HOPE BAY PROJECT DORIS AND MADRID WATER MANAGEMENT PLAN

HOPE BAY, NUNAVUT

MARCH 2021

Hope Bay Project Doris and Madrid Water Management Plan

Plain Language Overview:

The Doris and Madrid Water Management Plan (WMP; the Plan) describes the water management practices for the Hope Bay project at the Doris and Madrid mining sites.

The WMP outlines legislation and guidance relevant to the Plan, and describes the water management facilities. It also identifies various water management issues, and the mitigation measures which TMAC will implement during operations, closure and care and maintenance.

The Plan is intended primarily for use by TMAC and its contractors to ensure that best practices are employed throughout all water management activities associated with activities at Hope Bay, thus ensuring water licence conditions are met and minimal potential downstream environmental impacts occur.

Hope Bay, Nunavut

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Revisions

Revision #	Date	Section	Changes Summary	Author	Approver
0	October 2006	New Document	Initial version of the Water Management Plan submitted with the 2006 water licence application	MHBL	MHBL
1	April 2007	Throughout	Consolidation of information on water management facilities	MMC	MHBL
2	December 2010	Throughout	Updated in accordance with Type A Water Licence 2AM-DOH0713	SRK	HMBL
3	July 2011		Address monitoring of Doris Lake water levels, address party review comments, RO water treatment	SRK	HBML
4	December 2011		Include Table of Concordance, incorporate underflow sumps	SRK	HBML
5	February 2012		Approved Doris North Interim Water Management Plan under 2AM-DOH1323	SRK	HBML, NWB
6	December 2012		Update to address Part F Item 1.a.,b.,c. of Water Licence	SRK	HBML
7	June 2015	Throughout	Update to TMAC as current licensee for the Hope Bay region. Changes to document structure for operational suitability and efficiency	TMAC (SRK)	TMAC
		Sections • 1.3; • 2.2; • 2.5; • 2.7; • 2.8; • 4.	Addition of: Doris North Infrastructure Monitoring Program Pollution Control Pond 2 Talik water management Revised: Effluent discharge criteria TIA Decommissioning Water management contingencies		
		Module A	Underground talik water management, addition of proposed second Pollution Control Pond, TIA discharge to Roberts Bay		
8	August 2016	Sections	Updated to focus on Operations once tailings deposition has started. Inclusion of changes arising from party comments through Amendment Application process: Consideration of freshet Consistency with other TMAC documents Inclusion of relevant Standard Operating Procedures Addition of Interim Water Management Strategy	TMAC	TMAC

Revision #	Date	Section	Changes Summary	Author	Approver
			Characterization of TIA inputs Management of TIA discharge during Care & Maintenance		
9	February 2016	Sections	Update to align with Amended Type A Water Licence 2AM-DOH1323	TMAC	TMAC
10	December 2017		Added Madrid North and South water mgmt. components	TMAC	TMAC
11	March 2019	3.2.4	Added Sump 3 and updated to align with Amended Type A Water Licence 2AM-DOH1335	TMAC	TMAC
12	March 2020	Sections	Updated to add details regarding RBDS. Clarified Madrid site to align with 2AM-DOH1335	TMAC	TMAC
13	March 2021	4.2.2	Updated to add Madrid WRP sumps	TMAC	TMAC

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Glossary

Term	Definition
AEMP	Aquatic Effects Monitoring Program
CCME	Canadian Ministers of the Environment
CWP	Contact Water Pond
DOE	Department of Environment
ECCC	Environment and Climate Change Canada
GN	Government of Nunavut
CIRNAC	Crown Indigenous Relations and Northern Affairs Canada
KIA	Kitikmeot Inuit Association
MHBL	Miramar Hope Bay Ltd.
MMC	Miramar Mining Corporation
MDMER	Metal Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
MMB	RBDS Pumphouse
NWB	Nunavut Water Board
PCP	Pollution Control Pond
RBDS	Roberts Bay Discharge System
TIA	Tailings Impoundment Area
The Plan	Water Management Plan
TMAC	TMAC Resources Inc.
WTP	Water Treatment Plant

1 Introduction

This *Hope Bay Doris and Madrid Water Management Plan* (the Plan) has been prepared by TMAC Resources Inc. (TMAC) in accordance with various water licences held by TMAC associated with developments throughout the Hope Bay region.

The Plan is intended primarily for use by TMAC and its contractors to ensure that best practices are employed throughout all water management activities associated with the operation, closure and care and maintenance of the Doris and Madrid sites, thus ensuring water licence conditions are met and minimal potential downstream environmental impacts occur.

This document outlines TMAC's approach to water management as it pertains to the Doris and Madrid sites.

1.1 Relevant Legislation and Guidance

Table 1-1 provides a summary of federal and territorial regulations governing the Hope Bay Water Management Plan and associated guidelines.

Table 1-1. List of federal and territorial regulations and guidelines governing the Hope Bay Project Doris and Madrid Water Management Plan

Regulation	Year	Governing Body	Relevance
Nunavut Waters Regulations	2013	Nunavut Water Board	Licence for mining and milling undertaking to use water and deposit of waste in relation to the construction, operation, closure and reclamation.
Environmental Protection Act	1988	Government of Nunavut (GN), Department of Environment (DOE), Environmental Protection division	Legislation to authorize discharge of water
Environmental Rights Act	1988	GN, DOE, Environmental Protection division	Grants all residents the ability to launch an investigation
Metal Mining Effluent Regulation (MDMER)	2002	Federal Department of Fisheries and Oceans & Environment Canada	Allows for the designation of a water body for the deposition of mine waste and outlines requirements for mine-related discharges.
Territorial Lands Act	1985	Indigenous and Northern Affairs Canada (INAC)	Crown lease and land use permit
Guideline	**Year**	**Issued by**	**Relevance**
Canadian Environmental Quality Guidelines	1999	Canadian Council of Ministers of the Environment (CCME)	Provides guidance on water quality for the protection of aquatic life; both freshwater and marine

1.2 Related TMAC Documents and Programs

Table 1-2 provides a summary of documents related to the Hope Bay Water Management Plan.

Table 1-2. List of documents related to the Hope Bay Project Doris and Madrid Water Management Plan

Document Title	Year	Relevance
Hope Bay Project Waste Rock,Ore and Mine Backfilling Management Plan	2019	Management of surface contact water
Hope Bay Project Domestic Wastewater Treatment Management Plan	2017	Management of treated effluent
Hope Bay Project Spill Contingency Plan	2020	Spill response procedures
Tailings Impoundment Area Operations, Maintenance and Surveillance Manual	2020	Management of excess water from the TIA
Quality Assurance and Quality Control Plan	2020	Sampling practices document that is reviewed and approved by the NWB
Hope Bay Project Groundwater Management Plan	2020	Management of groundwater
Doris Water and Load Balance Model	2017	Identification of source terms, modelling results
Doris North Infrastructure Monitoring Program	2017	Water Management facility inspections
Standard Operating Procedure: Compliance Sampling – Water Samples (REF # ENV-SOP-EM-002)	2017	Procedures to be followed for sampling water quality within containment berms and sumps, planning and execution of compliant water discharge

1.3 Plan Management and Execution

This Plan is reviewed annually and updated as needed.

Personnel responsible for implementing and updating the Plan are identified in Table 1-3.

Table 1-3. Roles and responsibilities

Role	Responsibility
Mine General Manager	• Overall responsibility for and implementation of this management plan; • Provide the on-site resources to operate, manage, and maintain water management infrastructure, such as pipelines, diversion berms, lined ponds and holding tanks; • Provide input on modifications to design and operational procedures to improve operational performance.
Maintenance Manager (or designate)	• Conduct regular inspections of the water management facilities and audits of the maintenance records; • Responsible for tracking water movements between the various water management facilities, including from the pollution control ponds and sumps to the tailings impoundment area (TIA); • Maintain records of the source, disposition and volume of water transported/discharged; • Report irregularities identified during visual inspections to the Mine General Manager.
Environmental Superintendent	• Review and update this management plan as required; • Monitor water quality in the ponds, TIA and discharge points; • Assess whether water quality samples have met applicable regulatory standards and guidelines; • Coordinate with the surface manager responsible for water movements between the various water management facilities to ensure compliance with all licence requirements; • Audit of water management tracking records and all associated required reporting.

2 Water Management Strategy

2.1 Objectives

The objectives of water management at Hope Bay Mining areas are as follows:

- Minimize total volume of water which comes into contact with mining infrastructure by diverting non-contact runoff away from mining works;
- Capture and contain water which is deemed unsuitable for immediate discharge;
- Treat and dispose of water which cannot be discharged to meet water license requirements.

2.2 Water Classification

Water encountered at the Doris and Madrid mines is classified into five categories based on the contact surface. Each type of water is managed separately to achieve the water management goals, outlined in Section 2.1. Table 2-1 presents the water classifications.

Table 2-1: Water Classification

Type	Contact Surface
Non-Contact Water	Undisturbed runoff, runoff from access roads, overburden piles, quarries, fuel facilities, and landfills
Mine Water	Water which enters the underground workings
Contact Water	Runoff in contact with waste rock, ore stockpiles, tailings and process water
Freshwater	Freshwater from lake
Treated Sewage water	Domestic sewage

3 Doris Water Management

3.1 Management Approach

Figure 1 presents a flow diagram of the water management approach for the Doris Mining area. The following sections outline management and discharge strategy for each water classification.

3.1.1 Non-Contact Water

Best Management Practices (BMPs) will be put in place during construction of access roads and pads to ensure that sediment loading after initial material placement is controlled. This may include silt fences or coco matting around construction activities during the initial rainfall and snowmelt periods.

To divert water upstream of the mine area and reduce the amount of contact water, the Doris North diversion berm was constructed in 2011 and diverts water from the south slope of Doris Mountain away from the site.

Pad U does not require any diversion as it is on the downstream side of the existing access road to Doris Lake and the TIA. The surface of Pad U will be graded to ensure runoff and seepage flow to Contact Water Pond 2.

Runoff accumulating in individual quarries will be collected at the natural low point in each quarry area. If required, a sump may be constructed to improve containment of runoff at the based of the quarry. Excess waters will be tested against the discharge limits and suitable water will be discharged to the tundra at an approved location.

A sump exists at the natural low point in the landfarm. Vacuum trucks will dewater the sump and either discharge to surface or truck the water to Contact Water Pond #2, pending water quality results.

3.1.2 Contact Water

Contact water consists of tailings water, process water, waste rock and ore stockpile runoff. Process water is internally recycled in the Doris process plant, and excess water is sent to the TIA.

The TIA discharges to the RBDS Pumphouse, which pumps water to Roberts Bay.

Waste rock and ore stockpile runoff will be collected in contact water ponds, identified as pollution control ponds, which will be dewatered to the TIA.

Sumps capture shallow groundwater discharge from the active layer, downstream of the pollution control ponds. An automated float operated pump moves water from the sump back to the sedimentation ponds.

3.1.3 Mine Water

The Doris Mine will intercept talik and will therefore have mine inflows, according to the hydrogeological model (SRK, 2017b). For a period of time early in the mine life, TMAC will encounter saline groundwater similar in concentration to seawater, after which the salinity concentration is expected to decline due to an increased fresh water component of the mine inflow originating from Doris Lake.

The management of any groundwater interception is presented in the Hope Bay Groundwater Management Plan (TMAC, 2020).

3.1.4 Freshwater

Freshwater for potable and domestic use is sourced from either the North or South Windy Lake water intakes, and freshwater for fire protection, dust suppression and other industrial uses is sourced from Doris Lake.

Process freshwater is sourced from Doris Lake.

3.1.5 Treated Sewage Water

Domestic sewage will be treated on-site in the sewage treatment plant and discharged either to the TIA or the tundra at an approved location.

3.2 Facilities

Table 3-1 provides a summary of mine infrastructure relevant to the Doris Madrid Water Management Plan.

Table 3-1: Facilities within the Doris Mine Area and Associated Water Management Infrastructure

Facility	Reporting to
Pad X (Main Camp)	Sedimentation Pond
Pad B (Laydown Area)	Sedimentation Pond
Pad C (Administrative Buildings)	Sedimentation Pond
Pad R (Fuel Storage Area)	Sedimentation Pond
Pad Y (Warehouse/Laydown Area)	Sedimentation Pond
Pad E/P (Laydown Area)	Sedimentation Pond
Pad D (Mill Terrace)	Pollution Control Pond 1
Pad T (Waste Rock Storage Area)	Pollution Control Pond 1
Pad Q (Ore Storage Area)	Pollution Control Pond 1
Pad H/J (Ore Storage Area)	Pollution Control Pond 1
Pad I (Ore and Waste Rock Storage Area)	Pollution Control Pond 1
Pad F (Laydown Area)	Pollution Control Pond 1
Pad G (Laydown Area)	Pollution Control Pond 1
Pad U (Ore Storage Area)	Pollution Control Pond 2
Sumps	Contact water ponds
Doris North Diversion Berm	Non-contact area away from site
Water Treatment Plant	Roberts Bay
Tailings Impoundment Area	Roberts Bay

3.2.1 Sedimentation Pond

Surface runoff from pads located on the west side of the mine area reports to the existing sedimentation/holding pond. This pond also serves as a lined temporary holding pond for water from Pollution Control Pond (PCP) 1, the sumps, and other site water which is to be pumped to the TIA.

Operation

Water from this pond is pumped directly to the TIA on an as-needed basis. The existing sedimentation pond has capacity of 3,325 m^3.

Monitoring

Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

The pumps should have in-line flow meters to quantify total discharge.

A water quality sample should be collected at ST-1 annually during operations. Further details on monitoring are presented in Section 5. If water quality meets the designed criteria for discharge, excess water may be discharged to tundra at an approved location.

Inspection

The containment berm should be inspected by the Maintenance Manager on a regular basis to check for signs of seepage, erosion, slumping, or other signs of possible failure mechanisms.

Regular inspection along the dewatering pipeline will be performed by the Site Services department to check for signs of leaks.

An annual inspection of the containment berm will also be conducted as part of the Annual Geotechnical Inspection by the Engineer of Record (EOR). Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

3.2.2 Pollution Control Pond 1

Pads located on the east side of the mine area are graded to ensure all runoff and seepage will be diverted and collected in PCP 1. PCP 1 is designed to be a retention pond for the 24 hr 1 in 25 year storm, and is adequately sized to accommodate typical freshet flows. The total volume of runoff captured in this pond will be transferred to the TIA.

Operation

It is expected that the pond will always be operated in a manner allowing pumping and/or trucking to commence as soon as the containment volume is large enough for one continuous hour of pumping.

Monitoring

Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

The pumps should have in-line flow meters to quantify total discharge.

A water quality sample should be collected at ST-2 annually during operations. Further details on monitoring are presented in Section 5. If water quality meets the designed criteria for discharge, excess water may be discharged to tundra at an approved location.

Inspection

The containment berm should be inspected by the Maintenance Manager on a regular basis to check for signs of seepage, erosion, slumping, or other signs of possible failure mechanisms.

Regular inspection along the dewatering pipeline will be performed by the Environment Superintendent to check for signs of leaks.

An annual inspection of the containment berm will also be conducted as part of the Annual Geotechnical Inspection by the EOR. Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

3.2.3 Pollution Control Pond 2

Pad U will be located on the east side of the access road leading towards Doris Lake. The primary intent of use for Pad U is general laydown and temporary ore storage, if needed. The pad will be graded in a manner to ensure runoff and seepage is collected by a downstream pollution control pond. The pollution control pond will be designed to manage water and contain flow from the overall drainage area for a 100-year, 24 hour storm event.

Operation

The PCP 2 will always be operated in a manner allowing pumping to commence as soon as the containment volume is large enough for one continuous hour of pumping. All water will be transferred to the TIA.

Monitoring

Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

The pumps should have in-line flow meters to quantify total discharge.

A water quality sample should be collected at ST-13 annually during operations. Further details on monitoring are presented in Section 5. If water quality meets the designed criteria for discharge, excess water may be discharged to tundra at an approved location.

Inspection

The containment berm should be inspected by the Maintenance Manager on a regular basis to check for signs of seepage, erosion, slumping, or other signs of possible failure mechanisms.

Regular inspection along the dewatering pipeline will be performed by the Environment Superintendent to check for signs of leaks.

An annual inspection of the containment berm will also be conducted as part of the Annual Geotechnical Inspection by the EOR. Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

3.2.4 Sumps

Sump 1 is constructed downstream of the Sedimentation PCP 1, downstream of the south-east corner of the facility. Sump 2 is constructed downstream of Pad F/G along the east edge of the TIA Access Road. Sump 3 is constructed approximately 40 m south-west of Sump 1, within the tundra. The sumps ensure any seepage that may be bypassing the pond or emanating from Pad F/G is captured and returned to the water management system via an automated float operated pump.

Monitoring

Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

Water quality monitoring is not expected in the sumps.

The pumps should have in-line flow meters to quantify total discharge.

Inspection

Regular inspection of the sumps should be performed by the Environment Superintendent to ensure they are functioning as intended.

An annual inspection of the sumps will also be conducted as part of the Annual Geotechnical Inspection by the EOR Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

3.2.5 Tailings Impoundment Area

The TIA is an existing facility bounded by the North Dam, which is water retaining, and the South and West Dams, which are solids retaining. Sub-aerial tailings deposition occurs at the southern end of the facility with reclaim water being pumped from the Reclaim Pond in the north end of the facility.

During the operations, closure and care and maintenance phases additional characterization of TIA inputs as summarized in Table 5-1 will occur.

Operation

The TIA is operated to maintain sufficient water to supply the mill, while not exceeding the full supply level of 33.5 m and allowing for contingency water holding capacity. The current water management strategy is to convey all mine surface contact water to the TIA. Compliant TIA water, in excess of operational needs, is discharged to Roberts Bay, via the RBDS Pumphouse located at the mill building. Based on inflow volumes, the TIA effluent may comingle with groundwater discharge from the mine and both mine and excess TIA water will be co-disposed in Roberts Bay in compliance with the effluent quality limits outlined in License 2AM-DOH1335, Part I, Item 14, and the MDMER limits.

In the event of effluent non-compliance, discharge pipeline malfunction or excessive mine water inflows, the TIA has the capacity to contain water without discharging.

Monitoring

The following water quality samples will be collected from the TIA:

- At the reclaim pipeline at TL-1 on a monthly basis;
- Quarterly samples at the process plant in the tailings slurry line, TL-5;
- Monthly samples from the solids component of mill effluent at TL-6;
- Tailings sent underground will be sampled at TL-7 on a monthly basis;

Visual inspections will consist of the following:

- Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

Inspection

Regular inspections of the TIA should be performed by the Mill Operations Team to ensure the TIA is functioning as intended. An annual inspection of the TIA will also be conducted as part of the Annual Geotechnical Inspection by the EOR. Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

3.2.6 Mine Water

The Doris Mine will intercept talik which will result in groundwater inflows. The mine inflows will be made up of fresh water from lake infiltrations and hypersaline water from the surrounding rock, with a water quality dominated by high salinity, specifically chloride. TMAC will actively manage and mitigate inflows to protect workers, the environment, and ensure the mine can keep operating.

Operation

Groundwater will be collected in underground sumps and pumped to surface, from where it will be treated and discharged to Roberts Bay, either directly, or via the Tailings Impoundment Area (TIA).

The management of any groundwater interception is presented in the Hope Bay Groundwater Management Plan (TMAC, 2020) (TMAC, 2017f).

Monitoring

During periods of mine water discharge, either directly to Roberts Bay, or to the TIA, mine water is sampled as follows:

- Weekly water quality samples will be collected at TL-12 at the mine discharge point; and
- Twice annually from backfilled stopes as TL-11.

The Environmental Superintendent is responsible for conducting and documenting inflow water quality sampling. A record of this sampling and results of this analysis will be maintained on site.

Daily flow measurements will also be collected at the main portal flow metering point.

Additional monitoring details are presented in Section 5 and in the Hope Bay Groundwater Management Plan (TMAC, 2020).

Inspection

The underground operational crews are responsible for regular inspections of safely accessible non-working areas and providing daily reports of active work areas. Non-working areas are inspected on a monthly basis, or as necessary, if combined flows from those areas are observed to increase at main collection sumps.

Where new inflow or a change in inflow higher than 250 m^3/day is encountered, a description of the feature and related inflow characteristics are documented as part of the shift boss's daily mining report. This report includes:

- Description of features encountered;
- Inflow rates; and
- Estimated pressures.

An annual inspection of the underground workings will also be conducted as part of the Annual Geotechnical Inspection by the EOR. Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

3.2.7 Water Treatment Plant

Operation

Underground mine water is pumped from a settling sump system to a WTP on surface designed to provide Total Suspended Solids (TSS) removal from the effluent stream prior to final discharge to Roberts Bay. The multi-stage process consists of coarse suspended solids removal via a lamella clarifier and the addition of a polymer flocculent followed by fine suspended solids removal utilizing multimedia filters. This treatment process is capable of meeting the authorized limits for TSS outlined in Schedule 4 of the MDMER.

Monitoring

During periods of mine water treatment and discharge, either directly to Roberts Bay, or to the TIA, untreated and treated effluent is sampled as follows:

- Weekly water quality samples will be collected at TL-12 at the mine discharge point.
- Weekly water quality samples will also be collected after treatment to determine the performance for the WTP.

The Environmental Superintendent is responsible for conducting and documenting effluent water quality sampling. A record of this sampling and results of this analysis will be maintained on site.

Daily flow measurements are also collected at the WTP flow metering point.

Inspection

The Mill Operations Team is responsible for the operation, maintenance and most aspects of surveillance for the WTP. This includes daily inspections of the WTP and all ancillary equipment to ensure they are functioning as intended.

3.2.8 Quarry Water Management

The quarries will be developed such that runoff drains to the low point and is confined within the quarry boundaries. Sumps will be constructed on an as-needed basis, depending on the geometry of the quarry. For further detail, reference the Quarry Management and Monitoring Plan (TMAC, 2017g).

Monitoring

After storm events or snowmelt, a sample of the ponded water will be collected. Care will be taken to ensure that discharged water does not enter fish bearing waters and that the pump discharge is positioned in a manner that minimizes erosion and siltation of the area downstream of the discharge.

In the event that the quarry water does not meet the discharge criteria, an inquiry of the cause of the noted exceedance will be conducted, and appropriate mitigation developed. Any non-compliant water that needs to be discharged would be transported to the TIA.

3.2.9 Sewage Treatment

Domestic sewage will be treated on-site. During construction and closure, the treated effluent will be discharged to the tundra. The discharge pipeline will consist of a series of diffusers, situated such that each stream will flow in a different direction at the top of the catchment. During operations, the treated effluent will be discharged to tundra and/or pumped to TIA.

Monitoring

A monthly water quality sample will be collected during discharge periods. The sample will be collected at the effluent discharge tank at ST-8. While discharging to the tundra, a sample will be collected downstream of the discharge point, prior to entering Glen Lake, at ST-9.

During discharge to the tundra, additional monitoring will take place at the diffusers. Signs of erosion will be noted and mitigation measures will be implemented by realigning the diffuser pipeline or protecting erodible material.

3.2.10 Freshwater Intake

Domestic and potable water for the camp will be sourced from Windy Lake via the existing Windy Camp intake structure as well as the new Windy Lake North Freshwater intake (SRK, 2017c).

The new Windy Lake North intake pipeline will follow the access road and will transition from shoreline to lakebed beneath a protective rock berm. The insulated heat-traced pipeline will be anchored to the lakebed beneath the rock berm until the lake depth is a minimum of 3 m year-round. The pipeline will continue to a lake depth of 5 m year-round. The pipeline intake will be installed with a fish screen to protect fish in the lake, as per the requirements of Department of Fisheries and Oceans (Department of Fisheries and Oceans, 1995). Additional freshwater is pumped from Doris Lake to the process plant.

Monitoring

A water quality sample will be collected on a monthly basis during active pumping periods from ST-7 in Doris Lake and at ST-7a in Windy Lake. Further details on monitoring are presented in Section 5.

Total water volume extracted from both lakes will be recorded and reported in monthly and annual reports.

Inspection

Regular inspection along the intake pipeline will be performed by the Site Services department to check for signs of leakage.

3.2.11 Various Use Containment Sumps

Various containment sumps will capture runoff from associated land uses. Monitoring is summarized as follows:

- Non-hazardous landfill sump, sampled at ST-3 prior to discharge;
- Landfarm sump, sampled at ST-4 prior to discharge;
- Plant site fuel storage and containment area sump, sampled at ST-6 and ST-6b prior to discharge;
- Reagent and cyanide storage facility sump, sampled at ST-11 annually;

At each facility, if water is deemed acceptable for discharge, it will be safely discharged at an approved location. If water does not meet the effluent quality limits outlined in License 2AM-DOH1335, Part F, and the MDMER, it will be pumped or trucked to TIA.

Details on water quality monitoring at the landfarm and fuel storage and containment area sumps are presented in the Hydrocarbon Contaminated Material Management Plan (TMAC, 2017h).

4 Madrid Water Management

4.1 Management Approach

Figure 2 presents a flow diagram of the water management approach for Madrid Mining area. The following sections outline management and discharge strategy for each water classification. The Madrid site is currently operating under the existing Water Licence No. 2AM-DOH1335 (referred to as “Type A”). The Madrid Advanced Exploration Program operates under Water Licence No. 2BB-MAE1727 (referred to as “Type B”).

4.1.1 Non-Contact Water

Best Management practices will be put in place during construction of access roads and pads to ensure that sediment loading after initial material placement is controlled. This may include silt fences and coco matting around construction activities and during the initial rainfall and snowmelt periods.

Runoff collected in individual quarries will be collected at the natural low point in each quarry area. If required, a sump may be constructed to improve containment of runoff at the base of the quarry. Excess waters will be pumped to surface and tested against the discharge limits. Suitable water will be discharged to the tundra at an approved location.

A sump will be constructed at the natural low point in the fuel facilities at Madrid North and South. Vacuum trucks will dewater the sump and either discharge to surface or truck the water to the Primary contact water pond at Madrid North, pending water quality results.

4.1.2 Contact Water

Contact water consists of tailings water, process water, waste rock and ore stockpile runoff.

A concentrator will be constructed at the Madrid North site to process a portion of the Madrid North ore through a flotation circuit. The resulting tailings will be pumped via pipeline and deposited in the TIA. The concentrate will be trucked to the Doris process plant for gold extraction. Process water and tailings water are internally recycled in the concentrator as much as practical. Excess water is pumped to the TIA in the tailings stream (i.e. tailings at a higher moisture content).

Waste rock and ore stockpile runoff will be collected in contact water ponds which will be dewatered to the TIA.

4.1.3 Mine Water

The Madrid North mine will intercept talik below Patch, Windy and Imniagut Lakes, and mining at Madrid South mine is expected to intercept the talik below Wolverine and Patch Lakes (SRK, 2017b). This intercepted mine water is expected to be saline similar in concentration to seawater.

Mine water will be pumped or hauled to the Doris WTP and discharged to Roberts Bay, as described in the Groundwater Management Plan (TMAC, 2020).

4.1.4 Freshwater

Freshwater including potable and raw water for industrial use (brine mixing, and dust suppressant), will be sourced from Windy Lake via the existing water intake near the old Windy Camp, or if required from the Windy Lake North Fresh Water Intake (SRK, 2017c). Make-up water for the concentrator at Madrid North will be pumped from Doris Lake, and freshwater may be pumped from Patch Lake or Wolverine Lake, as needed.

4.1.5 Treated Sewage Water

There will not be a camp at the Madrid North or South sites. Sewage water will be trucked to Doris Site sewage treatment facility.

4.2 Facilities

Table 4-1 provides a summary of mine infrastructure relevant to the Madrid Water Management Plan.

Table 4-1: Facilities within the Madrid Mining Area and Associated Water Management Infrastructure

Facility	Reporting to
Madrid North Waste Rock Pile	Madrid North Contact Water Pond
Madrid North Ore Stockpile	Madrid North Contact Water Pond
Madrid North Equipment Pad	Madrid North Contact Water Pond
Madrid North Process Plant	Madrid North Contact Water Pond
Portal Laydown Area	Madrid South Secondary Contact Water Pond
Madrid South Waste Rock Pile	Madrid South Primary Contact Water Pond
Madrid South Ore Stockpile	Madrid South Primary Contact Water Pond
Madrid South Fuel Storage Facility	Madrid South Primary Contact Water Pond
Quarries	Windy Lake, tundra, or Primary Contact Water Pond
Sumps	Madrid North Contact Water Pond

4.2.1 Madrid North Contact Water Pond

The Madrid North CWP will capture contact water from the Madrid North concentrator area, ore stockpile, and waste rock pile. The pond will be situated against the contact water berm and access road, and is discussed in more detail in the Contact Water Pond Berm Thermal Modelling report (SRK, 2017d). At the maximum level, the freeboard against the contact water access road berm is 1.3 m.

Operation

The pond should be operated at a near-empty level such that capacity is always available for the design rainfall and snowmelt events.

After an inflow event, resulting from snowmelt or a precipitation event, pumps should be activated to dewater the Madrid North CWP to one of the following locations:

- Concentrator for use as make-up water to reduce the freshwater draw from Windy Lake;
- Tailings discharge line from Madrid North Concentrator to TIA; or
- Mine water line to the Doris WTP.

The maximum dewatering period is 14 days, based on the design capacity of the pond and pump. Should the pond water level approach the freeboard limit, dewatering should be immediately initiated via the pump and pipeline or hauled by tank truck.

Monitoring

Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

The pumps or tank trucks should have in-line flow meters to quantify total discharge.

A water quality sample will be collected prior to discharge at MAE-04(Type B)/ MMS-1 (Type A). If water quality meets the designed criteria for discharge, excess water may be discharged to tundra at an approved location. Further details on monitoring are presented in Section 5.

Inspection

The contact water pond access road berm should be inspected by the Maintenance Manager on a regular basis to check for signs of seepage, erosion, slumping, or other signs of possible failure mechanisms.

Regular inspection along the dewatering pipeline will be performed by the Site Services department to check for signs of leaks.

An annual inspection of the containment berm will also be conducted as part of the Annual Geotechnical Inspection by the EOR. Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

4.2.2 Sumps

Water management at the Madrid North Waste Rock Pile includes three water collection sumps located on the northern, eastern and western extents of the waste rock pile.

Monitoring

Water level in the sumps should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

Water quality monitoring is not expected in the sumps.

The pumps should have in-line flow meters to quantify total discharge.

Inspection

Regular inspection of the sumps should be performed by the Environment Superintendent to ensure they are functioning as intended.

An annual inspection of the sumps will also be conducted as part of the Annual Geotechnical Inspection by the EOR Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

4.2.3 Madrid South Primary Contact Water Pond

The Madrid South Primary CWP captures contact water within the Madrid South site. The Primary CWP is contained against the contact water berm access road (SRK, 2017d), and is located west of the waste rock pile. At the maximum level, the freeboard against the contact water access road berm is 1.3 m.

Operation

The pond should be operated at a near-empty level such that capacity is always available for the design rainfall and snowmelt events.

After an inflow event, resulting from snowmelt or a precipitation event, pumps should be activated to dewater the Madrid South Primary CWP to the Madrid North CWP.

The maximum dewatering period is 14 days, based on the design capacity of the pond and pump. Should the pond water level approach the freeboard limit, dewatering should be immediately initiated via the pump and pipeline.

Monitoring

Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

The pumps should have in-line flow meters to quantify total discharge.

A water quality sample will be collected prior to discharge at MAE-05 (Type B) / MMS-2 (Type A). If water quality meets the designed criteria for discharge, excess water may be discharged to tundra at an approved location. Further details on monitoring are presented in Section 5.

Inspection

The contact water pond access road berm should be inspected by the Maintenance Manager on a regular basis to check for signs of seepage, erosion, slumping, or other signs of possible failure mechanisms.

Regular inspection along the dewatering pipeline will be performed by the Site Services department to check for signs of leaks.

An annual inspection of the containment berm will also be conducted as part of the Annual Geotechnical Inspection by the EOR. Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

4.2.4 Madrid South Secondary Contact Water Pond

The Secondary CWP at Madrid South captures runoff from the portal laydown area and is confined by berms to the north and east, including the Portal Haul road. At the maximum level, the freeboard against the contact water access road berm is 1.3 m.

Operation

The pond should be operated at a near-empty level such that capacity is always available for the design rainfall and snowmelt events.

After an inflow event, resulting from snowmelt or a precipitation event, pumps should be activated to dewater the Madrid South Secondary CWP to the Madrid South Primary CWP.

The maximum dewatering period is 14 days, based on the design capacity of the pond and pump. Should the pond water level approach the freeboard limit, dewatering should be immediately initiated via the pump and pipeline.

Monitoring

Water level in the pond should be measured weekly during the open water season, and more frequently during intensive rainfall or snowmelt periods.

The pumps should have in-line flow meters to quantify total discharge.

A water quality sample will be collected prior to discharge at MAE-06 (Type B) / MMS-3 (Type A). If water quality meets the designed criteria for discharge, excess water may be discharged to tundra at an approved location. Further details on monitoring are presented in Section 5.

Inspection

The contact water pond access road berms should be inspected by the Maintenance Manager on a regular basis to check for signs of seepage, erosion, slumping, or other signs of possible failure mechanisms.

Regular inspection along the dewatering pipeline will be performed by the Site Services department to check for signs of leaks.

An annual inspection of the containment berm will also be conducted as part of the Annual Geotechnical Inspection by the EOR. Results of the inspection are submitted with the 2AM-DOH1335 License Annual Report by March 31 of each year.

4.2.5 Quarry Water Management

The quarries will be developed such that runoff drains to the low point and is confined within the quarry boundaries. Sumps will be constructed on an as-needed basis, depending on the geometry of the quarry. For further detail, reference the Quarry Management and Monitoring Plan (TMAC, 2017g).

Monitoring

After storm events or snowmelt, a sample of the ponded water will be collected. Quarries G, H, and I will have samples collected at MAE-11, MAE-12 and MAE-13, respectively (as required, under Type B). If the water quality is acceptable for discharge, care will be taken to ensure that discharged water does not enter fish bearing waters and that the pump discharge is positioned in a manner that minimizes erosion and siltation of the area downstream of the discharge.

In the event that the quarry water does not meet the discharge criteria, an inquiry of the cause of the noted exceedance will be conducted, and appropriate mitigation developed. Any non-compliant water that needs to be discharged would be transported to one of the CWPs.

4.2.6 Sewage Treatment

Madrid North and South will be equipped with a portable wash car containing toilets, washbasins and showers with heated black and grey water day tanks. These tanks will be emptied via a vacuum sewage truck and transported to a holding tank at the Doris Site for blending into the Doris Site sewage treatment facility.

Monitoring for Doris sewage treatment facility is described in Section 3.2.9.

4.2.7 Freshwater Intake

Domestic, potable and industrial water, including water for brine mixing and dust suppressant, will be sourced from Windy Lake via the existing Windy Camp intake structure as well as the new Windy Lake North Freshwater intake (SRK, 2017c).

The new Windy Lake North intake pipeline will follow the access road and will transition from shoreline to lakebed beneath a protective rock berm. The insulated heat-traced pipeline will be anchored to the lakebed beneath the rock berm until the lake depth is a minimum of 3 m year-round. The pipeline will continue to a lake depth of 5 m year-round. The pipeline intake will be installed with a fish screen to protect fish in the lake, as per the requirements of Department of Fisheries and Oceans (Department of Fisheries and Oceans, 1995).

Make-up water for the concentrator at Madrid North will be pumped from Doris Lake. Water may also be pumped from Patch Lake and Wolverine Lake, as needed.

Monitoring

A water quality sample will be collected on a monthly basis during active pumping periods from the freshwater intake in Windy Lake (MAE-01 (Type B) / MMS-4a (Type A)), and from Patch Lake (at MAE-02

(Type B)), and from Wolverine Lake (MAE-03 (Type B)), as needed. Further details on monitoring are presented in Section 5.

An in-line flow meter will measure total water volume extracted from Windy Lake.

Inspection

Regular inspection along the intake pipeline will be performed by the Site Services department to check for signs of leakage.

4.2.8 Fuel Facility Water Management

Fuel facilities at Madrid North and South will include self-contained sumps.

Monitoring

After a storm event or snowmelt and prior to discharge, water samples will be collected from the following locations:

Under Water Licence 2BB-MAE1727:

- MAE-07 at Madrid North fuel storage area sump;
- MAE-08 at Madrid North fuel transfer station sump;
- MAE-09 at Madrid South fuel storage area sump; and
- MAE-10 at Madrid South fuel transfer station sump.

Under Water Licence 2AM-DOH1335:

- MMS-5 at the Madrid South Fuel Storage facility
- MMS-8 at the Madrid North Fuel Storage facility

Samples will be sent for analysis to an accredited laboratory. If water quality is within the required limits for discharge, the water will be discharged to the tundra at a location approved by the inspector, or else water will be discharged into one of the contact water ponds.

5 Detailed Monitoring Plan

5.1 Monitoring Objectives

The objective of the monitoring undertaken under this Plan is to:

- Comply with monitoring requirements outlined in applicable water licences, project certificates, and the *MDMER*;
- Ensure water in the TIA, and that directed to the TIA is characterized to provide information for appropriate operation of the TIA, and so that it is available in case of an unintentional release;
- Ensure water being discharged to the environment meets the appropriate discharge limits;
- Ensure points of discharge to tundra are not negatively affected by pooling water or erosion; and
- Ensure tracking of water movement and volumes.

Monitoring is carried out in accordance with the Standard Operating Procedures.

5.2 Monitoring Plan

Monitoring locations, frequency, and parameters for the Doris site are summarized in Table 5-1 as per the existing Type A Water Licence 2AM-DOH1335. Monitoring locations, frequency, and parameter for the Madrid site are summarized in Table 5-2 as per the existing Type A Water Licence 2AM-DOH1335 or the Type B Water Licence 2BB-MAE1727. Monitoring locations are presented in Figure 3 for Doris and Figure 4 for Madrid.

Table 5-1 Water monitoring at Doris Site.

SNP Station	Description	Phase	Frequency during Operations and Any Time After Initial Deposit of Tailings to the TIA
ST-1	Sedimentation Pond	Construction, Operation, Care and Maintenance, Closure	Annually
ST-2	Doris Contact Water Pond	Construction, Operation, Care and Maintenance, Closure	Annually
ST-3	Discharge from Non-hazardous Landfill pollution control sump	Construction, Care and Maintenance, Operation, Closure	Annually. Once prior to every discharge onto the tundra
			Daily during periods of discharge
ST-4	Discharge from Landfarm sump	Construction, Operation, Care and Maintenance, Closure	Annually. Once prior to every discharge onto the tundra
			Daily during periods of discharge
ST-5	Discharge from the Plant Site Fuel Storage and Containment Area Sump	Construction, Operation, Care and Maintenance, Closure	Annually. Once prior to every discharge onto the tundra
			Daily during periods of discharge
ST-6a and ST-6b	Discharge from the Roberts Bay Fuel Storage and Containment Area Sumps	Construction, Operation, Care and Maintenance, Closure	Annually. Once prior to every discharge onto the tundra
			Daily during periods of discharge
ST-7	Freshwater pumped from Doris Lake	Construction, Operation, Care and Maintenance, and Closure	Monthly during periods pumping
			Monthly during periods of pumping
			Annually
ST-7a	Freshwater pumped from the Windy Lake freshwater intake	Construction, Operation, Care and Maintenance, Closure	Monthly during periods of pumping
ST-8	Discharge from Doris Sewage Treatment Plant	Construction, Operation, Care and Maintenance, Closure	Monthly when discharge to the Tundra, Annually when discharge to the TIA
			Monthly during periods of discharge
			Daily during periods of discharge
ST-9	Runoff from Doris Sewage Treatment Plant	Construction, Operation, Care and Maintenance, Closure	Monthly when discharged to the tundra
ST-10	Site Runoff from Sediment Controls	Construction, Operations, Closure	Daily during periods of discharge
ST-11	Reagent and Cyanide Storage Facility Sumps	Construction, Operation, Care and Maintenance, Closure	Annually
ST-12	Doris Lake	Operation, Closure	Monthly
			Annually in April
ST-13	Doris Contact Water Pond Pad U	Construction, Operation, Care and Maintenance, Closure	Annually
TL-1	TIA at the Reclaim Pipeline	Operation, Care and Maintenance, Closure, Post Closure (for up to nine (9) years after cessation of mining)	Monthly during Operations, Closure and Post Closure. Annually during Care and Maintenance.
			Annually
			Annually during Post-Closure
			Annually
TL-2	Doris Outflow Creek - upstream (at the flow monitoring station adjacent to the bridge)	Closure, Post Closure (for up to nine (9) years after cessation of mining)	Annually during Care and Maintenance Annually for 2 years prior to Post-Closure, and during Post-Closure, Increase to three times per year (under ice, freshet, and pre-freeze up), two years prior to breach of the North Dam.
		Operation	Daily upon commencement of mining in or beneath the Doris Lake Talik.
TL-3	Doris Outflow Creek (~80m downstream of the base of the waterfall)	Care and Maintenance, prior to any deposit of tailings to the TIA	Inactive
TL-4	TIA Discharge End-of-Pipe	Care and Maintenance, prior to any deposit of tailings to the TIA	Inactive
TL-5	Effluent from Process Plant (tailings slurry/ water)	Operations	Quarterly
TL-6	Tailings Discharged into TIA (Solid Component) taken from a valve in the mill at the discharge end of the mill tailings pumps	Operations	Monthly during periods of discharge
			Sampled on a weekly basis with analyses carried out monthly on a composite sample of the TL-6 weekly samples
TL-7A	Detoxified tailings solids sent underground as backfill	Operations	Monthly
TL-7B	Filtrate from TL-7A	Operations	Monthly
TL-8	Reclaim water pumped from TIA to Mill Process water tank taken from a valve at the discharge end of the reclaim water pump	Inactive	Inactive
TL-9	Detox tailings reactor tank (650-TK-565)	Operations	
TL-10	Water Column in deepest portion of Tail Lake and at a location away from the TIA Reclaim water floating pump house, sampled at surface, mid- depth and near bottom.	Inactive	Inactive
TL-11	Seepage from underground backfilled stopes	Operations	Survey Twice annually
TL-12	Mine Water Discharge Point	Operations during continuous pumping	Weekly
			Monthly
			Daily during periods of discharge

Notes:
(1) 1 As per Schedule J Table 2
(2) 2 Monitored under Groundwater Management Plan (TMAC 2016)

Table 5-2a: Water monitoring at Madrid sites based on Type A Water Licence No. 2AM-DOH1335

SNP Station	Description	Phase	Frequency during Operations and Any Time After Initial Deposit of Tailings to the TIA
MMS-1	Madrid North Contact Water Pond	construction, operations, care and maintenance	Sampled twice annually, Weekly water levels
MMS-2	Madrid South Primary Contact Water Pond	construction, operations, care and maintenance, closure	Sampled twice annually, Weekly water levels
MMS-3	Madrid South Secondary Contact Water Pond	construction, operations, care and maintenance, closure	Sampled twice annually, Weekly water levels
MMS-4A	Fresh Water Intake at Windy Lake North	construction, operations, care and maintenance, closure	Sampled monthly during active pumping periods
MMS-4B	fresh Water Intake at Windy Lake South (Windy Camp)	construction, operations, care and maintenance, closure	Sampled monthly during active pumping periods
MMS-5	Discharge from Madrid South Fuel Storage facility	construction, operations, care and maintenance, closure	Annually. Once prior to every discharge onto the tundra
MMS-6	Bring Mixing Facility	Operations during continuous pumping	Sampled monthly during active pumping periods
MMS-7	Effluent from Madrid North Concentrator to TIA	Operations	Sampled quarterly during active pumping periods
MMS-8	Discharge from Madrid North Fuel Storage facility	construction, operations, care and maintenance, closure	Annually. Once prior to every discharge onto the tundra
MMS-9	Site runoff from sediment controls during construction	construction	Sampled daily during periods of discharge
MMS-10	Mine Water Discharge Point	Operations during continuous pumping	Weekly (Chloride, TDS, Nitrate) and Monthly (remaining parameters)

Table 5-3b: Water monitoring at Madrid sites based on Type B Water License No. 2BB-MAE1727

SNP Station	Description	Phase	Frequency during Operations and Any Time After Initial Deposit of Tailings to the TIA
MAE-01	Madrid North freshwater intake at Windy Lake	Construction, Operations, Closure	Daily during periods of pumping
MAE-02	Madrid South freshwater intake at Patch Lake	Construction, Operations, Closure	Daily during periods of pumping
MAE-03	Freshwater intake at other lakes	Construction, Operations, Closure	Daily during periods of pumping
MAE-04	Madrid North contact water pond	Construction, Operations, Closure	Once prior to every discharge to tundra
MAE-05	Madrid South primary contact water pond	Construction, Operations, Closure	Once prior to every discharge to tundra
MAE-06	Madrid South secondary contact water pond	Construction, Operations, Closure	Once prior to every discharge to tundra

SNP Station	Description	Phase	Frequency during Operations and Any Time After Initial Deposit of Tailings to the TIA
MAE-07	Madrid North fuel storage area sump	Operations	Once prior to every discharge to tundra
MAE-08	Madrid North fuel transfer area sump	Operations	Once prior to every discharge to tundra
MAE-09	Madrid South fuel storage area sump	Operations	Once prior to every discharge to tundra
MAE-10	Madrid South fuel transfer area sump	Operations	Once prior to every discharge to tundra
MAE-11	Quarry G contact water sump	Operations	Once prior to every discharge to tundra
MAE-12	Quarry H contact water sump	Operations	Once prior to every discharge to tundra
MAE-13	Quarry I contact water sump	Operations	Once prior to every discharge to tundra
MAE-14	Windy Lake, immediately downgradient of the Pollution Control Pond Discharge	Operations	Once prior to every discharge and a maximum of two weeks post discharge
MAE-15	Patch Lake, immediately downgradient of the Pollution Control Pond Discharge	Operations	Once prior to every discharge and a maximum of two weeks post discharge
MAE-16	Wolverine Lake, immediately downgradient of the Pollution Control Pond Discharge	Operations	Once prior to every discharge and a maximum of two weeks post discharge

5.3 Discharge Criteria

Effluent discharged will be monitored as applicable and required under the MDMER. MDMER effluent discharge limits are presented in To discharge to Roberts Bay, the MDMER requires that effluent be non-acutely lethal to Rainbow Trout if the effluent salinity is less than ten parts per thousand, or non-acutely lethal to Threespine Stickleback if effluent salinity is equal to or greater than ten parts per thousand, when tested in accordance with the applicable Reference Method. If the effluent salinity is less than four parts per thousand *Daphnia magna* monitoring test must also be conducted.

Table 5-4.

To discharge to Roberts Bay, the MDMER requires that effluent be non-acutely lethal to Rainbow Trout if the effluent salinity is less than ten parts per thousand, or non-acutely lethal to Threespine Stickleback if effluent salinity is equal to or greater than ten parts per thousand, when tested in accordance with the applicable Reference Method. If the effluent salinity is less than four parts per thousand *Daphnia magna* monitoring test must also be conducted.

Table 5-4 Effluent limits during periods of discharge to Roberts Bay

Parameter	Units	***MDMER***
pH		6 to 9.5
Total Suspended Solids	mg/L	15
Total Cyanide	mg/L	1
Arsenic	mg/L	0.5
Copper	mg/L	0.3
Lead	mg/L	0.2
Nickel	mg/L	0.5
Zinc	mg/L	0.5
Radium	Bg/L	0.37

Quarry water samples will be compared against quarry effluent quality limits as stated in Part D Item 18 Water License 2BE-HOP122 and presented in the Quarry Management Plan (TMAC, 2017g).

5.4 Inspections

Routine visual inspections of all water management structures will be completed by site staff to determine whether the facilities are operating as designed and to assess maintenance requirements. Facility inspections are carried out following significant rain events and throughout the annual snowmelt period. Annual geotechnical inspections of all engineered facilities are carried out by the engineer of record. During construction activities, daily visual inspections and inspections after significant rain events, including those associated with freshet, are completed to:

- Monitor for signs of erosion and implement mitigation measures to prevent entry of sediment to any water body;
- Integrity of all piping and other water conveyance structures;
- Signs of erosion or water pooling occurring during high flow periods;
- Volumes of water in the contact water ponds;
- Geotechnical integrity of contact water berms; and
- Integrity of erosion protection at point of discharge to the tundra.

Any irregularities identified during the visual inspection will be recorded and relayed to the Mine General Manager and/or the Engineer of Record for the facility in order to ensure corrective action can be implemented.

5.5 Documentation and Reporting

All monitoring data compiled will be documented and reported as prescribed under the water licence, MDMER, or otherwise. Any data not explicitly requiring monthly reporting under the Water Licence will be reported in the existing Annual Reports to the NWB. These reports will include but are not limited to:

- An assessment of data to identify areas of non-compliance with regulated discharge parameters;
- A summary of all water inputs to the water treatment plant, water treatment plant discharges and discharges to tundra; and
- Annual review of the water balance and water quality predication model.
- Water management facility inspection and operations records will be retained on site and available for review upon request.
- An Annual Geotechnical Inspection Report will be submitted to the NWB annually.
- A Construction Monitoring Report will be prepared in applicable years and submitted to regulators where required. The report will include but is not limited to the following:
- A summary of all inspections conducted during construction; and
- Updated “As-built” drawings of the constructed infrastructure.

5.5.1 Record Keeping

Records of operation and maintenance are required to evaluate the effectiveness of the operation of all water management structures. Daily records include the following information:

- Volume, quality and discharge location of any effluent moved between facilities or discharged to environment; and
- Details of any construction or maintenance undertaken at site.

Record sheets and daily operations or inspection logs are maintained with the Site Services and Environmental Departments.

Results of sampling as presented in Table 5-1 and Table 5-2 are reported to the NWB in conjunction with Annual Reporting.

5.5.2 Monitoring

Monitoring of Doris Lake and Windy Lake water levels will occur under the Aquatic Effects Monitoring Program (AEMP). TIA water levels are monitored and reported in the Annual Geotechnical Inspection Report.

Sediment, pollution control ponds, and contact water ponds will have permanent staff gauges to allow for visual monitoring of water accumulations in each pond. Weekly staff gauge readings converted to volumes will be recorded in for each pond.

All volumes of water movements will be monitored with flow meters, tracked by truck load, or otherwise quantified as appropriate during the transfers. These include, but are not limited to, movements from:

- Discharges to tundra;
- Transfers between pollution control ponds, sedimentation ponds, or contact water ponds;
- Transfers to the TIA;
- Groundwater to the RBDS Pumphouse;
- TIA excess water to RBDS Pumphouse, and
- MMB to Roberts Bay.

Water quality in the ponds, TIA and discharge points will be monitored in accordance with To discharge to Roberts Bay, the MDMER requires that effluent be non-acutely lethal to Rainbow Trout if the effluent salinity is less than ten parts per thousand, or non-acutely lethal to Threespine Stickleback if effluent salinity is equal to or greater than ten parts per thousand, when tested in accordance with the applicable Reference Method. If the effluent salinity is less than four parts per thousand *Daphnia magna* monitoring test must also be conducted.

Table 5-4 herein, the Water Licence and MDMER where applicable. Confirmation of compliance will be required prior to discharging any water from facilities, as applicable. The Environmental Department is responsible for water quality monitoring and compliance reporting.

6 Closure and Care and Maintenance

6.1 Water Management at Closure and Post-Closure

At closure, the remaining inventory of TIA water will be discharged to Roberts Bay. This can be done in one open water season. The small pond behind the North Dam will be filled in and the tailings surface covered, after which it is expected that surface water runoff from the TIA will be suitable to discharge to the Doris system. Water quality criteria in the TIA for discharge to the Doris System will be determined in advance of final closure and in consultation with interested parties. Once the discharge criteria is met, the North Dam can be breached and flow restored to the Tail Lake Outflow. Sampling of the TIA water would be conducted prior to Post-Closure to ensure the North Dam can be breached. This sampling will be outlined in the Final Closure Plan, and would be discussed with relevant parties prior to dam breaching. Following breaching of the dam, water quality will be monitored in accordance with the provisions of the water licence. Post-Closure sampling will be described in the Final Closure Plan and at the time of water licence renewal.

6.2 Care and Maintenance Options

Should the project be placed into Care and Maintenance following tailings deposition in the TIA, compliant water will continue to be discharged to Roberts Bay seasonally to maintain water levels at or below the full supply level. Monitoring will continue as described above and as required under the MDMER.

7 References

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