SNAP LAKE MINE

Water Management Plan V.6

March 2025

DE BEERS GROUP

REVISIONS HISTORY

Version	Date	Notes/Revisions
Water Management Plan	December 2014	All Sections: Spelling and grammar. Section 2.1: Correction to Water Treatment Plant Bullet, reference to potable water treatment plant updated to state temporary water treatment plant Section 2.1.1: Updated to include water quality control. Section 2.1.3: Updated to include water quality control. Section 2.1.6: Clarification that independent geotechnical inspection carried out by design engineer. Section 2.1.8 and Section 3.2: Liner" keyed" replace to state "tied into freeze thaw resistant bedrock and mineral soils" Section 2.1.9 Figure2-1: Updated Figure2-1 (Water Balance) to include water quality control line. Section 2.5 Table 2-3: Updated Table 2-3 (Water Balance Estimates) to include water quality control. Section 2.1.3: Statement regarding recycled water for use in dust suppression was added. Section 2.1.9: Table 2-1 was updated to provide the linkage between the water treatment process and water licence discharge criteria for the interlock system. Section 2.1.9: Figure2-1 was updated to include the data source "Q8 = Q6 + Q7". Section 2.8.1: Table 2-4 was updated to include SNP 02-18. Section 2.8.1: Updated to reflect recent MVLWB extension compliance dates to January 2017. Section 3.3.2: Action Level exceedances notification to the Board. Section 3.3.3: Update to be consistent with MV2011L2-0004 Part G, item 9 specifically 30 day notification to MVLWB and Inspector
Extended Care and Maintenance Water Management Plan V. 1	April 2016	All Sections: The Extended Care and Maintenance Water Management Plan has been updated to reflect the proposed flooded condition at Snap Lake Mine and update organizational structures. This is considered an addendum to the previously provided Water Management Plan.
Extended Care and Maintenance Water Management Plan V.1.1	July 2016	Updated to address the interim MVLWB approval of June 22, 2016. Other revisions detailed within the 'Table of Revisions included in the Plan.
Extended Care and Maintenance Water Management Water Management Plan V.2	December 2017	All Sections: The Extended Care and Maintenance Water Management Plan has been updated to address remote monitoring and final closure. Section 2.1.5: Updated to reflect changes to the STP to an activated sludge treatment system. Section 2.1.9: Updated to reflect changes to the WTP system related to care and maintenance.

Version	Date	Notes/Revisions
Extended Care and Maintenance Water Management Plan V.3	March 2018	All Sections: The Extended Care and Maintenance Water Management Plan has been updated to address remote monitoring and final closure. Section 2.1.5: Updated to reflect changes to the STP to an activated sludge treatment system. Section 2.1.9 Updated to reflect changes to the WTP system related to care and maintenance. Section 2.1.9 Description of the anticipated supplemental water treatment system, including treatment process, target contaminants and expected treatment efficiency. All Sections: Accounting for current and future expectations Section 2.6.1.4 Sump maintenance, critical flow ditches and monitoring actions. All Sections: References to other Sections in this version of the Plan reflect actual content within the Plan.
Version 4	March 2019	All Sections: Plan has been updated to align with the Final Closure Plan and water licence application package
Version 5	September 2020	All Sections: Plan has been updated post-issuance of new Water Licence MV2019L2-0004 to align with Water Licence conditions and Board Directives
Version 5.1	March 2021	Updates to conform to the MVLWB direction provided in Table 1 of the January 20, 2021 letter.
Version 5.1	July 2021	Updates to conform to the MVLWB approval letter provided in Table 1 of the June 4, 2021 letter.
Version 6.0	February 2025	Update for post-closure while discharges to Snap Lake are still managed actively.

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ACRONYMS AND ABBREVIATIONS

EAR	Environmental Assessment Report
EQC	Effluent Quality Criteria
FCRP	Final Closure and Reclamation Plan
ISP	Influent Storage Pond (East and West)
Non-PAG	Not potentially acid generating
PAG	Potentially acid generating
PK	Processed kimberlite
PKC	Processed kimberlite containment
PWCS	Perimeter water control structures
PWTP	Potable water treatment plant
PS	Perimeter sump
SBR	Sequencing batch reactor
SNP	Surveillance network program
STP	Sewage treatment plant
TSS	Total suspended solids
WMP	Water management pond
WTP	Water treatment plant

UNITS OF MEASURE

m	metre
m^3	cubic metres
m^3/d	cubic metres per day
mg/L	milligrams per litre
Mt	mega tonne
t	tonne

1. INTRODUCTION

The Snap Lake Mine (the Mine) is a former underground diamond mine owned and operated by De Beers Canada Inc. (De Beers). It is located about 220 kilometers northeast of Yellowknife in the Northwest Territories. The Snap Lake Mine operated from 2008 to 2015. In December of 2015, De Beers ceased diamond mining operations and put the Mine into a temporary closure phase called Care and Maintenance. Throughout 2016 De Beers explored options for the future of the Mine. These options included a) reopening the Mine, b) further optimization of care and maintenance, c) sale to a qualified operator, or d) final closure of the Mine. De Beers elected not to reopen the mine and did not find a qualified buyer. At the beginning of 2017 the underground workings of the Mine were allowed to flood with water. Care and Maintenance activities included maintenance of buildings and facilities, progressive reclamation of the North Pile, management of surface water from on-site surface water structures, environmental monitoring and compliance, and planning for closure.

In December of 2017, De Beers announced its plan to proceed with the final closure and reclamation of Snap Lake Mine. During the 2018 calendar year, De Beers prepared a Final Closure and Reclamation Plan (FCRP) and updated all the environmental monitoring and management plans to align with plans for final closure of the Mine. In March 2019, De Beers submitted the FCRP together with a renewal application for the Type A Water Licence (MV2019L2-0004). Various management plans, including a Water Management Plan for Closure were submitted as part of the water licence renewal process required by the Mackenzie Valley Land and Water Board (MVLWB). The FCRP and the management plans (including the Water Management Plan) were reviewed during the public review process. The Water Management Plan was updated to align with Water Licence MV2019L2-0004 and the resubmitted Final Closure and Reclamation Plan (V1.1) (De Beers 2021). Following completion of the public review of the Water Management Plan (V.5), and additional directives by the MVLWB issued on January 20,2021, De Beers submitted the plan for approval as Version 5.1. Version 5.1 was approved by the MVLWB on July 5, 2021.

De Beers implemented active closure of the Snap Lake Mine from Q2 2022 to the Q1 2025. Active closure involved decommissioning, demolition, and disposing of project infrastructure such as the process plant, the power plant, the camp buildings, sewage treatment plant, fuel storage tanks etc. It also included the placement of cover materials on the North Pile and reconstruction of the water management structures around the North Pile, the capping of all openings to the underground, general site-wide reclamation and revegetation. Closure activities are described in the FCRP V1.5, approved in full by the MVLWB on May 2, 2024. Active closure has now been substantially completed. The only remaining physical works will be minor corrective actions as necessary, annual water management, and the final breaching of the water control structures to facilitate passive flow to Snap Lake. Dam breaching will occur once the MVLWB approves the final EQC report for post-closure as per MV2019L2-0004, Part F, item 24. From April 1, 2025 onwards, the site is in a post-closure state, however water management will remain active until the final breaching of water control structures. This period, between the end of active closure and the breaching of the dykes is a considered to be a transition period as it relates to water management.

Site will now only be occupied on a seasonal basis, during the spring and summer. During periods of zero occupancy there will be ongoing remote monitoring for certain parameters as stipulated in several different management plans. De Beers will continue to meet the terms and conditions of the water licence and land use permit and all approved environmental monitoring and management plans.

1.1 Purpose

The purpose of the Water Management Plan (the Plan) is to describe activities related to water management at Snap Lake Mine. The purpose of the water management system(s) is to collect, contain, and control the release of water at the Mine. This water management system is designed to operate passively, however De Beers will actively control the final release of water to Snap Lake until receipt of MVLWB approval for the final EQC re-evaluation report for passive discharge as per MV2019L2-0004, Part F, Item 24. De Beers will then breach the water control structures to allow for passive drainage.

1.2 Overview

Water management at the Mine has significantly changed since diamond mining operations ceased. During mining operations, a large volume of water was pumped from the underground to the surface for management and released to Snap Lake. This mine water was relatively high in total dissolved solids and total suspended solids and therefore had to be treated prior to discharge. Now that the underground is flooded, there is no longer a need to pump mine water to the surface. Water management is simplified greatly.

The remaining sources of managed water on the mine site include:

- the North Pile (i.e. seepage water);
- surface runoff (from precipitation); and
- water intake from the Northwest arm of Snap Lake during intermittent spring and summer periods of occupancy of the site.

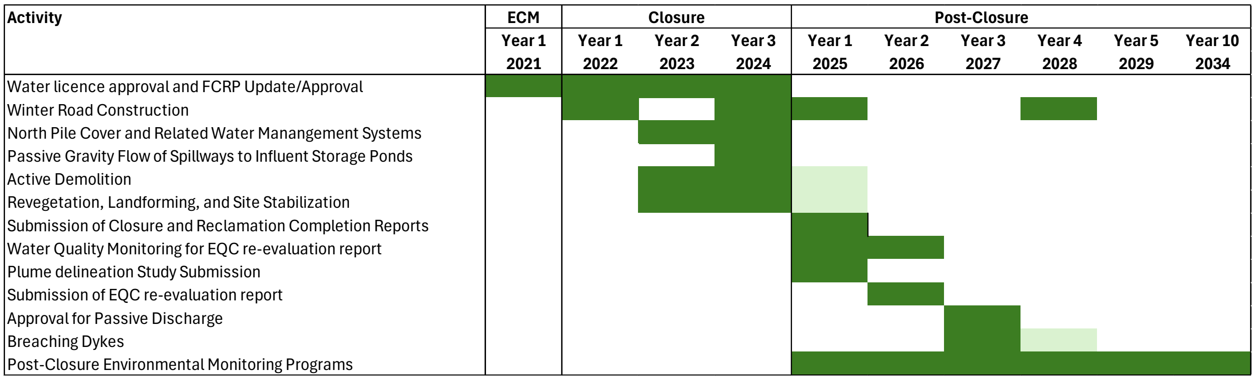
These water sources will continue to be managed to ensure compliance with the water licence. For the purposes of the Plan, water management is defined as the collection, storage, treatment (when required), recycling, and discharge of water at the mine site, in a safe, efficient, and compliant manner.

The water management system comprises the infrastructure and practices that are designed to manage water quantity and quality. The water management system can be divided into two main parts:

- The camp (domestic) water and wastewater facilities; the system contains infrastructure for water supply and discharge of greywater to an on-land sump, and
- The mine (surface) water facilities; the system contains facilities for collection and conveyance of surface water runoff and seepage from the North Pile, for storage and the return of effluent to Snap Lake.

The general timeline for the Project is provided below as Figure 1-1. This timeline is not a fixed schedule but rather is expected to be adjusted over time. It is provided herein to provide the MVLWB and reviewers with a general sense of the schedule for the closure and post closure activities. Year 1 of post-closure is equivalent to 2025.

Figure 1-1 Integrated Schedule of Closure Activities



1.3 Concordance

The Plan has been developed to include the following Sections:

- Site Setting Background (Section 2)
  - Summary of the environmental setting
  - Cross-reference to supporting engineering designs related to water and waste infrastructure
- Water and Wastewater Management (Section 3)
  - Predicted water balances to describe inflows, internal water transfers, and outflows related to project activities;
  - Description of the management of domestic water system components and processes including raw water intake and grey water discharge; and
  - Description of the management of surface water systems components and processes including the passive water control structure that was constructed as part of closure and the active system that will operate until the passive system is functional.
- Monitoring (Section 4)
  - Description of the monitoring program for water including a rationale for the components of the Water management system; and,
  - Description of the linkages to other monitoring programs.
- Response Framework (Section 5)
  - Description of the adaptive management approach, action levels, and contingency for the Snap Lake Water Management Systems in closure. The response framework links monitoring results to actions with the purpose of maintaining the Assessment Endpoints.

This plan is in alignment with the Water Licence Conditions (Table 1-1) and all previous the Board Directives. There are no outstanding Board Directives to address within this version of the Water Management Plan. It has been updated to align with the completion of active closure and the transition of site into a post-closure state with continued active management of water.

Table 1-1 Concordance with Water Licence Conditions

Item	Condition	Cross-Reference Section in Plan
Part F, 3	Within 90 days following the effective date of this Licence, the Licensee shall submit to the Board, for approval, a revised Water Management Plan. The Plan shall be in accordance with the requirements of Schedule 4, Condition 1. The Licensee shall not implement the Water management activities described in the revised Plan prior to Board approval	Version 5.1 of the Water Management Plan
Schedule 4, Item 1 a) Information regarding Water and Wastewater management during closure and Post-Closure		
i.	A description of the facilities to be constructed, including the purpose of the facilities	Section 3.2
ii.	Relevant background information for the area beneath the footprint of the containment and Runoff control structures, including the results of geotechnical and geochemical investigations; hydrogeological investigations; programs to characterize soil, rock, Groundwater, ground ice, and ground temperature conditions to the depth expected to be affected by the proposed facilities; and any other relevant information	Section 2 and the FCRP (De Beers 2020a; Appendices H1, L1, and L2)
iii.	The process and facilities for the collection and management of surface Runoff and Seepage generated on site	Section 3.2 and 3.3, and the FCRP (De Beers 2020a; Appendices H1, L1, and L2)
iv.	The process and facilities for the collection and management of any Wastewater resulting from closure and Post-Closure activities	Section 3.2 and the FCRP (De Beers 2020a; Appendices H1, L1, and L2)
v.	The process and facilities for the Water treatment and Discharge of Effluent from the Water management system to Snap Lake	Section 3.2.2
vi.	Details of the final hydraulic design of all Water management structures and Water balance estimates on a monthly basis for each year of the proposed Licence	Hydraulic design: Section 3.2, and the FCRP (De Beers 2020a; Appendices L1, and L2) Water Balance Estimates: Appendix A
vii.	A summary of the results of the site Water models, including Water quality and quantity predictions	Section 3.4, Appendix A
viii.	A summary of any linkages to activities described in the North Pile Management Plan	Section 3.2.2
ix.	Any other information required to describe how Water and Wastewater will be managed such that the objectives referred to in Part F, Condition 1 of this Licence will be met	Section 2
Schedule 4, Item 1 b) Information regarding contingency measures including:		

Item	Condition	Cross-Reference Section in Plan
i.	A description of the proposed contingency measures for Water and Waste Management	Section 5.3
ii.	A description of the criteria and events triggering the use of each contingency option	Section 5.3
iii.	A description of the series of events and sampling required to decide to use the proposed contingency measures; and	Section 5.3
iv.	Any other information required to describe the Water and Wastewater management of the contingency options.	Section 5.2
Schedule 4, Item 1 c) Information regarding monitoring during closure and Post-Closure including:		
i.	Details of monitoring, including a rationale for each component of the Water management system	Section 4.1, Appendix B
ii.	Linkages to other monitoring programs required in this Licence; and	Section 4.2
iii.	Any other information about the monitoring that will be performed to meet the objectives referred to in Part F, Condition 1 of this Licence	Section 4.2
Schedule 4, Item 1 d) Information about responses to closure and Post-Closure monitoring results		
i.	A description of how site Water monitoring results will be compared to modeling predictions for Water quality and quantity, including the frequency for calibrating and updating site Water models	Section 4.2.2
ii.	A description of the Response Framework that will be implemented by the Licensee to link the results of monitoring to those corrective actions	Section 5
a.	Definitions, with rationale for Action Levels applicable to the performance of the Water management system with respect to geotechnical stability, thermal characteristics, Seepage quality and quantity, and Runoff	Section 5
b.	For each Action Level, a description of how exceedances of the Action Level will be assessed, and generally which types of actions may be taken if the Action Level is exceeded	Section 5.1

2. SITE SETTING BACKGROUND

2.1 Site Description

The Mine, in its post closure state, includes the following key features: a processed kimberlite storage facility (the North Pile), a small post-closure camp, an airstrip, and rehabilitated roads and pads. An aerial view of the Mine illustrating the various mine components is provided in Figure 2-1 The reclaimed mine area, including winter access spur road, is approximately 250 ha and the total land lease area identified for the site is approximately 470 ha.

2.2 Topography and Surficial Geology

The overall topography of the site is gently sloping with occasional knolls. The elevation of the site varies from approximately 445 m at Snap Lake to approximately 482 m on a knoll located southwest of the Water Management Pond (WMP). The natural topography of the North Pile area slopes gently to moderately down from south to north, towards the northwest arm of Snap Lake.

Surficial geology of the mine site consists of a veneer of Quaternary morainal deposits (till) that contains cobbles and boulders mixed with matrix of sand and silt. The till is thin with some thicker pockets in topographic depressions. Fields of boulders, felsenmeer, and shattered rock debris occur in topographic depressions. Bedrock outcrops are common (De Beers 2002).

Surface drainage in the North Pile area was constructed to facilitate flows to the East and West Influent Storage Ponds. Seepage through the pile will collect in the perimeter water control channels which also direct flows to the influent storage ponds.

Figure 2-1 Snap Lake Mine Layout, September 2024

2.3 Permafrost and Hydrogeology

The Mine site is located just north of the border between zones of discontinuous and continuous permafrost, based on information provided by the International Permafrost Association (Golder 2000). The Atlas of Canada Permafrost Map (NRC 1995) gives a permafrost and ground ice classification symbol of 'Cl' for the Snap Lake Mine. This classification means that approximately 90% to 100% of the land area is underlain by permafrost, and that the ground ice content (% by volume of visible ice) in the upper 10 m to 20 m is low (<10%). This includes segregated ice, intrusive ice, reticulate ice veins, ice crystals and ice coatings on soil particles.

Studies confirmed that the Mine area is within the area of continuous permafrost and due to the warming properties of Snap Lake, a talik exists up to 20 to 40 m from the shoreline of the lake (De Beers 2002). Most of the Mine facilities are located on continuous permafrost, although a portion of Dam 1 (at the south end of the East Influent Storage Pond outlet channel) is located within a talik zone suspected to be a result of a natural pond at that location that outflows towards Snap Lake (De Beers 2002).

The hydrogeological setting at the Mine is characterized by its location adjacent to a headwater lake, just north of the border between the zone of discontinuous and continuous permafrost. A talik exists beneath Snap Lake, with permafrost becoming thicker with distance from the lake. There are two main groundwater flow regimes at the project site: a shallow groundwater flow regime within the active layer and a deep groundwater flow regime located beneath the permafrost and within the talik of large water bodies. The thick permafrost at site has low permeability, and thus there is limited hydraulic connection between the two regimes. Within the active layer, the water table is expected to mimic variations in topography. Groundwater gradients would thus be similar to topographic gradients. Groundwater in the active layer would flow to local depressions and ponds that drain to Snap Lake or would flow directly to Snap Lake. The permafrost in the rock at Snap Lake is considered to be virtually impermeable to groundwater flow (De Beers 2020a).

2.4 Related Engineering Studies

Information on geotechnical, geochemical, hydrogeological, ground ice, and ground temperature conditions that is specific to the water and waste containing engineered structures on the Mine, namely the North Pile and related water management structures are provided within reports prepared by the Engineer of Record. These reports were submitted as the Snap Lake North Pile Design and Construction Plan V1.1 in March of 2022. This plan was reviewed and approved by the MVLWB on May 3, 2022. The plan includes the following detailed reports provided as appendices:

- North Pile Closure Cover Detailed Design
  - This report presents the North Pile closure cover detailed design, including the construction drawings, construction specification, and Construction Quality Assurance Plan.
- North Pile Influent Storage Ponds Detailed Design
  - This report presents the detailed design of the East ISP, West ISP and modification to the WMP and associated hydraulic structures. The design of the ditches and channels to convey water from the North Pile to the storage facilities is provided in Appendix L2.

- North Pile Surface Water Management for Closure – Detailed Design
  - This report provides the detailed design of the North Pile closure surface water management structures with a summary of the overall surface water management concept and the detailed design of the North Pile perimeter water collection structures.

3. WATER AND WASTEWATER MANAGEMENT

3.1 Water Balance

The site water balance provides a basis for design of the water management plan. The water balance describes the quantity of inflow [gains] to the site, the quantity of water conveyed internally within the mine site, and the quantity of outflow [losses] from the site. The water balance was updated in support of an earlier version of this plan, to reflect the flooding of the Snap Lake Mine underground and to predict water quality during and after the closure of Snap Lake.

The North Pile foundation and outer embankments are aggrading permafrost at a quicker rate than predicted during the Environmental Assessment. This increased aggradation of permafrost will lead to reduced volumes and improved quality of seepage water in the coming years. As part of the FCRP De Beers remodeled water quality from the North Pile under a conservative case (Golder 2021a, b). Future updates of the water balance will be communicated to the MVLWB as part of the annual reports.

Water quantity and quality predictions (requirement of MV2019L2-0004, Schedule 4, Item 1,a,vi) for discharges to Snap Lake are provided in Appendix A as Table A-1 and Table A-2 (water quantity) and Table A-3 and Table A-4 (water quality). Corresponding Schematics showing the flow of water through the various management facilities are provided in Figure 3-1 (Closure) and Figure 3-2 (Post-Closure). Figure 3-1 (Closure) illustrates the water balance at site according to the primary pathway planned. The Site is entering into the Post-Closure phase, reflected in the Figure 3-2. Water flows as described in Figure 3-2, however the final discharge to Snap Lake will remain controlled until approval of the breaching of the dykes.

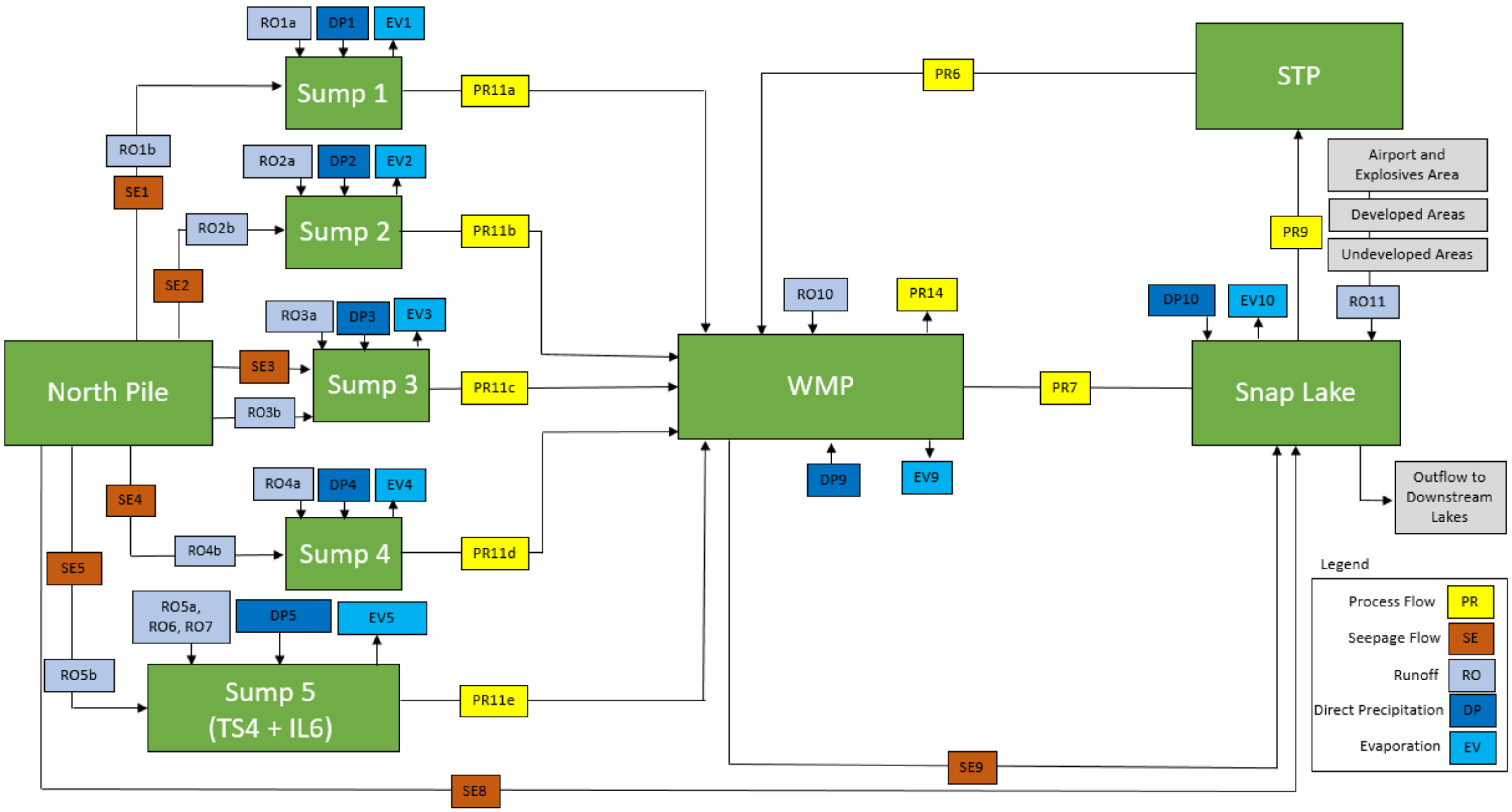
The water balance was not updated to support this Version of the Water Management Plan as the post-closure water balance previously provided, remains valid. An update to the water balance will be generated to support any future changes to the water licence if required.

3.1.1 Water Inflows

Water inflows considered in the mine water balance include:

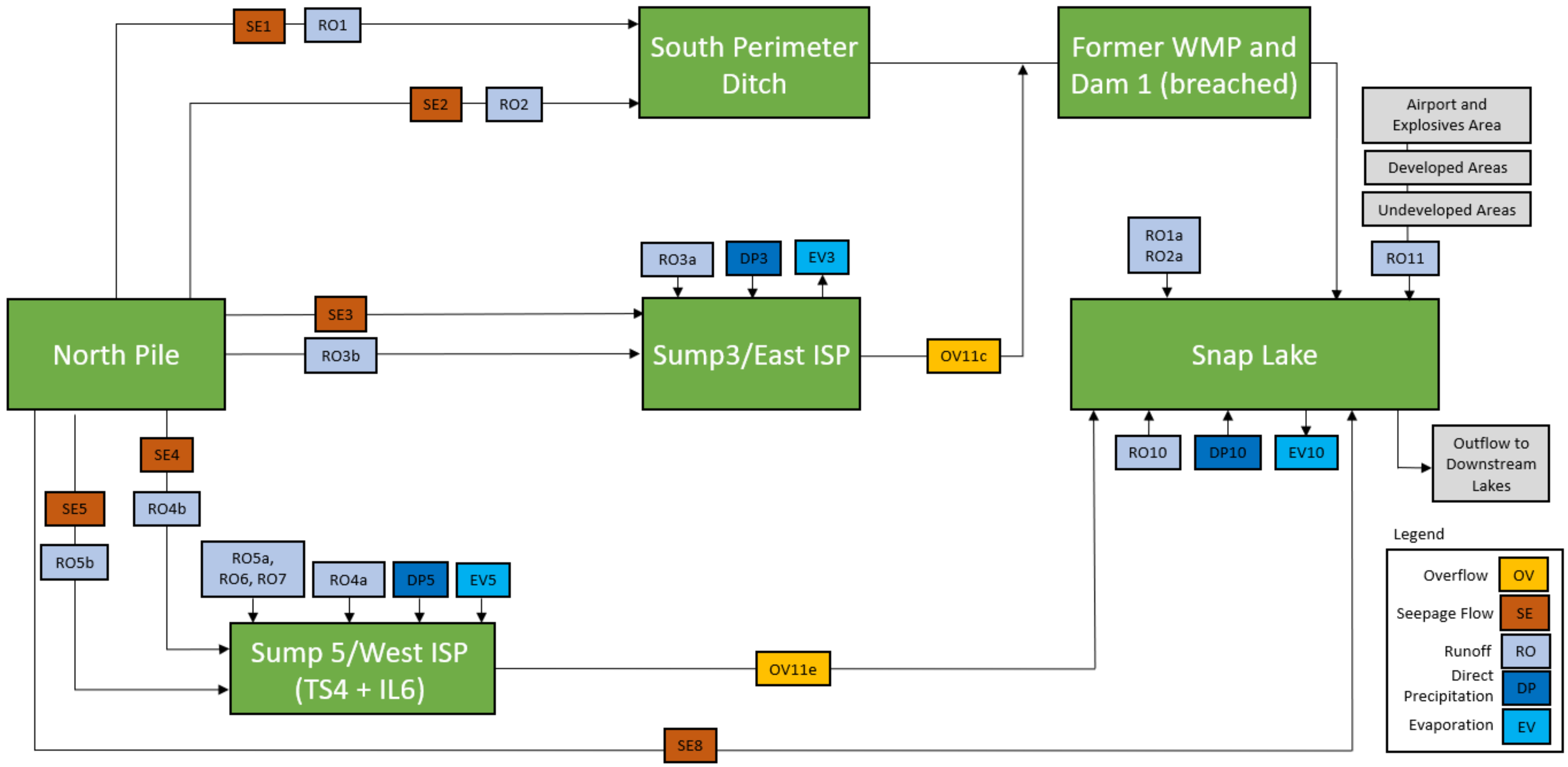
- Raw water withdrawn from Snap Lake for various uses (e.g., domestic use, fire suppression,);
- Direct precipitation to mine site; and
- Runoff to mine site from adjacent catchments.

Figure 3-1 Water Balance Schematic Diagram – Closure



Note: Treatment if required to meet effluent quality criteria for discharge to Snap Lake.

Figure 3-2 Water Balance Schematic Diagram –Post-Closure



Note: Sump 3 becomes the East Influent Storage Pond. Sump 5 becomes the west influent storage pond

3.1.2 Water Outflows

Water outflows considered in the mine water balance include:

- Water discharged to Snap Lake;
- Water used for dust suppression (closure);
- Losses to groundwater seepage from water management facilities and the North Pile; and
- Losses to evaporation from water management structures.

Seepage and runoff water from the North Pile will continue to be collected in the influent storage ponds in post-closure. This water will be tested and then actively discharged to Snap Lake until approval is received for the final EQC re-evaluation report as per MV2019L2-0004 Part F Condition 24. Use of water for dust suppression which occurred during operations and closure, is not expected in post-closure. In closure, treated domestic water was discharged to the water management pond and then to Snap Lake. In post-closure domestic water from the post-closure monitoring camp, will be discharged as greywater to an approved on-land sump.

3.2 Water Management System Components

Water management facilities at the Mine during Post-Closure include camp (domestic) water facilities and mine (surface) water structures.

Camp (domestic) water systems includes:

- Raw water intake;
- Grey water sump.

Mine (surface) water systems includes:

- North Pile Perimeter ditches;
- Influent Storage Ponds (ISP).

The sewage treatment plant, the potable water treatment plant, the raw water intake, the water management pond and the diffuser were all decommissioned during active closure.

3.2.1 Site (Domestic) Water System

3.2.1.1 Raw Water Intake

The raw water intake was decommissioned as part of Active Closure.

In Post-Closure, raw water will be withdrawn from the northwest arm of Snap Lake via a submerged intake pump. The pump and screen meets the Department of Fisheries and Oceans (DFO) 1995 criteria for domestic potable water use. As per the DFO policy intake screens are cleaned every two years.

Fresh water in post-closure will be used for:

- potable water supply.

The maximum amount of freshwater to be drawn from Snap Lake is not to exceed 188,000 m^3/year. De Beers expects to withdraw less than 50 m^3/day during periods of occupancy and no water during periods of zero occupancy. Consumption rates used in the model provide peak domestic water use and will be reported annually in the water licence annual report.

The use of water for fire suppression is not anticipated in post-closure. Fire extinguishers will be maintained and will serve as the first line of defense. Only a small volume of water will be stored on site to support the seasonal camp.

Dust suppression is not anticipated to occur in the post-closure environment. If it becomes necessary, then De Beers would preferentially use recycled water from one of the influent storage ponds. In the event of inadequate supply, raw water would be used for dust suppression. Freshwater will not be used to dilute effluent prior to discharge.

3.2.1.2 Potable Water Treatment Plant

The potable water treatment plant will be decommissioned as part of the final stage of active closure in Q1 of 2025. The post-closure camp will utilize commercially available water sanitation tablets and simple filtration systems to ensure water is safe to drink. Water will continue to be drawn from the same water intake location as authorized under the water licence, using a submerged pump and hose. A portable water tank will be filled and used as needed.

3.2.1.3 Sewage Treatment Plant

The sewage treatment plant was decommissioned as part of the final stage of active closure in Q1 of 2025. The post-closure camp will include incinolet toilets for human waste. Incinolet toilets use electricity to incinerate waste at each use, leaving only a small amount of ash for disposal as non-hazardous waste with other domestic garbage. The post-closure camp will also include an outhouse as a back-up.

3.2.2 Mine (Surface) Water System

Activities conducted under the North Pile Management Plan relevant to water management include monitoring of physical and chemical stability of the existing water control structures and drainage pathways (De Beers 2018).

During early Closure, North Pile drainage was collected in the perimeter sumps and pumped to the WMP for storage prior to treatment (if required) and discharged. The former WMP was used to collect surface runoff and drainage from the North Pile and provided influent to the RO WTP (if treatment is required) or for discharge directly to Snap Lake if water quality met discharge criteria. Two influent storage ponds (ISPs), sized to store the volume of water from one open water season to equalize seasonal flows and concentrations from seepage and runoff, are now constructed and used for storage of North Pile runoff and seepage. The East ISP and West ISP are located at the existing water storage facilities used through operations – Sump 3 (East ISP) and Sump 5 (West ISP). The former WMP was excavated and re-graded to develop the required gradient from the East ISP towards Snap Lake, and covered in Appendix L.1 of the FCRP (De Beers 2020a]).

During active Closure, the ISPs were constructed to collect water before the water was pumped to Snap Lake. Upon approval from the MVWLB, the water control structures (i.e. dams) will be removed to allow water to flow passively to Snap Lake through spillway channels from each of the ISPs.

The layout and closure modifications are provided in the FCRP design documentation with summary flow patterns at post-closure provided in Figure 3-3 and Figure 3-4 within this Water Management Plan.

A key design objective for closure of the North Pile was to convert the active system to a passive system whereby water is safely directed to the receiving environment in a manner that achieves closure objectives and criteria.

The active water collection system that managed water during operations were converted to a passive collection system during closure. The sumps that surrounded the North Pile were converted to gravity fed ditches, reporting to the influent storage ponds. The water management pond was converted to the East Influent Storage Pond outlet channel. The water treatment plant was decommissioned, and the diffuser was removed. De Beers continues to actively discharge water from the ISPs to Snap Lake and will continue to do so until the MVLWB approves the final EQC Re-Evaluation report for passive discharge as per MV2019L2-0004, Part F, Condition 24.

The water management configuration during the period of transition from closure to post-closure is provided in Figure 3-5. This figure illustrates the closure configuration, with WMP Dam 1 and access road near SP5 in place. Prior to approval to breaching the control structures, water in the ISPs and outlet channels will be tested and if it meets EQC, will be discharged to Snap Lake. Once approval is given by the MVLWB and as per MV2019L2-0004 Part F, Item 24, and following completion of the requirements of MV2019L2-0004 Part F, Items 21-23, Dam 1 and the access road near SP5 will be breached and the east and west ISPS respectively will be connected to the outlet channels to allow for passive flow to Snap Lake.

3.2.2.1 North Pile Perimeter Ditches

The design objective of the North Pile Perimeter Water Control Structures (PWCS) is to collect surface water runoff and internal seepage from the North Pile. These structures were modified from their operational design, which required active pumping from sump to sump, to a closure design comprised of swales and ditches that will collect and direct water passively to the influent storage ponds.

Two design events were considered for the detailed design of the North Pile Closure Water Management Structures:

- Environmental Design Flood (EDF): 200-year 24-hour precipitation or snowmelt; and
- Inflow Design Flood (IDF): 24-hour probable maximum precipitation or snowmelt.

The water management design developed to meet the above criteria includes the following infrastructure:

- Swales to collect runoff from the closure cover of the North Pile;
- Outlet channels constructed down the east and west embankments of the North Pile to convey runoff from the top surface of the North Pile, considering the detailed design of the closure cover, and direct it into the passive water control structure;

- Perimeter channels constructed along the north and south of the North Pile to collect seepage and runoff from the top of the North Pile and direct it into the passive water control structure; and
- A channel through the West Cell Divider Dyke to prevent ponding of water behind the dyke and direct drainage to the passive water control structure on the west side of the North Pile.

The water conveyance structures are shown as the engineered drawing (Figure 3-3) to illustrate the passive surface flows (Figure 3-4). The North Perimeter ditch collects water that seeped from the North Pile to the north. It conveys water westward to the West Influent Storage Pond. The surface of the North pile drains via the Cell 5 outlet channel to the East Influent Storage Pond. The South Perimeter ditch conveys water towards the East Influent Storage Pond outlet channel and the West Ditch collects water on the western side of the North Pile, conveying it northwards to the West Influent Storage Pond as shown on (Figure 3-5). Runoff and seepage from the North Pile are controlled to prevent water from reporting to the downstream environment until it achieves EQCs.

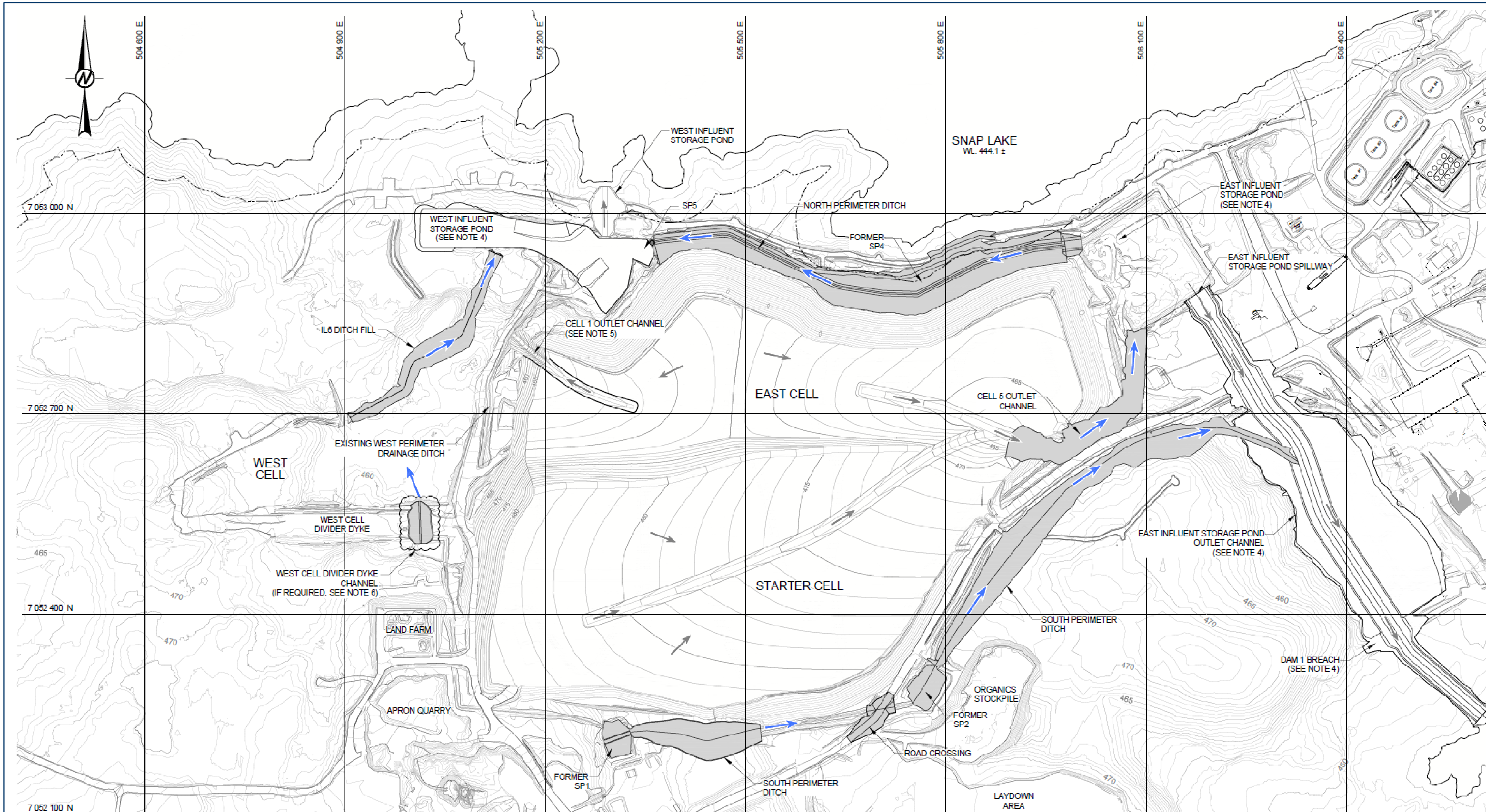
3.2.2.2 Influent Storage Ponds

Two influent storage ponds (ISP) were constructed to store water collected from the ditches of the North Pile. The East influent storage pond replaced the former Sump 3 and the West Influent storage pond replaced the former Sump 5. The influent storage ponds are designed to store the volume of water from one open water season (1:200 flood event) to equalize seasonal flows and concentrations prior to flow through the ISP discharge spillways.

The East influent storage pond discharges water via a spillway to the Main Basin of Snap Lake. The West influent storage pond direct water via a spillway to the northwest arm of Snap Lake (Golder 2020a,b). Water control structures (i.e. dams) will be present at the downstream end of the East and West ISPs until the MVWLB approves the final EQC Re-evaluation report for final discharge. Water collected within the ponds is tested and confirmed to meet EQC prior to discharge to Snap Lake. Water is tested prior to discharge at SNP 02-17c (East) and SNP 02-17d (West) respectively as illustrated on Figure 4-1.

The water control structures will be breached permanently upon MVLWB approval of the final EQC re-evaluation report for passive discharge (MV2019L2-0004, Part F, Item 24).

Figure 3-3 Water Conveyance at Snap Lake Mine Post Closure



Golder (2020b)

Figure 3-4 Passive Water Flow at Snap Lake Mine Post-Closure

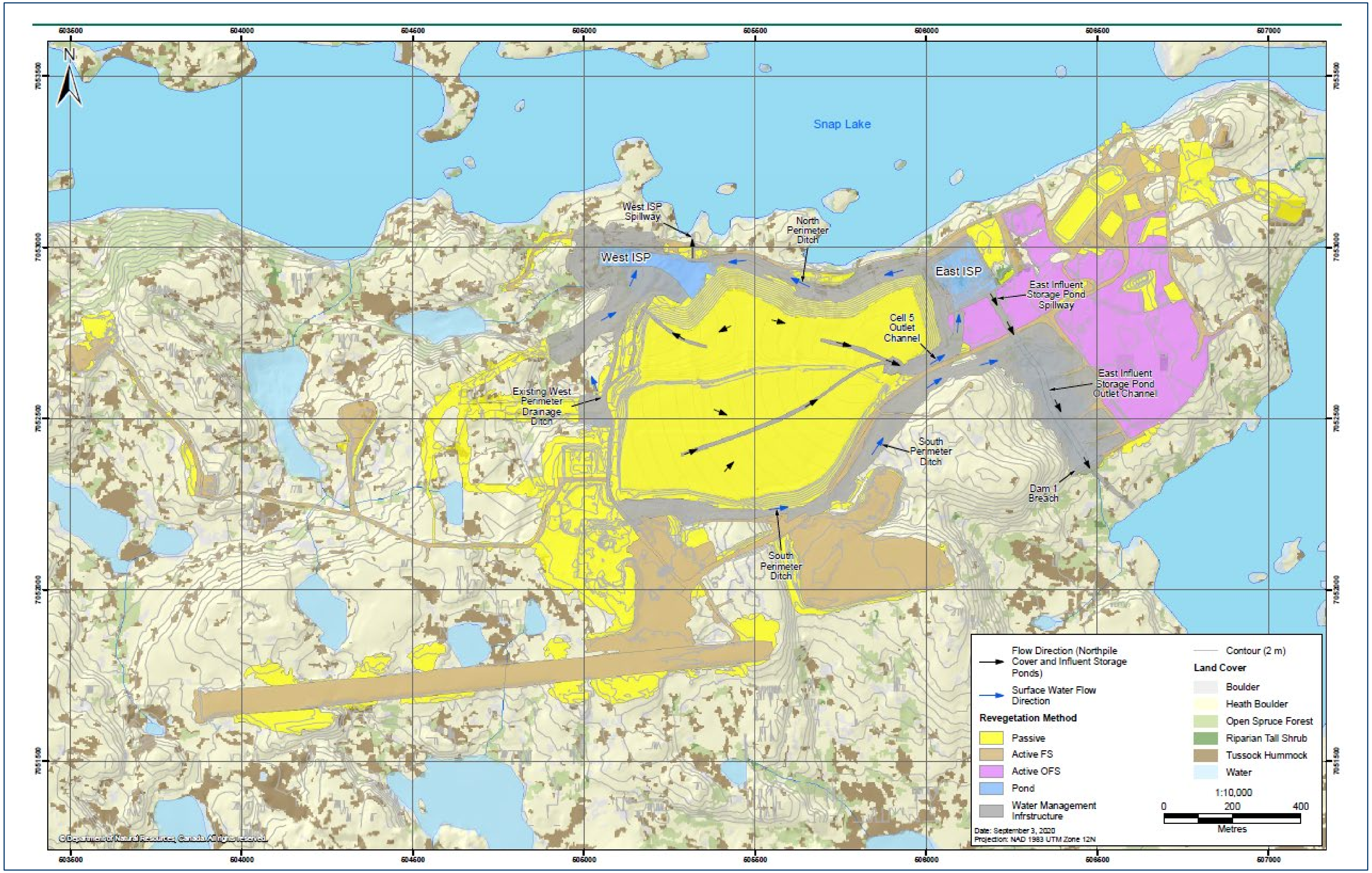
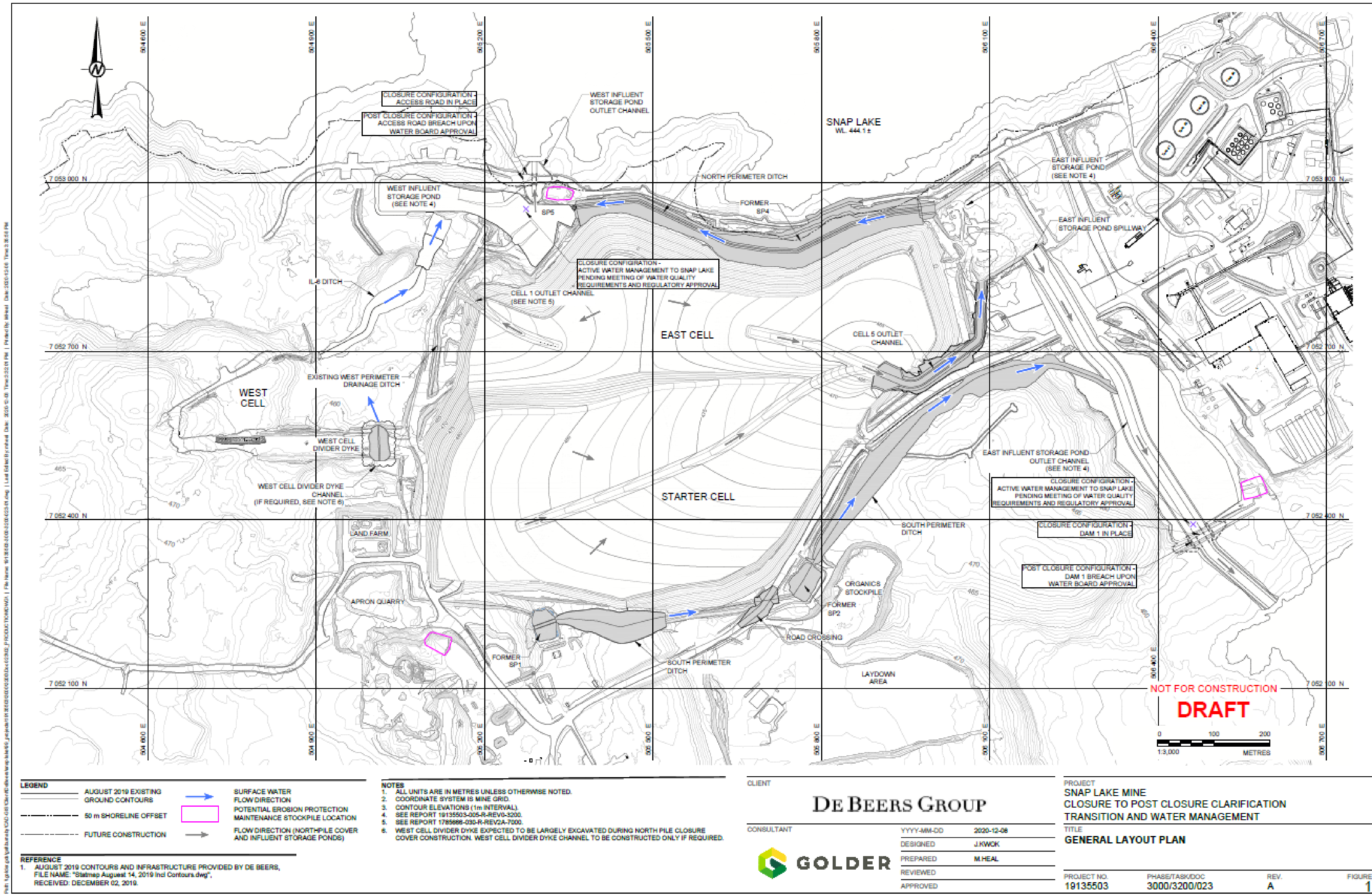


Figure 3-5 Closure to Post-Closure Transition and Water Management



3.2.2.3 East Influent Storage Pond Outlet Channel

The Water Management Pond was reconstructed into the outlet channel for the East Influent Storage Pond and is addressed within Section 3.2.2.2

A closure cover was constructed over the WMP (Golder 2020b [Appendix L.1 of the FCRP (De Beers 2020a]) including:

- Excavation and removal of deposited sediment in and around the WMP;
- Re-grading within the existing WMP area; and

Placement of a closure cover over the re-graded WMP area. Re-grading of the WMP area was completed to achieve the required longitudinal gradient east of the East ISP outlet channel. Once water quality in the East ISP and the outlet channel meets discharge criteria and all of the related requirements of the water licence are met, and the final EQC re-evaluation report is approved, Dam 1 will be breached and water will flow passively from the East ISP, through the channel in the WMP, and to the main basin of Snap Lake.

3.2.2.4 Water Treatment Plant

The water treatment plant was decommissioned as part of active closure.

3.2.2.5 Underground Water Return System

The underground was sealed as part of active closure. There is no longer an underground water return system in place to facilitate the return of water to, or extract water from the underground workings of the mine.

3.2.2.6 Diffusers

The high volume discharge diffusers were removed as part of active closure.

3.3 Freshet Management Processes

Surface water at the Mine is frozen for much of the year. The annual cycle of water management begins with spring melt (freshet) when the accumulated snow and ice from the winter melts. This melt water is collected in the water control structures described previously. Because much of the flow occurs during freshet, this section provides additional detail on the specific processes for water management during this important period. The purpose of freshet management is to provide a clear description of the steps that must be followed by the site water management personnel, daily as well as during an emergency events.

3.3.1 Managing Freshet at the North Pile

As described in Section 3.2.2.1, water captured by the North Pile PWCS drains passively to the influent storage ponds. There is generally no need to actively manage water during freshet as the system is designed to capture annual inflows within the ponds. However, there is a known point of seepage (446.6 masl) at the East Influent Storage Pond. De Beers will therefore manage water levels within the EISP at a level below the point of seepage to ensure water is discharged to the main basin, consistent with the water licence.

Furthermore, the water level in the influent storage ponds must be lowered each year to prepare for the following year, until passive flow to Snap Lake is authorized, and therefore there will be active management of the discharge from the ponds to Snap Lake during the snow free season.

3.3.2 Freshet Flocculation Tank – Auxiliary Treatment

The Freshet flocculation tank was decommissioned as part of closure.

3.3.3 Ice Management

Ice is no longer actively managed. As the snow and ice melt, water will flow passively to the influent storage ponds, where it will be stored or pumped out to Snap Lake as per the water licence.

3.3.4 IL6 Ditch

The IL6 ditch was modified as part of active closure and now flows into the west influent storage pond as shown in Figure 3-3 and 3-4.

3.4 Summary of Water Models

Water quantity and quality models were updated to support Closure (Golder 2021a,b) based on Version 5, Version 5.1 and Version 5.2 of the Water Management Plan. Summaries of the site water quantity and water quality models are as follows:

- The predicted water balance for Closure (Golder 2021a) was primarily based on the water balance models described in Golder (2019a), with the following modifications:
  - The calibration period was updated to account for monitoring data in 2016, 2017, 2018, and 2019.
  - The timing of closure activities was updated.
  - The structure of the model was updated to account for the South Perimeter Ditch.
- Water quantity predictions
  - Daily water balance predictions are provided in Appendix A, Tables A-1 and A-2.
  - Discharge will occur seasonally each year.
- The site water quality model was based on the model described in Golder (2019b), with the following modifications:
  - The calibration period was updated to account for monitoring data in 2016, 2017, 2018, and 2019.
  - The timing of closure activities was updated.
  - The structure of the model was updated to account for the South Perimeter Ditch and residual masses of nitrate and total ammonia were added to the model to account for blasting activities.
- Water quality predictions

- Predictions of water quality on the Mine site for the open-water seasons are provided in Appendix A, Table A-3 and Table A-4.
- These tables include median and 95th percent parameter concentrations for each of the sources that may discharge to Snap Lake.

4. MONITORING

The Water Management Plan incorporates all necessary measures and procedures to comply with the requirements of the Water License. De Beers monitors water quality and quantity within the water management system for the following purposes:

- to identify any changes to water quality and quantity that may require management response; and
- to identify the potential for Mine-related effects on water quality in the receiving environment.

Water quality and quantity monitoring specific to this Plan is the Surveillance Network Program (SNP) which is summarized in Section 4.1 and is linked to the Water Licence MV2019L2-0004 (Annex A). Other monitoring programs outside of this Plan, but related to water and environmental monitoring, are described in Section 4.2.

4.1 Surveillance Network Program

The Surveillance Network Program (SNP) has been designed to monitor inflows and outflows at the site during the Closure and Post-Closure phases in the life of the mine. A summary table of the SNP stations for Closure and Post-Closure is provided below (Table 4-1). Further details of the SNP stations, plus required sampling frequencies are provided in Appendix B of this plan (which is a copy of Annex A of water licence MV2019L2-0004).

Table 4-1 SNP stations in Closure and Post-Closure

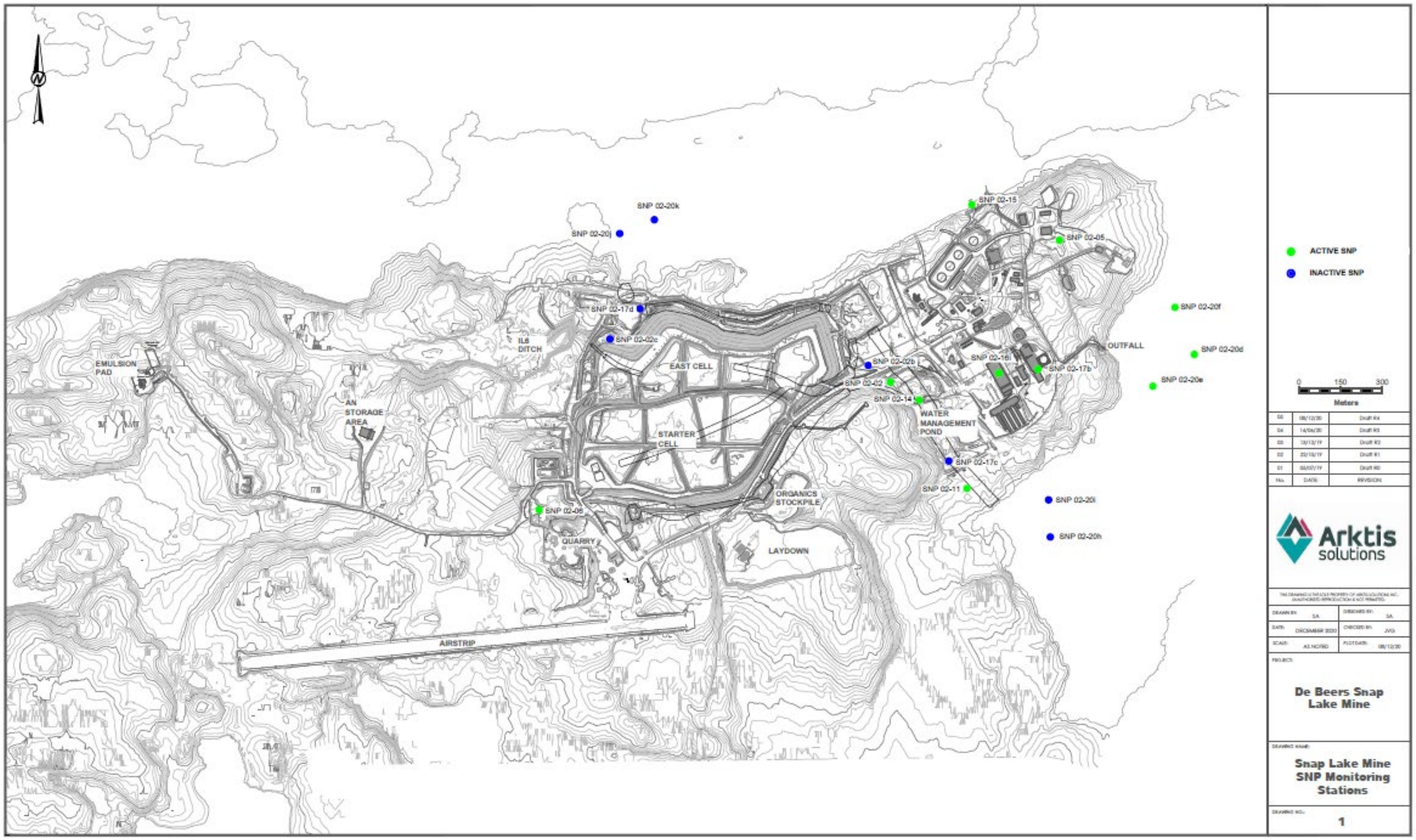
SNP station #	Description and Purpose	Status
02-02	North Pile drainage collection ditch north of Water Management Pond	Discontinued
02-02b	East Influent Storage Pond	Active
02-02c	West Influent Storage Pond	Active
02-05	Uncontrolled surface runoff at the Bulk Sample Mine Rock Pad	Active during Active Closure. Inactive during Post-Closure[1].
02-06	Uncontrolled surface runoff at Quarry Site on south side of North Pile	Active during Active Closure. Inactive during Post-Closure[1].

[1] This station will continue to be monitored as per Active Closure requirements until it is discontinued through MVLWB decision

SNP station #	Description and Purpose	Status
02-11	Seepage monitoring well down gradient from Water Management Pond Dam 1, near Snap Lake shoreline	Discontinued
02-14	Water Management Pond (stilling well near the pumphouse)	Discontinued
02-15	Water Intake from Snap Lake	Active during Active Closure. Inactive during Post-Closure[1].
02-16j	Sewage effluent from Sewage Treatment Plant, prior to mixing with Water Treatment Plant effluent	Active during Active Closure. Inactive during Post-Closure[2].
02-17b	Final Combined Water Treatment Plant and Sewage Treatment Plant effluent that is discharged via a diffuser into Snap Lake.	Discontinued
02-17c	Discharge from East Influent Storage Pond to Snap Lake main basin	Active
02-17d	Discharge from West Influent Storage Pond to Northwest Arm of Snap Lake	Active
02-20d, 02-2-e, 02-20f	In Snap Lake, the three stations located in a radius of 120 degrees at 200 meters from the diffuser, on the edge of the mixing zone around the diffuser Active during discharge from the diffuser	Discontinued
SNP 02-20h,i	In Snap Lake main basin, two stations located on the edge of the mixing zone 200 m from the East Influent Storage Pond Discharge location	Active
SNP 02-20j,k	In Northwest arm of Snap Lake, two stations located on the edge of the mixing zone 200 m from the West Influent Storage Pond Discharge location	Active

[2] This station is no longer be monitored as the sewage treatment plant has been decommissioned. It will be included in the next request for discontinuance that is made to the MVLWB.

Figure 4-1 Surveillance Network Stations



4.2 Other Related Monitoring

4.2.1 AEMP

Downstream water quality is monitored via the Aquatic Effects Monitoring Program (AEMP). The AEMP is described fully within the Aquatic Effects Design Plan (De Beers 2023), and therefore will not be discussed in detail herein. Predicted effluent quality will be compared to measured effluent quality annually in the AEMP report (MV2019L2-0004, Schedule 4, Item d,i).

4.2.2 Water Balance and Water Quality Models

The water balance and water quality models (i.e., site model, Snap Lake model, and downstream lakes model) for the Snap Lake Mine were updated to reflect the changes described in Version 5 (and Version 5.1) of the Water Management Plan and calibrated with data up to 2019. The next update of the water balance and water quality models, which will include calibration against available data up to 1 year prior to the submission, is planned to meet Part F Condition 24 in Water Licence MV2019L2-0004 (i.e., before proceeding to a passive discharge system). Incorporation of data from within the year prior to submission is not possible as it takes time to conduct the summation and analysis.

4.2.3 Ice Monitoring

During closure, ice monitoring in ISP/sump was conducted with visual inspections and when off site, monitoring was completed via remote surveillance cameras (currently being used during zero occupancy) and/or aerial surveillance. The ISPs will be pumped down to establish a minimum water/ice level prior to freeze up in the fall. Mitigation measure(s) during closure will depend on actual site conditions.

During post closure, ice monitoring is not required as ice formulation in ditches or the influent storage ponds is expected and does not pose an issue. Mitigation measures during post closure will depend on observations at that time but it is anticipated with water quality meeting EQC and experience gained during closure, minimal to no mitigation measures will be required during post closure. Surface ice build-up will eventually thaw and drain to the ISPs and then on to Snap Lake as intended.

5. RESPONSE FRAMEWORK

5.1 Adaptive Management

De Beers has taken an adaptive management approach for all aspects of site operations, including water management.

An effect is a change that follows an event or cause. An effect is not inherently negative or positive. A linkage must be established between a measured change and a cause (e.g., mining activity) before appropriate management actions can be determined. Should an effect be detected during monitoring activities, a corresponding action will occur. The type of action taken depends on the magnitude or severity of an effect relative to an assessment endpoint. This is termed the Action Level.

The goal of the Response Framework is to systematically respond to monitoring results such that the potential for significant adverse effects is identified and any necessary mitigation actions are undertaken. This is accomplished by implementing appropriate mitigation at predefined Action Levels, which are triggered before a significant adverse effect could occur. Action levels for the performance of the North Pile and associated facilities is addressed in the North Pile Management Plan. The action levels for water management are related to meeting AEMP benchmarks in Snap Lake (Table 5-1).

5.2 Action Levels

Action levels have been defined to facilitate clear and decisive decision points to correct issues early. For each action level, there are defined management responses.

- Action Levels related to geotechnical stability, thermal characteristics and water quantity levels in storage ponds are included within the response framework in the approved North Pile Management Plan (De Beers 2022).
- Action levels related to ice management in closure were included in the updated version of the North Pile Management Plan to be submitted as per MV2019L2-0004 Part F Item 4.
- Action levels for water quality have been developed and are included herein. Low action levels are set at 80% of the moderate action levels. The moderate action levels are set at concentrations whereby if the full volume of water anticipated for discharge on an annual basis was discharged at these levels, parameters would remain below AEMP benchmarks in Closure and Post-closure within Snap Lake (Tables 5-1 and 5-2). Moderate action level concentrations were calculated using Equation 1 for all parameters except nitrate and total phosphorus.

$$Action\ level\ concentration = DF\left(C_{Mixing\ Zone} - C_{Ambient}\right) + C_{Ambient} \quad \text{Eq. 1}$$

Where:

Action level concentration	= concentration of parameter “x” in the discharge or outflow from the Mine site to Snap Lake that is predicted to maintain concentrations in Snap Lake below AEMP benchmarks[3].
DF	= dilution factor. The predicted minimum dilution factor (i.e., 20) from near-field modelling at 150 metres from the discharge or outflow location to Snap Lake was obtained from Golder (2019c).
$C_{Mixing\ Zone}$	= the concentration of parameter “x” at the edge of the mixing zone in Snap Lake was set equal to the AEMP benchmark[4].

[3] Action level concentrations were calculated annually from 2021 to 2049 and the minimum concentrations were selected as the action level concentrations, except for total cobalt and total copper. For total cobalt and total copper, the minimum action level concentrations were either very close to or less than concentrations from monitoring data on the Mine site between 2017 and 2020. Therefore, total cobalt and total copper concentrations were calculated annually from 2021 to 2035 and the average concentrations were selected as the action level concentrations. Total cobalt and total copper are predicted to remain below benchmarks in Snap Lake (Golder 2021c).

[4] For AEMP benchmarks that are dependent on exposure and toxicity modifying factors (ETMFs; i.e., hardness concentrations, chloride concentrations, and water temperatures), the AEMP benchmark was calculated annually from 2021 to 2049 based on predicted ambient concentrations in Snap Lake (Golder 2021c). The range of predicted hardness concentrations in Closure that were used to calculate hardness-dependent Aquatics Effects Monitoring Program (AEMP) benchmarks were from: 128 to 153 mg/L as CaCO3 (main basin) and

$C_{Ambient}$ = the predicted annual, median, open-water, whole-lake average concentrations in the main basin and northwest arm of Snap Lake (Golder 2021c).

For nitrate, the low action level concentration was set equal to 80% of the maximum average concentration effluent quality criteria from Water Licence MV2019L2-0004 (i.e., 80% of 60 mg N/L). For total phosphorus, action level concentrations were calculated using Equation 2.

$$Action\ level\ concentration_{TP} = \frac{Q_{Snap\ Lake\ Outflow} \times C_{AEMP\ Benchmark}}{Q_{Mine\ site}} + C_{AEMP\ Benchmark} - \frac{Q_{Snap\ Lake\ Outflow} \times C_{Ambient}}{Q_{Mine\ site}} \quad \text{Eq. 2}$$

Where:

Action level $concentration_{TP}$ = concentration of total phosphorus in the discharge or outflow from the Mine site to Snap Lake that is predicted to maintain concentrations in Snap Lake below the AEMP benchmark.

$C_{AEMP\ Benchmark}$ = AEMP benchmark concentration for total phosphorus of 0.011 mg P/L.

$Q_{Snap\ Lake\ Outflow}$ = predicted annual outflow from Snap Lake without discharge from the Mine site for the average precipitation year.

$Q_{Mine\ site}$ = predicted annual outflow concentration from the Mine site to Snap Lake for the average precipitation year.

Note that the monitoring framework does not prevent an action level from being triggered. The purpose of the monitoring is to understand if water quality within the on-site water storage areas (measured at SNP stations SNP 02-17c and SNP 02-17d) may be trending away from predictions, may be approaching a compliance limit, may be at a level worth monitoring more closely, or may warrant action mitigation.

The triggering of an action level is not necessarily indicative of a trend given that a single exceedance of an action level would be considered a trigger. Triggering of an action level also does not indicate that there is any risk to the environment or cause for concern. Moderate action levels were set at concentrations whereby if discharge continued at those levels, at the full volume of water anticipated to be discharged every year, the AEMP benchmarks in Snap Lake would be maintained. A single exceedance, or even a series of exceedances of the moderate action levels are unlikely to result in an exceedance of an AEMP benchmark in any given year. The SNP and AEMP program will continue to monitor for all parameters at the edge of the mixing zone in Snap Lake to confirm AEMP benchmarks are achieved.

There are several management responses which could be implemented following the triggering of a low action level for water quality (Table 5-1). Responses will be implemented as appropriate in each instance, beginning with confirmation of the result and verification of the potential causes of the elevated concentration. Continued or additional monitoring will then be considered, and if warranted an application

82 to 96 mg/L as CaCO3 (northwest arm). The range of predicted hardness concentrations in Post-closure that were used to calculate hardness-dependent AEMP benchmarks were from: 23 to 116 mg/L as CaCO3 (main basin) and 19 to 77 mg/L as CaCO3 (northwest arm). The predicted ambient water temperature in Snap Lake was used to calculate the action level concentrations for total ammonia because the AEMP benchmark for total ammonia is temperature-dependent. A pH of 8 was used to calculate guidelines that are pH-dependent because recent pH values have typically been 8 or less in Snap Lake and are not expected to increase.

for revision of the action levels may be made to the MVLWB through an update to the WMP. The responses are the same for the moderate action levels, with the addition of consideration of mitigation during the closure phase for triggering of the moderate action levels.

During Post-Closure, the options for adaptive management are somewhat reduced. There is longer an active treatment option as the water treatment plant has been removed from site. Although an active treatment option no longer exists, the risk of an exceedance, is also reduced. Water quality at site will improve over time and the performance of the PWCS and ISPs will also improve over time. The risk of an exceedance large enough to cause an environmental effect during the Post-Closure period is considered to be negligible. There are nonetheless several management responses that could be exercised during Post-Closure, depending on the issue (Table 5-1). As in any adaptive management system, monitoring is the key to success. De Beers will continue to monitor water inputs and outputs as per the water licence requirements and respond appropriately. The decision tree that will apply during post closure, prior to the breaching of the dykes and allowance of passive flow to Snap Lake is provided as Figure 5-1.

Table 5-1 Water Management Action Levels for Post-Closure before and after breaching of the dykes

Action Level	Monitoring Station(s)	Definition	Period	Management Reponses
Low	SNP 02-17c (East Influent Storage Pond Discharge) SNP 02-17d (West Influent Storage Pond Discharge)	Concentration of any parameter that has an AEMP benchmark for Snap Lake, is greater than the Low Action Level Concentrations listed in Table 5-2 during the ice free season (a)	Prior to the breaching of the ISPs	• Confirm result with subsequent tests • Verify the potential causes of the issue • Consider increased monitoring (e.g., collect additional samples) • Consider revision to the action level concentrations in Table 5-2 through WMP update submitted to the MVLWB • Consider potential follow up actions for sustained action level triggers • Inform MVLWB in SNP report
			After the breaching of the ISPs	• Confirm result with subsequent tests • Verify the potential causes of the issue • Consider increased monitoring (e.g., collect additional samples) • Consider revision to the action level concentrations in Table 5-2 through WMP update submitted to the MVLWB • Inform MVLWB in SNP report

Action Level	Monitoring Station(s)	Definition	Period	Management Reponses
Moderate		Concentrations of any parameter that has an AEMP benchmark in Snap Lake are greater than Moderate Action Level Concentrations listed in Table 5-2 during the ice free season (a)	Before the breaching of the ISPs	• Confirm result with subsequent tests • Verify the potential causes of the issue • Consider increased monitoring (e.g., collect additional samples) • Consider revision to the action level concentrations in Table 5-2 through WMP update submitted to the MVLWB • Consider implementing mitigation measures (b) • Inform MVLWB in SNP report
			After the breaching of the ISPs	• Confirm result with subsequent tests • Verify the potential causes of the issue • Consider increased monitoring (e.g., collect additional samples) • Consider revision to the action level concentrations in Table 5-2 through WMP update submitted to the MVLWB • Inform MVLWB in SNP report

a) The management responses would be considered only when action levels are triggered during a period when discharge is anticipated (i.e., ice free season).

b) Mitigation measures to be considered include holding the water until such time as concentrations improve; transferring water from one storage area to another; and, treating the water if treatment infrastructure is available.

Table 5-2 Water Management Low Action Level and Moderate Action Level Concentrations

Parameter (a)	Monitoring Data (b)	Concentration to Meet AEMP Benchmark in Snap Lake (c)	Action Level Concentrations	
			Low (d)	Moderate (e)
Conventional				
Total dissolved solids, Calculated (mg/L)	1,938	5,430	2,400	3,000
Total suspended solids (mg/L)	11	N/A	12	15
Faecal coliforms (CFU/100 mL)	0.9	N/A	8	10
pH	7.7	N/A	<6.5, >8.5	<6.0, >9.0
Total Petroleum Hydrocarbons (mg/L)	<0.10	N/A	>MDL	4
Major Ions				
Chloride (mg/L)	248	640	512	640
Fluoride (mg/L)	0.9	11	1.6	2.0
Sulphate (mg/L)	704	2,400	800	1,000

Parameter [a]	Monitoring Data [b]	Concentration to Meet AEMP Benchmark in Snap Lake [c]	Action Level Concentrations	
			Low [d]	Moderate [e]
Nutrients				
Nitrate, as N (mg/L)	94	60	48	60
Nitrite, as N (mg/L)	0.4	1.2	0.95	1.2
Total ammonia, as N (mg/L)	1.0	12	9.7	12
Total phosphorus, as P (mg/L)	0.2	0.25	0.2	0.25
Total Metals and Metalloids				
Aluminum (mg/L)	1.3	1.7	1.3	1.7
Antimony (mg/L)	0.0006	0.12	0.095	0.12
Arsenic (mg/L)	0.001	0.1	0.020	0.025
Barium (mg/L)	0.07	20	16	20
Boron (mg/L)	1.2	29	4	5
Cadmium (mg/L)	0.00009	0.001	0.0008	0.001
Chromium (mg/L)	0.02	0.09	0.04	0.05
Cobalt (mg/L)	0.006	0.01	0.008	0.01
Copper (mg/L)	0.02	0.035	0.028	0.035
Iron (mg/L)	2.0	5.0	4.0	5.0
Lead (mg/L)	0.0010	0.02	0.016	0.02
Manganese (mg/L)	0.4	2.0	1.6	2.0
Mercury (mg/L)	0.00001	0.0003	0.00024	0.0003
Molybdenum (mg/L)	0.05	1.4	0.4	0.5
Nickel (mg/L)	0.1	0.5	0.4	0.5
Selenium (mg/L)	0.0008	0.02	0.016	0.02
Silver (mg/L)	0.00005	0.005	0.004	0.005
Strontium (mg/L)	3.0	37	30	37
Thallium (mg/L)	0.00005	0.02	0.016	0.02
Uranium (mg/L)	0.01	0.033	0.026	0.033
Vanadium (mg/L)	0.004	2.0	0.08	0.10
Zinc (mg/L)	0.03	0.04	0.032	0.04

mg/L = milligrams per litre; AEMP = Aquatics Effects Monitoring Program; MDL = Minimum Detection Limit; N = nitrogen; P = phosphorus.

a) Action level concentrations were calculated for all parameters that have AEMP benchmarks in Snap Lake, except for nitrate because nitrate has a maximum average concentration effluent quality criteria of 60 mg N/L in Water Licence MV2019L2-0004. A constant pH of 8 and a constant DOC concentration of 3.5 mg/L were used to calculate the dissolved zinc Aquatics Effects Monitoring Program (AEMP) benchmark. As the pH increases and the DOC concentration decreases, the dissolved zinc AEMP benchmark decreases.

b) Faecal coliforms represent the 95th percentile concentrations of parameters from monitoring data at SNP 02-17b between June and October from 2017 to 2020. All other values in column 2 represent the 95th percentile concentrations of parameters from monitoring data at Sumps 1 to 5, SNP 02-02, and SNP 02-05 between June and October from 2017 to 2020. The values in column 2 are expected to change as a result of construction and demolition activities during Closure.

c) The values in column 3 represent the concentrations that can be discharged to Snap Lake while meeting AEMP benchmarks at the edge of the mixing zone, except for chloride, fluoride, total phosphorus, and total uranium. The values for chloride and total uranium were reduced to the acute water quality guidelines for the protection of aquatic life from the Canadian Council of Ministers of the Environment (i.e., 640 mg/L and 0.033 mg/L) (CCME 1999). The value for fluoride was reduced to 11 mg/L because acute toxicity can occur to freshwater aquatic life at concentrations ranging from 11.5 mg/L to greater than 800 mg/L of fluoride (McPherson et al. 2014). The value for total phosphorus represents the concentration that can be discharged to Snap Lake while meeting the AEMP benchmark, which applies to whole-lake average concentrations.

d) The values in column 4 represent the proposed low action level concentrations, which are 80% of the concentrations that can be discharged to Snap Lake while meeting AEMP benchmarks from 2021 to 2050. Action levels presented have also considered livestock water quality guidelines (WQG) for the protection of agricultural water uses (CCME 1999) and low action level concentrations values are less than or equal to these WQG.

e) The values in column 5 represent the proposed moderate action level concentrations, which are 100% of the concentrations that can be discharged to Snap Lake while meeting AEMP benchmarks from 2021 to 2050. Action levels presented have also considered livestock water quality guidelines (WQG) for the protection of agricultural water uses (CCME 1999) and moderate action level concentrations are less than or equal to these WQG.

5.3 Contingency

The active closure period is now complete, therefore the contingency measures listed in previous versions of this Plan have been removed.

During the post-closure period, after the Water Treatment Plant and underground water return system have been removed, the following contingency options would be considered for addressing water that does not meet EQC:

- Continue to store water on site until it meets EQC;
- Identify the location of the poor quality water and segregate it, if possible, while continuing to discharge water that does meet EQC;
- Investigate options such as placing a cover if the source of poor water may be from runoff,
- Treat the water using a smaller, temporary, modular Water Treatment Plant;
- Apply for alternative contingency measures, such as active evaporation through a revision to this plan.

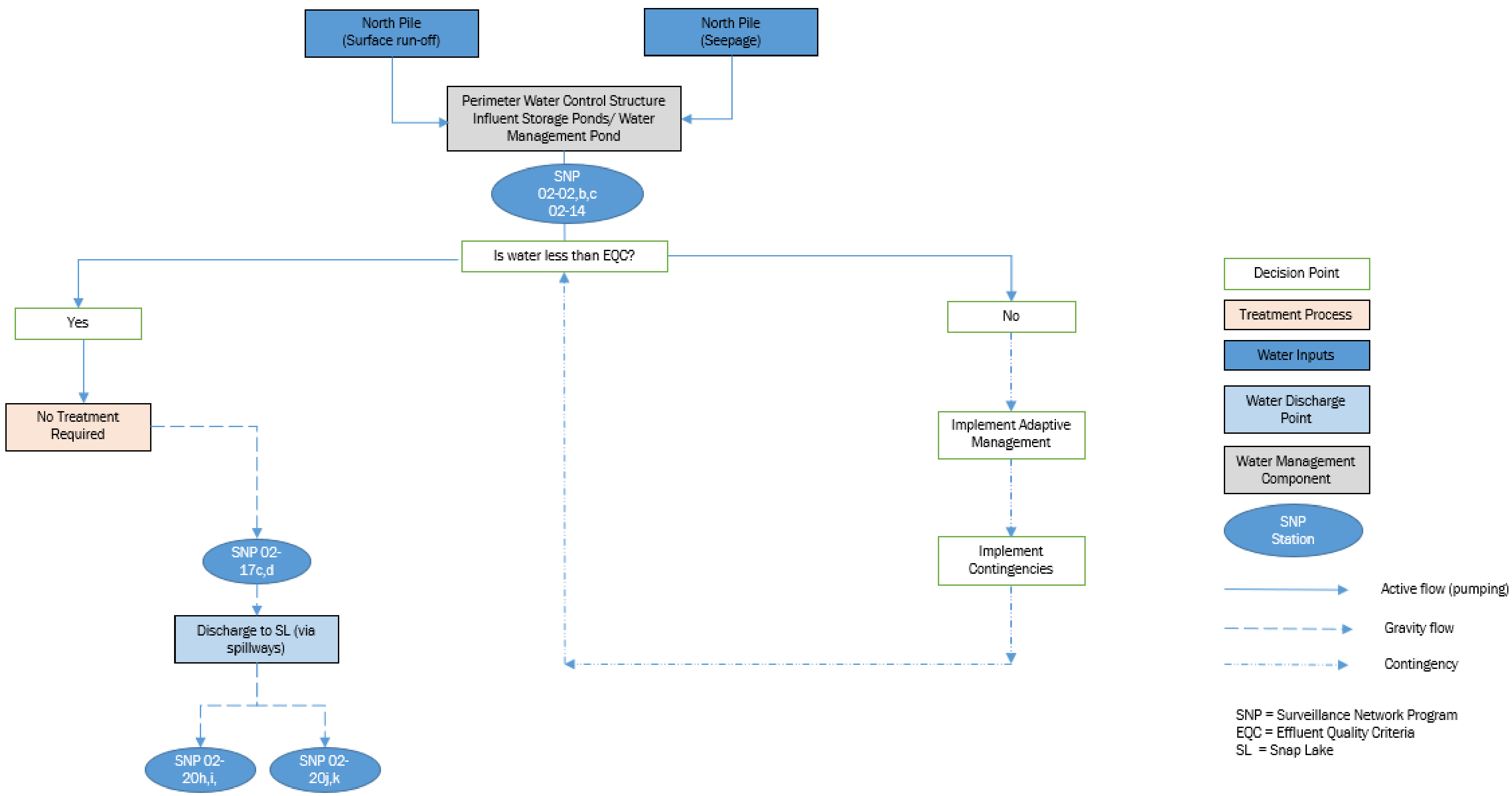
During the post-closure period, once there is no remaining infrastructure or water treatment options at the site and water is passively flowing to Snap Lake, the following contingency options would be considered to address water that does not meet EQC:

- Continue to monitor Snap Lake water quality as per approved monitoring plans;
- Re-instate controlled water storage by placing dams at outlet channels (i.e. control outflow to Snap Lake);
- Identify the location of the poor quality water and segregate it, if possible, while continuing to allow passive discharge of water that does meet EQC;
- Bring in an alternative treatment plant (such as a smaller modular unit) to site to treat water;
- Apply for alternative contingency measures, such as active evaporation through a revision to this plan;
- Apply for water licence amendment, or emergency discharge overland or to Snap Lake as appropriate.

In the event that icing results in capacity issues in the North Pile passive water control structure, contingency options for consideration would include:

- Conduct visual inspections of the facilities at least once per year and if necessary, add a second inspection, or modify the timing of the inspection, to occur during freshet;
- Manage water levels in the ISPs according to the response framework provided in the North Pile Management Plan and consider modifications to those water levels as needed;
- Monitor and evaluate the outlet of the ISPs and the spillway(s) to Snap Lake to determine if modifications are required;
- Implement actions as per the recommendation by the Engineer of Record;
- Apply for water licence amendment, or emergency discharge overland or to Snap Lake as appropriate.

Figure 5-1 Water Management Decision Tree during Post-closure prior to breaching of the dykes



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APPENDIX A WATER QUALITY AND QUANTITY PREDICTIONS

Table A-1: Predicted Open-Water Season Median and 95th Percentile Concentrations on the Mine Site for the Average Precipitation Scenario

Parameter	Units	Water Treatment Plant (2004 - 2017)		Reverse Osmosis Unit (2018 - 2020)		Water Management Pond (2020 - 2023)		East Influent Storage Pond (2024 - 2050)		West Influent Storage Pond (2024 - 2050)		South Perimeter Ditch (2024 - 2050)	
		Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile
Conventional Parameters													
Total dissolved solids, calculated	mg/L	655	946	28	94	646	1,210	607	711	588	705	410	910
Major Ions													
Calcium	mg/L	134	209	2.5	7.5	83	151	76	89	76	92	56	130
Chloride	mg/L	296	505	3.6	17	76	166	53	56	80	102	22	43
Fluoride	mg/L	0.39	0.63	0.018	0.06	0.32	0.48	0.23	0.24	0.2	0.23	0.47	0.55
Magnesium	mg/L	15	20	1.1	1.8	46	83	39	45	41	48	29	54
Potassium	mg/L	4.8	7.3	1.0	1.5	9.9	17	7.7	8.4	8.2	9.4	8.4	15
Sodium	mg/L	67	106	4.2	5.2	41	77	37	42	38	45	21	55
Sulphate	mg/L	54	75	5.6	27	213	413	131	143	174	214	168	361
Nutrients													
Nitrate, as N	mg/L	5.0	19	2.8	4.3	27	63	29	37	23	27	9.9	32
Nitrite, as N	mg/L	0.15	0.42	0.0083	0.021	0.18	0.25	0.099	0.13	0.16	0.17	0.071	0.14
Total ammonia, as N	mg/L	1.2	4.8	0.11	0.27	0.59	0.91	0.46	0.63	0.57	0.68	0.072	1.0
Total phosphorus, as P	mg/L	0.0067	0.033	0.15	0.3	0.15	0.86	0.036	0.14	0.061	0.064	0.05	0.12
Total Metals and Metalloids													
Aluminum	mg/L	0.024	0.091	0.033	0.13	0.34	0.34	0.87	0.88	0.88	0.88	0.25	0.51
Antimony	mg/L	0.0002	0.00034	0.00005	0.0001	0.00017	0.00021	0.00017	0.00017	0.00012	0.00013	0.00016	0.00032
Arsenic	mg/L	0.00011	0.0017	0.000033	0.00033	0.00032	0.00038	0.00047	0.00048	0.00044	0.00044	0.00034	0.0004
Barium	mg/L	0.045	0.096	0.00098	0.0043	0.036	0.051	0.036	0.038	0.036	0.038	0.033	0.049
Beryllium	mg/L	<0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	0.00036	0.00036	0.00034	0.00034	0.00005	0.000085
Bismuth	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00017	0.00017	0.00018	0.00018	0.000025	0.000025
Boron	mg/L	0.12	0.19	0.22	0.24	0.35	1.0	0.46	0.59	0.42	0.46	0.33	0.51
Cadmium	mg/L	0.000025	0.000029	<0.00002	<0.00002	0.000056	0.000064	0.000084	0.000088	0.000091	0.000093	0.000058	0.000097
Cesium	mg/L	0.0001	0.0002	0.000007	0.000013	0.000094	0.00013	0.00017	0.00018	0.00017	0.00018	0.000079	0.00022
Chromium	mg/L	0.00062	0.0043	0.000094	0.00026	0.0041	0.0042	0.0053	0.0053	0.0053	0.0053	0.0021	0.0046
Cobalt	mg/L	0.00032	0.00065	0.000056	0.00017	0.0035	0.0047	0.0037	0.0041	0.0038	0.0041	0.00083	0.0034
Copper	mg/L	0.00061	0.0014	0.00025	0.0006	0.0068	0.0094	0.010	0.01	0.0084	0.0085	0.0039	0.0046
Iron	mg/L	0.088	0.26	0.11	0.35	1.0	1.0	1.4	1.4	1.4	1.4	0.51	1.1
Lead	mg/L	0.0001	0.00035	<0.00005	0.000053	0.00053	0.00055	0.00093	0.00094	0.00096	0.00097	0.0002	0.00069
Lithium	mg/L	0.026	0.046	0.00058	0.00094	0.0069	0.011	0.009	0.0093	0.01	0.011	0.0064	0.0072
Manganese	mg/L	0.05	0.077	0.0086	0.081	0.19	0.36	0.24	0.29	0.27	0.32	0.034	0.21
Mercury	mg/L	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00001	0.00001
Molybdenum	mg/L	0.0044	0.011	0.00053	0.0026	0.016	0.028	0.016	0.017	0.013	0.014	0.021	0.027
Nickel	mg/L	0.011	0.018	0.0014	0.0046	0.043	0.053	0.049	0.053	0.038	0.041	0.013	0.031
Rubidium	mg/L	0.006	0.012	0.0019	0.0029	0.013	0.023	0.015	0.017	0.013	0.014	0.01	0.017
Selenium	mg/L	0.000056	0.00077	0.00005	0.0001	0.00023	0.00041	0.00034	0.00038	0.00026	0.00029	0.00021	0.00047

Parameter	Units	Water Treatment Plant (2004 - 2017)		Reverse Osmosis Unit (2018 - 2020)		Water Management Pond (2020 - 2023)		East Influent Storage Pond (2024 - 2050)		West Influent Storage Pond (2024 - 2050)		South Perimeter Ditch (2024 - 2050)	
		Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile
Silver	mg/L	0.00005	0.000051	0.000005	0.000005	0.0000029	0.0000035	0.00004	0.00004	0.00004	0.00004	0.000005	0.000005
Strontium	mg/L	1.8	3.2	0.031	0.1	0.76	1.4	0.9	1.0	0.84	0.96	0.44	1.1
Thallium	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.000027	0.000031
Titanium	mg/L	0.002	0.0059	0.005	0.01	0.016	0.016	0.048	0.048	0.048	0.048	0.024	0.05
Uranium	mg/L	0.00088	0.0013	0.0001	0.00048	0.004	0.0061	0.0041	0.0045	0.005	0.0058	0.0024	0.0074
Vanadium	mg/L	<0.0005	0.0022	0.0005	0.001	<0.0005	<0.0005	0.0028	0.0029	0.0028	0.0029	0.0012	0.0037
Zinc	mg/L	<0.003	0.0085	<0.003	0.0044	0.016	0.019	0.018	0.019	0.025	0.025	0.022	0.03

Source: Golder (2021).

Note: The open-water season is from May 15th to October 15th. The average precipitation scenario assumed that runoff and seepage generated in the model was based on an average precipitation year that was repeated year after year from 2020 to 2050.

mg/L = milligrams per litre; N = nitrogen; P = phosphorus.

Table A-2 Predicted Open-Water Season Median and 95th Percentile Concentrations on the Mine Site for the Stochastic Precipitation Scenario

Parameter	Units	Water Treatment Plant (2004 - 2017)		Reverse Osmosis Unit (2018 - 2020)		Water Management Pond (2020 - 2023)		East Influent Storage Pond (2024 - 2050)		West Influent Storage Pond (2024 - 2050)		South Perimeter Ditch (2024 - 2050)	
		Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile
Conventional Parameters													
Total dissolved solids, calculated	mg/L	655	946	21	94	662	1,202	594	680	613	737	410	910
Major Ions													
Calcium	mg/L	134	209	0.9	7.5	85	152	75	85	79	94	56	130
Chloride	mg/L	296	505	2.0	17	76	169	53	56	85	107	20	43
Fluoride	mg/L	0.39	0.63	0.01	0.06	0.31	0.43	0.22	0.24	0.21	0.24	0.45	0.66
Magnesium	mg/L	15	20	0.4	2.0	47	82	38	43	43	51	29	54
Potassium	mg/L	4.8	7.3	1.0	1.6	9.8	16	7.7	8.4	8.5	10.0	8.4	15
Sodium	mg/L	67	106	4.2	5.6	42	76	37	42	40	48	21	55
Sulphate	mg/L	54	75	2.0	27	214	399	132	144	188	239	168	361
Nutrients													
Nitrate, as N	mg/L	5.0	19	2.5	4.3	25	61	29	36	24	29	11.2	32
Nitrite, as N	mg/L	0.15	0.42	0.0083	0.022	0.19	0.23	0.095	0.12	0.15	0.17	0.074	0.14
Total ammonia, as N	mg/L	1.2	4.8	0.1	0.27	0.61	0.91	0.42	0.58	0.55	0.65	0.091	1.0
Total phosphorus, as P	mg/L	0.0067	0.033	0.15	0.3	0.13	0.96	0.042	0.14	0.062	0.067	0.076	0.12
Total Metals and Metalloids													
Aluminum	mg/L	0.024	0.091	0.01	0.13	0.34	0.34	0.87	0.88	0.88	0.88	0.21	0.58
Antimony	mg/L	0.0002	0.00034	0.00005	0.0001	0.00016	0.0002	0.00016	0.00017	0.00013	0.00013	0.00021	0.00032
Arsenic	mg/L	0.00011	0.0017	0.00003	0.00033	0.00031	0.00036	0.00047	0.00048	0.00044	0.00044	0.00034	0.00052
Barium	mg/L	0.045	0.096	0.0004	0.0043	0.037	0.048	0.036	0.038	0.037	0.04	0.033	0.049
Beryllium	mg/L	<0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	0.00036	0.00036	0.00034	0.00034	0.00005	0.000085

Parameter	Units	Water Treatment Plant (2004 - 2017)		Reverse Osmosis Unit (2018 - 2020)		Water Management Pond (2020 - 2023)		East Influent Storage Pond (2024 - 2050)		West Influent Storage Pond (2024 - 2050)		South Perimeter Ditch (2024 - 2050)	
		Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile	Median	95th Percentile
Bismuth	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00017	0.00017	0.00018	0.00018	0.000025	0.000025
Boron	mg/L	0.12	0.19	0.2	0.24	0.35	1.0	0.44	0.54	0.43	0.49	0.34	0.51
Cadmium	mg/L	0.000025	0.000029	<0.00002	<0.00002	0.000053	0.000063	0.000083	0.000085	0.00009	0.000092	0.000058	0.000098
Cesium	mg/L	0.0001	0.0002	0.000007	0.000013	0.000094	0.00013	0.00017	0.00018	0.00017	0.00018	0.000064	0.00022
Chromium	mg/L	0.00062	0.0043	0.000087	0.00026	0.0041	0.0042	0.0053	0.0053	0.0053	0.0053	0.0016	0.0047
Cobalt	mg/L	0.00032	0.00065	0.00005	0.00017	0.0034	0.0046	0.0036	0.004	0.0038	0.0041	0.00093	0.0034
Copper	mg/L	0.00061	0.0014	0.00025	0.0006	0.0068	0.0097	0.0099	0.01	0.0083	0.0085	0.0039	0.0048
Iron	mg/L	0.088	0.26	0.07	0.35	1.0	1.0	1.4	1.4	1.4	1.4	0.37	1.1
Lead	mg/L	0.0001	0.00035	<0.00005	0.000053	0.00052	0.00055	0.00093	0.00094	0.00095	0.00097	0.00016	0.00069
Lithium	mg/L	0.026	0.046	0.0005	0.00094	0.007	0.01	0.009	0.0094	0.01	0.011	0.0062	0.0072
Manganese	mg/L	0.05	0.077	0.0061	0.081	0.2	0.37	0.23	0.27	0.27	0.31	0.036	0.2
Mercury	mg/L	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Molybdenum	mg/L	0.0044	0.011	0.00016	0.0026	0.016	0.026	0.017	0.019	0.014	0.016	0.021	0.035
Nickel	mg/L	0.011	0.018	0.0005	0.0046	0.043	0.052	0.049	0.052	0.038	0.041	0.014	0.031
Rubidium	mg/L	0.006	0.012	0.0018	0.0029	0.013	0.023	0.014	0.016	0.014	0.015	0.01	0.017
Selenium	mg/L	0.000056	0.00077	0.00005	0.0001	0.00022	0.00039	0.00034	0.00037	0.00027	0.00031	0.00025	0.00047
Silver	mg/L	0.00005	0.000051	0.000005	0.000005	0.0000027	0.0000033	0.00004	0.00004	0.00004	0.00004	0.000005	0.000005
Strontium	mg/L	1.8	3.2	0.027	0.1	0.79	1.4	0.9	1.0	0.87	1.0	0.46	1.1
Thallium	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Titanium	mg/L	0.002	0.0059	0.005	0.01	0.016	0.016	0.048	0.048	0.048	0.048	0.017	0.051
Uranium	mg/L	0.00088	0.0013	0.00004	0.00048	0.0041	0.0061	0.0039	0.0043	0.005	0.0056	0.0028	0.0074
Vanadium	mg/L	<0.0005	0.0022	0.0005	0.001	<0.0005	<0.0005	0.0028	0.0028	0.0028	0.0028	0.0011	0.0037
Zinc	mg/L	<0.003	0.0085	<0.003	0.0044	0.014	0.019	0.018	0.019	0.024	0.025	0.018	0.03

Golder (2021).

Note: The open-water season is from May 15th to October 15th. The stochastic precipitation scenario assumed that runoff and seepage generated in the model was based on a synthetic daily precipitation record from 2020 to 2050, generated using a stochastic model with statistical parameters consistent with the derived historical precipitation record for the Snap Lake site.

mg/L = milligrams per litre; N = nitrogen; P = phosphorus.

APPENDIX B SURVEILLANCE NETWORK STATIONS