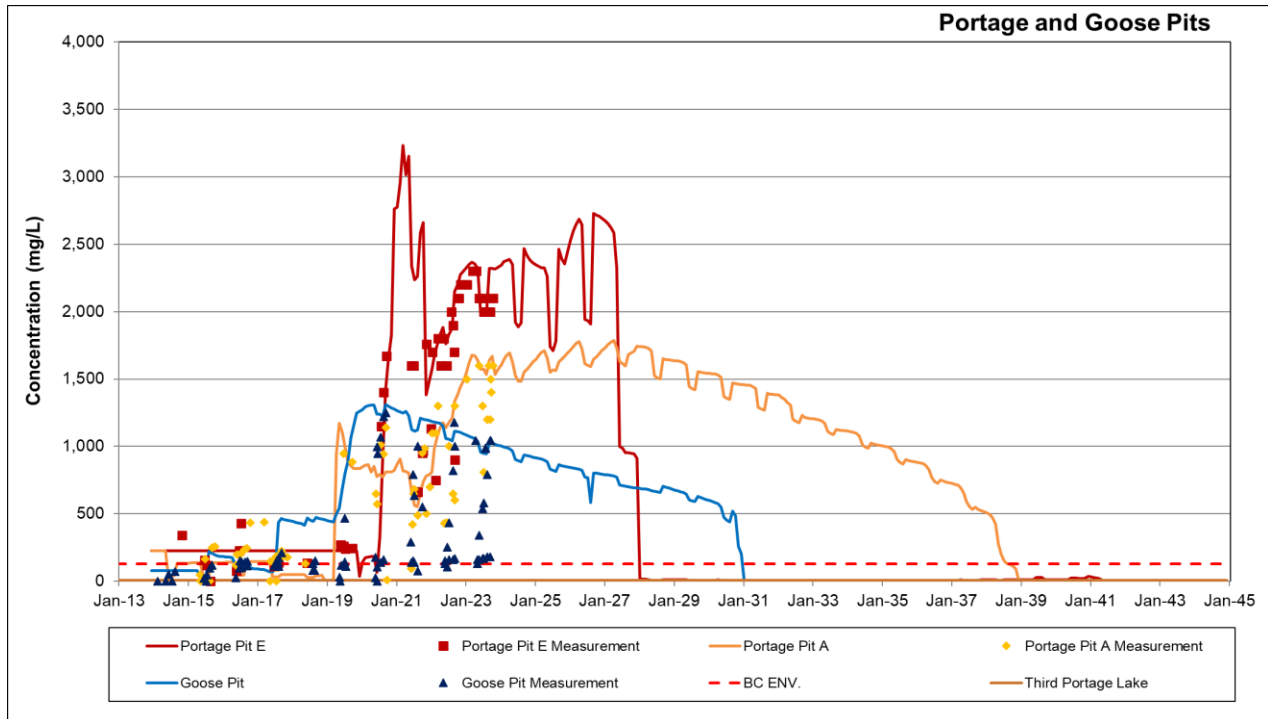
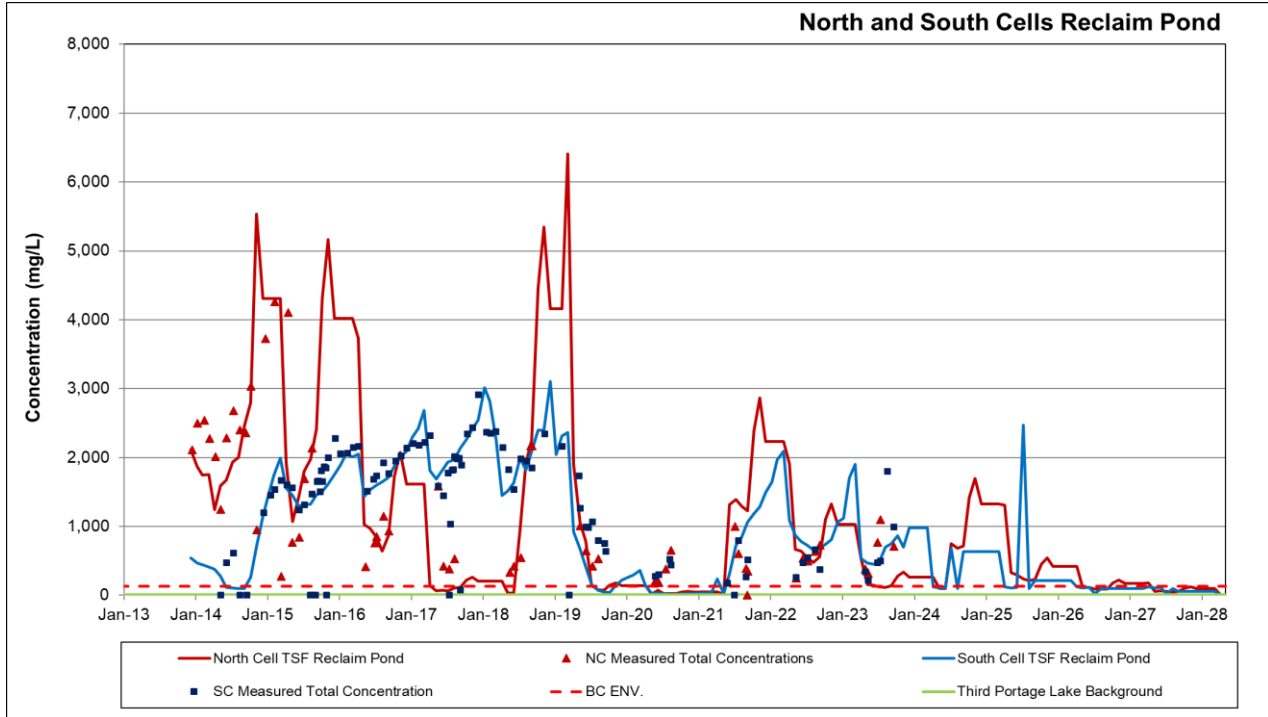


Figure 4-16: Sulphate Forecasted Concentration  
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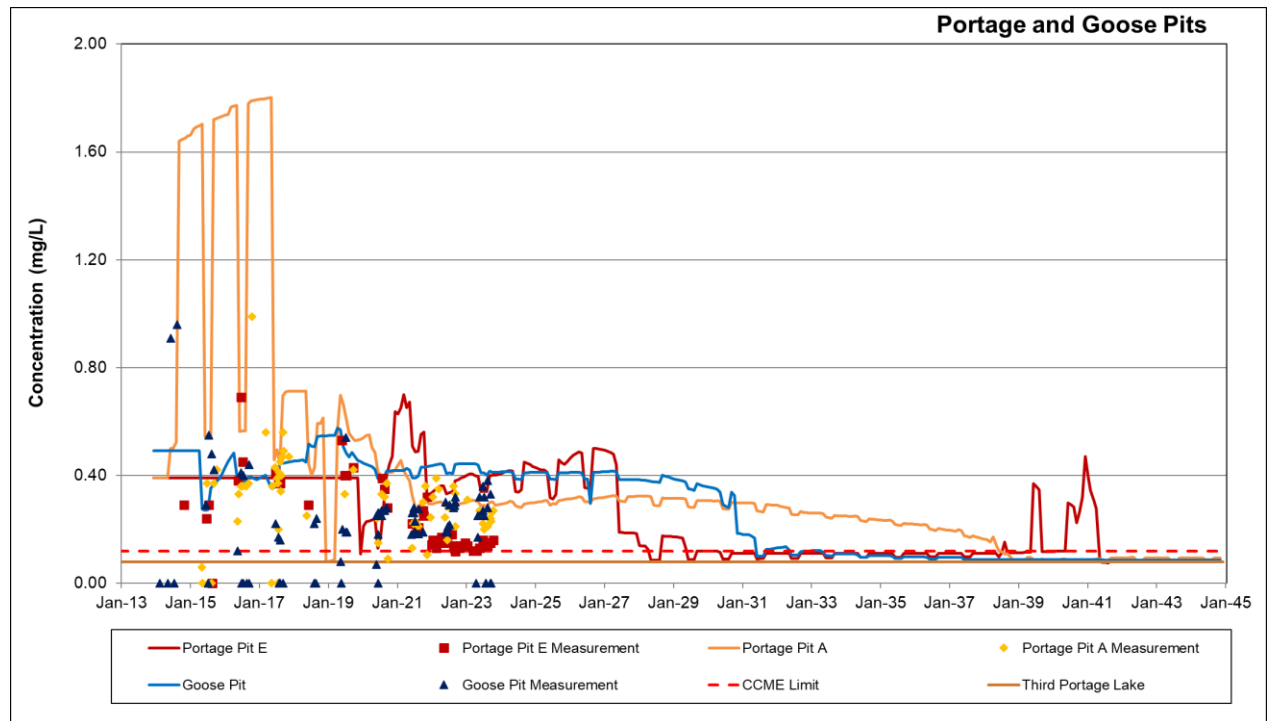
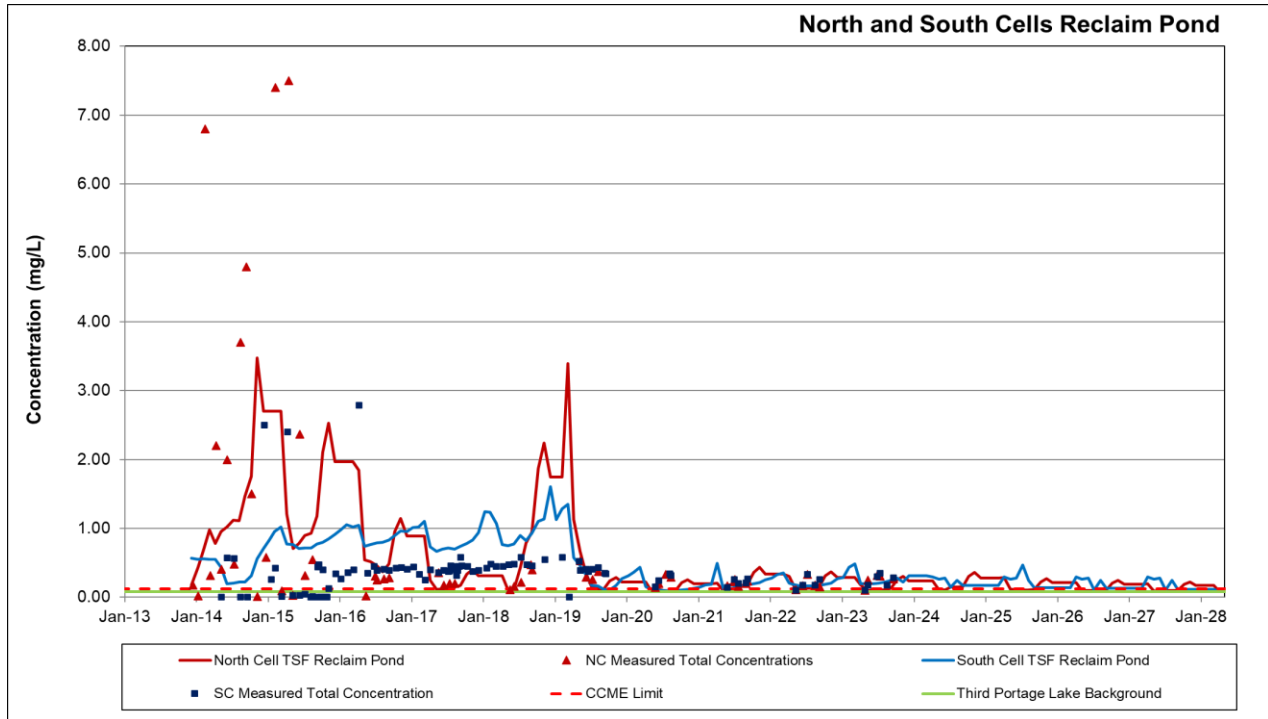


Figure 4-17: Fluoride Forecasted Concentration  
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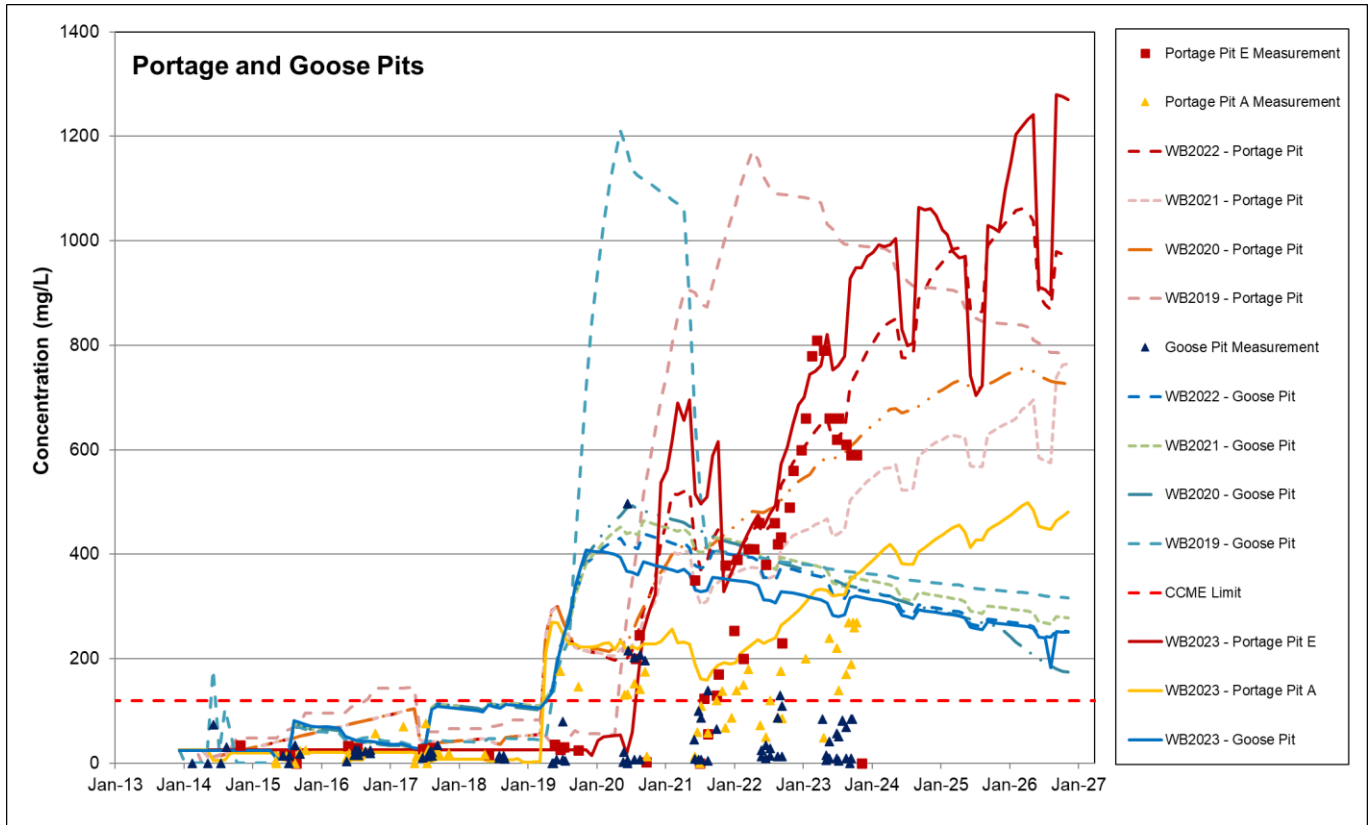


Figure 4-18: Comparison of Forecasted Chloride Concentration in Portage and Goose Pits



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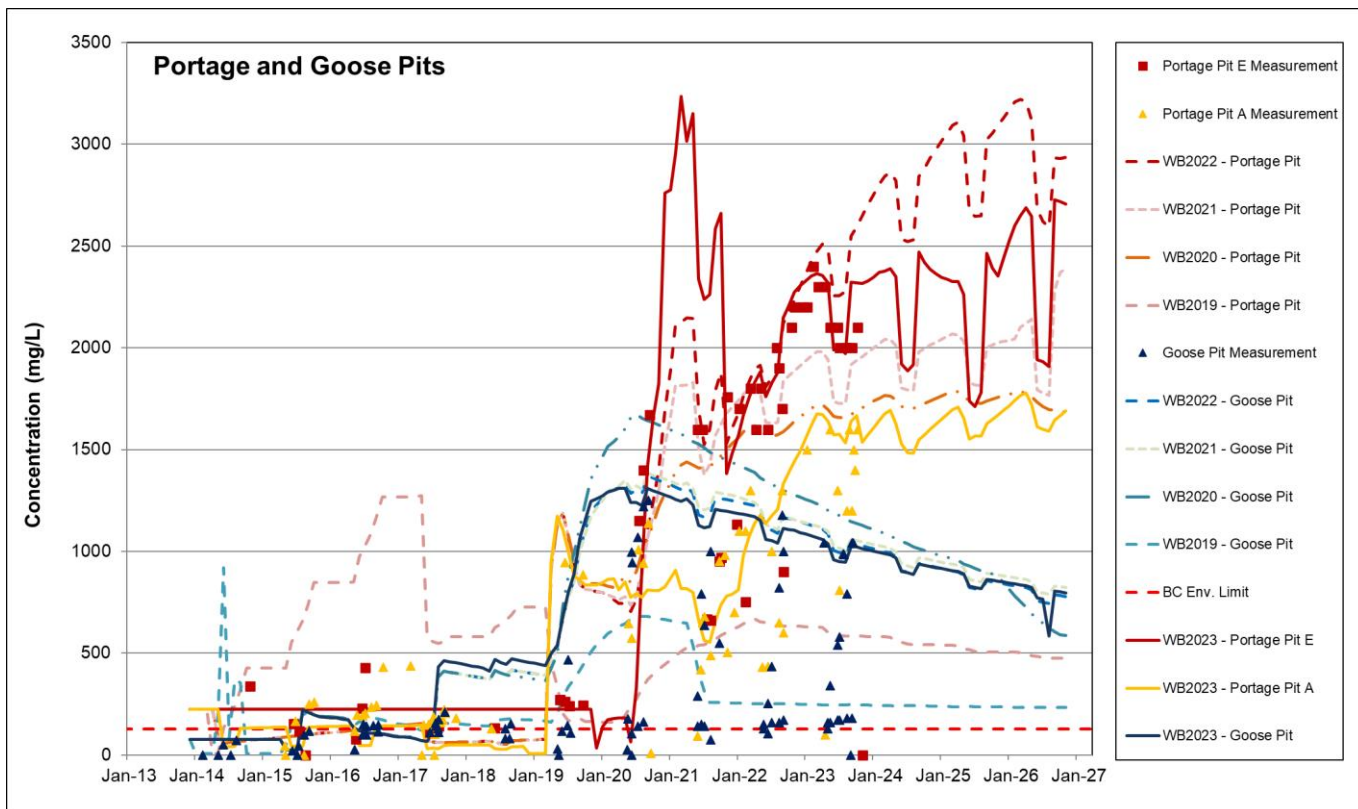



Figure 4-19: Comparison of Forecasted Sulphate Concentration in Portage and Goose Pits

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### 4.2.5 Sensitivity Analysis

The water quality forecast model provides a high-level evaluation of the impact of Mill Effluent on the future water quality in the North and South Cell TSF Reclaim Pond and Portage and Goose Pits. The model provides only an order of magnitude forecast of the concentration trends in these areas.

For demonstration purposes only, a sensitivity analysis was conducted on Total Arsenic, Copper and Nickel in Portage Pit E for year 2023 to 2026 (end of deposition). A water quality forecast for each of these parameters was evaluated assuming a Mill Effluent concentration equal to the 25<sup>th</sup> and 95<sup>th</sup> percentile of the water quality data sampled in 2023. The following figures compare the forecasted concentration against the results based on the 25<sup>th</sup> and 95<sup>th</sup> percentile data.

It is important to note that every year, the water quality forecast input parameters are adjusted to match the measured values sampled on site in North and South Cell TSF and Portage and Goose Pits.

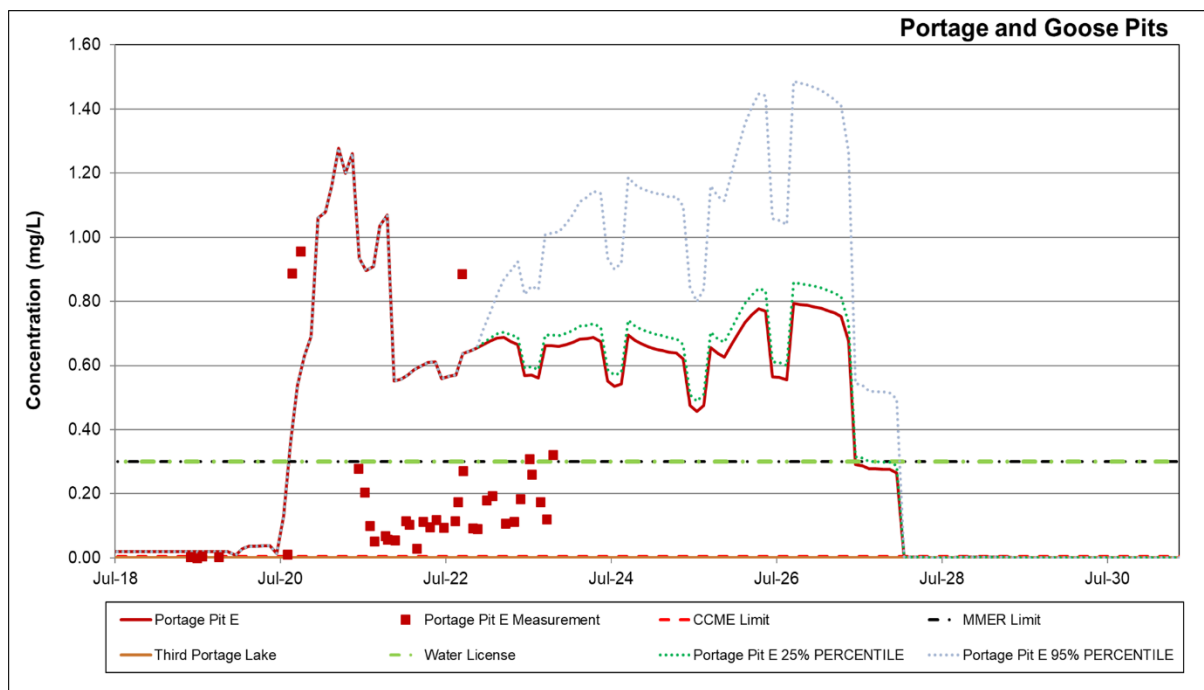


Figure 4-20: Sensitivity Analysis - Total Arsenic Forecasted Concentration in Portage Pit E



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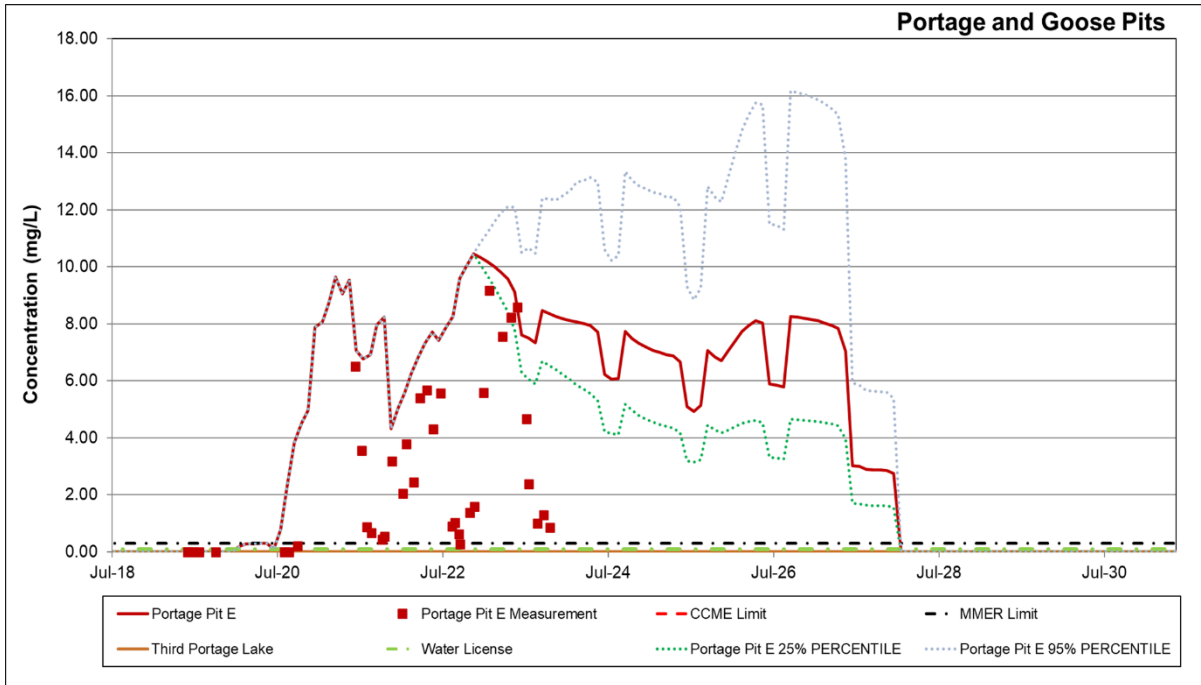
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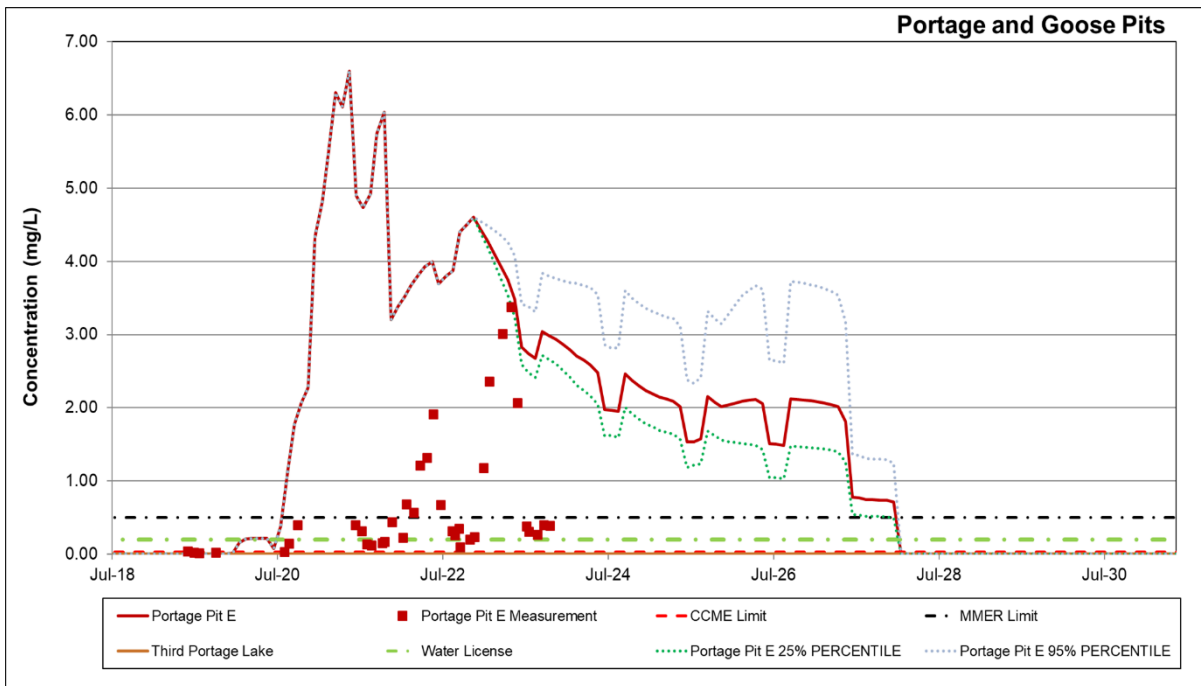
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**Figure 4-21: Sensitivity Analysis - Total Copper Forecasted Concentration in Portage Pit E**



**Figure 4-22: Sensitivity Analysis - Total Nickel Forecasted Concentration in Portage Pit E**

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## 4.3 Water Treatment Requirements

Based on the results of the water quality forecast mass balance presented in [Section 4.2](#), following the end of in-pit tailings deposition, the reclaim water will need to be treated and discharged to Third Portage Lake to be in line with the ICRP updated in 2019. The assimilative capacity of Third Portage Lake will be assessed with the objective of maintaining a baseline or guideline/protective water quality in the lake. Treated effluent discharge water criteria will be assessed based on this objective. Based on the water quality forecast results, treatment may be required for the following parameters:


- Total metals, such as aluminum, arsenic, cadmium, copper, mercury, nickel, and lead.
- Total ammonia.
- Total cyanide.
- Total Dissolved Solids (TDS).
- Chloride and nitrate.

The water treatment plant will be designed to treat the specific parameters of concern and could consist of one or a combination of the following treatment approaches:

- If high metal concentrations persist, such as copper, nickel, and aluminum, they can be removed through the following process:
  - Hydroxide precipitation: Caustic soda (NaOH) or lime can be added to the effluent to increase the pH to 9, causing the formation of metal hydroxide precipitates, which settle out. The different treatment options that may be considered to implement the precipitation of heavy metals are listed below.
- A water treatment plant (WTP) will need to be installed close to Portage Pit, and it will be designed for metal precipitation with the addition of lime or caustic dosing system. The water from Portage Pit can be pumped to the WTP for treatment, with the treated water discharged to TPL via a diffuser.
- Treatment *in situ* at Portage Pit (i.e., batch lime treatment).
- A pH adjustment of the treated water will be required prior to its release.


If required, additional pre-treatment steps can be added, depending on the actual water quality to be treated, such as an oxidation step to help oxidize any metal complexes, or post-treatment such as media filter for final polishing, such as:

- Organosulfide precipitation: Organosulfide product can precipitate heavy metal into sulfide solids and with the aid of a typical coagulation/flocculation process, these precipitates can settle out from the water. It should be noted that this process may be combined with caustic/lime precipitation.
- Ion exchange: The heavy metal contaminants in form of cations can also be removed by ion exchange resin (IX). Prior to IX process, raw water needs to be filtered to remove suspended solids which may cause resin fouling.
- Membrane separation: Heavy metals can be removed by membrane techniques including nanofiltration and reverse osmosis. Prior to the membrane process, raw water needs to present very low suspended solids and turbidity and thus multimedia filtration or microfiltration is required.

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- If arsenic concentrations are an issue, one of the most efficient techniques to reduce them is a coagulation-clarification/filtration process in order to co-precipitate the arsenic using an iron-based coagulant, such as ferric sulphate, to form a ferric-arsenate precipitate.
- For total dissolved salts, such as chloride and sulphate, membrane separation such as nanofiltration or reverse osmosis can be applied, if necessary.
- For total ammonia present in the Reclaim Water, more active treatment solutions could be implemented, such as:
  - Biological treatment (i.e., nitrification);
  - Ion exchange removal using zeolite;
  - Precipitation of ammonia using ettringite precipitation; or
  - A pH adjustment of the treated water near neutral pH, to ensure that most of the ammonia present is in the form of ammonium (NH<sub>4</sub><sup>+</sup>) instead of un-ionized ammonia (NH<sub>3</sub>).
- Sludge generated from the treatment process could be thickened and/or dewatered and stored in the North Cell or South Cell tailings storage facilities and capped with NPAG rockfill at closure.

A high-level closure water treatment strategy for the Meadowbank site was developed with the objectives of identifying conceptual treatment options to meet possible closure discharge criteria, identifying activities required for the development and implementation of the closure water treatment system, and establishing a preliminary schedule to develop and implement the closure water treatment system. The results of this study were presented in the technical note “Meadowbank Closure Water Treatment Strategy”, document 679254-7000-4KER-0001 (SNC Lavalin 2021). Studies are on going to assess water management strategies including water treatment option for closure. The results of these studies will be presented in the next versions of the Closure and Reclamation Plan.

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## 5.0 Vault Water Quality Forecasting

### 5.1 Review of Water Quality Data

#### 5.1.1 Review of Water Quality Discharged to Environment


A compilation of actual measured water quality data from the Vault Area sampled in 2023 was performed. The Vault Area includes Vault Pit (ST-26), Vault Attenuation Pond (ST-25), Vault Waste Rock Storage Facility (ST-24), Phaser Pit (ST-41), Phaser Attenuation Pond (ST-43), Discharge to Wally Lake and Exposure Area in Wally Lake. The average and maximum for each parameter monitored for the Meadowbank Water Quality Forecast Model are presented in [Table 5-1](#). Total metals were used in this analysis. For measured values that were below the detection limit, a value equal to half of the detection limit was considered in the analysis.

The yellow cells represent the concentrations that are higher than CCME guidelines for Protection of Aquatic Life, which are used for comparison purposes only. The water discharged to Wally Lake is governed by the Water Licence and the MDMER requirements. Any parameters measured at the discharge to Wally Lake (ST-10) that have concentrations above the Water Licence discharge criteria would be highlighted in red, which is not the case based on the samples taken in 2023.

In 2023, no water was discharged to Wally Lake. All the water was contained within the Vault Attenuation Pond and surrounding pits. No sample collected was above Water Licence criteria. Furthermore, the concentrations of metals and chloride in the water sampled in the Vault Pit, the Vault Attenuation Pond, the Vault Waste Rock Storage Facility (WRSF), the Phaser Pits, and the Phaser Attenuation Pond are relatively low compared to the Water Licence requirements.

Some elements were above CCME limits in the water sampled in the Vault Pit, the Vault Waste Rock Storage Facility, the Phaser Pits, and the Phaser Attenuation Pond. More precisely the average and the maximum values of the elements were above CCME limits:

- Total aluminum: Maximum values in the Vault WRSF and in Phaser Pit (ST-41) were slightly higher than the CCME limit;
- Dissolved aluminum: Maximum value in the Phaser Pit (ST-41) is slightly higher than the CCME limit;
- Total chromium: Maximum values in the Vault Pit and in the Phaser Pit (ST-41) were slightly higher than the CCME limit;
- Total copper: Average and maximum values were higher than the CCME limit in Vault WRSF, Phaser Pit (ST-41), and Phaser Attenuation Pond;
- Total lead: Maximum value in the Vault Pit is slightly above the CCME limit;
- Fluoride: Maximum value is slightly higher than the CCME limit in Phaser Pit (ST-41).

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As in 2022, in 2023 ammonia nitrogen in Vault Pit and Phaser Pit and in Vault and Phaser Attenuation Ponds was below the CCME limit, as were nitrate concentrations.

## 5.1.2 Ammonia Loading to the Environment

In 2023, no water was discharged to Wally Lake. Thus, for 2023, there is no ammonia loading discharged to the environment.



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**Table 5-1: Average and Maximum Concentrations Measured in the Vault Area for 2023**

Parameters	Units	Vault Pit		Vault Attenuation Pond		Vault Waste Rock Storage Facility		Phaser Pits		Phaser Attenuation Pond		Discharge to Wally Lake	CCME Guidelines	Water License Vault, Max. Avg. Conc.
		(ST-26)		(ST-25)		(ST-24)		(ST-41/42)		(ST-43)		(ST-10)		
		Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	No Discharge in 2023		
Alkalinity	mg CaCO <sub>3</sub> /L	43.50	53.00	29.00	31.00	47.83	64.00	40.67	55.00	32.00	42.00		n/a	n/a
Hardness	mg CaCO <sub>3</sub> /L	95.73	118.00	59.54	61.60	107.62	156.00	77.75	105.00	64.17	82.20		n/a	n/a
Total Aluminum (Al)	mg/L	0.05660	0.09590	0.01716	0.02460	0.06060	0.17000	0.05848	0.13800	0.03908	0.09090		0.1	1.5
Dissolved Aluminum (Al)	mg/L	0.01722	0.02890	0.00000	0.00000	0.00000	0.00000	0.03975	0.13700	0.01531	0.02630		0.1	1
Total Silver (Ag)	mg/L	0.00001	0.00004	0.00002	0.00002	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001		0.00025	n/a
Total Arsenic (As)	mg/L	0.00274	0.00331	0.00045	0.00051	0.00185	0.00228	0.00157	0.00183	0.00070	0.00084		0.005	0.1
Total Barium (Ba)	mg/L	0.01221	0.01360	0.01148	0.01280	0.01027	0.01330	0.01349	0.01860	0.01148	0.01410		n/a	n/a
Total Cadmium (Cd)	mg/L	0.00001	0.00002	0.00001	0.00001	0.00002	0.00002	0.00001	0.00002	0.00002	0.00003		0.00004	0.002
Total Chromium (Cr)	mg/L	0.00085	0.00349	0.00100	0.00100	0.00100	0.00100	0.00039	0.00134	0.00023	0.00070		0.001	n/a
Total Copper (Cu)	mg/L	0.00134	0.00168	0.00152	0.00164	0.00273	0.00296	0.00352	0.00608	0.00283	0.00335		0.002	0.1
Total Iron (Fe)	mg/L	0.09872	0.19900	0.02040	0.03800	0.10733	0.29700	0.10115	0.23800	0.15217	0.23100		0.3	n/a
Total Manganese (Mn)	mg/L	0.01186	0.02100	0.00466	0.00990	0.01240	0.02900	0.00749	0.02290	0.01372	0.03130		n/a	n/a
Total Mercury (Hg)	mg/L	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001		0.000026	0.004
Total Molybdenum (Mo)	mg/L	0.02009	0.02740	0.00360	0.00400	0.01723	0.02490	0.00768	0.01050	0.00161	0.00199		0.073	n/a
Total Nickel (Ni)	mg/L	0.00462	0.01610	0.00150	0.00220	0.00212	0.00300	0.00340	0.00704	0.00327	0.00514		0.025	0.2
Total Lead (Pb)	mg/L	0.00061	0.00197	0.00020	0.00020	0.00024	0.00036	0.00029	0.00075	0.00015	0.00026		0.0010	0.1
Total Selenium (Se)	mg/L	0.00022	0.00028	0.00010	0.00010	0.00025	0.00037	0.00014	0.00021	0.00007	0.00009		0.0010	n/a
Total Thallium (Ti)	mg/L	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001		0.0008	n/a
Total Zinc	mg/L	0.00144	0.00328	0.00500	0.00500	0.00500	0.00500	0.00093	0.00169	0.00221	0.00413		0.03	0.2
Ammonia (unionized NH <sub>3</sub> )	mg N/L	-	-	-	-	-	-	-	-	-	-		0.016	n/a
Total Ammonia Nitrogen (NH <sub>3</sub> -NH <sub>4</sub> )	mg N/L	0.05317	0.06900	0.05100	0.05500	0.06167	0.12000	0.05000	0.05000	0.05050	0.05300		1.83	20
Chloride	mg/L	5.83333	8.40000	1.90000	3.10000	1.31667	2.10000	2.30000	3.80000	2.78333	4.40000		120	500
Fluoride (F)	mg/L	0.10167	0.11000	0.10400	0.11000	0.10333	0.11000	0.11000	0.13000	0.10333	0.11000		0.12	n/a


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Parameters	Units	Vault Pit		Vault Attenuation Pond		Vault Waste Rock Storage Facility		Phaser Pits		Phaser Attenuation Pond		Discharge to Wally Lake	CCME Guidelines	Water License Vault, Max. Avg. Conc.
		(ST-26)		(ST-25)		(ST-24)		(ST-41/42)		(ST-43)		(ST-10)		
		Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	Avg. 2023	Max. 2023	No Discharge in 2023		
<b>Nitrate (NO<sub>3</sub>)</b>	mg N/L	1.03167	1.47000	0.11600	0.18000	0.76500	1.05000	0.60500	0.86000	0.11667	0.15000		2.94	50
<b>Total Cyanide (CNt)</b>	mg/L	0.00050	0.00051	0.00050	0.00050	0.00051	0.00054	0.00051	0.00058	0.00050	0.00050		0.005	n/a
<b>Sulphate (SO<sub>4</sub>)</b>	mg SO <sub>4</sub> /L	49.00	61.00	40.80	41.00	69.17	100.00	36.17	51.00	34.17	41.00		128 <sup>1</sup>	n/a
<b>Total dissolved solids</b>	mg/L	124.17	175.00	91.00	105.00	160.00	220.00	109.17	150.00	99.17	135.00		n/a	1400

Notes:



- Measured concentration higher than Water License requirement.
- Measured concentration higher than CCME guidelines. Value highlighted for comparison purposes only.
- 1. Threshold value for sulfate based on BC Environment guideline for the protection of aquatic life for very soft water (0-30 mg/L) (April 2013).

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## 5.2 Vault Water Quality Forecast


### 5.2.1 Model Description

A mass balance model was developed to assess the water quality forecast trends in the Vault Attenuation Pond (ATP) for ammonia and nitrate. The starting date for the model was set for June 2014.

### 5.2.2 Assumptions

The assumptions used in the development of the mass balance model for the Vault ATP of Meadowbank were the following:

1. The Vault ATP is a combination of Pond A, B, C and D. The model does not take into consideration the transfers between Pond A, B, C and D, only transfers inside and outside the Vault Attenuation Pond.
2. The model considers water transfers to the Vault ATP from Vault Pit, Phaser Pit, Phaser Lake, and runoff from its catchment area.
3. The model does not take into consideration the variations of volume due to ice (no free volume, as well as ice ratio and water/ice entrapment).
4. The water quality from Vault Pit, Phaser Pit, and Phaser Lake is based on the yearly average measured values and is assumed to be constant over a given year for ammonia and nitrate.
5. The water mass balance is performed around the Vault ATP. The volume of water transferred out of the Vault ATP to the water treatment plant or Wally Lake is assumed to be completely discharged to the lake.
6. It is assumed that the primary source of ammonia and nitrate loading is from Vault Pit and Phaser Pit. All other inflow contaminant concentrations (Phaser Lake, runoffs, etc.) are assumed to have a negligible impact on ammonia and nitrate loadings.
7. For simplification of the model, ponds and pits are assumed to be completely mixed systems.
8. For simplification of the model, the parameters are assumed to be inert: they do not degrade or react with other elements in the system.
9. For this analysis, it is assumed that the water treatment plant between the Attenuation Pond and Wally Lake does not reduce the concentration of ammonia and nitrate.

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### 5.2.3 Input to Model

The mass balance model is based on the assumptions above and on the following water quality sampled at:

- Vault Pit (ST-23 / ST-26);
- Phaser Pit (ST-41);
- Phaser Lake (ST-43);
- Vault Attenuation Pond (ST-25);
- Final Effluent to Wally Lake (ST-10).

The initial concentration of parameters in the Vault Attenuation Pond is assumed to be the average of 2014-2015 measurements (i.e., ammonia = 2.2 mg N/L; nitrate = 4.7 mg N/L).


**Table 5-2** presents the average concentrations used to estimate the loadings from Vault Pit and Phaser Pit to Vault ATP. Transfer of runoff from the Vault Pit area occurred from 2014 to 2018, while runoff transfer from Phaser Pit occurred from 2017 to 2018. As of 2019, surface runoff was allowed to accumulate in the pits.

**Table 5-2: Average Concentrations to Estimate Loading to Vault ATP**

Year	General Basis	Vault Pit		Phaser Pit	
		Ammonia (mg N/L)	Nitrate (mg N/L)	Ammonia (mg N/L)	Nitrate (mg N/L)
2014	Avg. 2014-15 measured data	18	46	--	--
2015		18	46	--	--
2016	Average 2016 measured data	5	20	--	--
2017	Average 2017 measured data	3.8	4.2	4	30*
2018	Average 2018 measured data	3.1	4.9	7.96	15.8
2019	Average 2019 measured data	1.2	7.5	1.75	3.3
2020	Average 2020 measured data	0.15	2.2	0.06	1.5
2021	Average 2021 measured data	0.07	1.5	0.05	1.1
2022	Average 2022 measured data	0.07	1.4	0.05	0.7
2023	Average 2023 measured data	0.06	1.0	0.05	0.6

Notes:

\* Value adjusted so that the forecasted value in Vault ATP is similar to the monitored data.

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Measurements taken at the final effluent to Wally Lake and in the Vault Attenuation Pond (ATP) were used to compare the forecasted results.

## 5.2.4 Forecasting Results

### 5.2.4.1 Ammonia


Ammonia concentrations sampled in Vault Pit and Phaser Pit are elevated because of the use of ammonium-nitrate explosives during the mining process. **Figure 5-1** presents the concentrations monitored in Vault Pit, Phaser Pit, Vault Attenuation Pond and at the final effluent to Wally Lake.

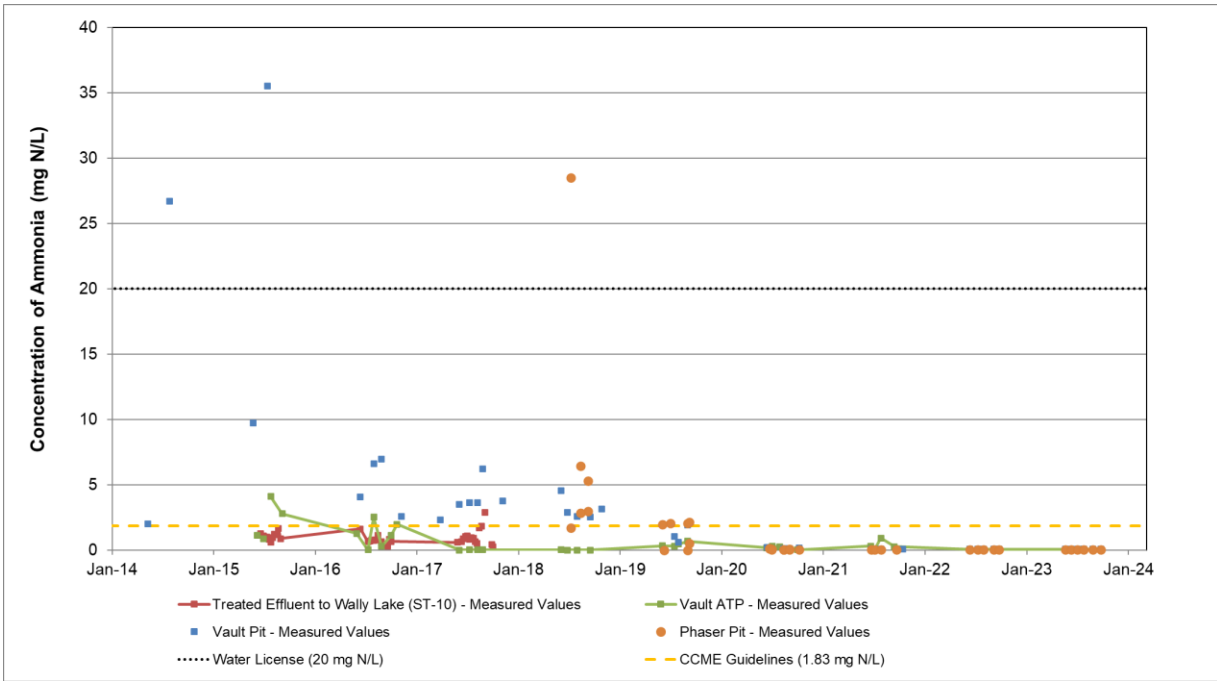
Two monitored values in Vault Pit exceeded the Water Licence limit in 2014 and 2015 and all values measured from 2016 to 2023 were below the limit. For Phaser Pit, there was one value higher than the limit in 2018. All of the samples taken in the Vault Attenuation Pond (ATP) and the final effluent towards Wally Lake were below the Water Licence discharge requirements. From 2020 to 2023, all ammonia concentrations were below the CCME Guidelines.

When forecasting the concentration of the water in the Vault ATP until closure, the forecasted concentration of ammonia reached a peak of about 3.7 mg-N/L in 2015 and then decreased to a concentration below 1 mg-N/L before closure.

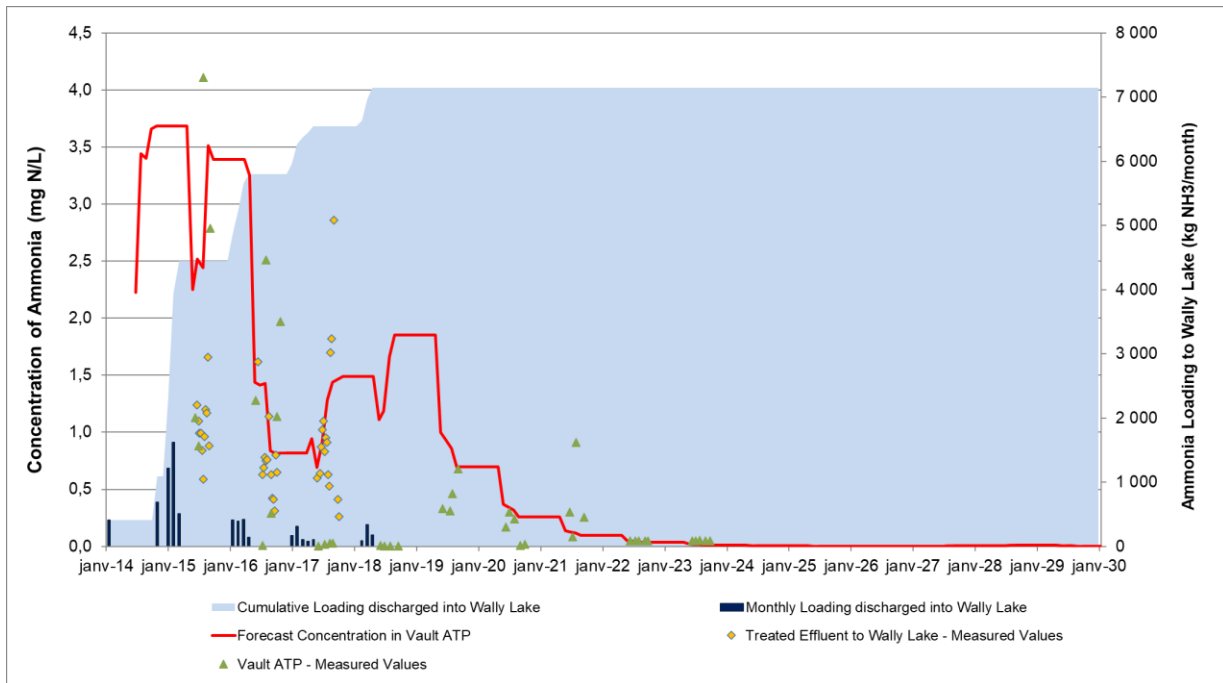
Agnico is required to meet the criteria for discharge to Wally Lake as stated in the Type A Water Licence, which is set at 20 mg N/L. No exceedance occurred and is foreseen with the current Vault water quality forecasting model.

**Figure 5-2** shows the forecasted concentration, the monthly loadings, and the cumulative loadings of ammonia in the treated effluent discharged to Wally Lake. As in previous years, forecasted and measured values in Vault ATP continue to decrease.


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**Figure 5-1: Measured Ammonia Concentration in Vault Area**



**Figure 5-2: Forecasted Ammonia Concentration in Vault Area**

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#### 5.2.4.2 Nitrate

Nitrate concentrations sampled in the Vault Pit and Phaser Pit are also found to be elevated because of the use of ammonium-nitrate explosives for the pit development. [Figure 5-3](#) presents the concentrations monitored in Vault Pit, Phaser Pit, Vault Attenuation Pond, and at the final effluent towards Wally Lake.

Measured nitrate concentrations in the Vault Pit and Phaser Pit were below the Water Licence limit of 50 mg N/L. The monitored values in Vault Attenuation Pond and in the final effluent are also well below the Water Licence requirements.

The forecasted trend of nitrate concentration in the effluent discharged to Wally Lake until closure is similar to that for ammonia. There is a rise of nitrate to about 8.6 mg-N/L in 2015, and then a decrease to a concentration of approximately 1 mg-N/L before closure. Since the Water Licence discharge limit for nitrate is 50 mg N/L, no exceedance is foreseen.

[Figure 5-4](#) shows the forecasted concentration, the forecasted monthly loadings, and the cumulative loadings of nitrate in the treated effluent discharged to Wally Lake.



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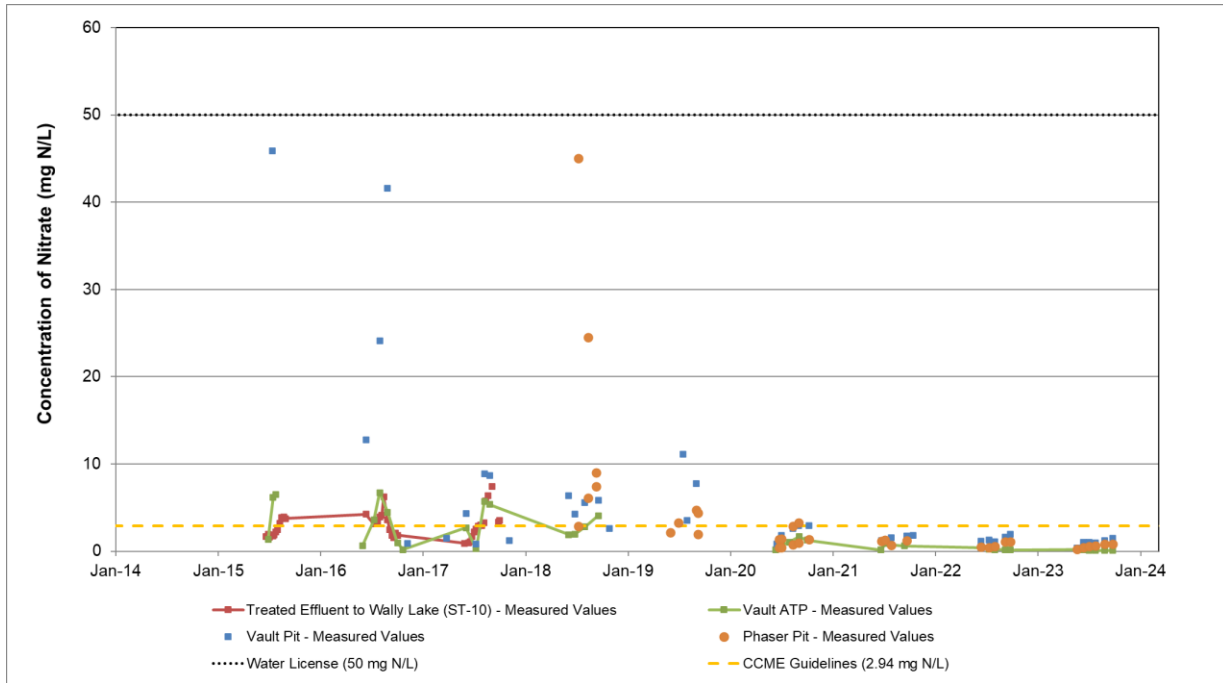


Figure 5-3: Measured Nitrate Concentration in Vault Area

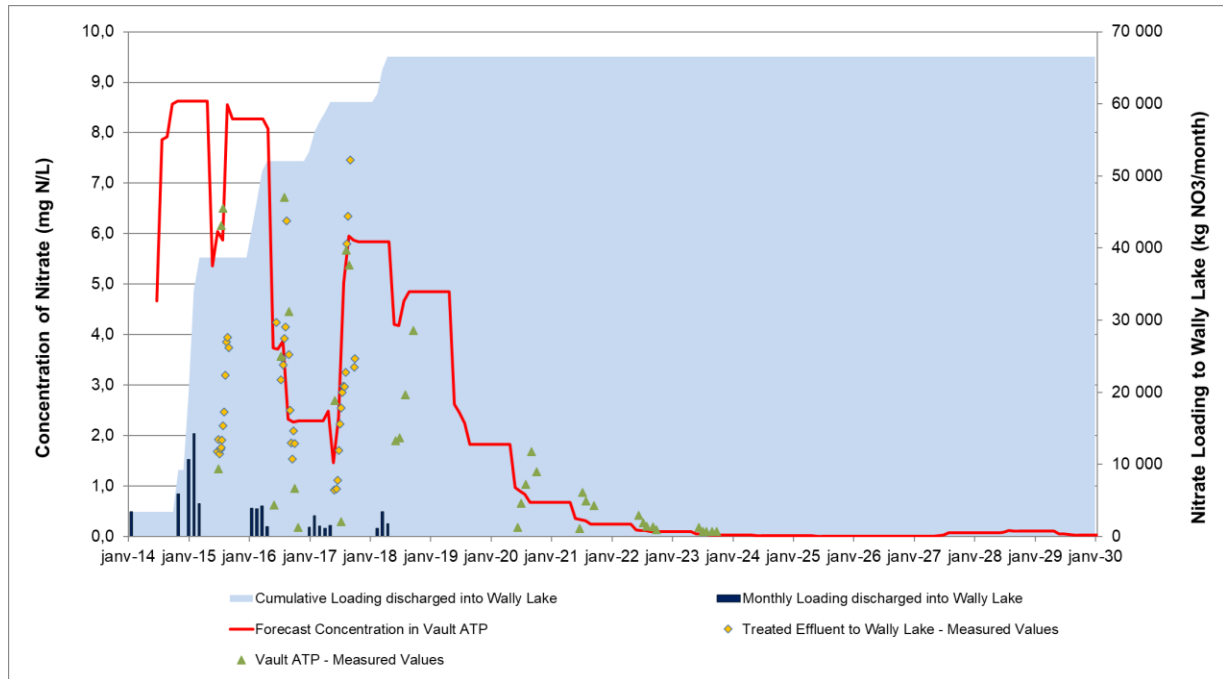




Figure 5-4: Forecasted Nitrate Concentration in Vault Area



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### 5.2.4.3 Final Remarks

In conclusion, the forecasted concentrations of ammonia and nitrate in the Vault ATP are expected to remain below the discharge requirements as defined in the Type A Water Licence. The primary source of ammonia and nitrate in the water comes from the use of an ammonium-nitrate based explosive in the development of the Vault Pit and Phaser Pit. Note that the model results are quite conservative when compared to the monitored data since the end of mining operations at Vault and Phaser pits.

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## 6.0 Conclusion

It is important to understand the limitations of the mass balance model and of this Technical Note. The limitations are presented in [Section 3.3](#) and are briefly summarized below:

- In order to simplify the model, the mass balance model assumes the following:
  - Ponds and pits are completely mixed systems;
  - No change in the water quality of the Mill Effluent;
  - A monthly time step.
- The mass balance model is based on a set of water quality analysis results provided by Agnico:
  - Water quality data collected at the surface of the North and South Cell TSF Reclaim Pond;
  - Water quality data available for the Mill Effluent;
  - Water quality data of various inflows and outflows of the North and South Cell TSF Reclaim Ponds;
  - Water quality data collected in Goose and Portage Pits;
  - Water quality data collected from pit seepages.


## 6.1 Results Summary and Treatment

This year's water quality forecast model ends at the end of in-pit deposition projected for June 2026 and at the end of pit reflooding projected for July 2041 based on the WB 2023. At the end of in-pit deposition, Reclaim Water stored in Goose Pit and Portage Pit shall then be treated and discharged to Third Portage Lake during closure. For the purpose of this study, parameters of concern were identified using the current Water Licence limits. However, final site-specific treated effluent discharge limits for closure will be developed through review of the closure plan by regulatory agencies.

Based on the results of the water quality forecast mass balance presented in [Section 4.2](#), the following parameters of concern were detected at the end of deposition:

- Total Aluminum (in Portage Pit E and Pit A)
- **Total Arsenic** (all pits)
- Total Cadmium (in Goose Pit, close to Water Licence limit)
- **Total Copper** (all pits)
- **Total Nickel** (all pits)
- Total Lead (in Goose Pit, slightly higher than Water Licence limit)
- Chloride (in Portage Pit E only)
- **Total Dissolved Solids** (in all pits)
- **Total Ammonia** (in all pits)
- Nitrate (in Portage Pit E only)
- Total Cyanide (in Portage Pit E and Pit A)

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Among the parameters listed above, five (5) parameters were identified in this year's water quality forecast report (bolded values). The increasing trend observed in Goose Pit and Portage Pit can be mainly attributed to the following:

- As of 2019, tailings are now being deposited in Goose Pit and Portage Pit. Reclaim water is allowed to accumulate in the pits and is pumped back to the mill for re-use.
- As of 2019, the main ore body processed at the Meadowbank site originates from the Whale Tail Pit ore body. The ore body from Whale Tail Pit has a different geochemical behavior than the ore extracted from Portage/Goose/Vault pits. This leads to higher forecasted concentrations of certain elements at the end of in-pit deposition, such as arsenic.
- The water quality forecast model was also adjusted based on the mill effluent sampled from 2019 to 2023. The quality of the mill effluent varies from year to year. The mill effluent is the main source terms for the identified parameters of concern.

Water treatment shall be undertaken at the end of in-pit tailings deposition. A potential treatment option for the removal of the metals in Reclaim Water prior to discharge is caustic or lime precipitation, while ammonia could be removed by ion exchange using a zeolite media. Coagulation with ferric sulphate could be used to co-precipitate the arsenic as a ferric arsenate precipitate. Additional treatment steps could be considered once the actual nature of the water to treat is known, such as the addition of an oxidation step to help oxidize metal complexes, additional polishing steps, like filtration or membrane treatment, and/or the addition of a biological treatment step to treat for ammonia. Studies are on going to assess water management strategies including water treatment option for closure. The results of these studies will be presented in the next versions of the Closure and Reclamation Plan.

Pit reflooding shall take place following the treatment of the Reclaim Water. The pits shall be reflooded with a combination of natural runoff and active transfer of water from Third Portage Lake. The forecasted water quality concentrations at the end of pit flooding are projected to be lower than the CCME limits. Note that the dikes will only be breached if the water quality within them meets the selected water quality criteria as per the water license requirement.


As for the Vault area, in 2023, the entire area is undergoing natural reflooding. No discharge to Wally Lake was reported in 2023. All the water sampled in the area did not exceed any of the Water Licence discharge limits. For comparison purposes only, copper concentrations were slightly higher than CCME guidelines. Ammonia and nitrate continue to show a decreasing trend as natural reflooding is progressing over time.

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## 6.2 Recommendations

In order to improve the accuracy of the model so that it can better forecast the concentration of certain parameters in the Reclaim Ponds or Portage and Goose Pits, the following studies, tests and monitoring are recommended:

1. Continue the current monthly monitoring program of all inflows and outflows of the North and South Cells TSF Ponds for cyanide, a complete total and dissolved metal scan, ammonia, nitrate, fluoride, chloride, sulphates, TDS and TSS. This will provide an indication of the runoff quality that is accumulated in these ponds following the end of tailings deposition in these areas.
2. Considering that deposition of the tailings is now occurring in the pits, continue regularly monitor pit water quality (Portage and Goose) when the site can be safely accessed, and analyze for cyanide, total and dissolved metals, ammonia, nitrate, chloride, fluoride, sulphates, TDS and TSS. This information will be useful in developing and calibrating a water quality forecast model of the pit water quality based on loadings from the mill effluent, surface runoff and possible pit seepages. Continue measuring the conductivity of water in the pits at different depths to detect if there is any stratification occurring in the pit lakes.
3. Once Portage and Goose Pits are hydraulically connected, it is recommended to sample the water at different points in the pit area in order to evaluate the mixing efficiency over the entire area. The samples should be taken at different depths over the entire area of the flooded pits before and after the filling season.
4. Continue to sample and analyze, as per the Water Licence requirement, water from the Vault Pit, Vault Attenuation Pond, Phaser Pit, and Phaser Attenuation Pond.
5. Continue bench scale water treatment test to evaluate the contaminant removal efficiency using treatment approaches such as lime neutralization, coagulation/flocculation with aluminum sulphate or ferric sulphate, and coagulation/flocculation with proprietary coagulants designed for metal removal, as well as alternative treatment options such as biological treatment for ammonia.

	<b>TECHNICAL NOTE</b> Meadowbank Water Quality Forecasting Update for the 2023 Water Management Plan		
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## 7.0 References

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MEADOWBANK GOLD MINE  
2023 WATER MANAGEMENT PLAN

APPENDIX D – 2024 FRESHET ACTION PLAN

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# **AGNICO EAGLE**

**MEADOWBANK COMPLEX**

**MEADOWBANK FRESHET ACTION PLAN**

**MARCH 2024**

**VERSION 12**



## 1. EXECUTIVE SUMMARY

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The purpose of this Freshet Action Plan is to identify areas of concern around the Meadowbank mine site and the AWAR that need to be managed in an organized and timely manner during the annual freshet period to prevent adverse environmental and operational impacts. The Plan outlines specified actions that will be taken by Agnico to manage and mitigate areas where environmental incidents could occur, as well as addressing historical incidents, specifically seepage on the north-east side of the Portage Waste Rock Storage area, known as sampling location ST-16 (2013) and seepage from the mill (inside) containment structures through the Assay Road southwest of the mill (Mill Seepage - 2013). Any future incidents that have the potential to affect off site water or land will be added and would include any specific mitigation and monitoring actions.

The freshet period is initiated during the annual snow and ice melt, around mid-May. During this period excess water is created and must be managed through additional pumping and management practices at vulnerable areas around the site. Mitigation techniques, timeframes and specified roles and responsibilities are outlined in this document for each area of concern.

The main areas of concern are the excavated pits (Pit A, Pit E, Goose Pit and Vault Pit), the North and South Cell TSF surrounding infrastructures (East and West diversion ditches, Northwest corner of the North Cell TSF, Saddle Dam 1 corner, Saddle Dam 2 sump, Saddle Dam 3 sump, Saddle Dam 4-5 downstream, Central Dike downstream pond (ST-S-5), Stormwater Dike), the areas around the Portage Waste Rock Storage Facility (RSF) (the northern portions of the NAG waste rock extension, the two collection ponds known as WEP1 and WEP2), Vault Road culverts, Vault Waste Rock Storage Facility, AWAR culverts near the site and along the road to Baker Lake, RSF – ST-16 Seepage, and the Assay Road (Mill) Seepage.

It is important for all water management and associated infrastructure to be in good working order and adequate to manage the expected water flows associated with the freshet period; this includes but is not limited to pumps, ditch, culvert and sump maintenance, critical piping system installation and inspection, as well as adequate resource allocation for preparative work. A concise summary of the 2024 preparation works and roles and responsibilities are presented in the attached Appendix 1 (2024 Freshet Action Plan Procedures). Appendix 1 will be updated yearly to reflect changes in conditions at the Meadowbank site. Appendix 2 contains diagrams depicting the areas of concern and incident response locations.

## DOCUMENT CONTROL

#	Revision			Pages Revised	Remarks
	Prep.	Rev.	Date		
01	Agnico	Internal	April 2014	All	
02	Agnico	Internal	May 2015	All	Comprehensive update from 2014 Plan
03	Agnico	Internal	October 2015	All	Comprehensive update from May 2015 Plan
04	Agnico	Internal	March 2016	All	2016 Comprehensive review
05	Agnico	Internal	March 2017	All	Comprehensive update from May 2016 Plan
06	Agnico	Internal	March 2018	All	Comprehensive update from 2017 Plan
07	Agnico	Internal	March 2019	All	Comprehensive update from 2018 Plan
08	Agnico	Internal	March 2020	All	Comprehensive update from 2019 Plan
09	Agnico	Internal	March 2021	All	Comprehensive update from 2020 Plan
10	Agnico	Internal	March 2022	All	Comprehensive update from 2021 Plan
11	Agnico	Internal	March 2023	3	2.1.3 Water transfers into Pit A were added
				2	Figure 2-1, Figure 2-2, Figure 2-3, Figure 2-4, Figure 2-6, Figure 2-7 were updated
				15	Section 2.9 was added
				Appendix 1	Section 2.9 was added
				Appendix 3	Snow management map was updated
				Appendix 4	Freshet flowchart and plan view was updated
12	Agnico	Internal	March 2024	8	Section 2.3.1.1 was updated
				11	Section 2.3.1.5 was updated
				15	Section 2.8 was updated
				15	Section 2.10 and Figure 2-10 were added
				Appendix 1	Section 2.10 was added
				Appendix 3	Snow management map was updated
				Appendix 4	Freshet flowchart and plan view were updated

Prepared By: Meadowbank Environment

Approved by:

Eric Haley, Environment and Critical Infrastructure Superintendent

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## 1. INTRODUCTION

---

The purpose of this Freshet Action Plan is to ensure that Agnico can address and manage excess water associated with the freshet season at the Meadowbank site in a manner to minimize environmental risks, and to ensure Agnico has implemented specific management and mitigation measures in response to environmental incidents with potential for offsite impacts to water or land.

The freshet season is loosely defined as starting approximately May 15<sup>th</sup> and in some cases, actions and mitigation measures can extend into early fall when freezing re-occurs. There are many areas around the site that are vulnerable to excess water; the goal is to identify these areas and develop a clear plan with defined roles and responsibilities (amongst Agnico Eagle Departments), and to manage the freshet flows.

In addition, several guiding principles are applicable to the formation of this plan. The highest priority principles are:

- 1) to ensure that the health and safety of Agnico employees is protected, especially with respect to mining operations when excess water is present;
- 2) to ensure that mine contact water from runoff or seepage is managed to prevent adverse environmental impacts; and
- 3) to ensure the site is in compliance with the Nunavut Water Board (NWB) License, Part D, Item 19 and Part E, Item 10.

The plan will identify the areas of concern and discuss the potential risks as well as mitigation measures necessary to address the identified issues. Appendix 1 contains the actual defined 2023 procedures, the roles and responsibilities and associated timelines. Agnico's intent is to update the Procedural Appendix on a yearly basis. For example, there may be additional mitigation measures for a defined problem area or, in some cases, a previously defined issue may be permanently rectified.

The main areas of concern are:

- IPD pits and Vault area Pits;
- Area around the Portage Waste Rock Storage Facility (RSF) including the northern portions of the NAG waste rock extension, which include the collection ponds known as WEP 1 and WEP 2;
- Vault Waste Rock Storage Facility;
- North and South Cell TSF surrounding areas:
  - East and West diversion ditches;
  - Northwest corner of the North Cell TSF;
  - Saddle Dam 1 corner;
  - Saddle Dam 2 sump;
  - Saddle Dam 3 sump;
  - Saddle Dam 4-5 downstream;
  - North Cell Internal Structure
- East Dike Seepage
- Vault Road culverts;
- Stormwater Management Pond;

- Fuel Tank Farms;
- AWAR culverts near the site and along the road to Baker Lake;
- RSF – ST-16 Seepage;
- Assay Road (Mill) Seepage;
- Central Dike Seepage.
- Monitoring Station at KM87 (ST-44)
- Baker Lake Marshalling Facilities

Each area identified above will be discussed in detail below. All areas of concern are considered priorities based on the guiding principles.

## 2 AREAS OF CONCERN

---

### 2.1 IPD Pits, Vault Pits

All active ramps, and ditches must be cleared of all ice and snow before May in order to access the shoreline of the filling pits. All pumps must be checked and serviced to be in working order prior to May. In addition, a check must be completed confirming that all piping systems starting from the different pits are in working order (leak free).

#### 2.1.1 *Goose Pit*

Mining in Goose Pit was completed in 2015. Tailings deposition began in July 2019. Water transfers from Goose Pit towards either Pit E or Pit A will be performed as required, as part of the deposition plan and water balance exercise. Water accumulating in the surface area around Goose Pit (Bay Goose Dike ring road, NPAG stockpile, Goose sump) will be pumped to Goose Pit as required.

#### 2.1.2 *Pit E*

Mining in Pit E was completed in 2019. Tailings deposition began in August 2020. Runoff water accumulated at the Pit E crest will be pumped into Pit E as required. The Pit E3 ramp requires proper trenching and snow clearing to ensure safe condition for the planned operations of the tailing deposition and mill reclaim systems. Water accumulating in the pit is either transferred to Pit A or reclaimed for the mill process.

#### 2.1.3 *Pit A*

Mining in Pit A was completed in 2018. The pit is now part of the in-pit deposition plan. The Pit A ramp requires proper trenching and snow clearing to ensure safe operations of the tailing deposition and mill reclaim systems.

Water from the South Cell, Central Dike seepage, East Dike Seepage (depending on water quality) and Stormwater Pond will be directed to Portage Pit A during freshet, where as accumulating water in Pit A will be reclaimed for mill process, as required.

#### 2.1.4 *Vault & Phaser Pits*

Mining activities were completed in the Vault area (including Phaser and BB Phaser) in 2019. No further discharge to Wally Lake are expected. As a result of all mining activity of Vault area being completed, passive pit reflooding has begun, with natural runoff being the only inflow. No active water management is planned in that area at freshet. For safety concern the area is restricted. Procedures are in place to safely access the area for sampling purposes.

Figure 2-1: View of Vault area and the surrounding area



## 2.2 Waste Rock Storage Area

### 2.2.1 Portage RSF

The Portage Rock Storage Facility (RSF) will require weekly inspections around the perimeter beginning as soon as the freshet starts until freeze up to identify any seepage. As will be noted in the following section, seepage was identified in 2013 at location ST-16. In the event that additional seepage is observed from the RSF, it must be reported to the Environment Department and samples must be taken to determine the water quality and source. A mitigation plan will be prepared and implemented if necessary.

Active pumping at the Portage RSF towards the North Cell and Pit A is planned at ST-16 (Section 2.2.1.1), WEP1 (Section 2.3.1.2), and WEP 2 (Section 2.3.1.2).

#### 2.2.1.1 ST-16 Seepage

In July 2013, a seepage from the Rock Storage Facility (RSF) was noted (see ST-16 on Figure 2-3). The seepage contained elevated copper, nickel, ammonia and cyanide. It was determined through investigation that the likely source of the contaminants was reclaim water from the North Cell TSF. Further details and discussion can be found in the Agnico Annual Report (Section 8.5.3.1.7).



Water ponding in ST-16 will be pumped to the North Cell Tailings Storage facility and Portage Pit A. Daily inspections will be undertaken in May until freshet is complete and after rain events to ensure water remains contained within ST-16. Water levels in ST-16 must remain below the till plug. Once the lake or seep area are ice free, the sample monitoring program will commence. If samples detect any concerns or elevated levels, Agnico will review the monitoring plan immediately, including downstream lakes. Pumped volumes will be documented and daily inspections of the area will be undertaken. In addition, snow will be removed from the ditches and culvert at the outlet of NP- 2 to NP-1 Lake to ensure freshet flows do not back up and overflow into the ST-16 seep location and that the north watershed non-contact runoff flows freely through to NP-1 Lake and further downstream (Dogleg Lake).

In the event that seepage water flows through the rockfill road reaching NP-2 Lake, the Environmental Department will notify authorities.

**Figure 2-2. View ST-16 station and surrounding area.**



### 2.2.1.2 Waste Extension Pool (WEP) sumps

WEP1 and WEP2 sumps were constructed in September 2015 to manage water around the northeast side of the RSF to ensure all water ponding is transferred to the North Cell TSF (see Figure 2-3). The WEP1 and WEP 2 sumps were replaced in 2016 with the WEP collection system. Water collected at WEP1 and WEP2 will be pumped to ST-16. Daily inspections will be undertaken in May until freshet is complete and after rain events to ensure water remains contained within

WEP1 and WEP2 and does not enter the East Diversion Ditch. Both sumps WEP1 (ST-30) and WEP2 (ST-31) will be sampled as per the monitoring plan.

### **2.2.1.3 North Portion of NAG Waste Rock Expansion**

The northwestern area of the RSF, which consists entirely of NAG material, extends towards the East Diversion ditch as shown in Figure 2-3. Runoff from this area, while not anticipated to be contaminated, could, if significant, discharge to NP-2 lake after crossing the tundra. The Environmental Department will conduct daily visual inspections during freshet. Sample monitoring will be undertaken when water is observed in order to determine water quality. Contaminated water must be kept from reaching NP-2 Lake; and if required, water will be pumped or diverted.

### **2.2.2 Vault RSF**

The Vault RSF requires monitoring during the freshet period to ensure adequate water management. Weekly inspections around the RSF perimeter will be conducted to identify any seepage as soon as the freshet starts. In the event that seepage is observed, the Environment Department must be notified and samples taken to determine water quality. The sample monitoring will be in accordance with the Water License requirements. No water quality issues are anticipated as primary drainage is towards the Vault Pit and the waste rock stored in the RSF is primarily NAG. No active pumping system is planned for that area.

## **2.3 North and South Cell Tailings Storage Facility**

Water management around both the North and South Cell Tailings Storage Facility (TSF) is required to maintain integrity of the tailings management infrastructure and to prevent any adverse environmental impacts. Water from the North Cell will be transferred to the South Cell which will then be pumped toward Portage Pit A. This section describes the infrastructure in place to control runoff water and reduce possible impact on both the tailings storage facility and the receiving environment. Tailings were last discharged in the North Cell in 2021, while tailings were last discharged in the South Cell in 2023.

### **2.3.1 Diversion Ditches**

The East and West Diversion ditches were constructed in 2012 around the North Cell TSF and the Portage RSF. The diversion ditches are designed to redirect the fresh water from the northern area watershed away from the tailings pond and RSF and direct it to Second and Third Portage Lakes. As seen in Figure 2-3, five zones associated with the diversion ditches have been identified where actions will be taken during or before freshet:

1. AWAR culvert – Discharge to Third Portage Lake (ST-6);
2. West Diversion Ditch elbow;
3. Northwest corner of North Cell TSF;
4. East Diversion Ditch Outlet to NP-2 Lake (ST-5);
5. Vault road culvert – NP-2 Lake exit to NP-1 Lake.

**Figure 2-3: Location of the areas of interest for the 2023 Freshet Action Plan**



### 2.3.1.1 AWAR culvert – discharge to Third Portage Lake

Ditch outflows are important to ensure proper flow of freshet drainage. The culvert under the AWAR (Figure 2-3) is a critical section of the West Diversion Ditch. Snow removal must be performed to avoid ponding and damage to the ditch/trench structure as well as to maintain the integrity of the AWAR which, in turn, is critical to transportation at the Meadowbank mine site. Figure 2-4 illustrates this culvert. Snow and/or ice must be removed on each side of the culvert to allow water to flow through to prevent upstream ponding prior to freshet to prevent any back up in the West Diversion ditch. If not completed, this could increase water levels upstream in the ditch causing problems discussed in Section 2.3.1.2. The culvert may need to be steamed if blocked by ice. Before starting the cleaning operation, it is important to ensure that the electrical cable (5kV) location has been visually identified.

**Figure 2-4: West diversion ditch area of interest**



Daily inspections will be conducted starting in May until Freshet is complete and after rain events. Sample monitoring will commence when open water is present in accordance with the Water License (ST-6). Sampling frequency of ST-6 may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. If a discharge of TSS occurs, the Environment Department will notify ECCC and NWB.

### 2.3.1.2 West Diversion Ditch Elbow

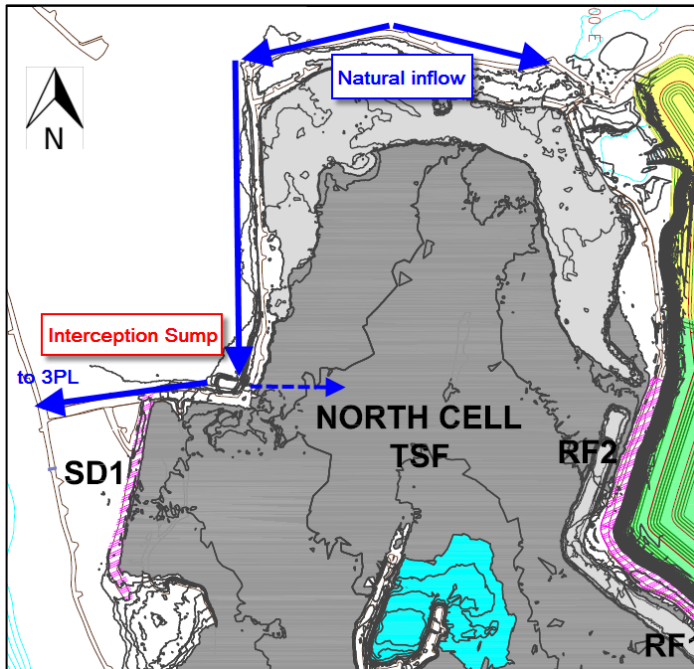
One of the deepest sections of the West Diversion ditch is located in the corner next to the Saddle Dam 1– see Figure 2-4 and Figure 2-5. In early May of each year, Agnico will remove the snow accumulation to allow the water to flow freely, preventing the water upstream from increasing in level and hydraulic head pressure. In addition, large flows can scour the ditch system causing sediment migration through the ditches which could impact Third Portage Lake.

As a precaution, Agnico constructed an interception sump located at the west diversion ditch elbow location in 2014. The sump has a capacity of 3,000 m<sup>3</sup>. These measures will prevent any

contaminated water from reaching Third Portage Lake. This sump will also act as a settling pond to prevent water with elevated TSS from reaching Third Portage Lake.

Daily inspections will be conducted from May until freshet is complete and after rain events. Sample monitoring will also be conducted. It is planned to let natural overflow to Third Portage Lake, if results are compliant. A pump will be installed preventively and ready to operate.

**Figure 2-5. View of the Interception Sump in relation to the Diversion Ditches**



### 2.3.1.3 Northwest Corner of North Cell TSF

The construction access road at the Northwest corner of the North Cell TSF (see Figure 2-4) was vulnerable to damage from the freshet water flow from the northern watershed (see watercourse flow in Figure 2-5 denoted by blue line). The start of the West Diversion ditch is also located in this area and is designed to collect the freshet. Ponding is limited in this area once the freshet is done.

Agnico will continue to monitor and conduct visual inspections of this area in May until freshet is complete and after rain events.

### 2.3.1.4 East Diversion ditch outlet to NP-2 Lake

This area of the East Diversion ditch, see Figure 2-6, acts as the outflow of the North part of the East Diversion ditch into NP-2 Lake. This outlet must be cleared of obstructions – snow and ice – in early May to promote drainage through the ditch and into NP-2 Lake. The presence of ice blocks could be mitigated using the steam machine to melt away the obstruction. Daily inspections will be conducted starting in May until freshet is complete and after rain events. Sample monitoring will be conducted monthly during open water in accordance with the Water License (location ST-5). Sampling frequency of ST-5 may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. Turbidity barriers have been installed at the ditch outlet into

NP-2 in 2013 to mitigate elevated TSS. If a discharge of TSS occurs, the Environmental Department will notify ECCC and NWB (CIRNAC water Inspector).

**Figure 2-6: View of the East Diversion ditch outlet into NP-2 Lake**



**2.3.1.5 NP-2 Outlet, Vault Road Culvert and NP1**

This area of the East Diversion ditch acts as the outflow of NP-2 Lake through the Vault Road culvert (see Figure 2-3). The culvert connects the East Diversion ditch from Lake NP-2 to NP-1. Snow and ice must be removed from the culvert area, including upstream at the exit of NP-2 Lake, in early May, to ensure that the outlet of NP-2 flows freely to NP-1 and ultimately to Dogleg Lake. Back up could cause an upstream water raise in Lake NP-2, which could cause overflow into the RSF ST-16 sump. First, snow from the ditch between NP1 and the road (1) will be removed in early May. Next, the culvert will be steamed, if necessary, to remove any ice/snow. If needed snow/ice around the outlet of NP2 Lake (4) would be removed to allow free flow of melt water. Daily inspections will commence in May until freshet is complete and after rain events. TSS sample monitoring will be conducted monthly and as needed for turbidity. Sampling frequency may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually

elevated. If a discharge of TSS occurs, the Environmental Department will notify ECCC and NWB (CIRNAC Water Inspector).

A snow management plan has been implemented, ensuring no large accumulations of stored snow in this area, to minimize runoff.

**Figure 2-7: View of the diversion ditches at the Vault road area**



### **2.3.2 Tailings and Dewatering Dikes**

#### **2.3.2.1 Saddle Dam 1**

This peripheral dike of the North Cell TSF is required for tailings containment. Daily inspections, starting May until water freezes, will be required for Saddle Dam 1 (SD1) to ensure that runoff water does not pool against the toe of the dike due to low topography. A pumping station located along the toe of the dike is installed to pump water in the North Cell. This pumping station must be operational once water is observed at the toe to pump the water to the TSF. The pumping system will be checked in early May to ensure proper operation. Monthly sampling will be conducted at this station (ST-S-2) during open water conditions in accordance with the Water License.

#### **2.3.2.2 Saddle Dam 2**

This peripheral dike is located South of SD1, is required for tailings containment. Historically, this structure has not had any issues with water pooling at the toe, therefore monthly inspections starting May until water freezes will be required for Saddle Dam 2 (SD2) to ensure that water does

not pool against the toe of the dike. If water is observed at the toe it will be pumped back in the North Cell and a water sample could be taken.

#### **2.3.2.3 Saddle Dam 3**

This peripheral dike of the South Cell was built in 2015 for water and tailings containment. A permanent sump was established in 2017 at a low spot that facilitates water management at freshet. The downstream area of the SD3 embankment will be pumped to the South Cell TSF to avoid water ponding against the structure. This pumping station must be operational once water is observed at the toe to pump the water to the TSF. The pumping system will be checked in early May to ensure proper operation. Monthly sampling will be conducted at this station (ST-32) during open water conditions in accordance with the Water License.

#### **2.3.2.4 Saddle Dam 4-5**

Since their initial construction in 2015, ponding in the downstream area is minimal. Localized pooling ponds are sometimes present during the freshet period and will be pumped into the South Cell TSF footprint on their upstream side.

#### **2.3.2.5 North Cell Internal Structure (NCIS)**

This internal structure was built as an upstream raise in the North Cell in 2018 and allowed for increased tailings storage capacity. Additional sump (NC-A, NC-B, NC-C, NC-D, NC-E) were implemented within the footprint of the North Cell in strategic point at the downstream of this structure to ensure proper water management. Water reporting to these sumps is pumped in the North Cell to reach the main water management station in the North Cell.

#### **2.3.2.6 Central Dike**

Central Dike seepage, monitoring station ST-S-5, is located at the downstream area of the Central Dike embankment, a peripheral structure of the South Cell used for tailings retention. A permanent pumping system is in place to manage the seeping water beneath the dike by keeping the downstream pond at a constant elevation. More details to be found in the Meadowbank Water Management Plan. Water in this sump is pumped to Portage Pit A. Weekly inspections of the area will be held by environment. Environment department will also conduct monthly sample as per the Water License.

#### **2.3.2.7 Stormwater Dike**

The Stormwater dike separates the North Cell from the South Cell, and is required for tailings containment. A small pump is installed on the Western edge of the dike to collect water and pump it in the North Cell. This will prevent pooling of water against the toe of the dike. The pumping system will be installed and checked in early May to ensure proper operation.

#### **2.3.2.8 East Dike**

The water quality of the East Dike seepage is monitored throughout the year. When the criteria for discharge are met the water is send to Second Portage lake, otherwise it is sent to the Portage Pits. Historically, at freshet, the water quality of the East Dike seepage does not meet TSS requirement.



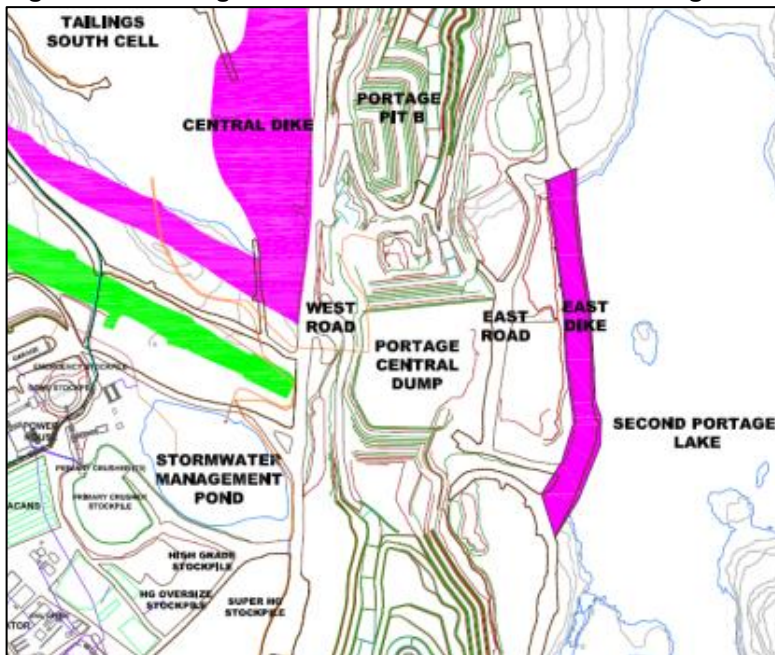
## 2.4 Vault Road Culvert

The Vault road crosses over a connection between two water bodies, Turn Lake and Drill Tail Lake, at approximately km 113. Beginning in May, until freshet is complete and after rain events, it will be important to complete daily inspections. In the case that excessive TSS is observed, samples will be taken and analyzed. In the case, where the TSS levels go beyond 30 mg/L (grab) and 15 mg/L (monthly average), a report will be made to the ECCC and NWB (CIRNAC Water Inspector). Turbidity barriers will be installed as a mitigation measure if needed.

## 2.5 Stormwater Management Pond

The Stormwater Management Pond (SWMP) is a small shallow and fishless water body that can be seen in Figure 2-8 adjacent to Portage Pit. Treated sewage is discharged into this pond before being transferred to one of the tailing storage facility. The quantity of water transferred each year is recorded. Weekly inspections in the spring and fall are undertaken to determine the commencement of pumping.

**Figure 2-8: Portage Pit area with the Stormwater Management Pond**



## 2.6 Bulk Fuel Storage Facilities

### 2.6.1 Meadowbank Tank Farm

Snow and ice accumulation within the fuel tank farm must be adequately managed to prevent overflow to the environment and/or damage to the fuel handling systems. The Energy and Infrastructure Department will advise the Environmental Department of their intent to pump the containment area once ice/snow begins to melt. Water samples will be taken in accordance with the Water License to ensure compliance prior to its release. A notice must be provided to the Inspector 10 days prior to this pumping activity. Once sample results have been obtained, the Environmental Department will advise the Energy and Infrastructure Department if pumping can

begin. If sample results permit, the pumping may begin; to direct water to the tundra/ground in a way to prevent erosion. In the event that the water sample results do not meet discharge criteria the water shall be sent to the Stormwater Management Pond.

### **2.6.2 Baker Lake Tank Farms**

Snow and ice accumulation within the fuel tank farms at Baker Lake must be adequately managed to prevent overflow to the environment and/or damage to the fuel handling systems. The Energy and Infrastructure Department will advise the Environmental Department of their intent to pump the containment area once ice/snow begins to melt. Water samples will be taken in accordance with the Water License to ensure compliance prior to its release. A notice must be provided to the Inspector 10 days prior to this pumping activity. Once sample results have been obtained, the Environmental Department will advise the Energy and Infrastructure Department if pumping can begin. If sample results permit, water can be directed to the tundra but the flow rate shall be such to avoid erosion or damage to the tundra. Environmental inspection of the setup is required prior to starting the discharge. In the event that the water sample results do not meet discharge criteria the water cannot be pumped to the tundra. If this occurs the water will be pumped to a tanker and transported to the Meadowbank site to be disposed of in the TSF or placed in containers for shipment south as hazmat.

### **2.7 AWAR Culverts on the Baker Lake Portion**

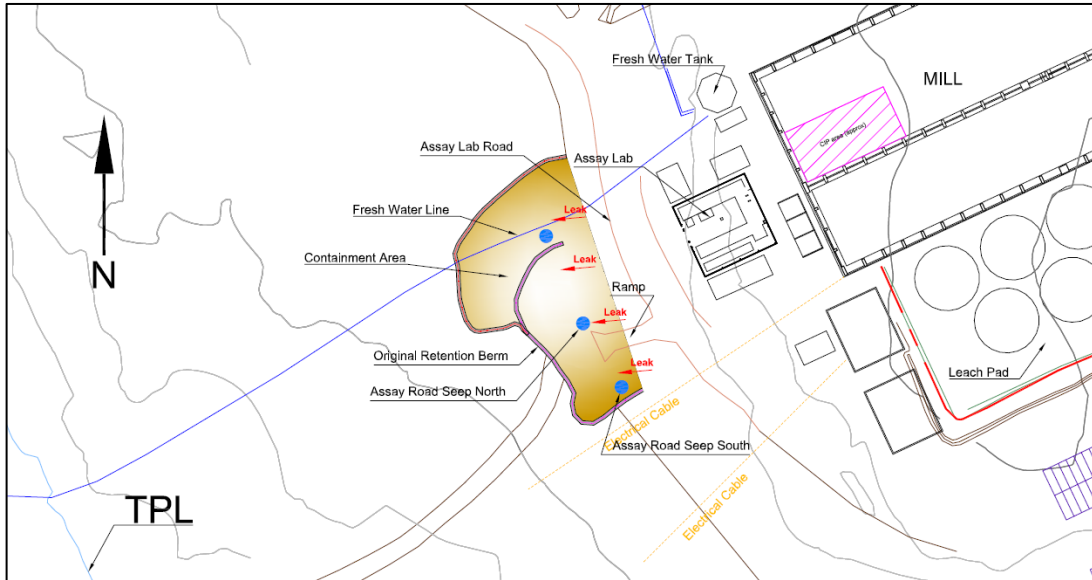
Weekly inspections will be undertaken starting in May at all culverts along the AWAR to ensure that water during freshet is flowing freely and no erosion is occurring. If elevated TSS/Turbidity levels are observed, sampling will occur and the results assessed. Turbidity barrier will be installed if required. The Energy and Infrastructure department will also be advised if severe erosion/scouring is observed. In addition, snow and ice removal may be required to allow the water to flow as per design specifications. Inspections will be performed during the freshet period by the Environment department.

### **2.8 Mill Seepage**

In November 2013, Agnico observed seepage containing cyanide and copper at a location west of the access road in front of the Assay Lab (see Figure 2-9). An investigation determined the source was several containments areas within the mill. Repairs to seal all the mill sumps and containment areas were completed in 2014 thus stopping the source of the seep. An interception/collection trench between the mill and TPL was built in 2014. The seepage appears to have been effectively contained and the source area has been repaired. Additional information and discussion surrounding previous sample results are available in the Annual Report in Section 8.5.8.1.6.

On December 15 2023, Agnico observed water inflow within the Assay Road Seep South retention berm. An investigation was undertaken to identify potential sources of the water, to date the exact source of the water inflow has not been identified but no water inflow has been observed since December 26 2023. The water inflow was contained within the existing water management infrastructure that was built in 2014.

**Figure 2-9. View of the mill seepage area and initial retention berm construction**



As soon as the trench, monitoring wells and Third Portage Lake are unfrozen a comprehensive monitoring program is implemented. Regular inspections will be conducted of the pumping, collection systems and perimeter area and the pumped volumes will continue to be recorded.

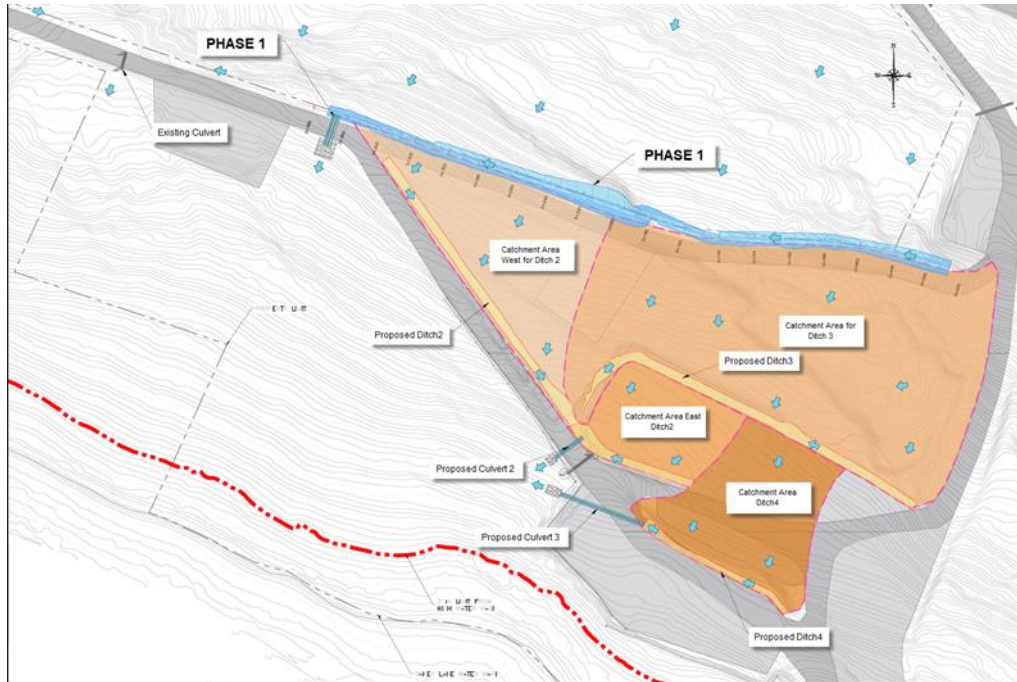
## 2.9 Monitoring Station at KM87 (ST-44)

In November 2022, a tractor trailer overturned at kilometer 87 on the AWAR resulting in a spill of diesel fuel. A downstream monitoring location, ST-44, will be sampled weekly during freshet and the results assessed. Additional internal sampling points may be identified during the monitoring. Routine visual inspections of the partially excavated contamination zone and collection sump(s) will occur. The inspections will include petroleum testing of any ponding water using test strips and PID. In the event of a positive result for petroleum or the presence of a visible sheen the collection sump(s) will be monitored daily, and contaminated water collected and sent to the Stormwater Management Pond or TSF.

## 2.10 Baker Lake Marshalling Facilities

In June 2022, a turbid flow of water was observed travelling through the Agnico Eagle facilities towards Baker Lake, resulting in a plume of total suspended solids (TSS) along the shore. Agnico Eagle received authorization to build a water diversion ditch in March of 2023 and construction of the first phase was completed in Fall 2023. Snow management practices at the marshalling facilities are in place to ensure manage snow melt reports to the diversion ditch. Weekly inspections will be undertaken starting in May of the Baker Lake Marshalling Facilities and the new water diversion ditch structure to ensure that water during freshet is being collected and flowing to the intended location. If elevated TSS/Turbidity levels are observed, sampling will occur and the results assessed. Turbidity barrier will be installed downstream of the diversion ditch outlet if required.

Figure 2-10. Design stages for the Water Management Improvement at Baker Lake Design Report



### 3. SNOW MANAGEMENT

The snow management procedure developed internally in 2015 and updated annually is illustrated in Appendix 3. Temporary snow storage dumps and snow accumulation areas of concern are identified on the map.



**APPENDIX 1**

**2024 Freshet Action Plan Procedure**

Section	Area of Concern	Role/Action	Responsibilities	Dates
<b>2.1</b>	<b>IPD Pits, Vault Pit and Pit Walls</b>			
2.1	IPD Pits, Vault Pit and Pit Walls – General	1) Clean all ice, mud and snow on all ramps, etc.	E&I	Before May
<b>2.1.1</b>	<b>Goose Pit</b>			
2.1.1	Goose Pit	1) Ensure pipes and pumps are serviced and ready to operate. 2) Give guidance as to when and where (Pit E or Pit A) water is to be pumped.	E&I ENV	Early May Early May
<b>2.1.2</b>	<b>Pit E</b>			
2.1.2	Pit E	1) Runoff water accumulated in ponds GP-4 and GP-5 will be pumped into Goose pit or Pit E;	E&I	During Freshet Early May
<b>2.1.2</b>	<b>Pit A</b>			
2.1.2	Pit A	1) Ensure pipes and pumps are serviced and ready to operate.	E&I	Early May
<b>2.1.3</b>	<b>Vault Pit Area</b>			

2.1.3 Vault & Phaser Pits	1) No further action in this area during the freshet period as mining is complete in Goose Pit. Water and/or ice will remain as part of the pit reflooding activity.	ENV	N/A
<b>2.2 WASTE ROCK STORAGE FACILITY</b>			
2.2.1 Portage RSF Inspection	1) Weekly inspection around the RSF perimeter to identify any seepage.	ENV	May - as soon as freshet starts until freeze up
	2) If seepage observed notify Eng and Env Department AND sample for CN and Water License Parameters – ST-16.	ENV	May - as soon as freshet starts until freeze up
2.2.1.1 ST-16	1) Check Piping from pump to discharge area at North Cell TSF.	ENV and E&I	Early May
	2) If the snow accumulation is judged to be too great, then snow must be removed.	ENV to coordinate with E&I	Early May
	3) Perform daily inspections or inspections as required, and keep records.	ENV	May - as soon as freshet starts until freeze
	4) Notify Eng. Dept and E&I when water present and pumping can start. <b>Water level to be maintained, as a minimum, below the till plug elevation. Water should not pond against the Till plug for extended</b>	ENV	May/early June - as soon as free water present and ice has melted until freeze

	5) <b>time periods - i.e. &lt; 2 - 3 hours. For emergencies the water truck can be requested. Start pumping.</b>		
	6) Any seepage through rockfill road to NP-2 must immediately be reported to Env Dept and authorities.	ENV and E&I	May/early June - as soon as water is present until freeze
2.2.1.2 Waste Extension Pool sumps	1) Snow removal to allow free water flow.	ENV to coordinate with E&I	Early May
	2) Perform daily inspections or inspections as required, and keep records.	ENV	May - until Freshet complete and after rain events
	3) Sample monthly during open water as per Water License ST-30 (WEP1) and ST-31(WEP2)	ENV	May - until Freshet complete and after rain events
2.2.1.3 North portion of NAG Waste Rock Expansion	1) Perform daily inspections or inspections as required, and keep records.	ENV	May - until Freshet complete and after rain events
	2) Sample for ST-S-XX when water observed; sample upstream (background) in diversion ditch for same parameters and compare results (rush analysis). If results indicate potential for impact, i.e. results are > background, meet with engineering and determine necessity of ditching	ENV	May - as soon as freshet starts until freeze up



		3) Prevent <b>contaminated</b> contact water from reaching NP-2.	ENV	May - as soon as freshet starts until freeze up
2.2.2 Vault RSF Inspection		1) Weekly inspection around the RSF perimeter to identify any seepage.	ENV	May - as soon as freshet starts until freeze up
		2) If seepage observed notify Eng and Env Department AND sample for Water License Parameters – ST-24.	ENV	May - as soon as freshet starts until freeze up
<b>2.3 NORTH AND SOUTH CELL TAILINGS STORAGE FACILITY</b>				
<b>2.3.1 Diversion Ditch</b>				
2.3.1.1	AWAR Culvert - West Diversion ditch exit to TPL	1) Snow and/or ice must be removed with an excavator on each side of the culvert to allow water flow.	ENV to coordinate with E&I	Before May 20
		2) If needed, steam to free any ice blockage.	ENV to coordinate with E&I	Before May 20
		3) Before starting snow clearing operation, make sure the electrical cable location has been visually identified in the field.	ENV to coordinate with E&I	Before May 20
		4) Perform daily inspections or inspections as required, and keep records.	ENV	May - until Freshet complete and after rain events

		5) ST-6 sampling as per Water License and TSF weekly inspection (keep record).	ENV	Monthly as soon as freshet starts (open water) and continue until freeze
		6) Increase frequency of ST-6 sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. Any extra samples to external lab.	ENV	TSS result dependent
		7) Have turbidity and silt barriers in place at TPL (2) and maintain.	ENV	May - before freshet starts and until water freezes
		8) Report any discharge of TSS to ECCC/NWB (grab > 30 mg/L).	ENV	May - as soon as freshet starts and until water freezes
2.3.1.2	West Diversion Ditch elbow near SD1	1) Snow and/or ice must be removed with an excavator to allow water flow and prevent ponding upstream.	ENV to coordinate with E&I	Early May
		2) Perform daily inspections or inspections as required, and keep records.	ENV	May - until Freshet complete and after rain events

		3) Sample for TSS monthly (external Lab) and as needed for Turbidity	ENV	May - until Freshet complete and after rain events
2.3.1.3	Northwest corner of North Cell TSF (West Diversion ditch)	1) Perform daily inspections or inspections as required, and keep records.	ENV	May - until Freshet complete and after rain events
2.3.1.4	East Diversion ditch outlet to NP-2 Lake	1) Snow and/or ice must be removed with an excavator on each side of the culvert to allow water flow.	ENV to coordinate with E&I	Early May
		2) If needed, steam to free any ice blockage.	ENV to coordinate with E&I	Before May 20
		3) Perform daily inspections or inspections as required, and keep records.	ENV	May - until Freshet complete and after rain events
		4) ST-5 sampling as per Water License and TSF Weekly inspection (keep record).	ENV	Monthly as soon as freshet starts and until water freezes
		5) Increase frequency of ST-5 sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average). Extra samples to external lab if necessary.	ENV	TSS result dependent

		6) Install turbidity barriers in NP-2, if needed, and maintain.	ENV	May - before freshet starts and until freeze up or water clears
		7) Report any discharge of TSS to ECCC/NWB (if grab > 30 mg/L).	ENV	May - as soon as freshet starts and until water freezes
2.3.1.5	East Diversion Ditch - NP2 Outlet and Vault Road culvert.	1) Snow and/or ice must be removed with an excavator on each side of the culvert and upstream at the exit of NP-2 Lake to allow water flow.	ENV to coordinate with E&I	Early May
		2) If needed, steam culvert to free any ice/snow blockage.	ENV to coordinate with E&I	Before May 20
		3) Daily inspection - keep record.	ENV	May - until Freshet complete and after rain events
		4) Install turbidity barriers in NP-1, if needed, and maintain.	ENV	May - before freshet starts and until freeze
		5) Sample for TSS monthly (external lab) and as needed for Turbidity. Increase frequency of sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average). Multi Lab for any increased sampling frequency.	ENV	May - until Freshet complete and after rain events

		6) Report any discharge of TSS to ECCCO/NWB (if grab > 30 mg/L).	ENV	May - as soon as freshet starts and until water freezes
<b>2.3.2 TSF Dikes</b>				
2.3.2.1	Saddle Dam 1	1) Inspect pumping system	E&I	Early May
		2) Perform daily inspections or inspections as required, and keep records.	ENV and E&I	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
		4) ST-S-2 sampling as per Water License.	ENV	Monthly as soon as freshet starts and until water freezes
2.3.2.2	Saddle Dam 2	1) Prepare pumping system	E&I	Early May
		2) Weekly Inspection - keep record.	ENV	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.3	Saddle Dam 3	1) Inspect pumping system	E&I	Early May

		2) Perform daily inspections or inspections as required, and keep records.	GENV and E&I	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	After May and until water freezes
		4) ST-32 sampling as per Water License.	ENV	Monthly as soon as freshet starts and until water freezes
2.3.2.4	Saddle Dam 4-5	1) Prepare pumping system	E&I	Early May
		2) Monthly Inspection - keep record.	ENV	May until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.5	North Cell Internal Structure	1) Prepare pumping system	E&I	Early May
		2) Weekly Inspection - keep record.	ENV	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.6	Central Dike ST-S-5	1) Pump water to the South Cell TSF - volumes documented.	E&I and ENV	All year round

		2) Daily inspection of pumping, collection systems, bermed areas and perimeter area – keep record.	E&I & ENV	All year round
2.3.2.7	Stormwater Dike	1) Prepare pumping system	E&I	Early May
		2) Weekly Inspection - keep record.	ENV	May and until water freezes
		3) Start pumping to TSF when water observed. Keep volume pumped out.	ENV and E&I	May until water freezes
2.3.2.8	East Dike	1) Monitor East dike water quality & coordinate with E&I to stop SPL discharge	ENV & E&I	All year long
<b>2.4 VAULT ROAD CULVERT</b>				
2.4	Vault road culvert from Turn Lake to Drill Trail Lake (~km 2 on Vault road)	1) Perform daily inspections or inspections as required, and keep records.	ENV	May - until Freshet complete and after rain events
		2) Install turbidity barriers, if needed (elevated TSS observed), and maintain	ENV	May - until freshet complete and after rain events
		3) Sample monitoring for TSS, if excess turbidity observed - use external lab.	ENV	May - until freshet complete and after rain events

		4) Report any discharge of TSS to Drill Tail to ECCC/NWB (if grab > 30 mg/L).	ENV	May - until freshet complete and after rain events
<b>2.5 STORMWATER MANAGEMENT POND</b>				
2.5	Stormwater Management Pond	1) Pump Stormwater to applicable TSF in Spring/Fall - pumped volume must be kept.	E&I and ENV	When required in Spring and/or Fall
<b>2.6 FUEL TANK FARMS</b>				
2.6.1 Meadowbank Tank Farm		1) E&I Dept to advise Env Dept in advance of intent to pump once ice melts in containment area.	E&I and ENV	As required during summer
		2) Sample water in accordance with Water License to ensure compliance with limits prior to release.	ENV	As required during summer
		3) Provide notice to Inspector 10 days prior to pumping.	ENV	As required during summer
		4) Advise Energy and Infrastructure Dept if pumping can begin based on sample results.	ENV	As required during summer



		5) Pump to tundra/ground or Stormwater Mgmt Pond (note pumping to Stormwater Mgmt Pond does not require compliance with limits - at Meadowbank only). <b>NOTE: The water cannot be pumped out to the tundra if it does not meet the Water License criteria.</b>	E&I	Following ENV. Authorization & inspection
2.6.2	Baker Lake Tank Farms	1) E&I Dept to advise Env Dept in advance of intent to pump once ice melts in containment area.	E&I and ENV	As required during summer
		2) Sample water in accordance with Water License to ensure compliance with limits prior to release.	ENV	As required during summer
		3) Provide notice to Inspector 10 days prior to pumping.	ENV	As required during summer
		4) Advise Energy and Infrastructure Dept if pumping can begin based on sample results.	ENV	As required during summer
		5) Once approval given by Env Dept, E&I Dept can pump to tundra but must avoid erosion during pumping, i.e., low flow, the volume must also be determined by E&I Dept personnel. <b>NOTE: The water cannot be pumped out to the tundra if it does not meet the Water License criteria. Any wastewater unsuitable for discharge will be transported back to Meadowbank for disposal in the TSF or shipped south for disposal.</b>	E&I Dept ENV	Following ENV. Authorization & Inspection

2.7 AWAR CULVERTS ON THE BAKER LAKE PORTION				
2.7	AWAR Culverts on the Baker Lake Portion	1) Weekly inspection of culverts along AWAR to Baker Lake.	ENV	May
		2) Sample for TSS and Turbidity if elevated TSS observed.	ENV	May - until freeze
		3) Notify E&I Dept if severe erosion/scouring observed - for repair action.	ENV	May - until freeze
		4) Install turbidity barriers if required.	ENV	May - until freeze
2.8 Mill Seepage				
2.8	Mill Seepage	1) Pump water from the trench to the mill - volumes documented.	ENV and E&I	Start May/early June when water present until freeze
		2) Daily inspection of pumping, collection systems, bermed areas and perimeter area – keep record. <b>For emergencies the water truck can be requested.</b>	ENV	Start May/early June when water present until freeze
2.9 Monitoring Station at KM87 (ST-44)				

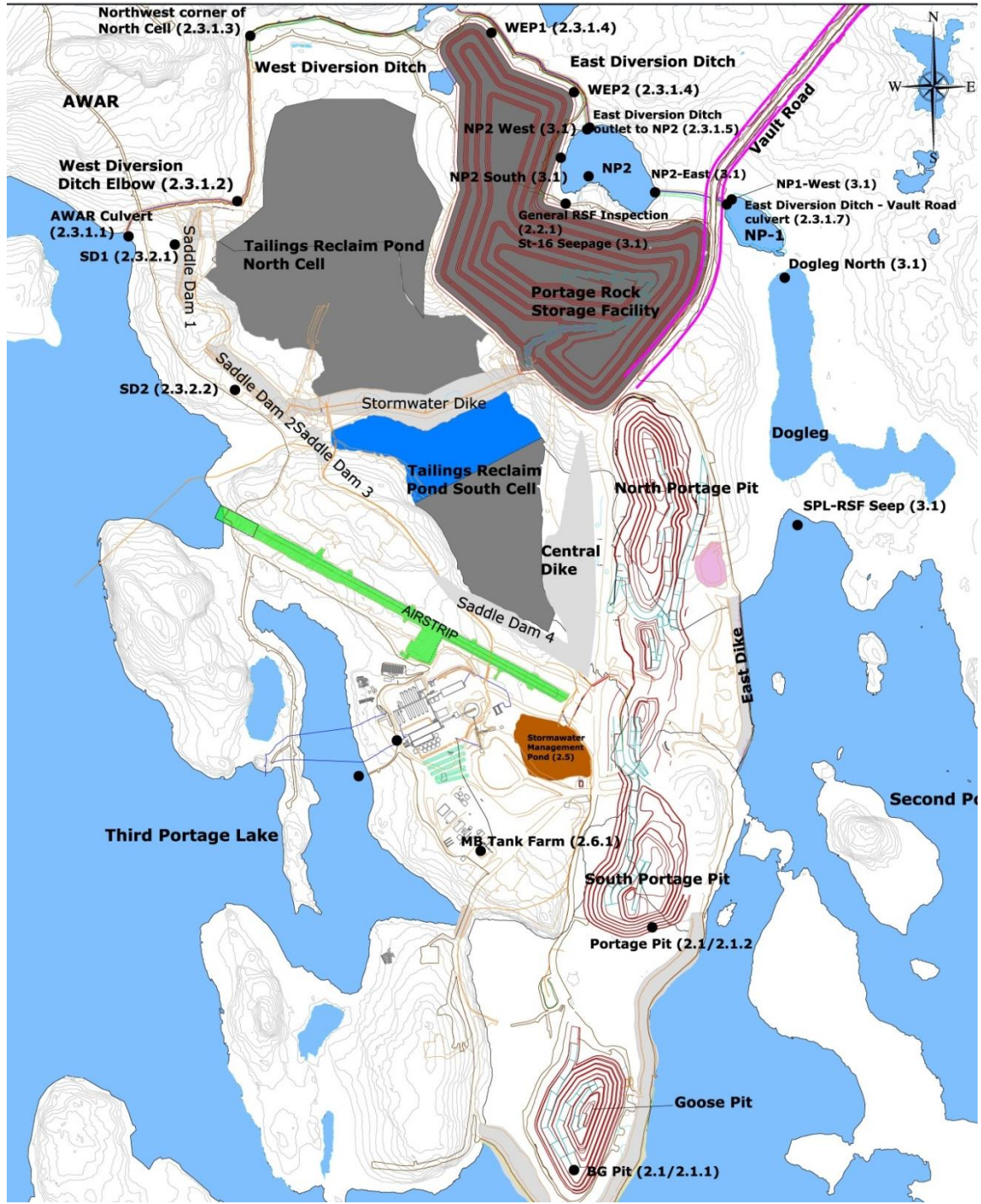
2.9 Monitoring Station at KM87 (ST-44)	1) Weekly sampling of downstream monitoring station ST-44	ENV	Start of May/early June when water present until freeze
	2) Pumping and removal of contaminated/contact water	E&I	As required during the summer
	3) Visual Inspection and testing of collection sump and contaminated area (Every second day)	ENV	Start of May/early June when water present until freeze or until location is deemed remediated
	4) Monthly soil sampling of spill location	ENV	Start of thaw until snow cover or until results are compliant
<b>2.10 Baker Lake Marshalling Facilities</b>			
2.10	Baker Lake Marshalling Facilities	1) Weekly inspection of Baker Lake Marshalling Facilities	ENV May - until freeze
		2) Sample for TSS and Turbidity if elevated TSS observed.	ENV May - until freeze
		3) Install turbidity barriers downstream of the diversion ditch outlet, if needed (elevated TSS observed), and maintain	ENV May - until freeze



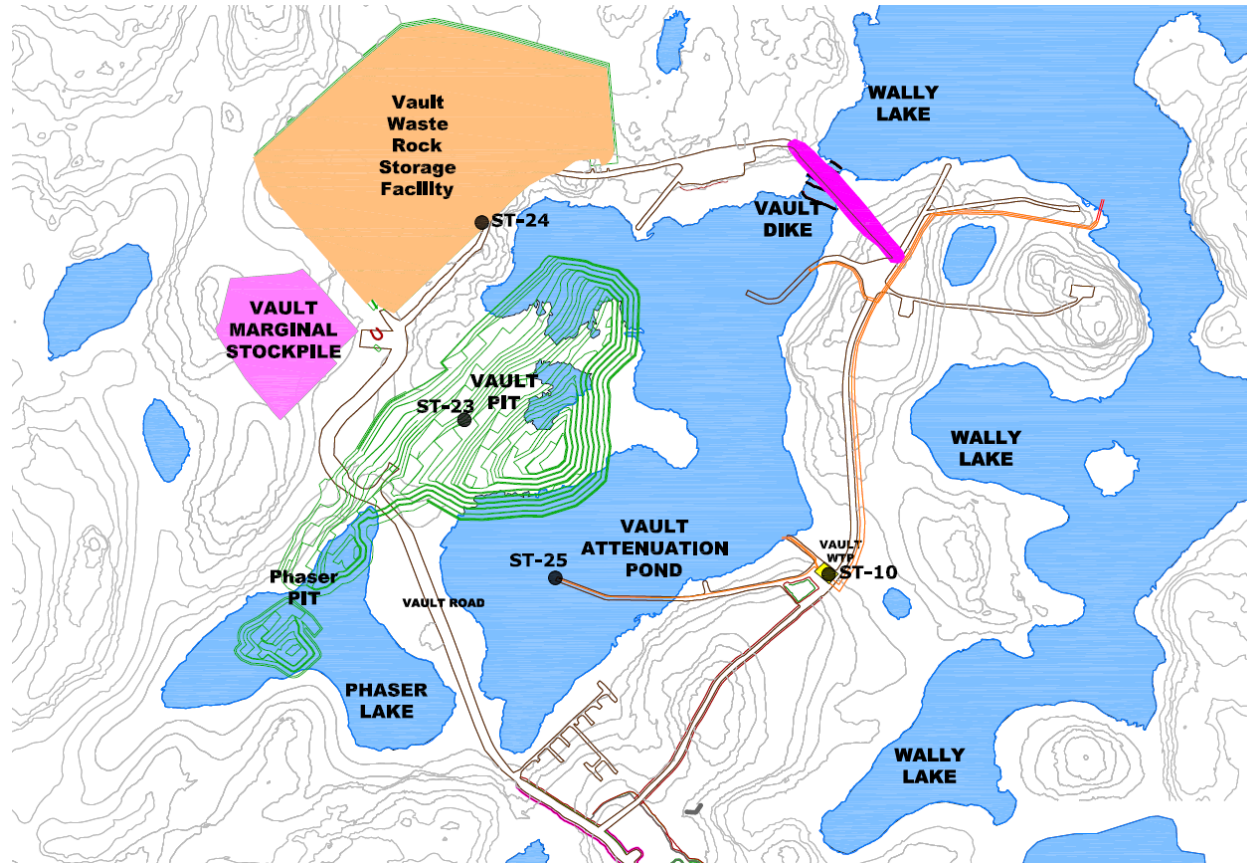
## **APPENDIX 2**

### **2024 Monitoring Locations and Areas of Concern for the Freshet Action**

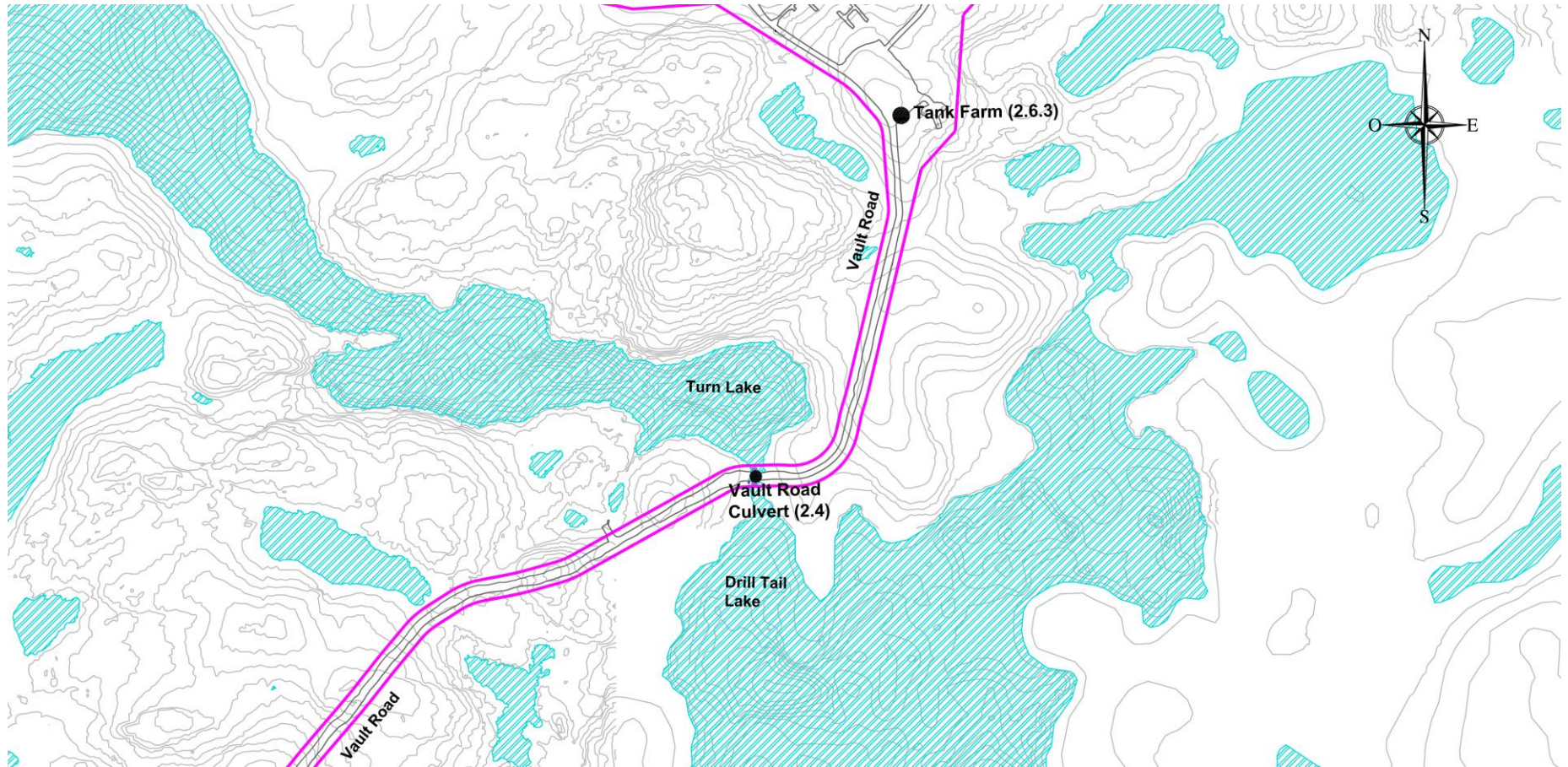
**Meadowbank Areas of Concern and Monitoring Locations**



Vault areas of concern



**Vault Road areas of concern**

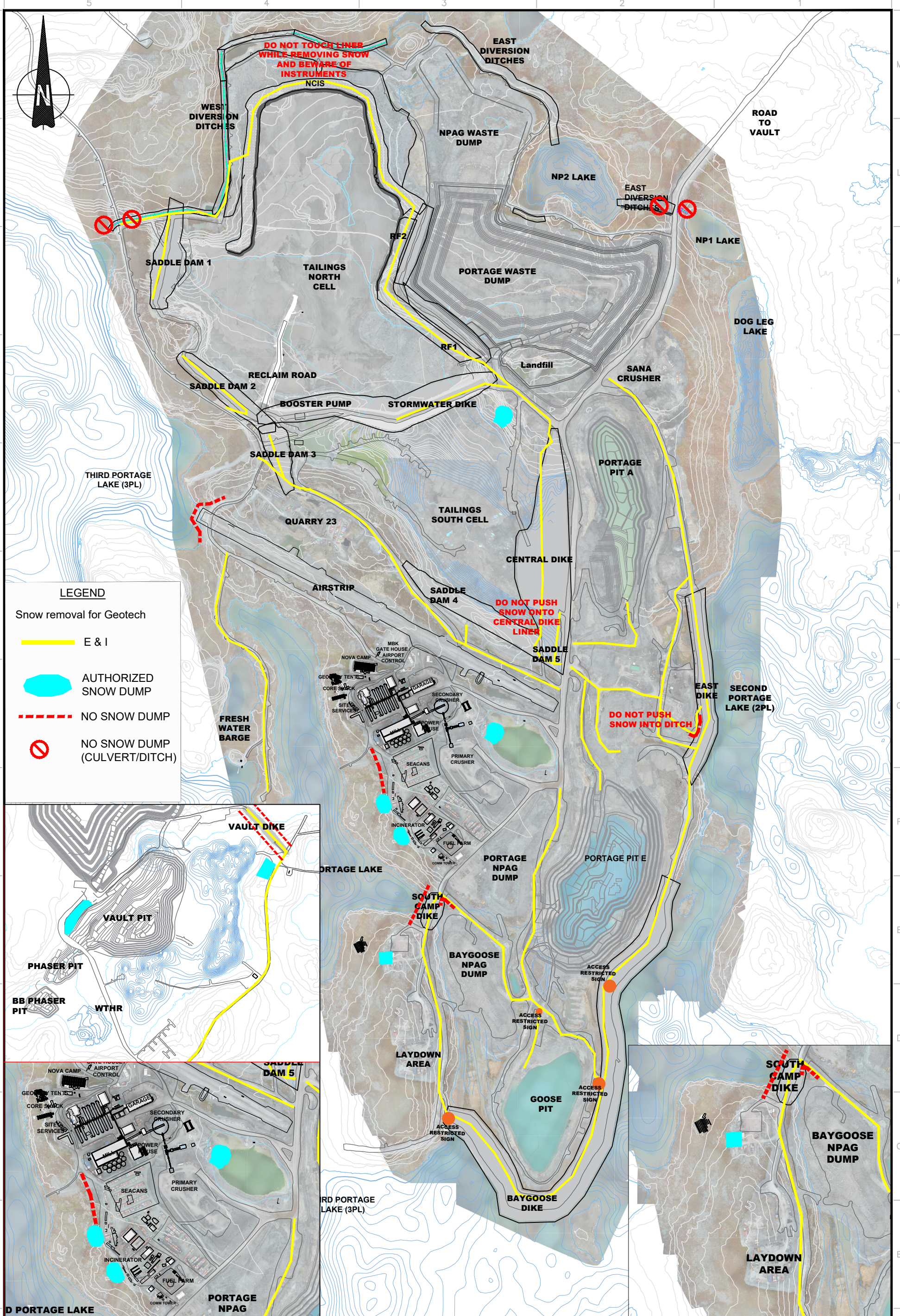




## **APPENDIX 3**

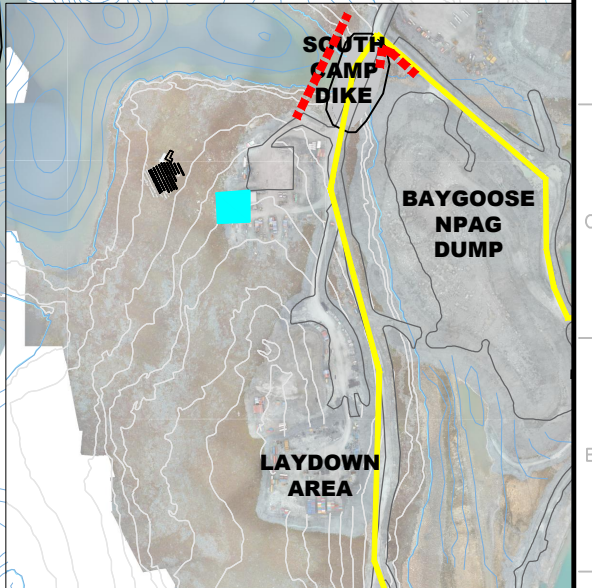
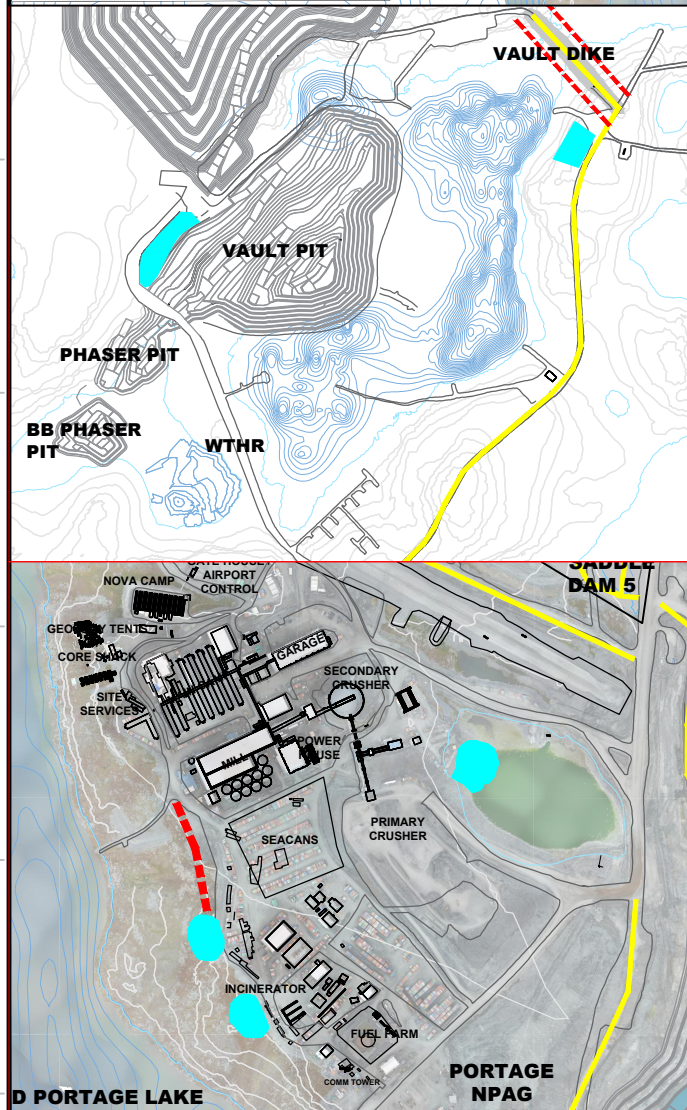
### **2023-2024 Snow management**





**LEGEND**

- Snow removal for Geotech
- E & I
- AUTHORIZED SNOW DUMP
- - - NO SNOW DUMP
- ⊘ NO SNOW DUMP (CULVERT/DITCH)



<b>TECHNICAL SPECIFICATION</b>
None

DRAWN BY	DATE
SURVEY CHECK	DATE
GEOLOGY CHECK	DATE
ENGINEERING CHECK	DATE

MODIFIED BY	DATE
G. Baril/T. Dahm	2022-10-30
C. Pelletier	2023-10-13

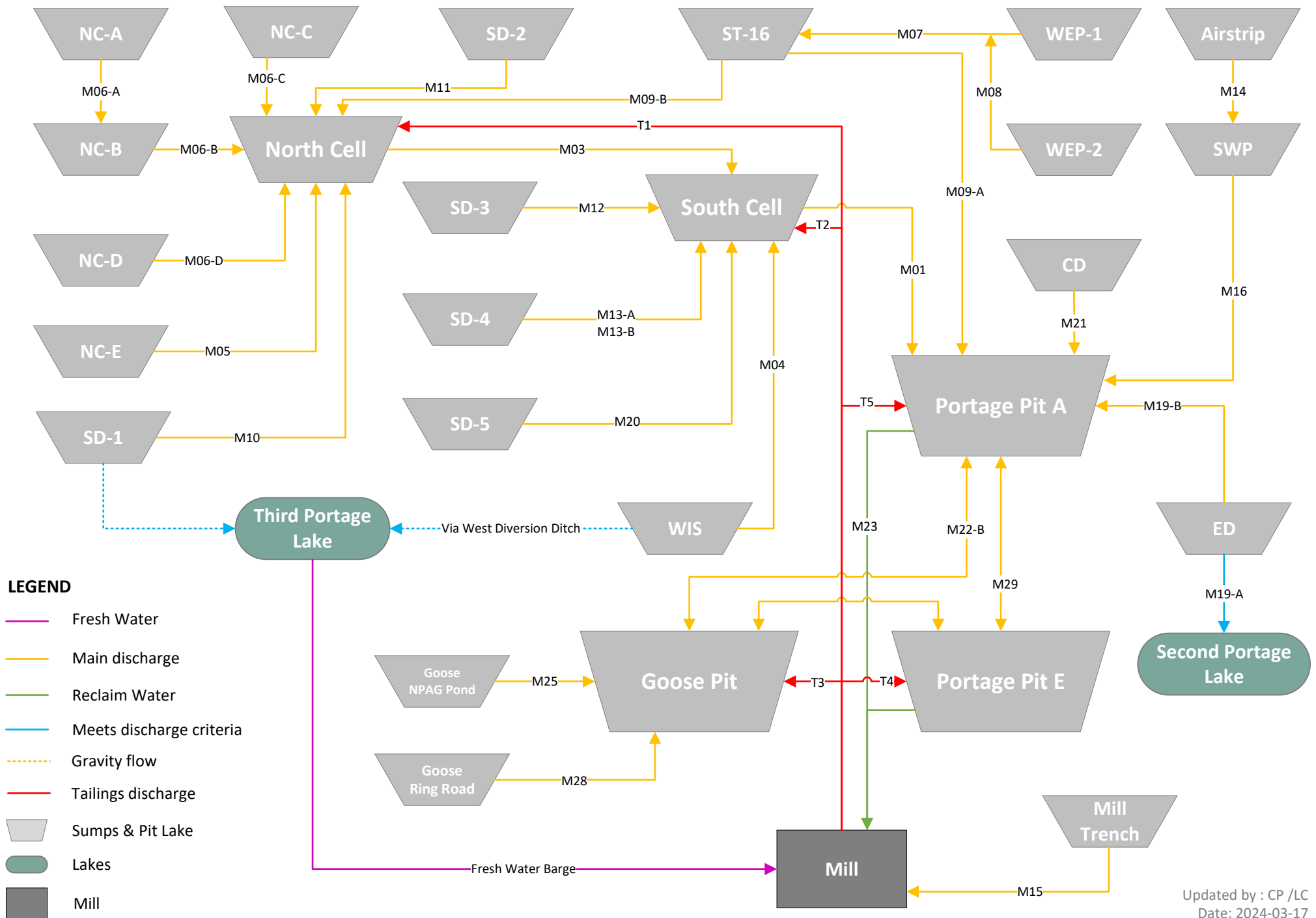
**MEADOWBANK DIVISION**  
 GEOTECH REQUIREMENTS  
 MBK SNOW CLEARING MAP  
**2023-2024**

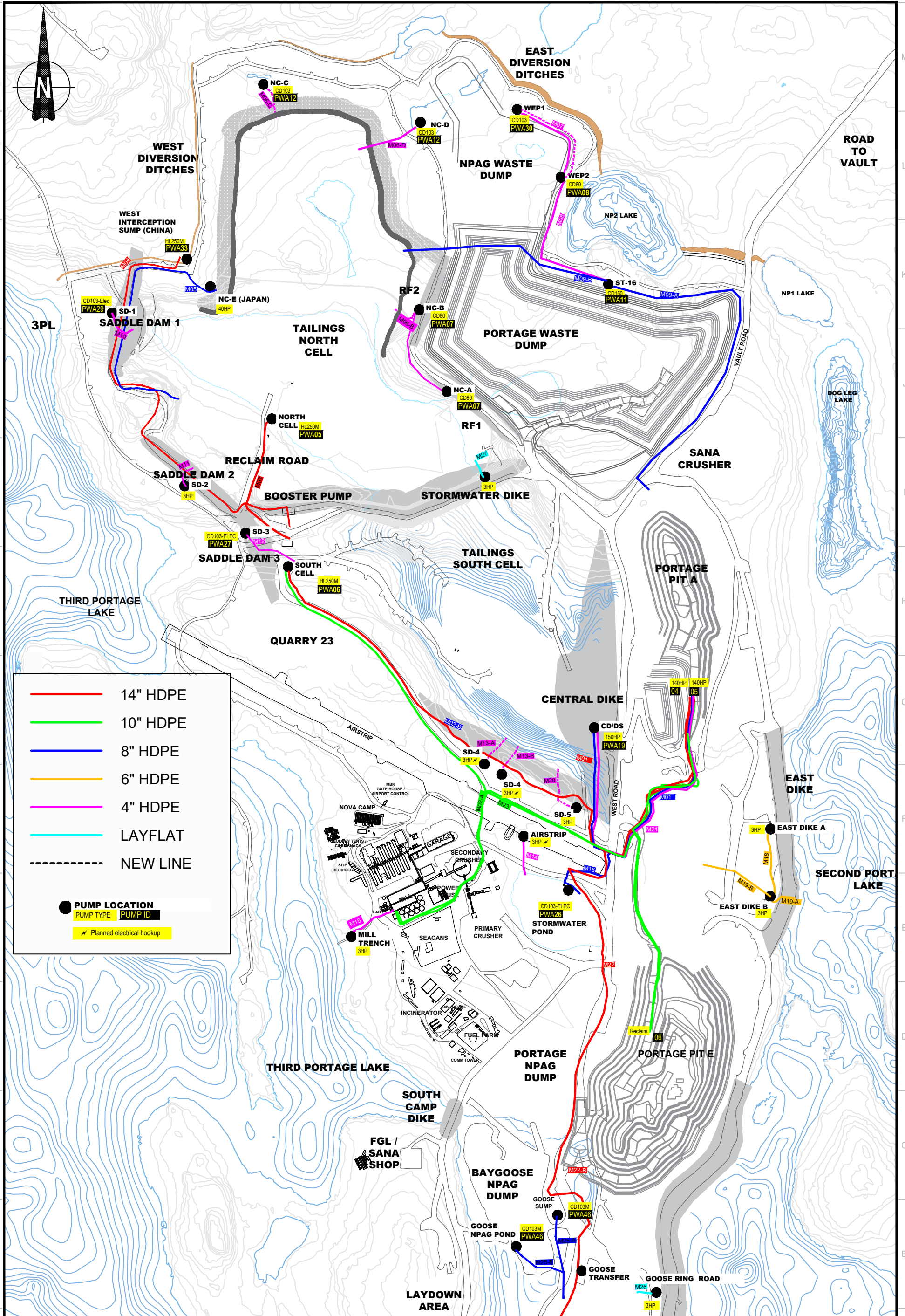


## **APPENDIX 4**

**2024 Freshet flowchart and plan view**

# Meadowbank Freshet Detailed Flowsheet - 2024





	14" HDPE
	10" HDPE
	8" HDPE
	6" HDPE
	4" HDPE
	LAYFLAT
	NEW LINE

	<b>PUMP LOCATION</b>
	PUMP TYPE
	PUMP ID
	Planned electrical hookup

TECHNICAL SPECIFICATION  
None



DRAWN BY	LC	DATE	4/22/2020
SURVEY CHECK		DATE	
GEOLOGY CHECK		DATE	
ENGINEERING CHECK		DATE	

MODIFIED BY	C. Pelletier	DATE	02-29-2024

**MEADOWBANK DIVISION**  
ENGINEERING - GEOTECH  
MBK DEWATERING  
**Freshet Plan**  
Revision 9

SCALE: 1:12500    DATE:    FILE: .DWG



MEADOWBANK GOLD MINE  
2023 WATER MANAGEMENT PLAN

**APPENDIX E – 2024 AMMONIA MANAGEMENT PLAN**

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**AGNICO EAGLE**

**MEADOWBANK COMPLEX**

**AMMONIA MANAGEMENT PLAN**

**JANUARY 2024**

**VERSION 5**

## **EXECUTIVE SUMMARY**

In accordance with the Type A Water Licenses (2AM-MEA1530 & 2AM-WTP1830) Agnico Eagle is updating the Ammonia Management at the Meadowbank and Whale Tail sites (e.g., the Meadowbank Complex), which includes monitoring for ammonia in all mine pit sumps, storage pond, tailings storage facility, seeps, etc. Furthermore, Agnico Eagle has implemented a comprehensive, regular inspection program related to explosives management within the mine pits, conducts regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use, and continues to perform continuous review of analysis results such that mitigation measures can be implemented when increasing trends of ammonia are determined. Agnico Eagle has not exceeded any ammonia discharge criteria (Water License or MDMER) to date.

This Ammonia Management Plan (AMP) is a companion document to the Spill Contingency Plan, the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provide guidance for monitoring ammonia levels at the Meadowbank and Whale Tail mine sites, as part of the conditions applying to waste disposal and management listed in the Water Licenses.

**DOCUMENT CONTROL**

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
00	SNC		February 2013	All	
01	Agnico Eagle	1	March 2016	13	Table 1 update
				16	Add section 6
				Appendix 1	Add Memorandum to address comments made during water license renewal process
WT	Agnico Eagle	WT	June 2016		Included Whale Tail Pit operations in the updated plan
02_NIRB	Agnico Eagle	2	Dec 2018		For WT Expansion permitting process
02_NWB	Agnico Eagle	2	April 2019		For WT Expansion permitting process
02	Agnico Eagle	2	April 2020	All	Comprehensive review of the plan + incorporates WT
03	Agnico Eagle	3	March 2021	All	Comprehensive update to reflect the current operation
04	Agnico Eagle	4	December 2021	Appendix 5, p.27	Update inspection sheet
				Section 2.1.1, p.9	Update to reflect WT emulsion plan construction
05	Agnico Eagle	5	January 2024	Section 2.1.1 and 2.1.2, p.9 Appendix 1, p.21 Appendix 3, p.25 Appendix 4, p.26	Updated to reflect current operation  Updated Figures Updated Emergency Response Plan  Updated MSDS

Prepared By: Environmental Department



Approved by: Eric Haley  
Environment and Critical Infrastructures Superintendent



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- APPENDIX 2 SPILL CONTROL AND LOADING PROCEDURE PLAN**
- APPENDIX 3 DYNO NOBEL EMERGENCY RESPONSE PLAN**
- APPENDIX 4 MSDS FOR BULK EMULSION AND SENATEL**
- APPENDIX 5 EMULSION PLANT / BLAST AREA INSPECTION SHEET**

## **ACRONYMNS**

AGNICO EAGLE	AGNICO EAGLE MINES LIMITED
AMP	AMMONIA MANAGEMENT PLAN
AN	AMMONIUM NITRATE
ANFO	AMMONIUM NITRATE – FUEL OIL
AWAR	ALL-WEATHER ACCESS ROAD
CCME	CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT
CIRNAC	CROWN-INDIGENOUS RELATIONS AND NORTHERN AFFAIRS CANADA
CNO-	CYANATE
CREMP	CORE RECEIVING ENVIRONMENTAL MONITORING PROGRAM
KIVIA	KIVALLIQ INUIT ASSOCIATION
MDMER	METAL AND DIAMOND MINING EFFLUENT REGULATIONS
NIRB	NUNAVUT IMPACT REVIEW BOARD
NWB	NUNAVUT WATER BOARD
TSF	TAILINGS STORAGE FACILITY
WMP	WATER MANAGEMENT PLAN
WRSF	WASTE ROCK STORAGE FACILITY
WTHR	WHALE TAIL HAUL ROAD

## 1 INTRODUCTION

---

The Meadowbank Mine Water Management Plan (WMP) was first prepared in 2009. This version was subsequently updated in preparation for the Type-A Water License Application for the Meadowbank Mine. The WMP was then updated in 2011. In 2015 WMP update, a technical note was added as an appendix, which was the first iteration of the Ammonia Management Plan (AMP) for the Meadowbank Mine. As an extension of the Meadowbank Mine, the 2016 update of the AMP includes measures to manage and monitor ammonia at the Whale Tail satellite open pit operations. Other facilities that are part of the Meadowbank Mine are the Baker Lake facility, the All-weather Access Road (AWAR) between Baker Lake and the Meadowbank Mine, the Meadowbank Mine Camp, the Meadowbank Tailings Storage Facility, the Whale Tail Haul Road (WTHR) between the Whale Tail and the Meadowbank Mine sites.

The Ammonia Management Plan (AMP) was updated in March 2016 in response to concerns raised during the Water License renewal process (January, 2015 – NWB Technical Meetings – Baker Lake) and was re-issued as part of the management plans update process. These concerns from interveners centered on ammonia loading resulting from mine infrastructure in particular from cyanidation in the Tailings Storage Facility (TSF), the use and management of explosives, and the management of treated sewage. In addition, there was a request for loading calculations of ammonia to the receiving environment. These comments are addressed in the Ammonia Management Plan Version 2 March 2016 and specifically in the SNC 2016 Technical Memorandum – WGFU, which was appended to the revised plan. It should be noted that there is no further planned discharge of mine contact water into Third Portage Lake from the Portage Attenuation Pond. The onsite Core Receiving Environmental Monitoring Program (CREMP), takes into account the overall ammonia levels in Third Portage Lake and to date Agnico Eagle has not reached any level of concern (no trigger levels have been reached for ammonia).

Ammonia management at Whale Tail site follows the same practices as outlined in this approved plan and similarly includes conducting routine monitoring in the receiving environment at the Whale Tail site under the CREMP.

This AMP is a companion document to the Spill Contingency Plan, the Water Management Plan and the Water Quality and Flow Monitoring Plan and has been updated to provide guidance for monitoring ammonia levels at the Meadowbank and Whale Tail mine sites, as part of the conditions applying to waste disposal and management listed in the water license. This includes monitoring for ammonia in all mine pit sumps, attenuation ponds, TSF, seeps, etc. in accordance with the Type A Water Licenses. Furthermore, Agnico Eagle implemented a comprehensive, regular inspection program related to explosives management within the mine open pits, conduct regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use, and continue to perform continuous review of analytical results such that mitigation measures can be implemented when increasing trends of ammonia are noted. Agnico Eagle has not exceeded any ammonia discharge criteria (Water License or MDMER) to date.

Ammonia is a naturally occurring nitrogen compound found in the environment. However, there are two sources at the mine site that can contribute to the mobilization of ammonia in the groundwater or surface runoff:

1. Blasting of ammonium-nitrate (AN) explosives is typically the primary source of ammonia in areas of mining operations. AN readily absorbs water and dissolves easily, thereby mobilizing ammonia in either groundwater or surface runoff.
2. In gold mine operations using a cyanidation process to extract the gold from the ore, the cyanide in solution is oxidized to cyanate (CNO<sup>-</sup>) using a sulfur dioxide (SO<sub>2</sub>) air process before discharge to the TSF. The cyanate can then hydrolyze to ammonia in the TSF reclaim pond.

Ammonia dissolved in water exists in equilibrium of interchanging un-ionized (NH<sub>3</sub>) and ionized (NH<sub>4</sub><sup>+</sup>) forms. The equilibrium is influenced by pH, temperature, and ionic strength (salinity) where the amount of un-ionized ammonia is favored as the pH becomes more basic or as the water temperature or salinity increases. Un-ionized ammonia can readily pass across the gill surface and enter into the bloodstream of fish, while ionized ammonia passes with greater difficulty. Once inside the fish, both forms of ammonia can cause toxic effects (CCME, 2010). Furthermore, it should be noted that ammonia oxidizes to nitrite (NO<sub>2</sub>) and nitrate (NO<sub>3</sub>), the former being particularly toxic to fish and humans. Both nitrite and nitrate have CCME guidelines to ensure the Protection of Aquatic Life.

In addition to ammonia, monitoring of nitrate and nitrite is also considered in the AMP, as both water quality parameters are signature compounds of AN explosives. NO<sub>3</sub> has a discharge criteria threshold specified in the conditions applying to waste disposal and management in the Meadowbank and Whale Tail Water Licenses. This AMP proposes monitoring of blasting practices for the assessment of explosive quantity used and blast performance, as well as monitoring of water quality to determine ammonia levels in waters within the mine sites. The monitoring results can be used to review and adjust blasting practices or water management if ammonia levels need to be reduced.

## 2 EXPLOSIVE MANAGEMENT AND BLASTING PRACTICES

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### 2.1 SITE DESCRIPTION

#### 2.1.1 Explosive Storage

The primary storage area of explosive products is located at the Whale Tail emulsion plant areas (see Appendix 1). The explosive products arrive by barge at the Baker Lake marshalling area. They are then transported by ground to the Whale Tail emulsion plant. There is no explosive storage at Meadowbank since the beginning of 2022.

Explosive products at the plant facilities are packaged in supplier provided containers, which limit the possibility of spillage into the environment. The products are only removed from these containers prior to use at the emulsion plant areas. Surface areas are graded to collect water runoff within the storage facilities.

The emulsion plant area at Meadowbank is located north of the Meadowbank mill, pits, and camp site and approximately 76 km from Whale Tail Mine. The storage area is accessible from the AWAR. Some ammonium nitrate prill containers are temporarily stored at the Meadowbank emulsion plant (no longer in operation) and brought to Whale Tail as needed due to the limited storage capacity on Whale Tail site. The Whale Tail Emulsion Plant is located in a remote area of Whale Tail Mine, southwest of the pits and the main camp. The plant was commissioned in January 2022. The infrastructure presently consists of an emulsion plant for the preparation of bulk emulsion explosives, two buildings for the storage of AN, a nitrate pad and seven explosive magazines along the access road to the plant.

Similar to the previous Meadowbank operations, the emulsion is trucked to Whale Tail Pit, IVR Pit and Underground operation. The current plan for emulsion delivery is to directly deliver to the open pits and underground however, emulsion is also stored in a remote emulsion storage building located where the Whale Tail mine explosives magazines are stored. In the case of road closures, inclement weather or other operational constraints, the remote emulsion storage will supply emulsion to the Whale Tail Pit, IVR Pit and underground.

#### 2.1.2 Roads

The AWAR and the WTHR are used to transport explosive products from the Baker Lake site facilities to Whale Tail Mine.

Agnico Eagle will continue to enforce restricted access from km 85 north to the Meadowbank Mine and will enforce the same restrictions along the WTHR (refer to the Whale Tail Haul Road Management Plan).

Spillage control protocols, procedures and handling of spilled material, and explosive management for both storage and transport have been established by Dyno Nobel Inc. (Dyno) and are provided in Appendix 2. Explosive products and spills on the AWAR/WTHR are referenced in the Spill Contingency Plan.

### 2.1.3 Pits and Underground Operations

The development sequence of the mine site is provided in the Meadowbank Mine Waste Rock and Tailings Management Plan and the Whale Tail Waste Rock Management Plan. Explosives are used for the excavation of waste rock and mining of the ore at the Portage, Goose and Vault pits at Meadowbank before depletion, and at the Whale Tail Pit, IVR Pit, and underground mines.

## 2.2 AMMONIA PATHWAYS

Emulsion not fully detonated in pit blasting operations provides several pathways for ammonia mobilization. Water from drainage runoff is the primary mechanism of mobilization for ammonia residuals remaining within open pits. This water, being at Meadowbank or Whale Tail, is collected at pit sumps and then is pumped to the associated Attenuation Ponds.

Blasting residuals are also expected to be attached to waste rock and ore materials, which are transported from the open pits to their respective storage and processing facilities. Residuals from waste rock may be washed off by precipitation and be ultimately conveyed to the attenuation ponds. Residuals from the ore may be carried in the tailings to the TSF. All these pathways (mine sumps, attenuation ponds, TSF) are monitored in accordance with the Water License.

At Whale Tail operations, if blasting residues on waste rock are mobilized, they will collect in the Waste Rock Storage Facility (WRSF) pond, which is downslope of the WRSF, or the IVR WRSF contact water collection system. For ore stored within the dewatered portion of Whale Tail Lake, drainage would flow to the attenuation pond. The locations of the WSRF and the storage ponds are shown in the figure for Whale Tail site in Appendix 1.

To avoid any case of poor or incomplete detonation, Agnico Eagle employs the following measures:

- inspection of drilling depth to ensure it is in accordance with blast design;
- inspection of quantity of explosives in each drillhole to ensure it is in accordance with blast design;
- inspection of blast tie-in execution; and
- reporting of any anomalies during loading and priming of explosives to correct situations prior to initiation.

These measures will be reviewed should ongoing cases of poor or incomplete detonation be encountered. This will be included in the next revision of the AMP.

## 2.3 EXPLOSIVES AND BLASTING

Based on experience at Meadowbank and at other open pit mines in the Canadian Arctic, the largest potential source of ammonia in mine water will be explosive residue from blasting. Depending on the wetness of the site, water may leach explosives from blastholes prior to the blast. Other forms of ammonia released from AN are explosives flowing into cracks and fissures in the rock and not detonating or leading to an incomplete detonation of the explosive column and misfired blastholes. An ammonium-nitrate based emulsion is used as a blasting agent at the Meadowbank

and Whale Tail sites. This material is designed to repel water thus minimizing the potential for ammonia to impact mine water.

Blasting operations on site include monitoring of explosive quantities, blast design, procedures, and practices. The results of this assessment are used to adjust blasting practices as needed to:

- a) Optimize the use of explosives; and
- b) Increase the completion and efficiency of explosive detonations.

Any modifications to blast design are intended to decrease the amount of ammonia that may become available for mobilization in mine water.

### **2.3.1 Explosive Products**

Explosive products used at the mine site include bulk explosives (bulk emulsion), packaged explosives, cast boosters, detonating cords, non-electric delay detonators and non-electric lead lines. The material safety data sheets (MSDS) for these products are provided in Appendix 4. Of these products, the greatest potential for water contamination comes from the bulk explosives. Meadowbank and Whale Tail use emulsion as the primary bulk explosive for blasting operations.

Bulk emulsions typically contain some or all of the following components:

- Ammonium, sodium and/or calcium nitrate;
- Fuel and/or mineral oil;
- Methylamine nitrate;
- Emulsifiers; and
- Ethylene glycol.

Although bulk emulsions are water resistant, contaminants can be leached from the product if it is left in contact with standing or flowing water for extended periods of time. The performance of the explosive, and hence the potential for post-blast contaminations, deteriorates with the length of time that the emulsion remains in the blasthole after it has been loaded (i.e., sleep time). Blast procedures currently in use are designed to minimize sleep time so that standing or flowing water is not in contact with the bulk emulsion for extended periods of time.

### **2.3.2 Procedures and Practices**

Quality control procedures are in place to verify AN content in bulk explosives. Quality control procedures for the emulsion occur at the plant and density tests are done at the blast site (on the trucks). Loading procedures specify that blastholes be loaded with emulsion from the bottom of the blastholes to provide a continuous explosive column. Details on the explosive quality control and loading procedures have been established by Dyno Nobel and are provided in Appendix 2.

The primary factors that may reduce the amount of ammonia available for mobilization in mine water are:

- Explosives handling; and
- Completeness of detonation



Bulk emulsion spillage during blasthole loading could (as bulk emulsion is resistant to water) be a source of ammonia that could be carried by water collected in the pits. Spillage control protocols, procedures and handling of spilled material, and explosive management for storage and transport, as well as the emergency response plan, have been established by Dyno and are provided in Appendix 2 and 3.

Incomplete detonation results in higher ammonia residue on the blasted rock. Evidence of incomplete detonation is often observed as an orange fume after a blast and sometimes an orange pigment on the blasted rock. Explosives that have failed to detonate may be observed in the muck pile. Muck piles are routinely inspected by Meadowbank and Whale Tail staff for signs of incomplete detonation.

### 3 MONITORING

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Monitoring of explosive handling and blasting is as follows:

- a) Explosive quantities: Records of explosive quantities used for in-pit blasting are kept for each blasting event and will be conserved throughout the mine life. Furthermore, a record of blast location (i.e., pit and elevation), blast date, and bulk explosive type and name used (emulsion, with the corresponding ratio of AN over emulsion) is kept for all events.
- b) Design parameters: Blast design parameters, as well as changes in the blast design parameters from the standard are recorded and dated.
- c) Loading instructions: Loading instruction forms are completed for each blast event and provide a record of the as-loaded parameters for all blastholes in the blast pattern including:
  - Hole depth
  - Collar height
  - Priming (single or double)
  - Other observations made by the blast crew (e.g., wetness of holes, use of liners, collapsing holes or difficulty loading)
- d) Video footage: Videos are taken of each blast. This practice provides a visual, qualitative record of the results of each blast and provides insight into potential problems such as incomplete detonation (e.g., orange fumes) and misfires, as well as areas of poor muck pile heave and forward movement.
- e) Blast audits: Blast audits are conducted on a monthly basis to ensure that best practices are being followed in the field (audits may be adjusted to a lesser frequency if low ammonia levels are consistently observed, or conversely may be adjusted to a higher frequency if high ammonia levels are consistently observed).

An additional monitoring technique commonly used is the measurement of the Velocity of Detonation (VOD), which has been shown to be directly related to the volumetric fraction of the explosive that has been consumed. This technique will be implemented if poor or incomplete detonation is consistently suspected.

## 4 MILL EFFLUENT

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### 4.1 SITE DESCRIPTION

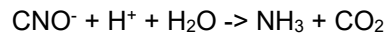
The mill effluent consists of tailings produced at the mill that is pumped as slurry and deposited in the TSF/in-pit disposal where the tailings particles can settle and consolidate. The reclaim water is pumped back to the mill for re-use. Prior to discharge of the mill effluent to the TSF, the effluent is sent to the cyanide destruction process. The cyanide destruction process at Meadowbank uses the sulfur dioxide (SO<sub>2</sub>) and air process to oxidize weak acid dissociable cyanide (CN-WAD) to a less toxic form: cyanate (CNO<sup>-</sup>) based on the following reactions:



The process can also use sodium metabisulfite (Na<sub>2</sub>S<sub>2</sub>O<sub>5</sub>) instead of sulfur dioxide in case there are operating issues with the dosing of sulfur dioxide gas in the process. This ensures that chemicals required for the cyanide destruction process (either SO<sub>2</sub> or Na<sub>2</sub>S<sub>2</sub>O<sub>5</sub>) are always available.

### 4.2 AMMONIA PATHWAY

Cyanate produced from the oxidation of CN-WAD can readily hydrolyze to ammonia (NH<sub>3</sub>) and carbon dioxide (CO<sub>2</sub>) based on the following reaction:



Thus, the mill effluent provides an ammonia loading to the TSF reclaim water.

During the operation of the TSF, the reclaim water will be pumped to the mill for re-use in a closed loop system. Consequently, there will be no discharge of reclaim water to the environment during this period. Furthermore, it is expected that the ammonia concentration will gradually increase in the TSF/in-pit reclaim pond over time, even though (1) there may be some slight attenuation of ammonia due to microbial/algae activity in the summer and (2) ammonia may oxidize to nitrite and nitrate, particularly near the top of the pond where oxygen is most present.

Annual Water Quality Forecasting provides a forecast of the concentration for ammonia in the TSF reclaim pond during the life of the mine. Furthermore, the report provides a forecast of the ammonia concentration in the Portage and Goose Pit flooding activities. This modeling has been updated for Whale Tail operations to include predictions for Portage and Goose Pit end pit water quality and will be updated according to the Type A Water License requirements.

### 4.3 MONITORING

Concentrations of ammonia, nitrate and nitrite are parameters that are monitored on a monthly basis as part of this sampling campaign of the TSF/in-pit reclaim water.

In the Water Quality Forecasting, a maximum ammonia concentration in the TSF reclaim water is evaluated in order to meet the Type A Water License criteria which for benchmarking are compared to CCME guidelines for the Protection of Aquatic Life in the Portage and Goose Pits once in-pit disposal and flooding activities are completed. If this concentration is exceeded before the end of the flooding operation, measures could be undertaken to lower the ammonia concentration, as well

as nitrate and nitrite if required, in the TSF reclaim pond prior to the transfer of TSF reclaim water to the pits.

Ammonia treatment technologies that could be further investigated, if the need arises, include:

- i) Biological nitrification / denitrification during the summer months.
- ii) In-situ volatilization of ammonia during the summer months.
- iii) Ammonia removal by snow making.

## 5 WATER MANAGEMENT

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For details on the site wide water management, please refer to the Meadowbank Water Management Report and Plan and the Whale Tail Water Management Plan.

In addition to controlling contact water through design, the Meadowbank Water Quality and Flow Monitoring Plans and Type A Water License requires monitoring stations that are used for the monitoring of ammonia loadings around the mine site and waste rock storage areas from explosive residuals, as well as ammonia concentration found in the reclaim pond. These monitoring requirements ensure contact water that may contain elevated ammonia, nitrates or nitrites are managed, treated if necessary and do not impact the receiving environment. Monitoring at Whale Tail site is presented in the Whale Tail Water Quality and Flow Monitoring Plan and in the Type A Water License.

In addition to the monitoring listed in the Water Quality and Flow Monitoring Plan, the following actions are undertaken at Meadowbank and Whale Tail as part of the AMP:

- If runoff or seepage is detected at the rock storage facility, water samples collected at the Portage, Vault, Whale Tail, or IVR WRSFs during late operations will also be analyzed for nitrate and nitrite to complete the suite of signature compounds found in explosive residuals.
- Tailings slurry volumes and density from the mill pumping facility to the TSF are recorded on a monthly basis.
- The records of water volumes pumped from the Meadowbank and Whale Tail sumps or WRSF pond to the attenuation ponds are recorded on a monthly basis.
- The records of water volumes pumped from the attenuation or storage ponds to the receiving environment will be recorded on a monthly basis.

Sampling frequency at the pit sump will also be increased if high variability is identified in observed constituent concentrations as a result of the blasting schedule.

The WRSF ponds at Whale Tail will collect all drainage from the WRSFs. Any drainage from the ore storage area will collect in the Whale Tail/IVR Attenuation Ponds. The open pit, water storage ponds and the Attenuation Ponds at Whale Tail and IVR Pits are shown in Appendix 1.

## 6 REPORTING

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Reporting of ammonia concentrations at the Type A sampling stations listed is included as part of the requirement of the Water License. The reporting frequency is prescribed by the Nunavut Impact Review Board (NIRB) Kivalliq Inuit Association (KivIA), and Nunavut Water Board (NWB) and include, but may not be limited to:

- Brief monthly reports of the compiled water quality monitoring results, sent to the NWB, the CIRNAC Water License Inspector and to the KivIA; and
- An annual report submitted to the NWB, KivIA, CIRNAC, NIRB, Government of Nunavut, and other interested parties. This report summarizes monitoring results for each sampling station, annual seep water chemistry results, annual groundwater monitoring results, receiving water monitoring results, spills and any accidental releases, measured flow volumes, effluent volumes and loadings, and results of QA/QC analytical data.

Mine operation personnel reviews on a monthly basis the data gathered from the sampling stations in the Type A Water License and from the monitoring action proposed under the AMP. If the data indicates that further studies and/or significant changes to the water management infrastructure are required to assess or control ammonia concentrations, Agnico Eagle will notify the NWB and KivIA as early as practical. Results of these further studies and/or changes to the AMP monitoring actions will be transmitted to the NWB for review.

## **7 INSPECTION**

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On a weekly basis, the environment department will conduct inspection in the blasting area to ensure that the Dyno Nobel loading procedures are being implemented (this will minimize blasting residues). In addition, inspections will be undertaken at explosive product storage facilities (Dyno Nobel) to ensure that explosives products are stored in sealed containers and there is no spillage. If any non-conformities are observed follow up action will be undertaken, and corrective measures will be put in place. See Appendix 5 for copy of the Emulsion plant inspection form.

## **8 REVIEW OF AMMONIA MANAGEMENT PLAN**

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Review of the results of the site water quality and AMP monitoring during the year may provide new information, and/or indications that changes to the AMP are necessary. When revisions are warranted, an updated AMP will be submitted to the NWB for review.



## 9 REFERENCES

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- Agnico Eagle (2020), Meadowbank Water Quality and Flow Monitoring Plan. July 2020.
- Agnico Eagle (2016), Whale Tail Pit Project FEIS and Type A application documents. Volume 8 – Monitoring and Mitigation and Management Plans. June 2016.
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- NWB (2020). Water License No: 2AM-WTP1830. Agnico- Eagle Mines Ltd. March 2020.
- SLI (2012). Water Management Plan 2012. Agnico-Eagle Mines. Document No. 610756- 0000-40ER-0001, Rev. 02. March 2013.
- SLI (2012). Water Quality Forecasting for the Portage Area 2012-2025. Agnico-Eagle Mines. Document No. 610756-0000-40ER-0002, Rev. 01. March 2013



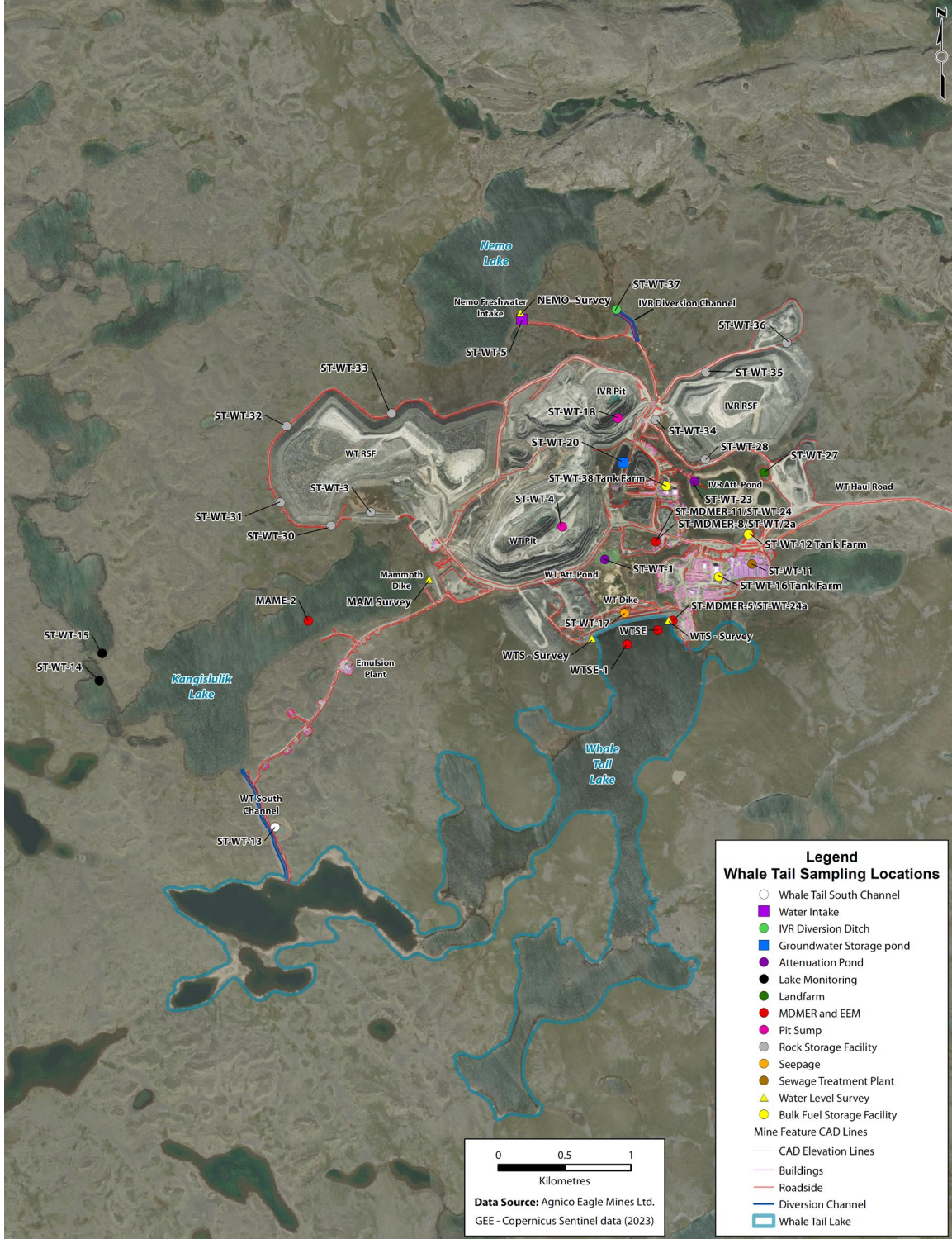
**APPENDIX 1**

**ENVIRONMENT FIELD STATIONS – MINE SITE VIEW**

Meadowbank Mine Site Layout Area



Whale Tail Mine Site Layout Area





**APPENDIX 2**

**SPILL CONTROL AND LOADING PROCEDURE PLAN**

## Dyno Spill Control and Loading Procedure Plan

- 1) All trucks are washed inside shop to contain any residue that may have contacted trucks. The water from the washing of the trucks and or the shop floors themselves is then picked up by the AEM e vacuum and disposed of in the onsite Stormwater Management Pond.
- 2) A.N. Prill is brought to the Emulsion Plant site in 20 ft Seacans and is stored in the Seacans on the A.N. Pad for the site till it is needed. It is then taken out of the Seacan /s and brought into the Plant for use. Sometimes enough product for the next batch is stored outside to speed up Batching time when it is necessary. A.N. Prill is not left outside if weather looks like it is going to be damp or raining to prevent the leaching of Prill through the Tote bags and on to the ground surface.
- 3) Any A.N. spills that occur are promptly cleaned up and disposed of in 1 of 2 ways:
  - i. Any contaminated prill is put into containment barrels or buckets inside Plant, depending on amount, and put into the next Ansol batch to be made.
  - ii. Any contaminated Prill is put in Barrels or Buckets (depending on amount) and then transferred from barrels to buckets for the Emulsion Truck Operators to take to the Blast Pattern and placed into the boreholes after they have been loaded (disposal via blast).

Any spills that are too difficult (some of our drummed Products) to take care of in this manner are placed in Metal Drums or HAZMAT bins etc. with absorbing materials, sealed and sent to AEM HAZMAT AREA (for shipment south).

- 4) Emulsion waste (with contaminants) is also either contained in drums or bins until it can be transferred into buckets and taken to Blast patterns and placed into boreholes for disposal (disposal via blasting).

Any non contaminated Emulsion is put back through the system and on to Trucks.

When Trucks need to be de-contaminated or process lines of trucks or plant need to be cleaned out, the excess water is strained through a Sack (this allows the water to go through, but contains the Emulsion) to minimize nitrites in our plant sump containment.
- 5) When an Emulsion Truck has completed loading on a blast pattern the remaining emulsion is flushed out of the loading hose by running water through the hose (water holding tank on trucks) until water discharges out the end of the hose into the borehole.

This does not completely remove all of the Emulsion out of the Hose; there is still a residue amount left in the hose. Thus, when the Truck operator starts up on the next blast pattern, the hose is put into the borehole and the Operator primes the hose and all the residue Emulsion is contained in borehole and disposed of when hole/s are blasted.



**APPENDIX 3**

**DYNO NOBEL EMERGENCY RESPONSE PLAN**

# DYNO NOBEL CANADA

## EMERGENCY RESPONSE PLAN

### AMARUQ NUNAVUT

**REVISION STATUS**

Revision #	Date	Revision Description	By	Checked by	Approved by	Revision Due
1.0	July 31, 2019	New Standard	P.St-Georges	D. Wall; P. Piprell	T. Medak	
1.1	October 26, 2020	Site Manager change		P.Piprell a& Shanno Ryan	T.Medak	
1.2	October 26, 2021	Review ERP	PSt-G.			October 2022
1.3	October 26, 2022	Review ERP <i>Mod. In Blue*</i>	P.St-G.			October 2023
1.4	October 17, 2023	Review ERP <i>Mod. In Blue*</i>	P.St-G.			October 2024

\* Modification done in the site ERP are in blue

**Approved for release by:**

**Signature:** Patrick Piprell \_\_\_\_\_

**Date:** October 17, 2023

Title: Site Supervisor



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### External Reports

All incident involving the manufacturing, importation, exportation, sales or storage of explosives and restricted components, and the use of fireworks, must be reported to the Chief Inspector of Explosives as soon as circumstances permit. For accident involving fatality, serious injuries or major property damage, call **1-855-912-0012** as soon as possible. All other accident/incidents must be reported to 1-613-948-5200. The completed Explosive Incident Report form F07-01 should be sent by email to [ERDmms@nrcan.gc.ca](mailto:ERDmms@nrcan.gc.ca) or by fax to 613-948-5195. The inspector of explosives responsible for your area should also be contacted.

## 1.0 SITE INFORMATION

The entrance to the site is south of AMARUQ mine site at the Explosive Manufacturing Road (EMR).

Latitude (North): 65° 23'43.45"N

Longitude (West): 96° 44'1.00"W

Office: +1 819 759-3555 ext 4606808

## 2.0 PURPOSE

The purpose of the 'Emergency Response Plan' is to provide guidelines for the protection of all employees and company property in the event of an emergency occurring on company premises. It outlines the setting up of emergency control within the site and the emergency procedures in place to ensure the safety and protection of people, property and the environment.

- Notifying all on-site personnel of emergencies.
- Organizing the site based emergency response, where applicable.
- Facilitating communications with Emergency Services.
- The plan provides procedures for:
  - Training of site personnel in emergency response.
  - Reviewing and updating emergency procedures.
  - Facilitating recovery operations.

To provide a management system for Dyno Nobel Canada and stakeholders, to deal with emergencies to protect people, property and the environment.

### Objectives:

- To minimize adverse effects on people, property and the environment
- To control or limit the effects of an emergency
- To facilitate an emergency response and to provide appropriate assistance to the emergency services
- To communicate vital information to all relevant persons as soon as possible
- To provide for competency-based training so that a high level of preparedness can be continually maintained
- To provide a basis for updating and reviewing emergency procedures
- To provide a system to manage an emergency
- To link current site plans with the corporate plan
- To identify and utilize an effective communication system

### 3.0 SCOPE

This plan has been prepared for Dyno Nobel Canada Inc. The plan covers the emergency response requirements for Dyno Nobel's AMARUQ Operations.

#### SCOPE OF OPERATION

Bulk Explosives Factory Site includes;

Emulsion [Manufacturing](#) site  
storage of emulsion, Ammonium Nitrate 182,500 NEQ  
- 50,000 liters of diesel;

### 4.0 REFERENCES

- Site Emergency Response Plan (Template)
- Emergency Risk Assessment Worksheet
- IPL HSE MS Element 9.1, Emergency Response Planning
- CSA-Z731-03 Standard – Emergency Procedures
- Regulatory Agencies, Groups, Industry and Community
- Environmental Emergency Regulation – Environment Canada

The regulatory agencies administering explosives are:

- Transportation of Dangerous Goods (TDG)
- Natural Resource Canada (NRC)
- Explosives Regulatory Division (ERD)
- Environment Canada (EC)

### 5.0 EMERGENCIES COVERED UNDER THE PLAN

Based on a risk assessment conducted the following natural or man made disasters could impact our business:

#### On-site Emergencies

- White outs
- High Winds
- Explosion – equipment (boiler/fuel or other)
- Fire in plant
- Injury or illness
- Wildlife interaction (wolverine; bear; caribou; other)
- Environmental contamination
- Spills
- Severe weather
- Product shortage
- Raw ingredient shortage
- Critical replacement parts unavailable
- NOX gas release possible.

Off-site Emergencies (including transportation)

- Transportation incident rollover or collision
- Blast pattern incident with drill
- Blast pattern incident near highwall
- Blast patten incident – lightning
- Fire –threat to vehicle
- Fire – toxic fumes
- Explosion – product detonation
- Security
- Injury or illness
- Wildlife interaction (wolverine; bear; caribou; other)
- Spills
- Severe weather
- NOX gas release possible.

**6.0 HAZARDOUS OPERATIONS**

The following zones, activities and equipment are hazardous and may require an emergency response:

The following is a prioritized list of hazardous operations and storage areas.

	Operation	Comments / Instructions
1.	Manufacture Emulsion	Plant and emulsion storage with chemicals. Emulsion storage in ISO tank.
2.	Operating loader	Yard; site access road
3.	Fuel storage area (bulk)	Bulk tank in yard
4.	Product delivery to blast pattern	Plant; Site yard; Mine road; pit
5.	Driving on a pattern	Pit
6.	Transferring chemicals	Plant; Process vehicles
7.	PTW activities	Confined Space Entry; Working at Height; Hot Work; Loading and unloading (Emulsion, Traces, Fuel); Lockout/Tagout; Critical Lifts

**7.0 HAZARD CHEMICALS AND MATERIALS**

The following is a prioritized list of or hazardous chemicals, materials and intermediates of significant quantities on site or transported by site:

	Chemical / Material	Quanties	Location
1.	Fuel oil	50,000L	Outside plant
2.	Trace 1 (citric acid)	284 L	
3.	Trace 2 (sodium nitrite)	284 L	
4.	ANP	120,000 kg	Outside

## 8.0 EMERGENCY CONTACT INFORMATION

Dial 6-9-1-1 in an emergency or call CODE 1 – CODE 1 – CODE 1

Non-Emergency Police / Fire

- Baker Lake RCMP (867) 93-1111

Regulatory Contacts: (NRCan via H&S or Regulatory Compliance Manager)

- H&S: Seamus Kilcommons Cell: 403 815-4066
- Reg: Pierre St-Georges Cell: 613 677-1051

DN Title	Name	Cell Phone	Work Phone	Home Phone
Manager of the Site	Patrick Piprell & Shannon Ryan	NA	819 759-3555 EXT 4606608	
Operations Manager	Krisnar Cruz	587-839-0654	587-839-0654	
General Manager	Jim O'Brien	913-940-5170	913-940-5170	
HSEC Manager	Seamus Kilcommons	403-837-2685	403-723-7547	
Emergency Supervisor (ES)	Shannon Ryan Patrick Piprell		819-759-3555 EXT: 4606808	

Local Emergency Services may be required to take control of the emergency situation. Dyno Nobel personnel will assist the Local Emergency Services with information and advice and will ensure that the Emergency Services are briefed with all appropriate information when attempting to take control of the situation.

## 9.0 EMERGENCY FUNCTIONS AND RESPONSIBILITIES

The following people will participate in emergency planning and crisis management.

Name	Role / Responsibilities
	Responsible for updating emergency response plan
Patrick Piprell & Shannon Ryan	Site Supervisors will be the EMERGENCY MANAGER, or in his/her absence the next most senior manager on site will assume this role. Responsibilities are to ensure ERP is site specific: Lead drills twice a year
Jim O'Brien	General Manager: Overall reviewer and sign off. General Manager; Media Liaison.
Krisnar Cruz	Operations Manager: responsible to review and ensure adequate: review of drills conducted; Bulk Site Operations Advisor
Seamus Kilcommons	HSEC Manager: responsible to review and ensure adequate: review of drills conducted; Liaison with regulatory authorities

Benoit Choquette	Environment Manager; Liaison with relevant regulatory authorities
Pierre St Georges	Regulatory Compliance Manager; Liaison with all relevant regulatory authorities

Emergency response responsibilities for all personnel on site are describe as follows:

<b>Roles</b>	<b>Responsibilities</b>
<b>Emergency Manager (EM)</b>	<p>This position will usually be filled by the Site Supervisor / Acting Site Supervisor and will be responsible for:</p> <ul style="list-style-type: none"> <li>• Overall responsibility for management of the emergency.</li> <li>• Contact with other external organizations (e.g. Police)</li> <li>• Contact with employees and relatives</li> <li>• Declaration of “All clear” to approve re-entry</li> <li>• Implementation of the DNA Crisis Communication Plan</li> </ul>
<b>Emergency Supervisor (ES)</b>	<p>This position will usually be filled by the one of the operators or designate and will be responsible for:</p> <ul style="list-style-type: none"> <li>• Liaison with the EM.</li> <li>• Arrange the removal of equipment (e.g. truck explosives).</li> <li>• On-site security.</li> <li>• Collect visitors book during evacuation (if safe to do so)</li> <li>• Conducting head count of all personnel on site</li> </ul> <p>In the event that there is only 1 person on site then that person will assume responsibilities of both the EM &amp; ES.</p>
<b>Other personnel on site</b>	<p>This position will usually be filled by any other employee on site.</p> <ul style="list-style-type: none"> <li>• If safe to do so, personnel holding appropriate licenses will attempt to remove all explosive trucks from the vicinity of the fire and shut down all equipment.</li> <li>• Follow the direction by EM to control the situation (e.g. extinguish fire) if directed</li> <li>• Make their way to the nearest designated evacuation point.</li> <li>• Visitors and contractors must proceed directly to the evacuation / muster point: The scale house.</li> </ul>

**10.0 ALARM COMMUNICATION SYSTEM**

- Type of warning/alarm system (including back-up): Alarms tied into AMARUQ mine site Notified system to security / ERT
- The communication system used: Two way radios and phone
- Location of Alarms: Emulsion plant and office – Internal and external alarms
  
- We will communicate an on-site in an emergency situation to employees by:
- Alarm System Bell. In the event of a disaster we will communicate with employees by: Two way radio
- In case of an emergency the triggered alarm communicate with the bitshop, crusher pad, magazines pads. The employees will gather at the muster point where a head count will be performed.
- In event no one is on site, the alarm system will activate by: Automatic alarm: sensed for smoke and heat??
- We will test the warning system and record results at least 1 time per year. Results are recorded by the mine. Mine owns the Dyno Nobel building

**11.0 EMERGENCY RESPONSE EQUIPMENT**

The following emergency response equipment is located on site:

<b>Location</b>	<b>Equipment</b>
Emulsion plant	<b>Spill Kits; Fire extinguishers; First Aid Kits</b>
Process Vehicles	<b>Spill Kits; Fire extinguishers; First Aid Kits</b>
Pickup trucks	<b>Fire extinguishers; First Aid Kits</b>

**EMERGENCY RESPONSE KITS & MATERIAL**

All DNCI worksites will maintain the following emergency response equipment, that is appropriately packaged, stored and easily loaded onto a pick-up truck and / or aircraft for immediate transfer to an accident scene:

**VERIFY WHAT IS READILY AVAILABLE IN SPILL KITS AS PER LIST BELOW**

- I - Spill Recovery Material**
- 1000 ft. of 3 inch fluorescent yellow security tape
- 3 explosion-proof lanterns / flashlights
- 1 roll (200 ft.) of 10 mil. clear plastic for ground or product cover
- 3 “explosives” signs plus assorted 1.1 / 1.5 “placards and labels”
- 4 polyethylene / non-ferrous 45 gal. drums with removable lids
- 1 doz. large heavy duty garbage bags (to line drums and for trash)
- 3 non-ferrous shovels
- 1 spill kit containing 1 - 25 lb. bag of granular absorbent material
- 30 ft. of 5 in. sorbent booms
- 10 ft of 3 in. sorbent socks

1 case of sorbent pads  
1 - 3 ft. x 3 ft. neoprene sheet (drain seal)  
6 heavy-duty cardboard boxes for repackaging broken boxes  
2 rolls of 3" duct tape  
2 rolls of 3" packing tape  
1 push broom  
6 blank (TDG) shipping documents

## **II - Personal Protective Equipment**

6 reflective safety vests  
6 safety "goggles"  
6 particulate respirators (dust masks)  
1 doz. disposable ear plugs  
6 pr. nitrile gloves  
6 pr. cotton gloves  
Industrial First Aid Kit

(Note: all DNCI Emergency Responders must wear CSA approved protective footwear and Type II (lateral protection) hard hats when on the job. As well, a camera should be readily available to photograph the scene of an accident and remedial measures for inclusion in the accident investigation report).

An inventory list of the emergency response kit/material will be kept with the cache, which must be inspected quarterly, to ensure the contents are present and in good working order (note: Emergency response kit cache may be witness/lock-wired closed, in which case only an annual verification that the contents are present and in good working order is necessary, so long as the witness/lock-wire is present and unbroken).

## **12.0 EMERGENCY CONTROL CENTER**

The Site Manager or Supervisor will nominate the most appropriate location of the Site Emergency Control Centre when all site personnel, contractors and visitors have mustered at the designed evacuation area. The Site Emergency Control Centre will depend upon type and location of the emergency.

In the event of an emergency that requires all personnel to be evacuated from the site, the Site Emergency Control Center will be located at the main gate.

## **13.0 EMERGENCY INSTRUCTIONS**

- Ring the alarm.
- Evacuation Procedure.
- Evacuation of people includes alarms, designation of staging areas and alternative routes/assembly points, and a system of head counts to determine if all individuals have been evacuated.



- Activating the emergency plan.
- Activating the emergency services.
- Terminating the emergency.
- Health and safety functions, such as roll call and search and rescue.
- To identify those responsible for conducting this work and detail procedure to clean and contain spills.

### **13.1 EXTREME TEMPERATURES**

Working in cold environments can be not only hazardous to your health but also life threatening. It is critical that the body be able to preserve core body temperature steady at + 37°C (+ 98.6°F). This thermal balance must be maintained to preserve normal body functioning as well as provide energy for activity (or work!). The body's mechanisms for generating heat (its metabolism) has to meet the challenge presented by low temperature, wind and wetness - the three major challenges of cold environments.

Uncomfortably cold working conditions can lead to lower work efficiency and higher accident rates. Cold impairs the performance of complex mental tasks. Manual tasks are also impaired because the sensitivity and dexterity of fingers are reduced in the cold. At even lower temperatures, the cold affects the deeper muscles resulting in reduced muscular strength and stiffened joints. Mental alertness is reduced due to cold-related discomfort. For all these reasons accidents are more likely to occur in very cold working conditions.

Protective clothing is needed for work at or below 4°C. Clothing should be selected to suit the temperature, weather conditions (e.g., wind speed, rain), the level and duration of activity, and job design. These factors are important to consider so that you can regulate the amount of heat and perspiration you generate while working. If the work pace is too fast or if the type and amount of clothing are not properly selected, excessive sweating may occur. The clothing next to body will become wet and the insulation value of the clothing will decrease dramatically. This increases the risk for cold injuries.

## 13.2 INJURY/ILLNESS

Medical emergencies may arise due to serious injury caused by machinery, entrapment, heart stroke. Limited first aid is available on site and casualties would likely be transferred by ambulance to nearest Hospital for treatment. A transport vehicle is always readily available on site for transportation needs. The site is accessible to local emergency services at all time.

A means of communication is mandatory for all employees working on site at all time. For emergencies requiring immediate medical attention, quickly assess the scene then call for assistance. Qualified Site First Aiders will assess the casualty, and if required, **call 6911** or CODE 1 – CODE 1 – CODE 1 on Two Way radio

The site has several trained first aid attendants and these people will be the first to assist in an emergency.

FIRST AID ATTENDANTS	EXPIRY DATE
Chris Paul	
Patrick Piprell	
Shannon Ryan	
Aubrey Chauk	
Billy Harrison	

**\* Report incident details in SHAERS database when the Emergency is over.**

## 13.3 EXPLOSION / FIRE CONTROL PROCEDURE

### EXPLOSION

All site personnel should be evacuated as soon as possible. In the event of an explosion the Emergency Services should be contacted immediately and the evacuated personnel assembled at the Muster area. No personnel should enter the site until at least one hour after the explosion or until the resultant fire has burnt out.

Dyno Nobel personnel should restrict access to the plant and nearby area until the Police and emergency services arrive at which time all access roads should be blocked off at a suitable distance. Emergency services should be advised not to enter the site but if they choose to do so they should be fully briefed before entering.

The Dyno Nobel Compliance Manager shall be notified of any explosion immediately so as to inform Government authorities of any incident that has occurred. There should be no attempt made at clean up or repair of the site until authorisation from the appropriate authorities has been received.

### 13.3 EXPLOSION / FIRE CONTROL PROCEDURE (Continued)

#### **FIRE CONTROL PROCEDURES**

Fires will vary in location and the materials involved. Each kind of fire shall have inherent risks associated with them. In general the following guidelines should be adhered to:

- **Do not fight a fire** that has become established which involves explosives or precursors used in the manufacture of explosives;
- Proceed with extreme caution when fighting fires involving Oxidizing agents as toxic fumes may be evolved;
- Never fight a fire unless you are comfortable to do so and have the correct equipment;
- Always leave an escape route when approaching or fighting a fire; and
- Always fight a fire from upwind.

**IF YOU ARE UNABLE TO CONTAIN THE FIRE WITH A FIRE EXTINGUISHER THEN YOU MUST EVACUATE THE AREA.**

### 13.4 SECURITY

The Site can be secured by a locked gate at the main entrance ( main emergency exit and gathering point ) of the site. Due to 24 hour operation the gate is not locked to allow access for DYN0 personell and mine blasters. A sign in, sign out book is located at the main entrance for visitor and employee manlimits as per the site ERD Factory License. Only Dyno Employee's have keys to the locked gate.

'A' & 'B'. Sign includes; Danger - Explosives, No Trespassing, Penalty-Section 18, Canada Explosives Act, \$ 5,000.00 fine. Man Limit. No smoking. A match/lighter box. PPE requirements, and a 24 hour Emergency Contact Number.

### 13.5 BOMB THREAT

In the event of a "Bomb" threat the telephone operator or other person receiving the call should obtain as much information as possible. Where practicable the person receiving the call should have access to the "Bomb Threat Checklist".

Action if bomb or other explosive device is found:

If object or parcel, suspected of being a "bomb" or other type of explosive device is found by anyone, the following action should be taken:

- Do not touch, tilt or otherwise tamper with the object, whether it is a bomb, improvised explosive device (IED) or other suspect object.
- Immediately evacuate the area surrounding the object.

### 13.5 BOMB THREAT (Continued)

- Consider the consequential damage and effect - both on site and off site -if process equipment, storages or pipelines are involved.

#### **Use the following guidelines:**

- Evacuate the area concerned.
- The possibility of shrapnel must be considered.
- Evacuate all persons to the emergency evacuation area. Safety perimeters must be maintained until the device is rendered safe.
- Quick detailed observations should be taken of a suspected IED. Time spent near an IED must be kept to absolute minimum.

#### **Observations should include:**

- Exact location and proximity to hazards such as dangerous chemicals or substances.
- Size, shape and colour of object.
- Any writings or labels appended to the device.
- Any other peculiarities.
- Notify Police simultaneously with the commencement of evacuation.
- approach police upon their arrival to supply all details of information.
- Police will, upon their arrival, coordinate and control all necessary procedures.

### 13.6 CHEMICAL SPILL/RELEASE

Spills of materials on site are most likely to originate from damaged containers and drums whilst unloading raw materials. The action taken to deal with a spill is dependent on the type of material spilt and the associated hazards with that material.

Environmental considerations should be taken into account when cleaning up a spill. To ensure that the appropriate action is taken to clean up a spill the MSDS (Material Safety Data Sheet) should always be consulted before any clean up attempt is made.

Care should also be taken that the spill does not mix with other raw materials as violent reactions or the generation of toxic fumes may be possible. In the case of reactions or fume generation the emergency services should be called and the area evacuated.

The Ministry of Environment is to be notified. Contact Dyno Nobel Canada Environmental Manager.

### 13.7 TRESPASSING/VANDALISM

**If there** has been a breach of security or obvious signs of trespassers, notify the police. Do not disturb scene.

**Determine** if there has been any damage or theft. Follow instructions of the mine security or police. If there has been a theft of explosive materials proceed to the appropriate section of this Plan.

**Take temporary** actions to prevent recurrence until permanent actions can be implemented.

### 13.8 LOSS/THEFT OF EXPLOSIVES

#### LOSS

**Determine** the nature of the loss. **Implement** the appropriate sections of the Notification Plan. **Retrace** all routes of travel. **Verify** security and inventory level with personnel at the place of origin and destination. **If material cannot** be accounted for, the HSE Advisor and Site Manager shall notify ERD & the RCMP.

#### THEFT OF EXPLOSIVES

**Immediately** call the police. **Implement** the Emergency Notification Plan.

**The** Site Manager, HSE Advisor or Regional Operations Manager will call, as soon as possible and within 24 hours, the RCMP & ERD. **Determine** exactly what product, how much and code date(s) was stolen from the magazine(s). **Be careful** not to disturb the magazine or its contents so as not to destroy evidence such as fingerprints, shoe marks, etc. **Do not** handle tools or equipment that may have been used to break in. **Allow** Police personnel access but protect the scene from others that may disturb the evidence.

**Do not** permit news media personnel or any other non-company personnel (excluding Police) to enter the site. **Do not** make any statements to the media or non-company personnel. Refer the media to the Company Spokesperson. **The** Site Manager shall be the direct liaison between the company and the police and regulatory agencies. **Keep a log**, (documentation), of all activities regarding the break-in investigation for the company record. **The** Regional Operations Manager, HSE Advisor, and Site Manager will review all information and determine prevention measures to be taken to deter future break-ins.

### 13.9 PROCESS LOSS/INTERRUPTION

The possibility of a power outage on the site is very thin. The site has a generator.

### 13.11 TRANSPORTATION VEHICLE ACCIDENT

Ensure the accident scene is safe. Check if there are injuries. Whether the victim is conscious. Ask someone to call emergency assistance. Provide First aid and take control of the scene of an accident. Take care of the victims until help arrives.

### 13.12 TRANSPORTATION VEHICLE BREAKDOWN

Call **911** and contact  
Regulatory Manager Pierre St-Georges at (613) 677-1051.  
Environment manager Benoit Choquette at (514) 249-6285

### 13.13 BLAST SITE INCIDENT

If the emergency involves a blasting incident, the crew at the blast site shall follow the emergency instructions outlined in the Blasting Guidelines and Procedures. This site shall implement the appropriate sections of the Notification Plan as directed. The site shall support the blasting crew with personnel and equipment as needed.

### 13.14 TRANSPORTATION CHEMICAL SPILL

**Initiate the ERAP by calling 1-800-367-4629 and call 911. The Emergency Response Advisor will contact the authorities.**

**Determine** what material(s) has spilled or leaked and secure the area. Do not walk through the spilled material. **Put** on appropriate Personal Protective Equipment.

**Protect** the area from ignition sources. If a vehicle is involved, engage the battery disconnect switch. **Keep** unauthorized persons away.

**Make** every effort to confine and contain the spill, using spill kit and all available resources. **Determine** the source of the spill, and stop the leak if possible. **Make** every attempt to see that the material does not reach any waterway. **Prevent** rain or water from coming in contact with the product. Diking may be possible with gravel, soil or any ground material. **Use** what resources you have to begin cleaning up the product, outside equipment may be required. **Return** uncontaminated product to the original containers.

If the material has spilled into a waterway, an outside clean-up contractor will be called to assist with the clean-up operation. Call the main office as soon as possible. Seek corporate counsel as soon as the situation is stable.

### 13.15 TRANSPORTATION FIRE/EXPLOSION INCIDENT

Should there be explosive detonations, or the risk of detonations due to the presence of fire or other detonating factors, advise the First Responders (or anyone within the immediate vicinity if First Responders are not at the scene) of the risk of an explosion. Help organize perimeter guards to prevent people from entering the evacuation zone. The minimal distance to evacuate for a 20,000 kg tanker is 1.2 km or 4000 feet.

## 14.0 AMMONIUM NITRATE (E2 REGULATION)

### 14.1 Physical and chemical properties

Ammonium nitrate in solid form (prill) is of a light or off-light color and is commercially available in small beads of various sizes. It gives off a light ammonia smell. It is considered an oxidizer (risk class 5.1). Its density varies between 0.72 and 1.0 g/cc. Its solubility in water is high at 192 g/100 ml at 20°C. Its boiling point (decomposition) varies between 177 and 210 °C and its fusion point is 170°C.

Ammonium nitrate is stable in normal conditions. However, when involved in a fire, it will give off toxic compounds of nitrogen oxides and may emit ammonia vapors in the air. When confined or exposed at high temperatures, it can explode. It becomes more sensitive to explosion when contaminated by organic matters or other combustible materials.

### 14.2 Potential environmental impact

Ammonium nitrate is a fertilizer composed of nitrate ion ( $\text{NO}_3^-$ ) and ammonium nitrogen ion ( $\text{NH}_4^+$ ). Nitrate is essential to life. Most crop requires a large quantity of nitrates to support growth. In moderate quantities, nitrate is a harmless component of food and water. The nitrate ions are very soluble in water. They are easily solubilized and transported by surface and groundwater. Ammonium nitrogen is a reduced form of nitrogen which has the potential in water to release ammonia gas and be toxic to aquatic life. This ion is not very mobile in soils. This ion normally stays attached to clay or humus soil particles. Ammonium nitrogen will normally be converted in nitrates by soil bacteria in a few weeks.

A high level of nutrients (nitrates) combined with the presence of phosphorus in water support the rapid growth of algae and aquatic plants in water. It may reduce dissolved oxygen level in water. Insufficient oxygen levels may create dead zones where fish species requiring cold and well oxygenated water could no longer live in. Nitrates can therefore contribute to the eutrophication phenomena of lakes and rivers. The closest water bodies that can be impacted by a spill are located within a kilometer of the plant site and testing is completed by Meadowbank environment regularly. No potable water wells are present at the site.

#### 14.3 What to do in case of a spill

In case of a spill, the product must be recovered rapidly to avoid exposure to water. Protect it with tarp and build berms around it if necessary to avoid exposure to surface water and rain. Avoid any contact with a flame. The product can be recovered manually using plastic shovels or brooms and put into plastic bags or containers. A HEPA filter can also be used if desired. In case of a very large spill, the product can be recovered using a mechanical shovel or loader and put in a sealed steel (20 cubic yards) bin equipped with a cover. The bin must be clean and not contaminated by any organic material.

In low concentrations in water, nitrates will be absorbed by surrounding vegetation and will support their growth. If there are water wells nearby, there is a potential to contaminate the potable water. The drinking water standards for nitrates is 10 mg/l (as N). Therefore, prevent contaminated water to enter sanitary and surface water drains. Recovered product can be re-used if clean, recycled as a fertilizer or disposed off-site as an oxidizer to an approved waste disposal company. Do not fight fires involving ammonium nitrate because of the risks of explosion.

#### 14.4 Maximum quantity planned during the year:

10,000,000 kg.

#### 14.5 Location of the substance :

In seacans at plant site (EMR)

#### 14.6 Training required for emergency responders

- First aid
- Transportation of Dangerous Goods
- WHMIS
- Emergency Response Plan (this plan)

#### Emergency Response equipment

- Danger tape
- Tote bags with internal plastic liner
- Plastic shovels
- Drain cover
- Brooms
- Polyethylene tarps

Note: equipment must be readily available at the Quaatuq location.



#### 14.7 Personnel Protective Equipment

- Reflective vests
- Safety Glasses
- Dust masks
- Plastic gloves
- Safety boots
- First aid kit

Note: equipment must be readily available at the Quaatuq site location.

#### 15.0 TRAFFIC CONTROL

In the event of an emergency it is essential that the traffic movements to the site be limited to essential vehicles only. The control of traffic will be achieved by posting sentries at the evacuation point. The sentry shall use the company vehicles onsite so that they can stay in contact via cell phone with the Emergency Manager or Emergency Services Coordinator.

During an emergency the only vehicles that will be allowed to enter the site will be:

- Emergency Services;
- Any equipment providers which have been requested to attend to the emergency; and
- Dyno Nobel personnel that are directly involved in the response effort.

Any other entry to site will require the permission of the Emergency Manager after consultation with the Emergency Services Coordinator.

If an employee or visitor is injured and can safely be transported to the mine without incurring additional harm to the employee/worker, or posing any additional risk to the safety of the person, Dyno vehicles can be used to transport.

***Where specific stabilization of an injured person is required, or where moving an injured person may result more serious injury or life threatening concerns, the injured person is to be stabilized as per first aid training and AMARUQ emergency services dispatched to site.***

In the event that there is a chance of an explosion or release of toxic fumes roadblocks should be at least **1200m** from the scene.

The Mine security or local Police are the only personnel authorised to close any public roads, as a result, the need to close the road should be established early. The road would need to be closed at a distance of no less than **1200m** from the facility in order to prevent damage to vehicles or people outside the site.

#### 16.0 PROTECTION OF VITAL ASSETS / EMERGENCY SHUTDOWN

Under no circumstance are lives to be put at unacceptable risk in order to preserve material assets or intellectual property.

To avoid knock on effects of an emergency such as escalated destruction or business disruption, consideration should be given to preserve critical company assets by shutdown or removal of equipment such as:

- Mobile Processing Units (MPU's)
- Raw Materials/Handling equipment

Materials handling equipment and energy sources should be shutdown or isolated by activating emergency stop buttons or closing valves on the following systems:

- Electrical

Isolation are clearly identified by color coded labeling. All personnel must know location and operation of these devices.

- Switches

The decision to isolate energy sources or remove assets may be made at the time of evacuation notification or post evacuation by the Emergency Manager or Supervisor. Either way, this action must not be made if it is considered that it will not delay the evacuation process or put personnel at an unacceptable level of risk in terms personal injury or health.

Energy Source / Equipment	Type of Isolation	Location
Electrical Systems & Equipment	Switch	

## 17.0 SEARCH AND RESCUE

Search and rescue shall be the responsibility of emergency services only as Dyno Nobel are not equipped to carry out search and rescue operations in a safe manner.

Search and rescue operations should only be conducted if it is safe to do so and if there is no potential of an explosion occurring. Very careful consideration should be made to limiting casualties.

Before attempting search and rescue, personnel must be knowledgeable of the following:

- Site layout;
- Hazardous effects from hazardous substances;
- Fumes/poisoning;
- Explosion;
- Burns;
- Use of proper PPE;
- Breathing apparatus;
- Fire extinguishers;
- Recovery gear;
- Practiced search and rescue techniques; and
- Possible casualties.

## **18.0 RECOVERY PLAN**

The Emergency Manager has the responsibility to declare the emergency over after consultation and agreement with Local Emergency Services:

- When the damage is localised to the extent that normal operations could resume in unaffected areas;
- Work in unaffected areas will not contaminate the emergency scene and destroy causal evidence;
- Affected areas are secure with actual or potential energy sources neutralized and controlled; and
- The all clear / re-entry approval should be communicated to all personnel in consideration of any special conditions.

## **19.0 CLEAN UP**

Environmental aspects and impacts need to be considered when dealing with chemical waste and approval for disposal of chemicals must be obtained before disposal.

## **20.0 RESUMPTION OF BUSINESS**

The EM will carry out the following:

- Arrange for appropriate personnel to complete a risk assessment of the area and assess the impact of the emergency; and
- Provide DNA appropriate personnel with an update as soon as practicable.

In conjunction with Dyno Nobel's VP of HSEQ and VP of Operations, the Emergency Manager shall develop an action plan to ensure that:

- The site is secure and safe for all personnel;
- Pollution due to leaking storages and firewater run-off is minimised;
- Production facilities are re-established; and
- Supply contingencies are activated.

Senior Management shall be informed of any loss and they will ensure that the underwriters are informed. It is essential that all costs of recovery and increased costs due to the incident be identified.

## **21.0 CRISIS COMMUNICATION PLAN**

The Site Media plan is only activated if the media has arrived at your site and is asking questions.

If the media is contacting you by phone, fax or email, refer them to Diana Roising, Crisis Media Advisor in Salt Lake City, cell: 801- 321 5338 or office: 801 328 6536

### **IF THE MEDIA HAS ARRIVED AT YOUR SITE**

The First Critical Statement may be made by a trained spokesperson (generally the Manager on Site) who has received permission from a member of the DNA Crisis Management Team. ***In most cases Media contact will be referred to the General Manager, Mike Soter, or his designate.***

If permission is granted, the Supervisor of the Site should fill in the information in the First Critical Statement template

After the statement is presented to the media on site, it is important not to attempt to answer additional questions. All other information will be done at the direction of the DNA Crisis Management Team, unless otherwise directed.

If additional personnel are available, have an assistant to this spokesperson remain behind to gather business cards and write down questions while the spokesperson leaves. This person must NOT answer any questions

Fax/email a copy of the Statement to DNA Crisis Management Team member and wait for further instructions

## **When the Media Arrives at Your Site Say ONLY the following:**

### **Site Media Statement**

At approximately \_\_\_\_\_ am/pm on \_\_\_\_\_ we experienced

\_\_\_\_\_

\_\_\_\_\_

*(Only obvious facts - No explanation - No elaboration)*

**This is all I can confirm at the present time. I am sure you understand that we are assessing the situation so we can provide the most accurate information.**

**Our company spokesperson will be in touch with you and other media representatives as soon as possible to provide more information. In the interim, we ask for your patience as we conduct our investigation.**

*(You are now free to turn and walk away.*

*(If you are asked additional questions, make the following statement:)*

## **22.0 TRAINING**

All Dyno Nobel employees will be trained to cope with an outbreak of fire in the site and MPU operation, at minimum all DNCI employees should be fully trained in the use of fire extinguishers.

All employees shall be trained in the roles they are expected to play during an emergency and/or an evacuation.

Regular evacuation and emergency drills shall be conducted in order to evaluate the effectiveness of the overall strategy and identify any deficiencies in the procedures. Emergency drills should be conducted every six months for DNCI internal drills with at least one of these involving local Emergency Service teams. Local Emergency Service providers shall be briefed on potential site emergencies by the Site Management team.

After conducting drills a meeting shall be conducted to identify the gaps found during the emergency drill.

Training shall include:

- Fire extinguisher training;
- WHMIS;
- Transportation of Dangerous Goods,
- Emergency Response Training.

## **23.0 INFORMATION**

Emergency procedures are posted on the Safety board. A copy of the Emergency Response Plan was provided to all employees during the Training.

Information on this Emergency Response Plan is recorded electronically on NEXUS.

**APPENDIX I – BOMB THREAT**

**INITIAL INFORMATION:**

Date :

Person receiving call:

Exact time of call:

Time of the call end:

Exact words of caller :

**QUESTIONS TO ASK**

Where is the bomb?

When is bomb going to explode?

What does it look like?

Did you place the bomb?

Why?

Where are you calling from?

Are you an employee?

Caller Gender : F / M

Age :

**CALLER'S VOICE (circle)**

Calm	Fast	Distinct	Joker	Throat clearing
Angry	Soft	Lisp	Disguised	Deep breathing
Excited	Mocking	Nasal	Loud	Stuttering
Slow	Crying	Irregular	Deep	Mumble

**LANGUAGE OF THE CALLER**

Articulate	Educated	Coarse	Irrational	Incoherent
Recorded	Message read by the author of the threat			

**BACKGROUND NOISES**

Traffic	Telephone booth	House sound	Music	Motor	Dishes
Soft	Long Distance/Local call	Machinery	Static	None	Animal

Others :

**APPENDIX II – EMPLOYEE ACKNOWLEDGEMENT, REVIEW & TRAINING  
CERTIFICATION RECORD**

Signature indicates that person has been given an opportunity to review and make comments regarding this safe work instruction and revisions. Signature indicates that person has received training about and understands the information contained in this document, related operating procedures, and requirements imposed by this program.

PRINT NAME	SIGNATURE	DATE

**APPENDIX 4**

**MSDS FOR BULK EMULSION AND SENATEL**

- 1. MSDS – Dyno Bulk Emulsion**
- 2. MSDS – Senatel**



# Safety Data Sheet

## SECTION 1 – IDENTIFICATION

### Name, Address, and Telephone of the Responsible Party

**Dyno Nobel Inc.**

2795 East Cottonwood Parkway, Suite 500

Salt Lake City, Utah 84121

Phone: 801-364-4800 Fax 801-321-6703

E-Mail: [dna.hse@am.dynonobel.com](mailto:dna.hse@am.dynonobel.com) [www.dynonobel.com](http://www.dynonobel.com)

**SDS #:** 1052

**Date:** 10/02/2018

Supersedes: 06/10/2016

### Product Identifier

**Product Form:** Mixture

**Product Name:** Bulk Emulsion

### Other Means of Identification

#### Synonyms:

DYNO GOLD®

DYNO GOLD® LITE

EXTRAMITE 1000

RUG-1 (Canada Only)

TITAN® 1000

TITAN® 1000 GREEN

TITAN® 1000G

TITAN® 1000G GREEN

TITAN® XL1000

SMS 1116, 1116A, 1126P, 1136P, 1146P

DX5037

TITAN® 2000

TITAN® 2000G

TITAN® PB 1000

TITAN® PB 2000

TITAN® PB 2000 HF

TITAN® SME 1000

TITAN® SME 1000 GREEN

TITAN® XL1000 GREEN

TITAN® HD

TITAN® SME 2000

TITAN® 5000

TITAN® 5000 G

### Intended Use of the Product

Industrial blasting applications as emulsion explosive precursor

### Emergency Telephone Number

FOR 24 HOUR **EMERGENCY**, CALL **CHEMTREC (USA)** 800-424-9300

**CANUTEC (CANADA)** 613-996-6666

## SECTION 2 – HAZARD(S) IDENTIFICATION

### Classification of the Substance or Mixture

#### Classification (GHS-US)

Ox. Liq. 2

H272

Acute Tox. 4 (Oral)

H302

Skin Irrit. 2

H315

Carc. 2

H351

STOT RE 2

H373

Asp. Tox. 1

H304

Eye Irrit. 2B

H320

#### Label Elements

#### GHS-US Labeling

#### Hazard Pictograms (GHS-US)



#### Signal Word (GHS-US)

: Danger

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- Hazard Statements (GHS-US)** : H272 - May intensify fire; oxidizer  
 H302 - Harmful if swallowed  
 H304 – May be fatal if swallowed and enters airways  
 H315 - Causes skin irritation  
 H320 – Causes eye irritation  
 H351 - Suspected of causing cancer  
 H373 - May cause damage to organs through prolonged or repeated exposure
- Precautionary Statements (GHS-US)** : P201 - Obtain special instructions before use  
 P202 - Do not handle until all safety precautions have been read and understood  
 P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking  
 P220 - Keep/Store away from clothing, combustible materials, combustibles  
 P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles  
 P233 - Keep container tightly closed  
 P260 - Do not breathe dust, fume, mist, spray, vapors  
 P264 - Wash exposed areas thoroughly after handling  
 P270 - Do not eat, drink or smoke when using this product  
 P273 - Avoid release to the environment  
 P280 - Wear protective gloves/protective clothing/eye protection/face protection  
 P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
 P302+P352 - IF ON SKIN: Wash with plenty of soap and water  
 P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
 P308+P313 - If exposed or concerned: Get medical advice/attention  
 P332+P313 - If skin irritation occurs: Get medical advice/attention  
 P362 - Take off contaminated clothing and wash before reuse  
 P370+P378 - In case of fire: Use appropriate media to extinguish  
 P403+P235 - Store in a well-ventilated place. Keep cool  
 P405 - Store locked up  
 P501 - Dispose of contents/container according to local, regional, national, and international regulations

**Other Hazards**

**Hazards Not Otherwise Classified (HNOC):** Not available

**Other Hazards:** Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

## SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture			
Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	45 - 80	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Calcium nitrate	(CAS No) 10124-37-5	0.1 - 35	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Sodium nitrate	(CAS No) 7631-99-4	0.1 - 18	Ox. Sol. 3, H272

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			Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
*Methylamine nitrate	(CAS No) 22113-87-7	0.1 – 3	Expl. 1.5, H205 Skin Corr. 1A, H314 Eye Dam. 1 – H318
**Fuels, diesel, no. 2	(CAS No) 68476-34-6	0.1 - 10	Flam. Liq. 4, H227 Acute Tox. 4 (Inhalation), H332 Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	0.1 - 6	Asp. Tox. 1, H304
<p>* This ingredient is not used in most products, including in GREEN-named products.  ** This ingredient is not used in GREEN-named products.  Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).  Full text of H-phrases: see section 16</p>			

## SECTION 4 - FIRST AID MEASURES

### Description of First Aid Measures

**General:** Never give anything orally to an unconscious person. If you feel unwell, seek medical advice (provide this Safety Data Sheet to medical personnel).

**Inhalation:** If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

**Skin Contact:** Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

**Eye Contact:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing for at least 15 minutes. Obtain medical attention if irritation develops or persists.

**Ingestion:** Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.

### Most Important Symptoms and Effects Both Acute and Delayed

**General:** May be harmful if swallowed. May cause eye or skin irritation.

**Inhalation:** May cause respiratory irritation.

**Skin Contact:** May cause skin irritation.

**Eye Contact:** May cause eye irritation.

**Ingestion:** Likely to be harmful if swallowed.

**Chronic Symptoms:** Contains an ingredient which may cause cancer. Causes damage to organs through prolonged or repeated exposure.

### Indication of Any Immediate Medical Attention and Special Treatment Needed

If symptoms occur, seek medical attention.

## SECTION 5 - FIRE-FIGHTING MEASURES

### Extinguishing Media

**Suitable Extinguishing Media:** Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.

**Unusual Fire and Explosion Hazards:** May explode or detonate under fire conditions. Burning material may produce toxic vapors.

**Unsuitable Extinguishing Media:** Not available

### Special Hazards Arising from the Substance or Mixture

In large, intense fires the emulsion can behave more like an explosive and detonate from confinement or strong shocks. Evacuation of at least 1 mile is recommended if a large amount of emulsion is involved in a large fire.

# Safety Data Sheet

**Fire Hazard:** May intensify fire; oxidizer. Will burn if exposed to heat, and in addition, will accelerate the burning of other combustibles, resulting in more rapid spread of fire.

**Explosion Hazard:** Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

**Reactivity:** May cause or intensify fire; oxidizer. May accelerate the burning of other combustible materials.

#### **Advice for Firefighters**

**Precautionary Measures Fire:** DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors.

**Firefighting Instructions:** DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors.

**Protection During Firefighting:** When controlling fire before involvement of explosives or explosive precursors, firefighters should wear positive pressure self-containing breathing apparatus (SCBA) and full turnout gear.

**Hazardous Combustion Products:** Nitrogen oxides. Carbon oxides (CO, CO<sub>2</sub>). Ammonia.

**Other information:** Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 1/2 mile (800 meters) in all directions.

**Reference to Other Sections:** Refer to section 9 for flammability properties.

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

### **Personal Precautions, Protective Equipment and Emergency Procedures**

**General Measures:** Avoid all contact with skin, eyes, or clothing. Avoid breathing dust, mist, or spray. Keep away from heat/sparks/open flames/hot surfaces. No smoking. Eliminate every possible source of ignition. Evacuate danger area.

#### **For Non-Emergency Personnel**

**Protective Equipment:** Use appropriate personal protection equipment (PPE).

**Emergency Procedures:** Evacuate unnecessary personnel.

#### **For Emergency Personnel**

**Protective Equipment:** Use appropriate personal protection equipment (PPE).

**Emergency Procedures:** Ventilate area.

### **Environmental Precautions**

Prevent entry to sewers and public waters.

### **Methods and Material for Containment and Cleaning Up**

**For Containment:** Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.

**Methods for Cleaning Up:** Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate state, federal and local regulations.

#### **Reference to Other Sections**

See heading 8, Exposure Controls and Personal Protection

## SECTION 7 - HANDLING AND STORAGE

### **Precautions for Safe Handling**

It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

**Additional Hazards When Processed:** When heated to decomposition, emits toxic fumes. Do not puncture or incinerate containers.

**Hygiene Measures:** Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

### **Conditions for Safe Storage, Including Any Incompatibilities**

# Safety Data Sheet

**Storage Conditions:** Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep /store away from combustible materials, extremely high or low temperatures, direct sunlight, ignition sources, incompatible materials.

**Incompatible Materials:** Corrosives, strong acids, strong bases and alkalis.

## SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

### Control Parameters

### Occupational Exposure Limits

Ingredients:	Product identifier:	ACGIH TLV-TWA	OSHA PEL-TWA
Ammonium nitrate	(CAS No) 6484-52-2	None	None
Sodium nitrate	(CAS No) 7631-99-4	None	None
Calcium nitrate	(CAS No) 10124-37-5	None	None
Methylamine nitrate	(CAS No) 22113-87-7	None	None
Fuels, diesel, no. 2	(CAS No) 68476-34-6	100 ppm	None
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	5 mg/m <sup>3</sup> (mist)	None

### Exposure Controls

Under normal conditions of use, over-exposure is not expected to occur.

**Appropriate Engineering Controls:** Ensure all national/local regulations are observed. Ensure adequate ventilation, especially in confined areas. Keep containers tightly sealed.

**Personal Protective Equipment:** Protective goggles. Gloves. Protective clothing.



**Materials for Protective Clothing:** Chemically resistant materials and fabrics.

**Hand Protection:** Wear chemically resistant protective gloves.

**Eye Protection:** Chemical goggles or face shield.

**Skin and Body Protection:** Not available.

**Respiratory Protection:** Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits. Under normal conditions of use and handling there is minimal likelihood for the this exposure limit to be reached.

**Other Information:** When using or handling, do not eat, drink or smoke.

## SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

### Information on Basic Physical and Chemical Properties

<b>Physical State</b>	: Liquid
<b>Appearance</b>	: Translucent to opaque viscous liquid.
<b>Odor</b>	: Fuel
<b>Odor Threshold</b>	: Not available
<b>pH</b>	: Not available
<b>Relative Evaporation Rate (butylacetate=1)</b>	: < 1
<b>Melting Point</b>	: Not available
<b>Freezing Point</b>	: Not available
<b>Boiling Point</b>	: Not available
<b>Flash Point</b>	: Not available
<b>Auto-ignition Temperature</b>	: Not available

# Safety Data Sheet

<b>Decomposition Temperature</b>	: Not available
<b>Flammability (solid, gas)</b>	: Not available
<b>Lower Flammable Limit</b>	: Not available
<b>Upper Flammable Limit</b>	: Not available
<b>Vapor Pressure</b>	: Not available
<b>Relative Vapor Density at 20 °C</b>	: Not available
<b>Relative Density</b>	: Not available
<b>Specific Gravity</b>	: 0.8 - 1.5 g/cc
<b>Solubility</b>	: Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.
<b>Partition coefficient: n-octanol/water</b>	: Not available
<b>Viscosity</b>	: Not available
<b>Explosion Data – Sensitivity to Mechanical Impact</b>	: Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
<b>Explosion Data – Sensitivity to Static Discharge</b>	: Not sensitive to static discharge.

## SECTION 10 - STABILITY AND REACTIVITY

**Reactivity:** May cause or intensify fire. May accelerate the burning of other combustible materials.

**Chemical Stability:** May intensify fire. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

**Possibility of Hazardous Reactions:** Hazardous polymerization will not occur.

**Conditions to Avoid:** Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

**Incompatible Materials:** Corrosives, strong acids, strong bases and alkalis.

**Hazardous Decomposition Products:** Does not decompose when used and stored as recommended. Thermal decomposition or combustion products may include the following substances: Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

## SECTION 11 - TOXICOLOGICAL INFORMATION

Under normal conditions of use, over-exposure is not expected to occur. Minor skin exposure is most likely.

**Information on Toxicological Effects - Product**

**Acute Toxicity:** Harmful if swallowed.

**LD50 and LC50 Data:** ATE Oral 1,510 (mg/kg)

**Skin Corrosion/Irritation:** Causes skin irritation.

**Serious Eye Damage/Irritation:** May cause eye irritation

**Respiratory or Skin Sensitization:** Not classified

**Germ Cell Mutagenicity:** Not classified

**Teratogenicity:** Not available

**Carcinogenicity:** Contains a substance which has been shown to cause cancer in laboratory animals. IARC Group 2A  
Probably carcinogenic to humans.

**Specific Target Organ Toxicity (Repeated Exposure):** May cause damage to organs through prolonged or repeated exposure.

# Safety Data Sheet

**Reproductive Toxicity:** Not classified

**Specific Target Organ Toxicity (Single Exposure):** Not classified

**Aspiration Hazard:** May be fatal if swallowed and enters airways.

**Symptoms/Injuries After Inhalation:** May cause respiratory irritation.

**Symptoms/Injuries After Skin Contact:** May cause skin irritation.

**Symptoms/Injuries After Eye Contact:** May cause eye irritation.

**Symptoms/Injuries After Ingestion:** May be harmful if swallowed. May be harmful if swallowed and enters airways. Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.

**Chronic Symptoms:** May cause cancer. May cause damage to organs through prolonged or repeated exposure.

**Information on Toxicological Effects - Ingredient(s)**

**LD50 and LC50 Data:**

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg (REACH dossier 2950 mg/kg)
LC50 Inhalation Rat	> 88.8 mg/l/4h
ATE CLP (oral)	2217.000 mg/kg body weight
Sodium nitrate (7631-99-4)	
LD50 Oral Rat	1267 mg/kg (REACH dossier 3430 mg/kg)
ATE CLP (oral)	1267.000 mg/kg body weight
Fuels, diesel, no. 2 (68476-34-6)	
ATE CLP (vapors)	11.000 mg/l/4h
Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg

## SECTION 12: ECOLOGICAL INFORMATION

**Toxicity** Harmful to aquatic life with long lasting effects.

**Ammonium nitrate (6484-52-2)**

LC50 Fish 1 95-102 mg/l (Exposure time: 48 h - Cyprinus carpio (Common carp))

EC 50 Aquatic Invertebrates 490 mg/l (Exposure time 48 h - Daphnia magna)

**Sodium nitrate (7631-99-4)**

LC50 Fish 1 2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])

LC 50 Fish 2 994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

**Fuels, diesel, no. 2 (68476-34-6)**

LC50 Fish 1 35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

**Calcium nitrate (10124-37-5)**

LC50 Fish 1 10000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])

**Persistence and Degradability**

**Bulk Emulsion**

Persistence and Degradability Not established.

**Sodium nitrate (7631-99-4)**

Persistence and Degradability Readily biodegradable in water.

# Safety Data Sheet

<b>Bioaccumulative Potential</b>	
<b>Bulk Emulsion</b>	
Bioaccumulative Potential	Not established.
<b>Ammonium nitrate (6484-52-2)</b>	
BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)
<b>Sodium nitrate (7631-99-4)</b>	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.
<b>Mobility in Soil</b> Not available	
<b>Other Adverse Effects</b>	
<b>Other Information:</b> Avoid release to the environment.	

## SECTION 13 – DISPOSAL CONSIDERATIONS

**Waste Treatment Methods:** Contact manufacturer for advice on proper disposal methods.

**Waste Disposal Recommendations:** Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

**Additional Information:** Clean up even minor leaks or spills if possible without unnecessary risk.

## SECTION 14 - TRANSPORT INFORMATION

### 14.1 In Accordance with DOT

**Proper Shipping Name** : AMMONIUM NITRATE EMULSION  
**Hazard Class** : 5.1  
**Identification Number** : UN3375  
**Label Codes** : 5.1  
**Packing Group** : II  
**ERG Number** : 140



### 14.2 In Accordance with IMDG

**Proper Shipping Name** : AMMONIUM NITRATE EMULSION  
**Hazard Class** : 5.1  
**Identification Number** : UN3375  
**Packing Group** : II  
**Label Codes** : 5.1  
**EmS-No. (Fire)** : F-H  
**EmS-No. (Spillage)** : S-Q



### 14.3 In Accordance with IATA

**Proper Shipping Name** : AMMONIUM NITRATE EMULSION  
**Identification Number** : UN3375  
**Hazard Class** : 5  
**Label Codes** : 5.1  
**ERG Code (IATA)** : 5L



### 14.4 In Accordance with TDG

No UN number exists for blasting intermediates for Transport Canada (use the following for Canadian shipments)

**Proper Shipping Name** : EXPLOSIVE, BLASTING, TYPE E  
**Packing Group** : II  
**Hazard Class** : 1.5D  
**Identification Number** : UN0332



# Safety Data Sheet

Label Codes : 1.5D



## SECTION 15 - REGULATORY INFORMATION

### US Federal Regulations

#### Bulk Emulsion

##### SARA Section 311/312 Hazard Classes

Immediate (acute) health hazard  
Reactive hazard  
Delayed (chronic) health hazard  
Fire hazard

#### Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Sodium nitrate (7631-99-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Calcium nitrate (10124-37-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

### US State Regulations

#### Ammonium nitrate (6484-52-2)

U.S. – California – Air Toxics “Hot Spots” (A-I)  
U.S. - Massachusetts - Right To Know List  
U.S. - New Jersey - Right to Know Hazardous Substance List  
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List  
U.S. - Pennsylvania - RTK (Right to Know) List  
U.S. – Rhode Island – RTK (Right to Know) List

#### Sodium nitrate (7631-99-4)

U.S. - Massachusetts - Right To Know List  
U.S. - Pennsylvania - RTK (Right to Know) List  
U.S. – Rhode Island – RTK (Right to Know) List

#### Fuels, diesel, no. 2 (68476-34-6)

U.S. - New Jersey - Right to Know Hazardous Substance List

#### Calcium nitrate (10124-37-5)

U.S. - New Jersey - Right to Know Hazardous Substance List

### Canadian Regulations

#### Bulk Emulsion

WHMIS Classification

**Note: Explosives are not regulated under WHMIS. They are subject to the regulations of the Explosives Act of Canada.**

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

## SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Revision date : 10/02/2018

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

# Safety Data Sheet

## GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 3	Flammable liquids Category 3
Ox. Liq. 2	Oxidizing liquids Category 2
Ox. Sol. 3	Oxidizing solids Category 3
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H227	Combustible liquid
H272	May intensify fire; oxidizer
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H314	Causes severe skin burns and eye damage
H315	Causes skin irritation
H318	Causes serious eye damage
H319	Causes serious eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure
H373	May cause damage to organs (Thymus, Liver, bone marrow) through prolonged or repeated exposure

## Party Responsible for the Preparation of This Document

Dyno Nobel Inc.  
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 Salt Lake City, Utah 84121  
 Phone: 801-364-4800

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Dyno Nobel SDS

# Safety Data Sheet

## SECTION 1 – IDENTIFICATION

### Name, Address, and Telephone of the Responsible Party

**Dyno Nobel Inc.**

6440 S. Millrock Drive, Suite 150

Salt Lake City, Utah 84121

Phone: 801-364-4800 Fax 801-321-6703

E-Mail: [dнна.hse@am.dynonobel.com](mailto:dнна.hse@am.dynonobel.com) [www.dynonobel.com](http://www.dynonobel.com)

**SDS #:** 1062

**Date:** 07/20/2020

Supersedes: 11/01/2018

### Product Identifier

**Product Form:** Mixture

**Product Name:** Bulk Emulsion Explosive

### Other Means of Identification

#### Synonyms:

DYNO® RU	TITAN® 2000 LD
DYNO® RU Alaska	TITAN® 2000 SD
DYNO® RU SX	TITAN® PB 2000 LD
DYNO® RU Uphole	TITAN® PB 2000 SD
EXTRAMITE 2000	TITAN® 7000 RU
FRAGMITE	TITAN® 7000 RU-A
TITAN® 1000 LD-E2	TITAN® 7000 RU-SX
TITAN® 1000 LD	TITAN® 5000 LD
TITAN® 1000 LD GREEN	TITAN® 7000
TITAN® 1000 SD	TITAN® 7000 A
TITAN® 1000 SD GREEN	TITAN® 7000 SX
TITAN® PB 1000 LD	DX5103
TITAN® PB 1000 SD	DX5108

### Intended Use of the Product

Industrial applications

### Emergency Telephone Number

**FOR 24 HOUR EMERGENCY, CALL** CHEMTREC (USA) 800-424-9300  
CANUTEC (CANADA) 613-996-6666

## SECTION 2 – HAZARD(S) IDENTIFICATION

### Classification of the Substance or Mixture

#### Classification (GHS-US)

Expl. 1.5	H205
Acute Tox. 4 (Oral)	H302
Skin Irrit. 2	H315
Eye Irrit. 2B	H320
Carc. 2	H351
STOT RE 2	H373
Asp. Tox. 1	H304

### Label Elements

#### GHS-US Labeling

#### Hazard Pictograms (GHS-US)



#### Signal Word (GHS-US)

: Danger

#### Hazard Statements (GHS-US)

: H205 - May mass explode in fire  
H302 - Harmful if swallowed

# Safety Data Sheet

H304 - May be fatal if swallowed and enters airways  
 H315 - Causes skin irritation  
 H320 - Causes eye irritation  
 H351 - Suspected of causing cancer  
 H373 - May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements (GHS-US)** :

P201 - Obtain special instructions before use  
 P202 - Do not handle until all safety precautions have been read and understood  
 P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking  
 P220 - Keep/Store away from clothing, combustible materials, combustibles  
 P221 - Take any precaution to avoid mixing with combustible materials, clothing, combustibles  
 P233 - Keep container tightly closed  
 P260 - Do not breathe dust, fume, mist, spray, vapors  
 P264 - Wash exposed areas thoroughly after handling  
 P270 - Do not eat, drink or smoke when using this product  
 P273 - Avoid release to the environment  
 P280 - Wear protective gloves/protective clothing/eye protection/face protection  
 P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician  
 P302+P352 - IF ON SKIN: Wash with plenty of soap and water  
 P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
 P370+P380 - In case of fire: Evacuate area  
 P372 - Explosion risk in case of fire  
 P373 - DO NOT fight fire when fire reaches explosives  
 P401 - Store local, regional, national, and international regulations  
 P403+P235 - Store in a well-ventilated place. Keep cool  
 P405 - Store locked up  
 P501 - Dispose of contents/container according to local, regional, national, and international regulations

**Other Hazards**

**Hazards Not Otherwise Classified (HNOC):** Not available

**Other Hazards:** Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions.

## SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

Mixture			
Name	Product identifier	% (w/w)	Ingredient Classification (GHS-US)
Ammonium nitrate	(CAS No) 6484-52-2	30 - 80	Ox. Sol. 3, H272 Eye Irrit. 2A, H319
Calcium nitrate	(CAS No) 10124-37-5	0.1 - 35	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Dam. 1, H318
Sodium nitrate	(CAS No) 7631-99-4	0.1 - 18	Ox. Sol. 3, H272 Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319
*Fuels, diesel, no. 2	(CAS No) 68476-34-6	0.1 - 8	Flam. Liq. 3, H226 Acute Tox. 4 (Inhalation), H332

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			Skin Irrit. 2, H315 Carc. 2, H351 STOT RE 2, H373 Asp. Tox. 1, H304
Distillates, petroleum, chemically neutralized light naphthenic	(CAS No) 64742-35-4	0.1 - 6	Asp. Tox. 1, H304
* This ingredient is not used in GREEN-named products. Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).  Full text of H-phrases: see section 16			

## SECTION 4 - FIRST AID MEASURES

### Description of First Aid Measures

**General:** Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

**Inhalation:** If symptoms occur, go into fresh air and ventilate suspected area. Seek medical attention.

**Skin Contact:** Remove contaminated clothing. Wash with soap and water followed by rinsing with water. Seek medical attention if irritation develops or persists. Wash contaminated clothing before reuse.

**Eye Contact:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention if irritation develops or persists.

**Ingestion:** Rinse mouth. Do NOT induce vomiting. Seek medical attention immediately.

### Most Important Symptoms and Effects Both Acute and Delayed

**General:** May be harmful if swallowed. Causes serious eye damage. Skin irritation.

**Inhalation:** May cause respiratory irritation.

**Skin Contact:** May cause skin irritation.

**Eye Contact:** Causes eye irritation.

**Ingestion:** May be harmful if swallowed. May be harmful if swallowed and enters airways.

**Chronic Symptoms:** Contains an ingredient that may cause cancer. Causes damage to organs through prolonged or repeated exposure.

### Indication of Any Immediate Medical Attention and Special Treatment Needed

If symptoms occur, seek medical attention.

## SECTION 5 - FIRE-FIGHTING MEASURES

### Extinguishing Media

**Suitable Extinguishing Media:** DO NOT FIGHT FIRES INVOLVING EXPLOSIVES.

**Unsuitable Extinguishing Media:** Not available

### Special Hazards Arising from the Substance or Mixture

**Fire Hazard:** In case of fire involving explosives: Evacuate area. DO NOT fight fires involving explosives. Consult the most current Emergency Response Guidebook (ERG), Guide 112 for additional information. Extreme risk of explosion from shock, friction, fire or other sources of ignition.

**Explosion Hazard:** Extreme risk of explosion by shock, friction, fire, impact, heat or other sources of ignition.

**Reactivity:** Accelerates the rate of burning materials.

### Advice for Firefighters

**Precautionary Measures Fire:** DO NOT ATTEMPT TO FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions. Can explode or detonate under fire conditions. Burning material may produce toxic vapors. It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

**Hazardous Combustion Products:** Nitrogen oxides. Carbon oxides (CO, CO<sub>2</sub>). Ammonia.

**Other information:** Do not attempt to fight fires involving explosive materials. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.

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**Reference to Other Sections:** Refer to section 9 for flammability properties.

## SECTION 6 - ACCIDENTAL RELEASE MEASURES

### Personal Precautions, Protective Equipment and Emergency Procedures

**General Measures:** Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security.

#### For Non-Emergency Personnel

**Protective Equipment:** Use appropriate personal protection equipment (PPE).

**Emergency Procedures:** Evacuate unnecessary personnel.

#### For Emergency Personnel

**Protective Equipment:** Use appropriate personal protection equipment (PPE).

**Emergency Procedures:** Ventilate area.

### Environmental Precautions

Prevent entry to sewers and public waters.

### Methods and Material for Containment and Cleaning Up

**For Containment:** Contain any spills with dikes as necessary to prevent migration and entry into sewers or streams. Do not take up in combustible material such as: saw dust or cellulosic material.

**Methods for Cleaning Up:** Collect spillage for possible reuse. Clean up spills immediately and dispose of waste in accordance with appropriate State, Federal and local regulations.

### Reference to Other Sections

See heading 8, Exposure Controls and Personal Protection

## SECTION 7 - HANDLING AND STORAGE

**Precautions for Safe Handling:** It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

**Additional Hazards When Processed:** When heated to decomposition, emits toxic fumes. Do not puncture or incinerate container.

**Hygiene Measures:** Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

### Conditions for Safe Storage, Including Any Incompatibilities

**Storage Conditions:** Store in a dry, cool and well-ventilated place. Keep container closed when not in use. Keep/Store away from combustible materials, extremely high temperatures, direct sunlight, ignition sources, incompatible materials.

**Incompatible Materials:** Corrosives, strong acids, strong bases and alkalis.

## SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

### Control Parameters

#### Fuels, diesel, no. 2 (68476-34-6)

USA ACGIH	ACGIH TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
Alberta	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
British Columbia	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
Manitoba	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
Newfoundland & Labrador	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
Nova Scotia	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
Ontario	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
Prince Edward Island	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>
Saskatchewan	OEL STEL (mg/m <sup>3</sup> )	150 mg/m <sup>3</sup>
Saskatchewan	OEL TWA (mg/m <sup>3</sup> )	100 mg/m <sup>3</sup>

### Exposure Controls

**Appropriate Engineering Controls:** Ensure all national/local regulations are observed. Ensure adequate ventilation,

# Safety Data Sheet

especially in confined areas.

**Personal Protective Equipment:** Protective goggles. Gloves. Insufficient ventilation: wear respiratory protection. Protective clothing.



**Materials for Protective Clothing:** Chemically resistant materials and fabrics.

**Hand Protection:** Wear chemically resistant protective gloves.

**Eye Protection:** Chemical goggles or face shield.

**Skin and Body Protection:** Not available

**Respiratory Protection:** Use NIOSH-approved air-purifying or supplied-air respirator where airborne concentrations of vapor or mist are expected to exceed exposure limits.

**Other Information:** When using, do not eat, drink or smoke.

## SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

### Information on Basic Physical and Chemical Properties

Physical State	: Liquid
Appearance	: White, yellow or pink opaque viscous liquid.
Odor	: Slight fuel oil odor.
Odor Threshold	: Not available
pH	: Not available
Relative Evaporation Rate (butylacetate=1)	: < 1
Melting Point	: Not available
Freezing Point	: Not available
Boiling Point	: Not available
Flash Point	: Not available
Auto-ignition Temperature	: Not available
Decomposition Temperature	: Not available
Flammability (solid, gas)	: Not available
Lower Flammable Limit	: Not available
Upper Flammable Limit	: Not available
Vapor Pressure	: Not available
Relative Vapor Density at 20 °C	: Not available
Relative Density	: Not available
Specific Gravity	: 1.00 - 1.45 g/cc
Solubility	: Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.
Partition coefficient: n-octanol/water	: Not available
Viscosity	: Not available
Explosion Data – Sensitivity to Mechanical Impact	: Not sensitive to mechanical impact. May be sensitive to supersonic explosively driven projectile impacts.
Explosion Data – Sensitivity to Static Discharge	: Not sensitive to static discharge.

# Safety Data Sheet

## SECTION 10 - STABILITY AND REACTIVITY

**Reactivity:** Accelerates the rate of burning materials. Oxidizer. May react violently with strong acids, strong oxidizing and reducing agents.

**Chemical Stability:** May intensify fire; oxidizer. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.

**Possibility of Hazardous Reactions:** Hazardous polymerization will not occur.

**Conditions to Avoid:** Direct sunlight. Extremely high temperatures. Heat. Sparks. Overheating. Open flame. Combustible materials. Sources of ignition. Incompatible materials.

**Incompatible Materials:** Corrosives, strong acids, strong bases and alkalis.

**Hazardous Decomposition Products:** Nitrogen oxides. Toxic vapors. Ammonia. Carbon monoxide.

## SECTION 11 - TOXICOLOGICAL INFORMATION

### Information on Toxicological Effects - Product

**Acute Toxicity:** Harmful if swallowed.

**LD50 and LC50 Data:** Not available

**Skin Corrosion/Irritation:** Not classified

**Serious Eye Damage/Irritation:** Causes serious eye irritation.

**Respiratory or Skin Sensitization:** Not classified

**Germ Cell Mutagenicity:** Not classified

**Teratogenicity:** Not available

**Carcinogenicity:** Contains an ingredient suspected of causing cancer.

**Specific Target Organ Toxicity (Repeated Exposure):** May cause damage to organs through prolonged or repeated exposure.

**Reproductive Toxicity:** Not classified

**Specific Target Organ Toxicity (Single Exposure):** Not classified

**Aspiration Hazard:** May be fatal if swallowed and enters airways.

**Symptoms/Injuries After Inhalation:** May cause respiratory irritation.

**Symptoms/Injuries After Skin Contact:** May cause skin irritation.

**Symptoms/Injuries After Eye Contact:** Causes eye irritation.

**Symptoms/Injuries After Ingestion:** May be harmful if swallowed. May be harmful if swallowed and enters airways. Aspiration into the lungs can occur during ingestion or vomiting and may cause lung injury.

**Chronic Symptoms:** Contains an ingredient that may cause cancer. Causes damage to organs through prolonged or repeated exposure.

### Information on Toxicological Effects - Ingredient(s)

**LD50 and LC50 Data:**

#### Ammonium nitrate (6484-52-2)

LD50 Oral Rat	2217 mg/kg
LC50 Inhalation Rat	> 88.8 mg/l/4h
ATE CLP (oral)	2217.000 mg/kg body weight

#### Sodium nitrate (7631-99-4)

LD50 Oral Rat	1267 mg/kg
ATE CLP (oral)	1267.000 mg/kg body weight

#### Fuels, diesel, no. 2 (68476-34-6)

ATE CLP (vapors)	11.000 mg/l/4h
------------------	----------------

#### Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg



# Safety Data Sheet

## SECTION 12: ECOLOGICAL INFORMATION

**Toxicity** Not classified

### Sodium nitrate (7631-99-4)

LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC 50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

### Calcium nitrate (10124-37-5)

LC50 Fish 1	10000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
-------------	--

### Fuels, diesel, no. 2 (68476-34-6)

LC50 Fish 1	35 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
-------------	---

### Persistence and Degradability

#### Bulk Emulsion

Persistence and Degradability	Not established.
-------------------------------	------------------

### Sodium nitrate (7631-99-4)

Persistence and Degradability	Readily biodegradable in water.
-------------------------------	---------------------------------

### Bioaccumulative Potential

#### Bulk Emulsion

Bioaccumulative Potential	Not established.
---------------------------	------------------

### Ammonium nitrate (6484-52-2)

BCF fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)

### Sodium nitrate (7631-99-4)

Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

**Mobility in Soil** Not available

### Other Adverse Effects

**Other Information:** Avoid release to the environment.

## SECTION 13 – DISPOSAL CONSIDERATIONS

**Waste Treatment Methods:** Contact manufacturer for advice on proper disposal methods.

**Waste Disposal Recommendations:** Collect spillage for possible reuse. Dispose of waste material in accordance with all local, regional, national, provincial, territorial and international regulations.

**Additional Information:** Clean up even minor leaks or spills if possible without unnecessary risk.

## SECTION 14 - TRANSPORT INFORMATION

### 14.1 In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E or Agent blasting, Type E  
 Hazard Class : 1.5D  
 Identification Number : UN0332  
 Label Codes : 1.5D



Packing Group : II  
 ERG Number : 140

### 14.2 In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E (AGENT, BLASTING, TYPE E)  
 Hazard Class : 1.5D  
 Identification Number : UN0332  
 Label Codes : 1.5D  
 EmS-No. (Fire) : F-B  
 EmS-No. (Spillage) : S-Y



# Safety Data Sheet

## 14.3 In Accordance with IATA

Proper Shipping Name : AGENT, BLASTING TYPE E  
 Identification Number : UN0332  
 Hazard Class : 1  
 Label Codes : 1.5D



ERG Code (IATA) : 1L

## 14.4 In Accordance with TDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E  
 Packing Group : II  
 Hazard Class : 1.5D  
 Identification Number : UN0332  
 Label Codes : 1.5D



## SECTION 15 - REGULATORY INFORMATION

### US Federal Regulations

#### Bulk Emulsion

#### SARA Section 311/312 Hazard Classes

Immediate (acute) health hazard  
 Reactive hazard  
 Delayed (chronic) health hazard  
 Fire hazard

#### Ammonium nitrate (6484-52-2)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Sodium nitrate (7631-99-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Calcium nitrate (10124-37-5)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Fuels, diesel, no. 2 (68476-34-6)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

#### Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

### US State Regulations

#### Ammonium nitrate (6484-52-2)

U.S. - Massachusetts - Right To Know List  
 U.S. - New Jersey - Right to Know Hazardous Substance List  
 U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List  
 U.S. - Pennsylvania - RTK (Right to Know) List

#### Sodium nitrate (7631-99-4)

U.S. - Massachusetts - Right To Know List  
 U.S. - Pennsylvania - RTK (Right to Know) List

#### Calcium nitrate (10124-37-5)

U.S. - New Jersey - Right to Know Hazardous Substance List

#### Fuels, diesel, no. 2 (68476-34-6)

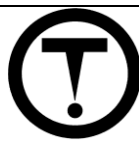
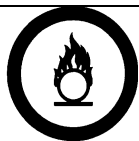
U.S. - New Jersey - Right to Know Hazardous Substance List

### Canadian Regulations

#### Bulk Emulsion

WHMIS Classification : Class C - Oxidizing Material  
 Class D Division 2 Subdivision B - Toxic material causing other toxic effects

# Safety Data Sheet



## Ammonium nitrate (6484-52-2)

Listed on the Canadian DSL (Domestic Substances List) inventory.

WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects
----------------------	---

## Sodium nitrate (7631-99-4)

Listed on the Canadian DSL (Domestic Substances List) inventory.

Listed on the Canadian Ingredient Disclosure List

WHMIS Classification	Class C - Oxidizing Material Class D Division 2 Subdivision B - Toxic material causing other toxic effects
----------------------	---

## Calcium nitrate (10124-37-5)

Listed on the Canadian DSL (Domestic Substances List) inventory.

## Fuels, diesel, no. 2 (68476-34-6)

Listed on the Canadian DSL (Domestic Substances List) inventory.

## Distillates, petroleum, chemically neutralized light naphthenic (64742-35-4)

Listed on the Canadian DSL (Domestic Substances List) inventory.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all of the information required by CPR.

### SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

<b>Revision date</b>	: 07/20/2020
<b>Other Information</b>	: This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200.

#### GHS Full Text Phrases:

Acute Tox. 4 (Inhalation)	Acute toxicity (inhalation) Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Asp. Tox. 1	Aspiration hazard Category 1
Carc. 2	Carcinogenicity Category 2
Expl. 1.5	Explosive Category 1.5
Eye Dam. 1	Serious eye damage/eye irritation Category 1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Skin Corr. 1A	Skin corrosion/irritation Category 1A
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H205	May mass explode in fire
H302	Harmful if swallowed
H304	May be fatal if swallowed and enters airways
H315	Causes skin irritation
H320	Causes eye irritation
H332	Harmful if inhaled
H351	Suspected of causing cancer
H373	May cause damage to organs through prolonged or repeated exposure

# Safety Data Sheet

**Party Responsible for the Preparation of This Document**

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Phone: 801-364-4800

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Dyno Nobel SDS



# Senatel Powersplit

## Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

Revision Date: 02/08/2017

Date of Issue: 06/15/2011

Supersedes Date: 11/12/2013

Version: 2.0

### SECTION 1: IDENTIFICATION

#### Product Identifier

**Product Form:** Mixture

**Product Name:** Senatel Powersplit

**Product Code:** 3020

**Synonyms:** Magnum Powersplit

#### Intended Use of the Product

A detonator sensitive emulsion explosive. For professional use only.

#### Name, Address, and Telephone of the Responsible Party

##### **USA:**

Orica USA Inc.  
33101 E. Quincy Avenue  
Watkins, CO 80137-9406  
For SDS Requests: 1-855-26-ORICA (1-855-266-7422)  
[sds.na@orica.com](mailto:sds.na@orica.com)

##### **Canada:**

Orica Canada Inc.  
301 Rue Hotel-de-Ville  
Brownsburg-Chatham, QC  
J8G 3B5  
For SDS Requests:  
1-855-26-ORICA (1-855-266-7422)  
[sds.na@orica.com](mailto:sds.na@orica.com)  
[www.oricaminingservices.com](http://www.oricaminingservices.com)

#### Emergency Telephone Number

**Emergency Number** : **Canada:** 1-877-561-3636 (Orica Transportation Emergency Response)

**USA:** 1-800-424-9300 (CHEMTREC)

FOR CHEMICAL EMERGENCIES (24 HOUR) INVOLVING TRANSPORTATION, SPILL, LEAK, RELEASE, FIRE OR ACCIDENTS: **IN CANADA CALL:** THE ORICA TRANSPORTATION EMERGENCY RESPONSE SYSTEM AT **1-877-561-3636. IN THE U.S. CALL: CHEMTREC 1-800-424-9300. IN THE U.S.:** FOR LOST, STOLEN, OR MISPLACED EXPLOSIVES CALL: BATF **1-800-800-3855**. FORM ATF F 5400.5 MUST BE COMPLETED AND LOCAL AUTHORITIES (STATE/MUNICIPAL POLICE, ETC.) MUST BE ADVISED.

### SECTION 2: HAZARDS IDENTIFICATION

#### Classification of the Substance or Mixture

##### **GHS-US/CA Classification**

The explosive classification below only applies to US 29 CFR 1910.1200 (HCS/HazCom 2012). The explosive classification is excluded from Canada Hazardous Products Regulations (HPR, SOR/2015-17), it is regulated under the Canada Explosives Act (R.S.C., 1985, c. E-17).

Explosives, Division 1.1	H201
Ox. Liq. 3	H272
Acute Tox. 4 (Oral)	H302
Eye Irrit. 2A	H319
Carc. 1B	H350
STOT RE 2	H373
Aquatic Acute 3	H402
Aquatic Chronic 3	H412

Full text of hazard classes and H-statements : see section 16

#### Label Elements

##### **GHS-US/CA Labeling**

Any labeling elements (pictograms, signal word, hazard, and precautionary statements) related to explosive classifications apply to the OSHA Hazard Communication Standard (HCS, 29 CFR 1910.1200) only and are excluded from Canada's Hazardous Products Regulations (HPR, SOR/2015-17).

# Senatel Powersplit

## Safety Data Sheet

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### Hazard Pictograms (GHS-US/CA)



### Signal Word (GHS-US/CA)

: Danger

### Hazard Statements (GHS-US/CA)

- : H201 - Explosive; mass explosion hazard.
- H272 - May intensify fire; oxidizer.
- H302 - Harmful if swallowed.
- H319 - Causes serious eye irritation.
- H350 - May cause cancer.
- H373 - May cause damage to organs through prolonged or repeated exposure.
- H402 - Harmful to aquatic life.
- H412 - Harmful to aquatic life with long lasting effects.

### Precautionary Statements (GHS-US/CA)

- : P201 - Obtain special instructions before use.
- P202 - Do not handle until all safety precautions have been read and understood.
- P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- P220 - Keep away from clothing and other combustible materials.
- P260 - Do not breathe fumes, vapors, mist, or spray.
- P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
- P270 - Do not eat, drink or smoke when using this product.
- P273 - Avoid release to the environment.
- P280 - Wear protective gloves, protective clothing, and eye protection.
- P301+P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.
- P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P308+P313 - If exposed or concerned: Get medical advice/attention.
- P314 - Get medical advice/attention if you feel unwell.
- P330 - Rinse mouth.
- P337+P313 - If eye irritation persists: Get medical advice/attention.
- P405 - Store locked up.
- P501 - Dispose of contents/container in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.
- P240 - Ground/bond container and receiving equipment.
- P250 - Do not subject to friction, grinding, shock.
- P370+P380 - In case of fire: Evacuate area.
- P372 - Explosion risk in case of fire.
- P373 - DO NOT fight fire when fire reaches explosives.
- P401 - Store in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555.

### Other Hazards

Exposure may aggravate pre-existing eye, skin, or respiratory conditions. Overexposure may cause methemoglobinemia. Initial manifestation of methemoglobinemia is cyanosis, characterized by navy lips, tongue and mucous membranes, with skin color being slate grey. Further manifestation is characterized by headache, weakness, dyspnea, dizziness, stupor, respiratory distress and death due to anoxia.

### Unknown Acute Toxicity (GHS-US/CA)

No data available

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

### Mixture

Name	Product Identifier	% *
Ammonium nitrate	(CAS No) 6484-52-2	70 - 80

# Senatel Powersplit

## Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

Sodium nitrate	(CAS No) 7631-99-4	7 - 13
Sodium perchlorate	(CAS No) 7601-89-0	5 - 10
Petroleum	(CAS No) 8002-05-9	3 - 7
Pentaerythrite tetranitrate	(CAS No) 78-11-5	0.5 - 2

\*Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%).

## SECTION 4: FIRST AID MEASURES

### Description of First-aid Measures

**General:** Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

**Inhalation:** When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

**Skin Contact:** Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation develops or persists.

**Eye Contact:** Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention.

**Ingestion:** Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

### Most Important Symptoms and Effects Both Acute and Delayed

**General:** Causes serious eye irritation. Harmful if swallowed. There are potential chronic health effects to consider. Overexposure to this material may result in methemoglobinemia. Methemoglobinemia decreases the blood's ability to carry oxygen and results in symptoms such as dizziness, drowsiness, headache, shortness of breath, blue skin and lips, rapid heart rate, unconsciousness, and possibly death.

**Inhalation:** Prolonged exposure may cause irritation.

**Skin Contact:** Prolonged exposure may cause skin irritation.

**Eye Contact:** Contact causes severe irritation with redness and swelling of the conjunctiva.

**Ingestion:** This material is harmful orally and can cause adverse health effects or death in significant amounts.

**Chronic Symptoms:** May cause cancer. May cause damage to organs through prolonged or repeated exposure.

### Indication of Any Immediate Medical Attention and Special Treatment Needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

## SECTION 5: FIRE-FIGHTING MEASURES

### Extinguishing Media

**Suitable Extinguishing Media:** DO NOT FIGHT FIRES INVOLVING EXPLOSIVES. Water may be applied through fixed extinguishing system (sprinklers) as long as people need not be present for the system to operate.

**Unsuitable Extinguishing Media:** DO NOT fight fires involving explosives.

### Special Hazards Arising From the Substance or Mixture

**Fire Hazard:** Explosive, could cause fire and secondary explosions. May intensify fire; oxidizer.

**Explosion Hazard:** Explosives, Division 1.1 - Chemicals and items which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously). Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

**Reactivity:** Extreme risk of explosion by shock, friction, fire or other sources of ignition. Oxidizer: increases the burning rate of combustible materials.

### Advice for Firefighters

**Precautionary Measures Fire:** Exercise caution when fighting any chemical fire. This product is an explosive with mass detonation hazard. DO NOT FIGHT FIRES INVOLVING EXPLOSIVE MATERIALS.

**Firefighting Instructions:** DO NOT ATTEMPT TO FIGHT FIRE. Immediately evacuate all personnel from the area to a safe distance. Guard against re-entry. Thermal decomposition can lead to release of irritating gases and vapors. In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion.

**Protection During Firefighting:** Do not enter fire area without proper protective equipment, including respiratory protection.

**Hazardous Combustion Products:** Carbon oxides (CO, CO<sub>2</sub>), hydrocarbons, nitrogen oxides. At temperatures above 210 °C (410 °F), decomposition may be explosive, especially if confined.

**Other Information:** Do not allow run-off from fire fighting to enter drains or water courses.

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### Reference to Other Sections

Refer to Section 9 for flammability properties.

## SECTION 6: ACCIDENTAL RELEASE MEASURES

### Personal Precautions, Protective Equipment and Emergency Procedures

**General Measures:** Keep away from heat, sparks, open flames, hot surfaces. – No smoking. Do not get in eyes, on skin, or on clothing. Do not breathe vapor, mist or spray. Evacuate danger area. Keep away from heat, hot surfaces, sparks, open flames, and other ignition sources. No smoking. Keep away from combustible material. Avoid all contact with skin, eyes, or clothing.

#### For Non-Emergency Personnel

**Protective Equipment:** Use appropriate personal protective equipment (PPE).

**Emergency Procedures:** Evacuate unnecessary personnel. Evacuate danger area.

#### For Emergency Personnel

**Protective Equipment:** Equip cleanup crew with proper protection.

**Emergency Procedures:** Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit. Ventilate area. Eliminate ignition sources.

### Environmental Precautions

Prevent entry to sewers and public waters. Avoid release to the environment.

### Methods and Materials for Containment and Cleaning Up

**For Containment:** Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Absorb and contain with inert material. Place contents in suitable container for disposal. Use only non-sparking tools.

**Methods for Cleaning Up:** Use only non-sparking tools. Be careful to avoid shock, friction, and contact with grit. Collect product for recovery or disposal. For release to land, contain discharge by constructing dykes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Collect contaminated soil and water, and absorbent for proper disposal. Notify applicable government authority if release is reportable or could adversely affect the environment. Absorb and/or contain spill with inert material, then place in suitable container. Do not take up in combustible material such as: saw dust or cellulosic material.

### Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

## SECTION 7: HANDLING AND STORAGE

### Precautions for Safe Handling

**Additional Hazards When Processed:** May cause or intensify fire; oxidizer.

**Precautions for Safe Handling:** Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Keep away from sources of ignition - No smoking. Keep away from extremely high or low temperatures, ignition sources, and incompatible materials. - No smoking. Handle empty containers with care because they may still present a hazard. Do not get in eyes, on skin, or on clothing. Do not handle until all safety precautions have been read and understood. Do not breathe fumes, vapors, mist, spray. Avoid contact with skin, eyes and clothing.

**Hygiene Measures:** This product is an explosive and should only be used under the supervision of trained and licensed personnel. Handle in accordance with good industrial hygiene and safety procedures. Wash hands and other exposed areas with mild soap and water before eating, drinking, or smoking and again when leaving work.

### Conditions for Safe Storage, Including Any Incompatibilities

**Technical Measures:** Comply with applicable regulations. Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment.

**Storage Conditions:** Store under moderate temperatures recommended by competent authority. Store under dry conditions in a well ventilated magazine that has been approved for either detonator storage or explosive storage. Do NOT store explosives in a detonator magazine or detonators in an explosive magazine. Keep away from heat, spark and flames. Keep containers closed. Explosives should be kept well away from initiating explosives; protected from physical damage; separated from oxidizing materials, combustibles, and sources of heat. Isolate from incompatibles. . Keep/Store away from combustible materials, organic material, ignition sources, incompatible materials. Keep in fireproof place.

**Incompatible Materials:** Oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

**Special Rules on Packaging:** Keep only in the original container.



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### Specific End Use(s)

A detonator sensitive emulsion explosive. For professional use only.

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

### Control Parameters

For substances listed in section 3 that are not listed here, there are no established Exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

Petroleum (8002-05-9)		
USA OSHA	OSHA PEL (TWA) (mg/m <sup>3</sup> )	2000 mg/m <sup>3</sup>
USA OSHA	OSHA PEL (TWA) (ppm)	500 ppm
USA NIOSH	NIOSH REL (TWA) (mg/m <sup>3</sup> )	350 mg/m <sup>3</sup>
USA NIOSH	NIOSH REL (ceiling) (mg/m <sup>3</sup> )	1800 mg/m <sup>3</sup> (15 min)
USA IDLH	US IDLH (ppm)	1100 ppm (10% LEL)

### Exposure Controls

**Appropriate Engineering Controls:** Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed. Proper grounding procedures to avoid static electricity should be followed. Product to be handled in a closed system and under strictly controlled conditions. Use explosion-proof equipment. Gas detectors should be used when flammable gases or vapors may be released.

**Personal Protective Equipment:** Gloves. Protective clothing. Protective goggles. Insufficient ventilation: wear respiratory protection.



**Materials for Protective Clothing:** Chemically resistant materials and fabrics. Wear fire/flame resistant/retardant clothing.

**Hand Protection:** Wear protective gloves.

**Eye Protection:** Chemical safety goggles.

**Skin and Body Protection:** Wear suitable protective clothing.

**Respiratory Protection:** If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

**Other Information:** When using, do not eat, drink or smoke

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

### Information on Basic Physical and Chemical Properties

Physical State	: Liquid
Appearance	: Viscous. String of plastic wrapped material traced internally with detonating cord. If the outer plastic is perforated, the exposed product appears putty-like.
Odor	: Odorless
Odor Threshold	: Not available
pH	: Not available
Evaporation Rate	: Not available
Melting Point	: Not available
Freezing Point	: Not available
Boiling Point	: Not available
Flash Point	: Not available
Auto-ignition Temperature	: Not available
Decomposition Temperature	: Detonating Cord 70 °C (158 °F) / Ammonium Nitrate 210 °C (410 °F)
Flammability (solid, gas)	: Not available
Lower Flammable Limit	: Not available

# Senatel Powersplit

## Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

<b>Upper Flammable Limit</b>	: Not available
<b>Vapor Pressure</b>	: 0 mm Hg @ 20 °C (68 °F)
<b>Relative Vapor Density at 20°C</b>	: Not available
<b>Relative Density</b>	: 1.2 - 1.3
<b>Density</b>	: 1.2 - 1.3 g/cc
<b>Specific Gravity</b>	: 1.2 - 1.3
<b>Solubility</b>	: Slightly soluble in standard organic solvents. Insoluble in water.
<b>Partition Coefficient: N-Octanol/Water</b>	: Not available
<b>Viscosity</b>	: Not available
<b>Explosive Properties</b>	: Explosives, Division 1.1 - Chemicals and items which have a mass explosion hazard (a mass explosion is one which affects almost the entire quantity present virtually instantaneously)

### SECTION 10: STABILITY AND REACTIVITY

**Reactivity:** Extreme risk of explosion by shock, friction, fire or other sources of ignition. Oxidizer: increases the burning rate of combustible materials.

**Chemical Stability:** Extreme risk of explosion by shock, friction, fire or other sources of ignition. May intensify fire; oxidizer.

**Possibility of Hazardous Reactions:** Hazardous polymerization will not occur.

**Conditions to Avoid:** Keep away from open flames, hot surfaces and sources of ignition. Incompatible materials. Direct sunlight, extremely high or low temperatures, ignition sources, combustible materials, incompatible materials.

**Incompatible Materials:** Oxidizable materials, metal powder, bronze & copper alloys, fuels (e.g. lubricants, machine oils), fluorocarbon lubricants, acids, corrosive liquids, chlorate, sulphur, sodium nitrite, charcoal, coke and other finely divided combustibles. Strong oxidizing and reducing agents.

**Hazardous Decomposition Products:** None expected under normal conditions of use.

### SECTION 11: TOXICOLOGICAL INFORMATION

#### Information on Toxicological Effects - Product

**Acute Toxicity (Oral):** Oral: Harmful if swallowed.

**Acute Toxicity (Dermal):** Not classified

**Acute Toxicity (Inhalation):** Not classified

#### LD50 and LC50 Data:

Senatel Powersplit	
ATE US/CA (oral)	1,733.41 mg/kg body weight

**Skin Corrosion/Irritation:** Not classified

**Eye Damage/Irritation:** Causes serious eye irritation.

**Respiratory or Skin Sensitization:** Not classified

**Germ Cell Mutagenicity:** Not classified

**Carcinogenicity:** May cause cancer.

**Specific Target Organ Toxicity (Repeated Exposure):** May cause damage to organs through prolonged or repeated exposure.

**Reproductive Toxicity:** Not classified

**Specific Target Organ Toxicity (Single Exposure):** Not classified

**Aspiration Hazard:** Not classified

**Symptoms/Injuries After Inhalation:** Prolonged exposure may cause irritation.

**Symptoms/Injuries After Skin Contact:** Prolonged exposure may cause skin irritation.

**Symptoms/Injuries After Eye Contact:** Contact causes severe irritation with redness and swelling of the conjunctiva.

**Symptoms/Injuries After Ingestion:** This material is harmful orally and can cause adverse health effects or death in significant amounts.

**Chronic Symptoms:** May cause cancer. May cause damage to organs through prolonged or repeated exposure.

#### Information on Toxicological Effects - Ingredient(s)

#### LD50 and LC50 Data:

Ammonium nitrate (6484-52-2)	
LD50 Oral Rat	2217 mg/kg

# Senatel Powersplit

## Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

LC50 Inhalation Rat	> 88.8 mg/l/4h
<b>Petroleum (8002-05-9)</b>	
LD50 Oral Rat	> 4300 mg/kg
LD50 Dermal Rabbit	> 2000 mg/kg
LC50 Inhalation Rat	2.18 mg/l/4h
<b>Sodium nitrate (7631-99-4)</b>	
LD50 Oral Rat	> 2000 mg/kg
<b>Sodium perchlorate (7601-89-0)</b>	
LD50 Oral Rat	2100 mg/kg
ATE US/CA (oral)	500.00 mg/kg body weight
<b>Pentaerythrite tetranitrate (78-11-5)</b>	
LD50 Oral Rat	1660 mg/kg
<b>Petroleum (8002-05-9)</b>	
IARC Group	3

## SECTION 12: ECOLOGICAL INFORMATION

### Toxicity

Ecology - General: Harmful to aquatic life with long lasting effects.

<b>Ammonium nitrate (6484-52-2)</b>	
LC50 Fish 1	542 mg/l
EC50 Daphnia 1	555 mg/l
<b>Petroleum (8002-05-9)</b>	
LC50 Fish 1	< 7.1 mg/l (Species: Pimephales promelas, Exposure time 96 h)
LC50 Other Aquatic Organisms 1	2.7 mg/l LL50 96 hr (Kelp forest mysid shrimp)
EC50 Daphnia 1	6.9 mg/l (Exposure time: 48 h)
<b>Sodium nitrate (7631-99-4)</b>	
LC50 Fish 1	2000 mg/l (Exposure time: 96 h - Species: Lepomis macrochirus [static])
LC50 Fish 2	994.4 - 1107 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [static])

### Persistence and Degradability

<b>Senatel Powersplit</b>	
Persistence and Degradability	May cause long-term adverse effects in the environment.
<b>Sodium nitrate (7631-99-4)</b>	
Persistence and Degradability	Readily biodegradable in water.

### Bioaccumulative Potential

<b>Senatel Powersplit</b>	
Bioaccumulative Potential	Not established.
<b>Ammonium nitrate (6484-52-2)</b>	
BCF Fish 1	(no bioaccumulation expected)
Log Pow	-3.1 (at 25 °C)
<b>Sodium nitrate (7631-99-4)</b>	
Log Pow	-3.8 (at 25 °C)
Bioaccumulative Potential	Not expected to bioaccumulate.

**Mobility in Soil** Not available

### Other Adverse Effects

**Other Information:** Avoid release to the environment.

## SECTION 13: DISPOSAL CONSIDERATIONS

**Waste Disposal Recommendations:** Dispose of contents/container in accordance with the Explosives Act of Canada and the provisions of the Bureau of Alcohol, Tobacco and Firearms regulations contained in 27 CFR part 555

**Additional Information:** Container may remain hazardous when empty. Continue to observe all precautions.

# Senatel Powersplit

## Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

**Ecology - Waste Materials:** Avoid release to the environment. This material is hazardous to the aquatic environment. Keep out of sewers and waterways.

### SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

#### In Accordance with DOT

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E  
 Hazard Class : 1.1D  
 Identification Number : UN0241  
 Label Codes : 1.1D  
 Packing Group : II  
 ERG Number : 112



#### In Accordance with IMDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E  
 Hazard Class : 1.1D  
 Identification Number : UN0241  
 Label Codes : 1.1D  
 EmS-No. (Fire) : F-B  
 EmS-No. (Spillage) : S-X  
 MFAG Number : 112



#### In Accordance with IATA

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E  
 Identification Number : 1.1D  
 Hazard Class : UN0241  
 ERG Code (IATA) : 1L

#### In Accordance with TDG

Proper Shipping Name : EXPLOSIVE, BLASTING, TYPE E  
 Hazard Class : 1.1D  
 Identification Number : UN0241  
 Label Codes : 1.1D  
 Packing Group : II



### SECTION 15: REGULATORY INFORMATION

#### US Federal Regulations

<b>Senatel Powersplit</b>	
<b>SARA Section 311/312 Hazard Classes</b>	Sudden release of pressure hazard Fire hazard Immediate (acute) health hazard Delayed (chronic) health hazard
<b>Ammonium nitrate (6484-52-2)</b>	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
<b>Petroleum (8002-05-9)</b>	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
<b>Sodium nitrate (7631-99-4)</b>	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
<b>Sodium perchlorate (7601-89-0)</b>	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
<b>Pentaerythrite tetranitrate (78-11-5)</b>	
Listed on the United States TSCA (Toxic Substances Control Act) inventory	
<b>EPA TSCA Regulatory Flag</b>	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA

# Senatel Powersplit

## Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

### US State Regulations

<b>Ammonium nitrate (6484-52-2)</b>
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List
<b>Petroleum (8002-05-9)</b>
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
<b>Sodium nitrate (7631-99-4)</b>
U.S. - Massachusetts - Right To Know List U.S. - Pennsylvania - RTK (Right to Know) List
<b>Sodium perchlorate (7601-89-0)</b>
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List
<b>Pentaerythrite tetranitrate (78-11-5)</b>
U.S. - New Jersey - Right to Know Hazardous Substance List

### Canadian Regulations

<b>Ammonium nitrate (6484-52-2)</b>
Listed on the Canadian DSL (Domestic Substances List)
<b>Petroleum (8002-05-9)</b>
Listed on the Canadian DSL (Domestic Substances List)
<b>Sodium nitrate (7631-99-4)</b>
Listed on the Canadian DSL (Domestic Substances List)
<b>Sodium perchlorate (7601-89-0)</b>
Listed on the Canadian DSL (Domestic Substances List)
<b>Pentaerythrite tetranitrate (78-11-5)</b>
Listed on the Canadian DSL (Domestic Substances List)

## SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

<b>Revision Date</b>	: 02/08/2017
<b>Other Information</b>	: This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR).

### GHS Full Text Phrases:

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Aquatic Acute 3	Hazardous to the aquatic environment - Acute Hazard Category 3
Aquatic Chronic 3	Hazardous to the aquatic environment - Chronic Hazard Category 3
Carc. 1B	Carcinogenicity Category 1B
Expl. 1.1	Explosive Category 1.1
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Ox. Liq. 3	Oxidizing liquids Category 3
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H201	Explosive; mass explosion hazard
H272	May intensify fire; oxidizer
H302	Harmful if swallowed
H319	Causes serious eye irritation

# Senatel Powersplit

## Safety Data Sheet

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H350	May cause cancer
H373	May cause damage to organs through prolonged or repeated exposure
H402	Harmful to aquatic life
H412	Harmful to aquatic life with long lasting effects

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NA GHS SDS 2015 (Can, US)



**APPENDIX 5**

**EMULSION PLAN / BLAST AREA INSPECTION SHEET**

**Environmental Inspection Report for the Emulsion Plant Area and the Loading of Blast Holes**

**Date:**

**Inspected By:**

**Time:**

**Weekly Inspection**

**Location:** Emulsion Plant

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
NWB Part B Item 10	Sign posted to inform of a waste disposal facility				
NWB Part D Item 17 MBK SCP MBK NIRB Condition 26	Are there any visual spills?				
NWB Part F Item 10	All Hazardous Waste disposal is located 30m from the ordinary high water mark.				
NWB Part H Item 2	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 3 Ammonia Management Plan	Is secondary containment for chemical storage provided.				
NWB Part I Item 7	Monitoring signs are posted in English, French, and Inuktitut.				
MBK SCP	Spill Kits Present				
MBK NIRB Condition 26	Ensure that spills, if any, are cleaned up immediately and that the site is kept clean of debris, including wind-blown debris.				
MBK NIRB Condition 25	Management and control waste in a manner that reduces or eliminates the attraction to carnivores and/or raptors.				



# Agnico Eagle Mines: Whale Tail Project

## Division Environment Department



MBK NIRB Condition 27 Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				
Hazardous Management Plan	Are storage containers clearly labelled to identify Hazardous substance?				
Ammonia Management Plan	Are storage containers in good condition? Is there any visible damage or leaks? Can the doors be sealed shut?				
Ammonia Management Plan	Where necessary – Are containers with product stored in an upright position?				
Ammonia Management Plan	Do you see any potential environmental hazards posed by these HAZARDOUS containers/materials?				
BMP	Are there any additional environmental hazards/potential impacts that require attention?				
MINE ACT	Are there any Health and Safety issues that should be addressed to prevent injury to workers?				

**Pit Location:**

**Blast Pattern:**

<b>In Compliance with</b>	<b>Subject</b>	<b>Conform</b>	<b>Non-conform</b>	<b>N/A</b>	<b>Comments</b>
NWB Part D Item 17 MBK SCP MBK NIRB Condition 26	Are there any visual spills, including emulsion?				
Ammonia Management Plan	Is there presence of Emulsion outside of the holes that are being loaded?				
NWB Part F Item 10	All Hazardous Waste disposals are located 30m from the ordinary high water mark.				

# Agnico Eagle Mines: Whale Tail Project

## Division Environment Department



NWB Part H Item 2	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 3 Ammonia Management Plan	Is secondary containment for chemical storage provided?				
MBK NIRB Condition 27  Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				

**Comments/Recommendations:**

**Environmental Personnel Name:**

**Actions Corrected: None**

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**Dyno Nobel Supervisor Name:** \_\_\_\_\_

**Signature:** \_\_\_\_\_