Baffinland

Baffinland Iron Mines Corporation

BIM-5200-PLA-0009 Surface Water and Aquatic Ecosystem Management Plan

Document Revision Record*

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3/17/2016	4	AV	JM	In support of the 2016 Work Plan
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*For revisions prior to Rev. 4, refer to previous revisions of the Plan.

Item No.	Description of Change	Relevant Section
1	Added section for Surface Water Management for Steensby and Railway	7.3
2	Addition of list of water crossing on Tote Road	Appendix C
3	Addition of Snow Management Plan water quality and sampling requirements	Appendix D
4	Addition of section on Surface Water Management for the KM105 Surface Water Management Facility	Section 8.1.2.5
5	Updated Management Plan ID's	Full Document
6	Addition of Event Based Monitoring	Section 9.8
7	Expanded Groundwater Monitoring Section	Section 9.5

Table of Contents

List of Tables

Lists of Appendices

1. Introduction

As required by Baffinland Iron Mines Corporation's (Baffinland) Type 'A' Water Licence No. 2AM-MRY2540 (Type 'A' Water Licence), issued by the Nunavut Water Board (NWB), the Surface Water and Aquatic Ecosystem Management Plan (SWAEMP) has been updated to reflect current operations at the Mary River Project (the Project). This Plan is a living document and will be revised, as required, based on future work scope modifications and associated approvals and in accordance with Baffinland's Type 'A' Water Licence, Commercial Lease – Q13C301 (Commercial Lease) between Baffinland and the QIA, the Project Certificate No. 005 (Project Certificate) issued by the Nunavut Impact Review Board (NIRB) and any subsequent requirements which may be issued for the Project.

1.1 Purpose

The purpose of this Plan is to outline how potential Project impacts on the quality and quantity of surrounding waters will be managed throughout the lifecycle of the Project. Management processes and procedures include practices implemented at the Project to limit the potential for adverse impacts to receiving waters, aquatic ecosystems, fish and fish habitat. This document details the systems in place to mitigate and manage drainage and runoff at Project facilities, address non-point discharges to surface waters, and assess those discharges in terms of water quality relative to their receiving water systems.

This document identifies the management strategies and general mitigation measures related to controlling sedimentation and erosion effects on aquatic ecosystems. Applicable monitoring programs and roles and responsibilities are identified.

1.2 Regulatory Framework

This Plan outlines the Project's policies and procedures to ensure compliance with the relevant terms, conditions and regulations outlined in the following regulatory instruments:

- Project Certificate No. 005;
- Type 'A' Water Licence (2AM-MRY2540);
- Type 'B' Water Licence (2BE-MRY2131);
- Commercial Lease, and;
- Metal and Diamond Mining Effluent Regulations (MDMER).

Project activities are monitored for compliance with the regulatory instruments listed above. Where it is determined that Project activities fail to comply with the regulatory requirements, further assessment shall be completed to modify activities such that compliance is achieved, or mitigation methods shall be implemented.

1.3 Relationship to Other Management Plans

Project activities may have the potential to affect site water quality, fish habitat, vegetation, and other environmental components. Therefore, this Plan must be viewed in consideration with the following Environmental Management and Monitoring Plans for the Project.

Referenced Management Plan	Document Reference Number	Information Provided by Referenced Plan
Environmental Protection Plan	BIM-5200-PLA-0003	Provides relevant environmental protection measures
Fresh Water Supply, Sewage and Wastewater Management Plan (FWSSWMP)	BIM-5200-PLA-0022	Describes plans for managing fresh water supplies and the disposal of effluents (sewage, oily water and mine contact water)
Aquatic Effects Monitoring Plan	BIM-5200-PLA-0023	Monitors changes in the local aquatic environment from multiple Project stressors (effluent discharges, sedimentation, dust deposition)
Road Management Plan	BIM-5200-PLA-0027	Describes mitigation for managing dust along project roadways and specifically the Tote Road, including the application of dust suppressants
Snow Management Plan (Appended)	BIM-5200-PLA-0006	Includes operational protocols and plans developed to manage freshet's high flows and mitigate freshet's potential negative impacts on surface water quality and associated infrastructure
Sampling Program - Quality Assurance and Quality Control (QA/QC) Plan	BAF-PH1-830-P16-0001	Describes sampling methodologies and related QA/QC measures for sampling and testing water, sediment and effluents

2. Baffinland's Corporate Policies

Baffinland's Sustainable Development Policy (BIM-5000-POL-0005)) identifies Baffinland's commitment internally and to the public to operate in a manner that is environmentally responsible, safe, fiscally responsible and respectful of the cultural values and legal rights of Inuit.

Baffinland's Health, Safety and Environment Policy (BIM-5000-POL-0001)) is the company's commitment to achieve a safe, health and environmentally responsible workplace.

All employees and contractors are expected to comply with the contents of both above mentioned policies, which are included in Appendix A.

3. Targeted Valued Ecosystem Components

Baffinland has identified the following targeted valued ecosystem components (VECs) to serve as indicators subject to this Plan:

- Water quantity;
- Surface water quality;
- Aquatic ecosystems;
- Fish; and,
- Fish habitat.

The protection of regional water quality and quantity is critical to the residents of Baffin Island. Long-term downstream users (i.e., local residents) have not been identified; however, there is potential for incidental water use by hunters and visitors on adjacent lands. Potential effects to fish and fish habitat from either water withdrawal exceedances or compromised water quality and/or quantity have been identified.

Project activities may influence surface water through the following pathways:

- Water intakes required for potable water in camps, dust suppression and construction;
- Tote Road water crossings (i.e. culverts, bridges, etc.) and road maintenance;
- Sewage treatment and disposal at Milne Port, Steensby Port, and the Mary River Mine Site (Mine Site);
- Runoff from waste rock and ore stockpiles;
- Potential surface water runoff generated from developed Project areas; and,
- General site runoff from land disturbances.

A complete matrix of Project interaction with identified VECs is provided in the Project's Amended Final Environmental Impact Statement (FEIS), Volume 7 – *Freshwater Aquatic Environment*.

4. Roles And Responsibilities

Responsibilities for water management and monitoring at the Project are as follows.

4.1 Executive Vice President (EVP) / General Manager

- Reports to the Chief Executive Officer
- Responsible for providing oversight for all Project operations and allocating the necessary resources for the operation, maintenance and management of Project infrastructure.

4.2 Mine Operations Manager / Superintendent

- Reports to the EVP / General Manager
- Provides oversight for all Deposit No. 1 mining operations, including the operation, construction and maintenance of surface water management infrastructure at Deposit No. 1 mining areas, Waste Rock Facility, Run of Mine Ore Stockpile Facility, and along the Mine Haul Road, including culverts, ditches, contact water, surface water management ponds and associated water treatment systems.
- In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods.

4.3 Crushing Manager / Superintendent

- Reports to the EVP / General Manager
- Provides oversight for all ore crushing operations, including the operation, construction and maintenance of surface water management infrastructure at the Crusher Facility, including culverts, ditches, surface water management ponds and any associated water treatment systems.
- In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods.

4.4 Site Services Manager / Superintendent

- Reports to the EVP / General Manager
- Provides oversight for all Site Services operations, including the operation, construction and maintenance of surface water management infrastructure associated with Project service roads, snow stockpiles, and camp laydowns at the Mine Site and Milne Port, including culverts, ditches, surface water management ponds and any associated water treatment systems.
- Responsible for managing water retained in containment areas associated with Project bulk fuel facilities and hazardous materials/waste storage areas, including landfarm and landfill facilities.
- In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods.

4.5 Road Maintenance Manager / Superintendent

- Reports to the EVP / General Manager
- Provides oversight for all Road Maintenance operations, including the operation, construction and maintenance of surface water management infrastructure for the Tote Road that runs between Milne Port and the Mine Site, including culverts, bridges, ditches and swales and snow stockpiles.
- In communication with the Environment Department, develop response plans to possible erosion and sediment issues from freshet and severe weather periods.

4.6 Environment (Sustainable Development) Department

- Support the management of the Project's surface water management infrastructure by advising operational departments and obtaining the appropriate regulatory approvals for necessary changes and modifications.
- Advise operational departments on the implementation of the appropriate controls to manage surface water flows and effluents at the Project, including the implementation of sedimentation and erosion controls outlined in Section 6 of this Plan.

- The on-site Environment Department will have the lead role in conducting and managing all on-site aquatic effects monitoring programs at the Project, discussed in Section 9 of this Plan.
- Conduct inspections and monitoring to ensure compliance with applicable regulations and commitments.
- Report incidents to senior management and the appropriate regulatory agencies and stakeholders.
- Provide training sessions to operational departments on the appropriate mitigation measures and strategies for managing surface water flows and effluents at the Project.
- Taking a lead on planning and implementing an annual MDMER Emergency Response Plan exercise with Mine Operations and/or Crushing departments.
- The on-site Environmental Superintendent, in concert with the corporate Sustainable Development team, is responsible for data management and reporting related to surface water management and monitoring.

4.7 All Departmental Supervisors

- Report to their respective Departmental Manager / Superintendent
- Responsible for reading and understanding applicable sections of this Plan and directing departmental personnel on the appropriate mitigation measures and strategies for managing surface water flows and effluents in their Project area.
- Report any visual observations, or reports, of erosion and sediment issues to the Environment Department.
- Assist in implementing appropriate erosion and sediment control measures.

4.8 All Project Personnel

- Responsible to comply with the requirements of this Plan in the management of surface water flows and effluents at the Project.
- Report any visual observations of erosion and sediment issues to their respective supervisors.
- Assist in implementing appropriate erosion and sediment control measures.

5. Regional Landscape, Climate and Hydrology

The Qikiqtani Region is characterized by long cold winters and short cool summers, with continuous daylight from approximately May to August, and continuous darkness from November through February.

5.1 Regional Landscape, Climate and Hydrology

The Project lies within the zone of continuous permafrost, with an active layer thickness of up to two metres and a permafrost depth that may be as much as 610 m deep, based on extrapolation from temperature gradients measured in a 400 m-deep thermistor-instrumented drill hole located on site (Baffinland, 2012; Volume 3). The presence of permafrost greatly increases ground stability at depth but at surface it can affect the rates of soil erosion through the formation of ice wedges and patterned ground, pingos and palsas, massive ground ice, thermokarst, and mass wasting (i.e. solifluction).

Regional data near the Project indicate a mean annual temperature of approximately -15°c. The frigid temperatures result in very low precipitation values for northern Baffin Island due to the combined effect of the low moisture carrying capacity of cold air and the scarcity of liquid water throughout much of the year. According to Natural Resources Canada, the mean annual total precipitation ranges from 200 to 400 mm in the Project area, classifying it as semi-arid (Baffinland, 2012; Appendix 5A).

The extreme temperatures of the region, combined with permafrost ground conditions, result in a short period of runoff that typically occurs from June to September, extending into October in watersheds with significant lake surface areas. All rivers and creeks, with perhaps the exception of the very largest systems, are frozen solid to the bottom during the winter months. The peak runoff period is quite short, and the volume of the annual hydrograph is low, relative to the rest of Canada, due to the region's very low average annual precipitation (Baffinland, 2012; Appendix 7A). However, the proportion of annual precipitation

that is realized as runoff is very high, due to low temperatures (low evaporation), permafrost ground conditions (low infiltration), and minimal vegetative cover (minimal uptake by plants). Extremely limited “groundwater” flow is restricted to the upper one to two metres within the summer active layer.

Peak instantaneous flows are significant due to frozen ground conditions and the lack of tall vegetation to provide subsurface root systems. This in turn produces very rapid basin runoff response. In larger watersheds, peak instantaneous flows are typically produced by snowmelt during the freshet, but in smaller watersheds (less than a few hundred square kilometres) rainfall, or rain on snow, may produce the largest events and may occur at any time during the non-freeze period. Flood water levels in the smaller watersheds typically rise and fall very quickly with run-off response (Baffinland, 2012; Appendix 7A).

Baffinland continues to conduct hydrology monitoring at the Project, as required by the Project Certificate (conditions regarding the AEMP) and Type ‘A’ Water Licence. Details on the ongoing hydrology monitoring conducted at the Project are provided in Section 9 of this Plan.

5.2 Implementing Erosion and Sediment Control Measures in the Arctic

A greater level of understanding of the unique site conditions that influence the selection of appropriate sediment and erosion control measures has been achieved through the ongoing construction and operation of the Project. Influences from climate, topography, and limited vegetation combine to produce short-term, high intensity discharges throughout May, June, and July. Due to the impeded vegetation growth rate, sediment and erosion control techniques that involve vegetative covers (i.e., hydro seeding and the use of erosion control blankets) have been dismissed as potential mitigation options. Additionally, ESC measures that contain untreated vegetative products such as straw and hay bales are not permitted at the project due to the possibility of introducing foreign species, unless they are certified “weed free”.

6. Mitigation Measures

6.1 General Erosion and Sedimentation Mitigation Measures

Ongoing construction and operations at the Project have the potential for soil disturbance and water diversions requiring sediment and erosion control planning to manage site contact water. Best management practices and adaptive management strategies, including preventative measures, shall be implemented throughout the lifecycle of the Project. The following section outlines the general measures used to mitigate potential environmental impacts arising from site contact water.

Monitoring of Project stream and river crossings, lakes and ponds adjacent to construction and operational areas will be completed during the life of the Project as outlined in Section 9 of this Plan. Subject to site-specific conditions, a variety of civil design structures or additional controls may be required to prevent localized erosion.

The deposition of debris or sediment into or onto any water body during any activity, including the construction of access roads, site laydown pads and areas of other earthworks, is prohibited. To prevent sedimentation into adjacent water bodies, stockpiling of debris must take place at a distance greater than 31 m from the ordinary high-water mark of nearby water bodies. In addition, removal of material below the ordinary high-water mark of any water body is prohibited, unless otherwise approved by the NWB.

All Project infrastructure and activities that have the potential to influence any watercourse (i.e., culvert modifications, diversion of watercourses, modifications to the Milne Inlet Tote Road, development of Steensby, and other areas of the Project site), will be designed and constructed in a manner that is consistent with the approach presented in the FEIS and the conditions of existing or future permits and authorizations. Construction and operational activities are prohibited

from preventing and/or restricting the movement of water in identified fish bearing streams and rivers without the appropriate approvals.

Prior to the development of new water related infrastructure and/or facilities, Baffinland will conduct an assessment to ensure sensitive landforms are not negatively impacted (i.e., ice-rich soils or easily erodible soil). Where it is determined that the infrastructure and/or facility developments will not negatively impact sensitive landforms, Baffinland will continue to ensure that all regulatory requirements are met.

6.2 Surface Material Management

The removal of surface material in Arctic regions can cause the underlying permafrost to melt and result in the pooling of water, destabilization of landforms and sedimentation and erosion issues. To mitigate possible permafrost degradation from surface material removal, the following measures will be implemented throughout the Project.

- Removal of surface material should be avoided where possible to reduce permafrost degradation and will occur only at approved locations;
- Areas will be graded by filling in low areas rather than cutting into high areas, where feasible;
- Pooling water will be diverted from low-lying areas through constructed drainages or pumping;
- The grade of low-lying areas with pooling water resulting from the removal of surface material will be restored with material from other construction projects when possible;
- Erosion control will be evaluated for areas where removal of surface material is required;
- Use of insulating material or erosion control material, such as concrete fabric or riprap, will be utilized to reduce erosion and potential permafrost degradation, as required;

- Fill material placed below 31m of the high-water level mark, where specifically authorized, will be either erosion resistant or protected from erosion and only clean fill will be used; and,
- No waste material resulting from work activities will be left in a manner such that it can enter the water (e.g., by being left on the ice).

Additional guidance for managing surface material and mitigating permafrost degradation is provided in Baffinland's EPP (BIM-5200-PLA-0003), Steensby Construction EPP (BIM-5200-PLA-XXXX), and Borrow Pit and Quarry Management Plan (BIM-5200-PLA-0025).

6.3 Erosion and Sedimentation Controls

Table 6-1 outlines the sedimentation and erosion controls used at the Project. These controls may be used alone or in combination to achieve a more effective control. Furthermore, the installation and inspections of Erosion and Sedimentation Controls will be monitored by a designated inspector of erosion and sediment controls.

Table 6-1 Sediment and Erosion Controls

Armouring and Riprap	
Description	A rock lining used as a barrier between water flow and materials that are susceptible to erosion. Quarry rock and/or naturally occurring granular borrow material are used to protect underlying fine-grained material from scour and erosion.
Installation Locations	In areas of cuts and/or excavations and on exposed erodible slopes i.e. on the upstream and downstream ends of culverts. May also be installed at locations where existing flows may cause erosion of the present surface materials, specifically where flows may become concentrated.
Substitute	Water diversion, berms, sumps and/or silt fencing may be used where armouring is not practical or where there is low risk of impacts to downstream receptors.
Performance Issues/ Limitations	Potential limited material in various sizes available. Limited suitability for certain higher slope grades.
Benefits	Materials are local and are an effective long-term solution for preventing erosion and re-suspension of susceptible fine-grained materials. They may also be installed over non-woven geotextile (see below) to provide additional protection.

Gabion Baskets	
Description	Metal wire baskets filled with rip rap are used for slope stabilization by armoring the existing bank where erosion is weakening the slope.
Installation Locations	Eroding slopes and embankments that require stabilization to stop erosion.
Performance Issues/Limitations	Requires a lot of manpower, material and equipment to fill and install each gabion basket.
Benefits	Gabions can withstand strong erosion forces, providing significant stabilization to eroding slopes.

Concrete Fabric	
Description	Flexible concrete impregnated fabric installed along a ground surface or structure to prevent erosion of the underlying material and/or sediments. Rolled out at desired location and sprayed with water to set impregnated concrete.
Installation Locations	Installed in swales, ditches and areas with concentrated flows as well as along embankments and slopes.
Substitute	Riprap coupled with geotextile
Performance Issues/Limitations	Expensive. Large installations require heavy equipment for installation. Installation issues in colder temperatures.
Benefits	Permanent solution to control erosion and sedimentation. Quick installation with concrete achieving 80% strength within 24 hours. No mixing plant or equipment required.

Geotextile – Woven and Non-Woven	
Description	Low erodible lining material installed for temporary erosion control.
Installation Locations	Along stream embankments, water channels and/or ditches.
Performance Issues/Limitations	Required to be securely anchored and properly keyed-in in order to be effective. Installed material is difficult to remove when it is no longer required.
Benefits	Easy to install and an effective erosion barrier that can be installed along a variety of embankments.

Polyacrylamides/Flocculants	
Description	Sediment and Turbidity Control Applicator Logs are solid form flocculants that are placed directly in the impacted watercourse to efficiently bind to particulate matter causing it to settle out providing clarification. Flocculants can also be used as an additive to surface water management ponds or sumps (temporary or permanent).
Installation Locations	Along stream embankments or directly in impacted channels and/or ditches. Product can also be used to settle out suspended sediment in dedicated/temporary surface water management ponds/sumps as required.
Performance Issues	Performance issues in colder temperatures.
Benefits	Cost effective.

Silt Fence	
Description	Woven geotextile or fabric barrier that impedes the flow of surface water which potentially may cause suspended solids to be deposited upstream of installation. Typically supported using rebar (secured to the fabric) and may be placed using methods such as digging a trench and backfilling material to ensure stability. Attempts are made to install silt fence in lines of equal elevation (along contour lines) to prevent flow channelling. Standards for installation including trench excavation, insertion of fabric, and backfilling and compacting.
Installation Locations	Used in areas where surface water could potentially come into contact with disturbed sites causing elevated suspended solids. Typical installation locations are: Downstream of drilling activities Along roads where surface runoff is expected Surrounding stockpiles of material or drill cuttings
Performance Issues	Not permeable enough to be placed in streams with greater higher flows. Difficult to install rebar and dig trenches due to frozen ground conditions, weight and susceptibility to wind. Silt fence with wooden stakes may not be durable enough for installation in Arctic conditions. Annual snow management activities at culvert inlet/ outlets prevent predictive, preventative installations in the fall in anticipation for freshet.
Substitutes	Coir logs, spring berms, sand bags.
Benefits	Effective in shoreline construction work where they are used to surround the installation of culvert crossings installed during open-water conditions. Can be used as diversion barriers around erosion prone areas and as flow impediment. Can be installed in a diagonal, staggered formation to create meanders and slow flow in higher velocity waters that would otherwise flow over a silt fence if installed across the flow.

Diversion/Collection Channel or Berm	
Description	Diversion/collection channels or berms are used to locally direct surface water runoff. Constructed using suitable materials to divert the surface water without causing erosion or suspension of additional sediment. Additionally, collection channels or berms may be constructed to collect runoff emerging from an area of soil disturbance or source of contamination. Also, used to ensure runoff is directed to a constructed mitigation measure such as an in-ground sump.
Installation Locations	Used in locations where diversion and/or collection of surface water is required. Diversion structures are installed to prevent runoff from entering a site where the surface soil has been disturbed and would cause suspension of sediment, or has been impacted in any way that would impact water quality. May be constructed to collect runoff emerging from an area of soil disturbance.
Performance Issues/ Limitations	Permeability of the berms may be too high depending on material size availability. Surface material of the channel or berm must not contain fine grained material that could contribute to additional suspended solids.
Substitute	Silt fences can be used as an alternative to construction of a channel or berm for lower flows.
Benefits	Effective method to direct runoff to a constructed mitigation measure such as an in-ground sump.

Check Dams	
Description	Constructed to slow surface runoff flows and create pooling to allow for suspended sediment particles to settle out. Designed to allow water to slowly flow through or over the check dam. Constructed using larger aggregate for the base, geotextile liner on the upslope side, and smaller aggregate to cap the berm.

Check Dams	
Installation Locations	Across small valleys, natural depressions or ditches where there is surface runoff.
Performance Issues/ Limitations	Potential limited material available in the various sizes required. Requires maintenance to excavate sediment build-up on the upslope side.
Substitutes	Containment Berms coupled with pumping.
Benefits	Surface water flow directions are unaltered. Sediment has time to settle out before reaching the receiving environment.

Containment Berm	
Description	Constructed to establish a sump, basin or pond to contain or collect water. The sump could be used to contain discharge water to allow settling of sediment before discharge or to temporarily contain the water for re-circulation (i.e., drilling activities). Constructed using native soils or acceptable man-made products which are nominally compacted to provide strength for the structure. Berm heights are minimized (typically <1 m).
Installation Locations	Across small valleys or around natural depressions to augment the capacity of the low-lying terrain.
Performance Issues	Care must be taken when constructing berms to ensure the base is on a solid foundation. Pumping required for a controlled discharge of the berm. Permeability of the berm may be too high depending on material size availability.
Substitutes	In-ground sumps or portable containment sumps or tanks can be used in place of a containment berm.
Benefits	Effective structure in forming sumps, basins or ponds to contain water and settle out suspended solids prior to discharge or reuse.
In-Ground Sump	

Containment Berm	
Description	Constructed to establish a sump, basin or pond to contain or collect water, similar to the containment berm. Constructed by excavating a depression into soil to provide water containment.
Installation Locations	Used in areas where excavation of soil is possible and other control measures are impractical or ineffective.
Performance issues/ Limitations	Requires regrading of the excavated area when the sump is no longer needed to restore natural drainage patterns. Flows from the active layer in the ground may enter the sump, requiring management of additional water.
Substitutes	Containment berms, or portable containment sumps or tanks can be used in place of an in-ground sump.
Benefits	Excavated material from the sump can be used to construct a containment berm surrounding the sump to augment the capacity of the sump.
Portable Containment Sump	
Description	Used to establish a sump to contain water from a source such as a drill rig. Where required, can be connected together in a series to provide additional containment or settling capacity if required. Collected sediment or drill cuttings from the portable containment sumps are removed from the sumps as necessary and disposed of in pit locations approved by Baffinland management and located at distances of at least 31 m from water bodies.
Installation Locations	Used in areas where containment berms or in-ground sumps are impractical such as steep topography or in areas where overburden is not readily available.
Substitutes	Containment berms or in-ground sumps can be used in place of a portable containment sump.
Benefits	Requires minimal excavation or construction to provide a level base for the sump.

Geotubes	
Description	A woven tube of geosynthetic fabric into which water is pumped to filter out and remove suspended solids in impacted water. Water pumped into the tube diffuses through the geosynthetic fabric across the length of the tube. Popular water treatment option for dewatering projects. Can be combined with Polyacrylamides/Flocculants to improve the sediment collection performance of the geotube.
Installation Locations	Installed downstream of a pump on ground that is not erosion prone to prevent erosion and the suspension of sediments downstream of geotube.
Performance issues/Limitations	Non-passive water treatment method. Requires active pumping. Effectiveness limited by a maximum influx/pumping rate. Limited by the geotube material pore size in comparison to targeted sediment particle size and the physical area available for geotube placement
Substitutes	Containment berms, portable containment sumps or tanks and/or chemical treatment can be used in place of a geotube to settle out suspended solids.
Benefits	Easy to deploy, inexpensive compared to chemical treatment or water filtering options. Can also be used as a containment berm to augment the capacity of a sump or temporary surface water management pond.

Bag Filters	
Description	Water treatment method where bag filters installed in line during active pumping filter out suspended solids.
Installation Locations	Installed in the discharge line to filter out suspended solids before the water is released to the receiving environment.
Performance issues/Limitations	Ineffective once they become clogged with sediment, and require regular replacement and disposal. Requires monitoring of inlet pressures to ensure filters are changed. Limited by the filter pore size in comparison to targeted sediment particle size.

Bag Filters	
Substitutes	Geotubes, containment berms and portable sumps.
Benefits	Suspended sediments are captured in the bag filter, enabling both sediment removal and easy disposal of the sediment.
Spring Berms	
Description	Made up of a loose spring/coil covered with a geosynthetic fabric for filtering turbid water and removing suspended sediments.
Installation Locations	Across small channels and/or shallow outlets of in-ground sumps or ponds.
Performance issues / Limitations	Limited by the berm material pore size in comparison to targeted sediment particle size.
Substitutes	Silt fences or containment berms can be used in place of a spring berm.
Benefits	Easy to deploy, low cost and effective when combined with other mitigation measures.

Coir Logs	
Description	Coir fibre rolls constructed from coconut husks for filtering turbid water and removing suspended sediments.
Installation Locations	Across small channels and/or shallow outlets of in-ground sumps or ponds.
Performance issues / Limitations	Ineffective once when they become clogged with sediment. Heavy when wet and full of sediment, impeding effective removal.
Substitutes	Silt fences, spring berms.
Benefits	Natural, biodegradable option for removing suspended sediments. Minimal resources required for installation.

Floating Silt Curtains	
Description	Floating panels/sections made of geosynthetic fabric used to contain and limit the spread of turbid water in low flow environments (i.e. lakes, marine environment). Suspended vertically in the water column using floats and weights on the top and bottom of each section, respectively. Additional anchors used on shore to fix silt curtain in place.
Installation Locations	Installed in low flow environments such as stream/lake outfalls or in open water for large construction projects.
Performance issues/Limitations	Limited to low flow environments. Cannot be used to treat suspended solids in high flow environments (i.e. rivers, large streams). Effective deployment of multiple sections for large construction projects requires a significant level of knowledge, expertise, equipment and manpower.
Substitutes	None.
Benefits	Effective at containing turbid water/suspended solids in low flow/ open water settings. Able to connect multiple panels together for large scale construction projects (i.e. marine docks) or use single sections for small scale sedimentation control at stream/lake outfalls.
Molecords	
Description	Strips of fabric made of chenille fibers engineered to ensure rapid adhesion to particulates and suspended solids in turbid water. Turbid water streams are directed through draped sections of partially submerged molecords to remove suspended solids and particulates in impacted water.
Installation Locations	Used in multiple applications. Typical setups involve pumping turbid water through a series of molecords draped over a holding tank to remove particulates in turbid water.
Performance issues/Limitations	Limited effective lifespan. Must be replaced regularly based on particulate levels in impacted water streams requiring treatment.
Substitutes	Chemical treatment (i.e. flocculants)

Floating Silt Curtains	
Benefits	Effective alternative to chemical treatment. Effective at removing particulates without changing water chemistry. Easy to deploy.

6.4 Erosion and Sedimentation Mitigation Measures at Water Crossings

Culverts that are installed along water crossings shall meet the following criteria:

- Install culverts at the same slope as the existing stream, where feasible;
- Minimize culvert lengths;
- Culverts with lengths that exceed 50 m may be considered barriers to fish passage due to darkness. Examine and consider methods to provide light inside culverts, where applicable;
- Compare culvert velocities to the velocity in the existing watercourse to determine fish passage potential. This information can be used to reassess design velocities under proposed conditions with the culvert installed; and
- With the channelization of flows and conveyance in culverts, the velocity of the flows may increase. This may be mitigated by placing rocks and boulders or manufactured culvert baffles inside the culverts (stream replication) to provide greater friction, thereby reducing velocities and increasing the flow depth and to provide resting locations for fish. Boulders may be bolted into place.

Table 6-2 outlines the mitigation measures implemented at the Project to control sedimentation and erosion at Project water crossings.

Table 6-2 Control Measures at Water Crossings

Pumping	
Description	Pumps are used to transfer water from one side of the road/structure to another.
Installation Locations	At crossings where culverts are not installed, incorrectly installed, blocked, or not allowing sufficient flow. Pumping is required prior to culvert installation for dewatering. Pumps may also be used as a temporary solution during freshet or prior to culvert installation.
Performance Issues/Limitations	Ineffective during high flows. Erosion control measures are required at pump discharge points. The associated risk of fuel spills requires secondary containment. Temporary solution requiring additional resources. Additional considerations and mitigation measures (e.g. fish intake screens) are required in conjunction with pumping for fish bearing watercourses.
Substitutes	Siphons can be used as an alternative, but require a pump to prime the system and sufficient slope between upstream and downstream locations.
Benefits	Effective temporary solution to lower water levels in places where water levels are high or prior to culvert installation. Also, useful at low flow locations where culverts have not been installed.

Culvert	
Description	Pipes installed through embankments to allow the passage of water while maintaining access over the site. The size and/or number of culverts required for installation is determined by a hydraulic design study, conducted to assess suitable hydraulic design criteria to avoid flooding or washouts. Culvert flow capacities are assigned using hydraulic analysis methods assuming an appropriate return period with allowance for ice accumulation. Permitting process may be required for watercourses where authorizations are required depending upon watercourse classifications.
Installation Locations	At points where roads intersect streams, rivers or seasonal drainages (freshet) or at locations where there is potential for water to flow over roads.
Performance Issues/Limitations	Potential for siltation during installation. Requires labour, equipment and materials (compacted backfill) for proper installation. Concentration of flows cause potential for erosion at downstream discharge points. Increased velocities may prevent fish passage upstream through the culvert. Culverts may become perched, requiring installation of fish ladders. Clearing of snow and/or ice prior to spring freshet is required to minimize the potential for blockages, however also has the potential for damaging culvert mouths if not adequately marked
Benefits	High flow capacities can be achieved depending on culvert selection. Culverts also permit fish passage under roads where crossings have been identified as fish habitat.

French Drain	
Description	A ditch or channel filled with rock to provide a flow path for water. The rock material can be covered with a non-woven geotextile to prevent the ingress of finer material which could reduce the permeability of the drain.
Installation Locations	At points where roads intersect streams/drainages and where fish passage is not a consideration. May be used as an alternative for a culvert if culverts are not available.
Performance Issues/Limitations	Ice blockage potential in French drains has not been adequately assessed. Long-term performance has not been assessed. Susceptible to blockage by siltation. Design capacity is not as well defined as those for a culvert. Clean rock fill is critical to the performance of the French Drain.
Benefits	Constructed of natural local and/or local materials.
Bridge	
Description	Bridges are required for the crossing of larger streams or rivers where culvert crossings are not feasible. The installation of bridges requires hydraulic design studies undertaken to evaluate suitable hydraulic design criteria to avoid flooding or any unexpected damage to the adjacent ground.
Installation Locations	Bridge locations are assessed using a river hydraulics analysis assuming an appropriate return period with an allowance for ice accumulation. Typically rest on foundations constructed on either side of the watercourse. Typically installed at locations where hydraulic efficiency, fish habitat, and/or fish passage are considered important.
Performance Issues/Limitations	Permitting process may be required for watercourses where authorizations are required depending upon watercourse classifications. Possibility for sediment on the bridges from vehicle crossings to build up and release into the water, requiring routing maintenance to ensure the platform prevents this release.

French Drain	
Benefits	Can maintain the original stream width (assuming no mid-stream support columns) and streambed materials, and has increased hydraulic efficiency.

Arch Culvert	
Description	A culvert consisting of an arch with an open bottom such that native streambed is exposed. Arch culverts typically rest on foundations constructed on either side of the watercourse.
Installation Locations	Typically installed at locations where hydraulic efficiency, fish habitat, and/or fish passage are considered important.
Performance Issues/Limitations	Reduced potential for siltation during installation as water diversion structures are typically not needed. Requires labour, equipment and materials (compacted backfill) for proper installation. Clearing of snow and/or ice prior to spring freshet is required to minimize the potential for blockages.
Benefits	Maintains the original stream width and streambed materials and has increased hydraulic efficiency.

Armouring	
Description	Used as a barrier between water flow and roadside material. Clean quarry rock and/or clean naturally occurring granular borrow material are used to protect underlying fine-grained material from scour and erosion around crossings. May be combined with an underlying non-woven geotextile.
Installation Locations	Around culvert inlet/ outlets, typically on exposed erodible slopes.
Benefits	Effective long-term solution for preventing erosion and re-suspension of susceptible fine-grained materials from runoff into crossings.

Temporary Steel Pipes	
Description	Temporary steel pipes may be installed to limit water interaction with site infrastructure and roads during the freshet period and severe weather events.
Benefits	This is an effective measure to limit sediment and erosion issues short term.

6.5 Mitigation Measures for Fish and Fish Habitat

The following subsections discuss the mitigation measures implemented at the Project to protect fish and fish habitat.

6.5.1 Freshet Mitigation

Extreme flows occurring during freshet can result in significant erosion and damage to water crossing structures. Operational procedures and plans, including the Snow Management Plan (BIM-5200-PLA-0006), and the Roads Management Plan (BIM-5200-PLA-0027), have been developed to manage freshet's high flows and mitigate freshet's potential negative impacts on surface water quality and associated infrastructure. Project procedures and plans include the following measures:

- Physically marking fish-bearing water crossings so that they can be easily identified in the spring, prior to snow/ice melt where feasible;
- Clearing snow from roads adjacent to water crossings and stockpiling snow in approved locations as outlined in the Snow Management Plan (BIM-5200-PLA-0006);
- Monitoring snow stockpiles during freshet as outlined in the Snow Management Plan (BIM-5200-PLA-0006);
- Monitoring culverts for clearance of snow and ice prior to the onset of freshet;
- Re-establishing flows by removing snow and ice blockages through excavation and steaming prior to, and during, freshet;
- Implementing the appropriate erosion and sedimentation mitigation measures, as outlined in Section 6.2 and 6.3 of this Plan;
- Ensuring sufficient fish migration passage through routine monitoring and mitigation; and,
- Monitoring Project water crossings and completing the appropriate repairs/modifications.

6.5.2 Fish Protection

Fish and fish habitat are present throughout streams and water bodies near Project infrastructure and have been identified as an important VEC for the Project. As such, several operational protocols and plans, including the Snow Management Plan (BIM-5200-PLA-0006), Dust Mitigation Action Plan (Golder, 2016) and Sedimentation Mitigation Action Plan (Golder, 2016), have been developed to prevent and mitigate negative impacts on fish and fish habitat at the Project. Project protocols and plans include the following measures:

- Construction of rocky ramps at locations where scour and erosion at culvert outlets are problematic;
- Monitoring Project water crossings and completing the appropriate repairs/modifications to improve fish passage;
- Maintaining the natural channel width within crossing structures as much as possible;

- All fill placed under and around culvert will be clean and devoid of organics and silt;
- Adhering to the Fisheries and Oceans Canada (DFO) guidance "Guidelines for Use of Explosives in or Near Canadian Fisheries Waters, 1998" for work in or near fish bearing water, where feasible[1];
- Using silt curtains to prevent the dispersion of sediments during work activities in/near marine waters (dredging, piling, backfilling) and/or freshwater lakes;
- Ensuring compliance for Project activities with the No-Net-Loss principle (DFO, 2001) to prevent or mitigate direct or indirect fish and fish habitat losses;
- Continued implementation of the Dust Mitigation Action Plan (Golder, 2016), Sedimentation Mitigation Action Plan (Golder, 2016) and Tote Road Earthworks Execution Plan (TREEP; Golder, 2017;)to address surface water drainage and water quality concerns at Project sites and mitigate potential impacts to fish and fish habitat;
- Continuing crossing remediation as identified by Fisheries and Oceans Canada;
- Implementing the appropriate erosion and sedimentation mitigation measures, as outlined in Section 6.2 and 6.3 of this Plan;
- Culvert maintenance will be planned outside of the restricted activity window, June 30 - September 1, where there is water flowing and spawning habitat is present or at sites where fall spawning movements are occurring to avoid effects on Arctic Char spawning and egg incubation. If unplanned culvert maintenance is required during this restricted activity window, the DFO will be consulted if instream work is required for applicable in-water work guidelines. Culverts will be isolated from flow prior to construction work;

[1] At locations where compliance with the DFO guidelines cannot be achieved, consultation with DFO will take place prior to blasting. Consultations with DFO and the QIA may be required to identify Project specific thresholds for blasting that would exceed the requirements of DFO Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters.

- If dewatering is required, salvage fish prior to dewatering and release to adjacent surface waters; if water is pumped from within a cofferdam prior to fish salvage, screens meeting criteria set out by DFO will be used;
- Design mitigation for potential effects of increased flows on fish habitat include channel widening, regrading, construction of habitat features (in fish bearing streams), and channel stabilization;
- All water intake hoses shall be equipped with a screen of an appropriate mesh size (as approved by the DFO) to ensure that fish are not entrained. Additionally, operators will ensure the water intake hoses withdraw water at such a rate that fish do not become impinged on the screen. Additional guidance regarding fish screens on water intakes is provided below; and,
- In developing Project quarries, efforts are made to ensure that a minimum 100 m naturally vegetated buffer between the high-water mark of any fish-bearing water bodies and any permanent quarries with potential for acid rock drainage or metal leaching is maintained.

6.5.3 Operating Equipment in and Near Water

Surface water runoff from areas of intense vehicular activity is susceptible to contamination from minor spills and/or leakage of machinery and equipment. Additionally, machinery and equipment can cause inadvertent sedimentation and/or erosion. As such, the following mitigation measures will be followed to minimize potential impacts:

- Machinery will arrive at site in a clean condition and free of fluid leaks, invasive species and noxious weeds;
- Erosion and sediment control measures will be implemented prior to the start of any construction and maintained until all disturbed ground has been permanently stabilized;
- Measures for managing water flowing onto the site, as well as water being pumped/diverted from the site, will be implemented such that sediment is filtered out prior to the water entering the waterbody (e.g., by discharging water to a vegetated area or to an area further from a waterbody);
- No waste material resulting from work activities will be left in a manner such that it can enter the water;

- Machinery will be refuelled and serviced, and fuel and other materials will be stored at least 31 m from the high-water mark; and,
- Limit fording of the watercourses by machinery to a one-time event (i.e., over and back), and only if no alternative crossing method is available. If repeated crossings of the watercourse are required, a temporary crossing structure may be constructed; and,
- Temporary ice crossings used in the winter season will follow the DFO Code of Practice: Ice Bridges and Snow Fills and have all sediment and impacted snow removed from the crossing prior to spring freshet, and the surface of the ice scarified to promote breakup.

7. Surface Water Management

The following subsections describe how surface water runoff is managed at Milne Port, Steensby Port, the Mine Site, and along the Tote Road, with the exception of mining operations. This section describes general surface water management for infrastructure not directly associated with the mining operations such as access roads, waste management facilities, laydowns and accommodation complexes. Refer to Section 8 of this Plan for information on the surface water management strategies associated with Deposit No. 1 mining operations.

Water balance and general site drainage/monitoring figures for the Project's Milne Port and Mine Site have been developed and are presented in Appendices B and C respectively.

7.1 Milne Port and Mine Site

Key activities at Milne Port focus on managing ore transported to the Port from the Mine Site and materials and equipment received annually by conventional sealifts. During the open-water season (July – October), stockpiled ore is loaded onto ore carrier vessels for shipment while materials and equipment received by sealift vessels are unloaded using barges. Equipment and materials received from sealift vessels are placed in designated laydowns at Milne Port or transported overland by trucks to the Mine Site via the Tote Road. The Mine Site is located approximately 100 km inland from Milne Port. Main activities at the Mine Site include the management of the Project aerodrome, waste management facilities, and the mining, crushing and hauling of ore from the Nuluujaak Pit at Deposit No. 1.

7.1.1 Impacts on Surface Water

Surface water runoff from areas of intense vehicular activity is susceptible to contamination from minor spills and/or leakage from machinery and equipment. Mitigation measures identified in Section 6 of this Plan will be implemented at these sites to divert non-contaminated surface runoff away from these areas

which will minimize the potential for contamination. Surface water suspected to be impacted by hydrocarbons will be addressed using spill response absorbents and/or by transporting impacted surface water to containment areas, such as the Milne Port Landfarm Facility east cell (MP-04A; refer to Section 7.1.2) or the Mine Site Hazardous Materials Containment Area 7 (MS-HWB-7) for temporary storage and subsequent treatment and discharge using the Project's mobile Oily Water Treatment System (OWTS).

Storage of hazardous materials (e.g. fuel) are contained within approved impermeable containment areas (lined with geomembranes). As required by the Type 'A' Water Licence, water within containment areas (e.g. bulk fuel storage facilities, surface water management ponds, etc.) will be sampled and demonstrated to be in compliance with the relevant water quality discharge criteria prior to being discharged to the receiving environment.

7.1.2 Milne Port Landfarm Facility

The Milne Port Landfarm Facility (Landfarm Facility) is described in detail in the FWSSWMP (BIM-5200-PLA-002). Water treated by this facility will be monitored and treated as outlined in the FWSSWMP (BIM-5200-PLA-0022) to ensure effluent quality criteria in Baffinland Type 'A' Water Licence is met.

Mitigation measures include routine inspections of the facility to ensure surface water infrastructure, such as the ditching and berms, are operating as designed. Refer to the FWSSWMP for additional information on the water treatment processes approved for project effluents.

Mitigation measures for the landfarm are described in the Landfarm Operation Maintenance and Monitoring Manual (BIM-5200-PLA-0001).

7.1.3 Milne Port Ore Stockpile Facility

The Milne Port Ore Stockpile Facility (Ore Stockpile Facility) is equipped with surface water management ponds to manage and monitor runoff retained within its footprint. Surface water runoff is directed to the surface water management ponds by a network of ditches that run along the Ore Stockpile Facility's perimeter. Water treated by this facility will be monitored and treated as outlined in the FWSSWMP (BIM-5200-PLA-0022) to ensure applicable effluent quality criteria in Baffinland Type 'A' Water Licence is met.

Mitigation measures include routine inspections of the facility to ensure surface water infrastructure, such as the ditching and berms, are operating as designed. Refer to the FWSSWMP for additional information on the water treatment processes approved for project effluents.

Mitigation for managing dust originating from stockpiling activities is presented in the AQNAMP (BIM-5200PLA-0005).

7.1.4 Landfill Facility

The Mine Site Landfill Facility is located just south of the NE Basin of Sheardown Lake. Both facility monitoring stations, MS-MRY-13A and MS-MRY-13B, are sampled monthly during the open water season and are situated on a small stream down gradient of the Landfill Facility. The small stream drains into the NE Basin of Sheardown Lake on its southern shoreline. All runoff and seepage from the Landfill Facilities at Monitoring Stations MS-MRY-13A and MS-MRY-13B may not exceed the Effluent quality limits listed in Table 7 of the Type 'A' Water License. Mitigation measures related to the landfill are addressed in the Landfill Operation Maintenance and Monitoring Manual (BIM-5200-MAN-0002; Appendix K of the Waste Management Plan).

7.1.5 Surface Water Direction and Quantity

The general drainage/monitoring figures for Milne Port and Mine Site provided in Appendix B show the local drainage routes and their flow direction. Estimated surface water runoff quantities for catchment areas were outlined in a Knight Piésold report provided in the FEIS, Volume 7 – *Freshwater Aquatic Environment*.

7.1.6 Mitigation Measures

Mitigation measures will include periodic site inspections, as outlined in Baffinland's EPP (BIM-5200-PLA-0003), to ensure existing drainage routes are maintained and surface water infrastructure is operating as designed. Erosion and sedimentation controls as outlined in Sections 6.2 and 6.3 of this Plan will be utilized as required to address erosion and sedimentation concerns from construction and ongoing operations. Routine monitoring shall be completed to ensure compliance with applicable regulations and prescribed threshold values.

To minimize impacts on surface drainage and water quality, the Project footprint (i.e. laydowns, roads, quarries) is required to be constructed at least 31 m from the ordinary high-water mark of any water body unless otherwise approved by the NWB.

As shown in Appendix B, drainage structures have been installed to divert surface water runoff to specific points of discharge to facilitate monitoring of site contact water as required by the Type 'A' Water Licence.

7.2 Tote Road

The Tote Road is the primary transportation route between Milne Port and the Mine Site and is used daily to transport ore, equipment, material, fuel, and supplies between the Project sites.

7.2.1 Impacts on Surface Water

The requirement and selection of effective sedimentation and erosion controls to be employed at areas along the Tote Road will be subject to Project authorizations and applicable DFO guidance, and informed by in field monitoring and site experience. Water crossings have been designed and constructed to minimize the potential loss of fish habitat. Erosion and sedimentation controls for water crossings as outlined in Section 6.3 of this Plan will be utilized as required to address erosion and sedimentation from construction and ongoing operations of the Tote Road. Scheduled monitoring for fish, fish habitat and water quality at water crossings along the Tote Road is outlined in Section 9 of this Plan. Appendix C of this plan includes a list of all crossing locations between Mary River and Milne Port, as well as the proposed crossings for the Steensby Rail.

Construction areas established along the Tote Road will be designed and prepared such that surface water runoff is effectively channeled/diverted to allow for water quality monitoring to ensure compliance with Part D, Item 15 of the Type ‘A’ Water Licence.

7.2.2 Mitigation Measures

The Tote Road Earthworks Execution Plan (TREEP) (Golder, 2017) was developed to address sedimentation concerns observed along the Tote Road by improving the road’s surface water drainage infrastructure. Improvements outlined in the TREEP include culvert extensions, lining drainage ditches with riprap, improving road bed material and stabilizing road embankments. Improvements outlined in the TREEP along with the Issued-For-Construction drawings developed by Hatch for the Early Revenue Phase of the Project will continue to be implemented along the Tote Road as required by Project operations. Scheduled monitoring of water quality, water quantity and fish passage at water crossings along the Tote Road, as detailed in Section 9 of this Plan, will be used to inform and prioritize Tote Road maintenance activities and surface water drainage improvements.

To minimize impacts on surface drainage and water quality, the Project footprint (i.e. laydowns, roads, quarries) is required to be constructed at least 31 m from the ordinary high-water mark of any water body unless otherwise approved by the NWB.

The Road Management Plan and Air Quality and Noise Abatement Management Plan (BIM-5200-PLA-0027; BIM-5200-PLA-0005) outline the mitigation measures used to manage dust across site and along the tote road. For further details on dust control measures, please refer to that plan for additional details

7.3 Steensby Port and Railway

Steensby Port and the associated Railway (the Steensby Components) will be constructed in the near future. This section is preliminary and subject to change as infrastructure plans and activities associated with the Steensby Components are finalized.

7.3.1 Impacts on Surface Water

7.3.1.1 Steensby Port

Surface water runoff from areas of frequent vehicular activity are susceptible to contamination from minor spills and/or leakage from machinery and equipment. Mitigation measures identified in Section 6 of this Plan shall be implemented at project sites to divert non-contaminated surface runoff away from these areas which will minimize the potential for contamination. Surface water suspected to be impacted by hydrocarbons will be addressed using spill response absorbents and/or by transporting impacted surface water to containment areas, such as the Mine Site Hazardous Materials Containment Area 7 (MS-HWB-7) for temporary storage and subsequent treatment and discharge using the Projects Oily Water Treatment System.

Storage of hazardous materials (e.g. fuel and other hazardous materials) are contained within approved impermeable containment areas (lined with geomembranes). As required by the Type 'A' Water Licence, water within containment areas (e.g. Bulk Fuel Storage Facilities, surface water management ponds, etc.) will be sampled and demonstrated to be in compliance with the relevant water quality discharge criteria prior to being discharged to the receiving environment.

7.3.1.2 Railway

The requirement and selection of effective erosion and sedimentation controls to be employed at areas along the railway will be subject to future Project authorizations and applicable DFO guidance, but also informed by in field monitoring and site experience. Water crossings will be designed and constructed to minimize the potential log of fish habitat. Erosion and Sedimentation controls for water crossings as outlined in Section 6.3 of this Plan will be utilized as required to address concerns from operations along the railway.

Scheduled Monitoring for fish, fish habitat, and water quality at water crossings along the Railway will be outlined in a future update to this Plan and the associated Management/Monitoring Plans.

Construction areas established along the Railway will be designed and prepared such that surface water runoff is effectively channeled/diverted to allow for water quality monitoring to ensure compliance with Part D, Item 15 of the Type 'A' Water Licence.

7.3.2 Mitigation Measures

7.3.2.1 Steensby Port

Mitigation measures will include periodic site inspections, as outlined in Baffinland's EPP (BIM-5200-PLA-0003), to ensure future drainage routes are maintained and surface water infrastructure operates as designed. Erosion and sedimentation controls as outlined in Section 6.2 and 6.3 of this Plan will be utilized as required to address erosion and sedimentation concerns from construction and future operations. Routine monitoring shall be completed to ensure compliance with applicable regulations and prescribed threshold values.

To minimize impacts of surface drainage and water quality, the Project footprint (i.e. laydowns, roads, quarries, etc.) are required to be constructed at least 31 m from the ordinary high-water mark of any water body, unless otherwise approved by the NWB.

The Air Quality and Noise Abatement Management Plan (BIM-5200-PLA-0005) outlines the mitigation measures used to manage dust. For further details on dust control measures, please refer to that plan for additional details.

A further update to Appendix B will include where drainage structures have been installed to divert surface water runoff to specific point of discharge to facilitate monitoring of site contact water, as required by the Type 'A' Water Licence.

7.3.2.2 Railway

Mitigation measures will include periodic site inspections, as outlined in Baffinland's EPP (BIM-5200-PLA-0003), to ensure future drainage routes are maintained. Erosion and sedimentation controls as outlined in Section 6.2 and 6.3 of this Plan will be utilized as required to address erosion and sedimentation concerns from construction and future operations. Routine monitoring shall be completed to ensure compliance with applicable regulations and prescribed threshold values.

To minimize impacts of surface drainage and water quality, the Project footprint (i.e. laydowns, roads, quarries, etc.) are required to be constructed at least 31 m from the ordinary high-water mark of any water body, unless otherwise approved by the NWB.

The Air Quality and Noise Abatement Management Plan (BIM-5200-PLA-0005) outlines the mitigation measures used to manage dust. For further details on dust control measures, please refer to that plan for additional details.

A further update to Appendix B will include where drainage structures have been installed to divert surface water runoff to specific point of discharge to facilitate monitoring of site contact water, as required by the Type 'A' Water Licence.

8. Surface Water Management – Mining Operations

Surface water management infrastructure required for mining operations continue to be developed to ensure compliance with applicable regulations. Where required, these structures will be maintained throughout the lifecycle of the Project. Open pit mine, ROM stockpile, Mine haul road, and waste rock stockpile management activities and accountabilities will progress over time to accommodate future development and changes, management reviews, incident investigations, regulatory changes or other Project related modifications.

8.1.1 Mitigation Measures

Erosion and sedimentation controls as outlined in Sections 6.2 and 6.3 of this Plan will be utilized as required to address erosion and sedimentation concerns from construction and ongoing operations associated with Mining Operations. Routine monitoring shall be completed to ensure compliance with applicable regulations and prescribed threshold values.

8.1.2 Deposit No. 1 Mining Facilities

The following facilities have been designed, or will be, constructed at the Mine Site to facilitate Deposit No. 1 mining operations at the Project:

- Open Pit
- Mine Haul Road;
- Run-of-Mine (ROM) Ore Stockpile Facility;
- KM105 Surface Water Management Facility
- Crusher Facility; and,
- Waste Rock Facility.

The surface water runoff associated with these facilities is directed to appropriate surface water management ponds where it is monitored and treated if required to ensure effluent meets applicable water quality discharge criteria outlined in Baffinland's Type A Water Licence and Metal and Diamond Mining Effluent Regulations (MDMER). The details regarding mitigation measures associated with surface runoff from the above-mentioned project facilities are addressed in Section 7 of the FWSSWMP.

The general drainage/monitoring figure for the Mine Site, provided in Appendix B, shows the local drainage routes and their flow direction. Estimated surface water runoff quantities for Mine Site catchment areas were outlined in a Knight Piésold report provided in the FEIS, Volume 7 – Freshwater Aquatic Environment.

8.1.2.1 Open Pit

The open pit will be excavated using a conventional bench configuration with access via ramps. Predicted dimensions of the final open pit, determined by the preliminary design presented in the FEIS are:

- Maximum length: 2.0 km;
- Maximum width: 1.2 km; and

- Maximum depth: 465 m (northern side) to 195 m (southern side).

It is anticipated that groundwater inflows will be minimal below the active zone at the open pit. An assessment was completed to compare operations at three (3) mine sites at northern latitudes, including the Polaris, Ekati, and Diavik mines. From this assessment, it was determined that the Ekati mine is most similar to the Project's Mine Site. The Ekati pits were developed in competent granite that was cut by moderate faults. The base of permafrost at the Ekati mine was encountered at approximately 350 to 400 m. With the exception of the near surface layer, groundwater was not encountered in the pits until mining reached limits below permafrost. From the assessment, it was determined that the Project's Deposit No. 1 pit will receive negligible groundwater inflow below the active layer because mining activities will take place in competent bedrock characterized by colder mean temperatures, topographically higher elevations, minimal faulting, and a deeper permafrost zone.

Geotechnical investigations at Deposit 1 are detailed in the Phase 1 Waste Rock Management Plan (BIM-5200-PLA-0029). The thermistor monitoring indicates permafrost conditions will allow only shallow seasonal subsurface water flows. It is anticipated that water inflows into the pit will be minor, but mostly direct contribution from precipitation events. Drifting snow is not expected to significantly contribute to in-pit water volumes due to ongoing snow management under the Snow Management Plan (SMP).

8.1.2.2 Run-of-Mine (KM 106) Ore Stockpile Facility

Run-of-mine ore from the Deposit No. 1 temporarily stockpiled KM 106 Ore Stockpile Facility located on the Mine Haul Road.

The surface water runoff from the KM 106 Stockpile Facility's pad and ore stockpiles is directed to the Km 106 Stockpile Facility's surface water management pond (Km 106 Facility Pond) using ditches that run along the Facility's perimeter. Water treated by this facility will be monitored and treated as

outlined in the FWSSWMP (BIM-5200-PLA-0022) to ensure effluent quality criteria in Baffinland Type 'A' Water Licence is met.

Mitigation measures include routine inspections of the facility to ensure surface water infrastructure, such as the ditching and berms, are operating as designed. Refer to the FWSSWMP for additional information on the water treatment processes approved for project effluents.

8.1.2.3 Mine Site Crusher Facility

Run-of-mine ore from the Deposit No. 1 is processed by crushing ore into lump and fines at Mine Site Crusher Facility.

The surface water runoff from the Crusher Facility's pad and ore stockpiles is directed to the Crusher Facility's surface water management pond (Crusher Facility Pond) using ditches that run along the Facility's perimeter. Water treated by this facility will be monitored and treated as outlined in the FWSSWMP (BIM-5200-PLA-0022) to ensure effluent quality criteria in Baffinland Type 'A' Water Licence is met.

Mitigation measures include routine inspections of the facility to ensure surface water infrastructure, such as the ditching and berms, are operating as designed. Refer to the FWSSWMP for additional information on the water treatment processes approved for project effluents.

8.1.2.4 Waste Rock Facility (WRF)

Surface water runoff from waste rock deposited at the WRF is directed to a surface water management pond (WRF Pond) using ditches and swales that run along the WRF's perimeter. Water treated by this facility will be monitored and treated as outlined in the FWSSWMP (BIM-5200-PLA-0022) to ensure effluent quality criteria in Baffinland Type 'A' Water Licence is met.

Mitigation measures include routine inspections of the facility to ensure surface water infrastructure, such as the ditching and berms, are operating as designed.

Refer to the FWSSWMP for additional information on the water treatment processes approved for project effluents.

8.1.2.5 KM105 Surface Water Management Facility

The KM105 Surface Water Management Facility treats storm water and snow melt runoff originating from the Mine Haul Road during the open water season. This runoff is collected in ditching prior to the facility along the side of the Mine haul road, which is then directed towards the facility. Water treated by this facility will be monitored and treated as outlined in the FWSSWMP (BIM-5200-PLA-0022) to ensure effluent quality criteria in Baffinland Type 'A' Water Licence is met.

Mitigation measures include routine inspections of the facility to ensure surface water infrastructure, such as the ditching and berms, are operating as designed. Refer to the FWSSWMP for additional information on the water treatment processes approved for project effluents.

9. Monitoring

9.1 Routine Inspections

In addition to the specific monitoring and reporting requirements subject to applicable regulatory approvals, routine inspections of Project areas will be conducted. Routine surface water management inspections shall be conducted at drill sites, Project camp sites and infrastructure, roadways, and other areas associated with Project development. Where required, inspection locations will be modified to reflect current Project infrastructure and activities.

Table 9-1 outlines the basic components of typical routine inspections conducted at the Project. For the current compliance inspection forms used, refer to the Project's EPP (BIM-5200-PLA-0003).

Table 9-1 Routine Inspections and Monitoring Requirements

Site / Area	Routine Inspections
Milne Port Mine Site Steensby Port	• Water management systems and infrastructure • Sediment and erosion control structures • Fuel storage and transfer operations • Drip pans and equipment condition (i.e. leaks, hydrocarbon staining) • Use of secondary containment (i.e. lined containment areas, spill trays, etc.) • Water intakes • Flow meter readings • Land disturbance (i.e. vehicle rutting) and construction projects • Spill kits • Snow stockpiles
Tote Road Railway	• Water management systems and infrastructure • Sediment and erosion control structures • Use of secondary containment (i.e. lined containment areas, spill trays, etc.) • Water intakes • Snow stockpiles • Land disturbance (i.e. vehicle rutting) and construction projects
Borrow Sites Quarries	• Drip pans and equipment condition (i.e. leaks, hydrocarbon staining) • Fuel transfer operations • Sediment and erosion control structures • Spill kits

Site / Area	Routine Inspections		
Drill Sites	*Pre-Drilling*	*Drilling Period*	*Post-Drilling*
	• Drill hole • coordinates • Water source • coordinates • Site photo • Water source photo • Distance to nearest • water source • Archaeological • approval • Wildlife survey	• Fuel leaks • Sediment and • erosion control • structures • Drip pans • Equipment condition • Rutting by • vehicles • Water intake • Water management • Flow meter reading	• Fuel leaks • Sediment and • erosion control • structures • Drip pans • Equipment condition • Rutting by • vehicles • Water intake • Water management • Flow meter reading
Waste Rock Facility	• Water management systems and infrastructure • Sediment and erosion control structures • Drip pans and equipment condition (i.e. leaks, hydrocarbon staining) • Deposition of Waste Rock to encapsulate PAG		
Bulk Fuel Storage Areas	• Primary containment structure • Evidence of hydrocarbon staining or leaks from containment devices • Equipment condition • Spill kits • Transfer pipelines to other Project infrastructure		

Site / Area	Routine Inspections
Explosives Storage Areas	• Primary containment structure • Access and security • Equipment condition
Laydown and Storage Areas	• Sediment and erosion control structures • Evidence of hydrocarbon staining or leaks from containment devices • Fuel leaks • Drip pans • Equipment condition

9.2 Trigger Action Response Plan (TARP) for Potential Erosion and Sediment

A Trigger Action Response Plan (TARP) for Potential Erosion and Sediment Release Events (Table 9-2) provides a summary of the monitoring required and responsibilities in managing environmental monitoring of erosion and sediment events. The TARP outlines indicators and triggers, and will be utilized to outline appropriate actions and responses to possible erosion and sediment release events. Associated responsibilities are also detailed in the TARP.

Table 9-2 Trigger Action Response Plan - Erosion and Sediment Release Events

Trigger	Action	Response	Responsibility
Observations identifying potential causes of erosion and sediment issues.	Investigate and identify potential sources and actiities that may lead to an exceedance in total suspended solids. This can include, but is not limited to: construction based activities on land or near water (e.g. ditching, roads, signs of erosion, drilling, sediment deposition, run-off, etc.), effectiveness of erosion and sediment controls, contact water movement. Refer to coordination meetings in preparation for freshet, and allocation of responsibilities as per each department. Ensure equipment is readily available.	• Contact Baffinland Environment and assist in implementing appropriate control measures focused at the source of the issue. • Reference Table 6-1 for a list of erosion and sediment control measures.	• All employees working for the Operation (via visual observation). • Report to Supervisor immediately, who will report to Environment. • Environment to advise Departments based on specific needs.
Severe weather period in the forecast, as per on-site weather stations and weather alerts.	Assess risk for site and plan appropriate mitigation measures. This includes but is not limited to Table 6-1 Sediment and Erosion Controls. Complete snow removal in prioritized areas as per the Snow Management Plan.	• Communicate with Environment to develop an incident (sediment release, melting event, freshet, high precipitation) specific response plan. • Communicate plan to workforce which may include: • Implementing additional mitigation techniques and/or facilities • Reducing or re-scheduling tasks (e.g., Reduce activities to non-ground disturbing related tasks)	• Environment • Mine Operations • Technical Services • Site Services • Road Maintenance
TSS Exceedance of Water Licence Criteria	During and after a suspected exceedance of the authorized limit, water samples will be taken at key locations for TSS testing. Record results, investigate and communicate to external stakeholders in line with regulatory requirements and Baffinland's Spill Contingency Plan (BIM-5200-PLA-0012).	• If sediment attributed to Project Infrastructure, review and modify controls. • Communicate incident investigation outcomes with regulatory authority via follow up spill reports and the QIA NWB Annual Report for Operations.	• All employees working for the Operation (via visual observation). • Report to Supervisor immediately, who will report to Environment. • Environment to advise Departments based on specific needs.
Regulatory Feedback	Record feedback details, investigate and communicate to external stakeholders in line with Baffinland management plans.	• If sediment is attributed to Project Infrastructure, review and modify controls. • Respond to regulatory authority with outcomes of the investigation.	• Environment • Technical Services • Operations

9.3 Snow Management Monitoring

Water Quality monitoring associated with the Project Facilities at the Mine Site, Steensby, and Milne Port Site are incorporated into the SWAEMP. This consolidation includes details from the Snow Management Plan that constitute water quality monitoring stations and schedules, monitoring group parameters and visual conformance inspections relevant to the Mine Site and Milne Port Facilities. Information associated with commercial lease requirements that is not applicable to the Water Licence is not included here. The transportation corridor between both Facilities will continue to be monitored as per the Tote Road Monitoring Program (TRMP).

Snowmelt from snow stockpiles at the Mine Site and Milne Port are monitored via the Surveillance Network Program (SNP) as stipulated by the Project's Type 'A' Water License, and through dedicated monitoring locations. Along the Tote Road, snow stockpile snowmelt is monitoring via the TRMP, or as other representative locations are established to capture snowmelt runoff. Milne Port utilizes select SNP locations to monitor associated snow stockpile run-off. The Mine Site has identified four (4) monitoring locations that are representative of the effects on the receiving environment associated with the Facility's stockpiles. These locations are in addition to established SNP monitoring locations.

The frequency of water quality monitoring will be established in accordance with the Snow Management Plan. For further details, refer to Appendix D, which outlines Baffinland's monitoring of snow management and snow stockpiles at the Project under the Snow Management Plan.

9.4 Area-Specific Surface Water and Aquatic Ecosystem Monitoring

Baffinland has developed and/or implemented several monitoring programs at the Project to fulfill surface water and aquatic effects monitoring requirements outlined in the Project's Type 'A' Water Licence, Project Certificate and other

applicable regulations (i.e. MDMER, etc.). The following subsections describe the area-specific freshwater monitoring requirements and monitoring programs conducted at the Project.

9.4.1 Milne Port and Mine Site

Surface water and aquatic ecosystem monitoring programs implemented at Milne Port and Mine Site focus on fulfilling the monitoring requirements outlined in Schedule I of the Project's Type 'A' Water Licence, Project Certificate, and other applicable regulations, including the MDMER.

9.4.1.1 Type 'A' Water Licence

Type 'A' Water Licence water quality and quantity monitoring requirements for surface water include:

- The monitoring of volumes and water quality of surface water runoff and storm water retained by Project infrastructure (e.g. surface water management ponds, containment areas) and discharged to the receiving environment;
- The monitoring of volumes and water quality of specific surface water drainage systems downstream of Project areas;
- The monitoring of water quality of surface water drainage downstream of active quarries and borrows sources; and,
- The monitoring of water volumes withdrawn from approved water sources.

Volumes of effluent discharged from the Project infrastructure are monitored using inline flow meters and/or flow rate extrapolation. Weir boxes, water level data loggers and instream flow measurements are used to monitor flow volumes at monitored surface water drainages downstream of Project areas. Volumes of water withdrawn from approved water sources are monitored using inline flow meters and/or flow rate extrapolation. Water withdrawal limits for approved water sources are outlined in Table 2, 3, and 4 of the Type 'A' Water Licence and discussed further in the FWSSWMP (BIM-5200-PLA-0022).

Sampling frequency, monitored parameters and water quality discharge criteria for monitoring stations are outlined in Part F and Schedule I of the Type 'A' Water Licence.

Table 9-3 provides the select storm water and surface water monitoring stations outlined in Schedule I of the Type 'A' Water Licence for Milne Port and the Mine Site, including each monitoring station's current status. Monitoring requirements for developed quarries and borrow sources near Milne Port (i.e. Q1) and the Mine Site (i.e. QMR2), as stipulated by the Type 'A' Water Licence, are discussed in Section 9.7 of this Plan.

Table 9-3 Milne Port and Mine Site – Water Licence Monitoring Stations[2]

Monitoring Station	Description	UTM Coordinates (NAD83) Easting (m)	Northing (m)	Status
MP-03	Milne Port Bulk Fuel Storage Facility Stormwater	503638	7976272	Active
MP-04	Milne Port Landfarm Facility -Storm water	503710	7975574	Active
MP-04a	Contaminated Snow & Water Containment Berm beside the Milne Port Landfarm Facility	503862	7975482	Active
MP-05	Milne Port Ore Stockpile Facility – East Surface Water Management Pond	503469	7976383	Active
MP-06	Milne Port Ore Stockpile Facility – West Surface Water Management Pond	503125	7976364	Active
MP-C-B	Surface water drainage downstream.	502836	7975732	Active
MP-C-K		502982	7975333	Active
MP-C-H		504113	7976509	Active
MP-C-J		502940	7974760	Active
MS-MRY-6	Hazardous Materials Storage Area 7 (Hazardous Waste Berm 7)	558341	7914508	Active
MS-03	Mine Site Bulk Fuel Storage Facility Stormwater	561258	7913304	Active

[2] Refer to Schedule I of the Type 'A' Water Licence for a complete list of all water licence monitoring stations.

Monitoring Station	Description	UTM Coordinates (NAD83) Easting (m)	Northing (m)	Status
MS-03B	Second Mine Site Bulk Fuel Storage Facility Stormwater	561154	7913446	Active
MS-05	Mine Site Landfarm Facility Stormwater	560828	7912727	Active
MS-06	Mine Site Crusher Facility Surface Water Management Pond	561475	7913000	Active
MS-07	Run-of-Mine Ore Stockpile Facility Surface Water Management Pond	563583	7913074	Active
MS-08	Waste Rock Stockpile West Surface Water Management Pond	563217	7916789	Active
MS-09	Waste Rock Stockpile East Surface Water Management Pond	N/A	N/A	Not Constructed
MS-10	SDLT-1 Pond Ore Stockpile Stormwater	N/A	N/A	Not Constructed
MS-11	KM105 Pond Stormwater	561645	7913474	Active
MS-MRY-13A	Non-Hazardous Waste Landfill Facility - Downstream Surface Water Drainage	560754	7912484	Active
MS-MRY-13B		560642	7912527	Active
MS-C-A	Surface water drainage downstream.	561263	7913571	Active
MS-C-B		561454	7913537	Active
MS-C-C		561110	7913199	Active
MS-C-D		561008	7913280	Active
MS-C-E		560980	7913388	Active

Monitoring Station	Description	UTM Coordinates (NAD83) Easting (m)	Northing (m)	Status
MS-C-F		561797	7913278	Active
MS-C-G		561813	7911830	Active
MS-C-H		561162	7912067	Active

9.4.1.2 Metal & Diamond Mining Effluent Regulations

The MDMER were developed primarily under subsection 36(5) of the Fisheries Act and are designed to protect fish, fish habitat and fish use from effects in receiving waters from the release of effluents from metals and diamond producing mines. At the Mine Site, runoff and effluent managed at the Crusher Facility, Run-of-Mine Facility and Waste Rock Facility are regulated under the MDMER and are identified as monitoring locations MS-06, MS-07, and MS-08 under the Type 'A' Water Licence, respectively.

Sampling frequency, monitored water quality parameters and discharge criteria for effluent discharges from facilities regulated under the MDMER at the Mine Site are fully discussed in the FWSSWMP (BIM-5200-PLA-0022). For details on the Project's Environmental Effects Monitoring (EEM) Program required for receiving water bodies of regulated effluents under MDMER, refer to Project's FWSSWMP (BIM-5200-PLA-0022) and the Project's AEMP (BIM-5200-PLA-0023), discussed in Section 9.4.1.3below.

9.4.1.3 Aquatic Effects Monitoring Plan

The Aquatic Effects Monitoring Plan describes how monitoring of the aquatic environment will be undertaken at the Mine Site. The Aquatic Effects Monitoring Program (AEMP) was identified as a follow-up monitoring program in Baffinland`s FEIS (Baffinland, 2012) and is prescribed by the Type 'A' Water Licence. The AEMP, specifically, is a monitoring program designed to:

- Detect the short-term and long-term effects of the Project's activities on the surrounding aquatic environment;
- Evaluate the accuracy of impact predictions;
- Assess the effectiveness of planned mitigation measures; and,
- Identify additional mitigation measures to avert or reduce unforeseen environmental effects.

The AEMP focuses on the key potential impacts to freshwater environment valued ecosystems components (VECs), as identified in the FEIS and Addendum for the Early Revenue Phase (ERP). The freshwater VECs include water quantity, sediment quality, and freshwater biota and fish habitat. The AEMP has been structured to serve as an overarching 'umbrella' that conceptually provides an opportunity to integrate results of individually monitored but related aquatic monitoring programs.

The following are the component studies that comprise the Project's AEMP.

- Core Receiving Environment Monitoring Program (CREMP), provides a basis for the evaluation of any mine-related influences on water quality, sediment quality and/or biota (including phytoplankton, benthic invertebrates and/or fish) within aquatic environments located near the Mine Site.
- Lake Sedimentation Monitoring Program evaluates baseline and Project-influenced lake sedimentation rates.
- Hydrometric Monitoring Program assesses flow in several streams and rivers near Project sites and supports the AEMP.
- Dustfall Monitoring Program evaluates dustfall rates in proximity to the Tote Road, Milne Port and Mine Site and informs aquatic effects monitoring programs on the potential effects of dust generated by the Project on surrounding aquatic ecosystems and water bodies.
- Stream Diversion Barrier Study an initial study evaluating the potential for fish barriers under natural conditions and due to Project-related stream diversions. This study has been deferred due to the low impact anticipated by the reduced footprint of the Waste Rock Facility during the Early

Revenue Phase of the Project. The resumption of this study will be dependent upon the schedule and size set forth for any future development.

- Environmental Effects Monitoring (EEM) Program, as required under the MDMER, includes both water quality, benthic and fish monitoring studies in the receiving water bodies of effluent discharges at the Mine Site.

Monitoring data collected requires a systematic data evaluation process, as well as management responses that would be taken, in response to certain data evaluation outcomes. An assessment and management response framework is described in detail in Section 5 of the Aquatic Effects Monitoring Plan. For additional details on the aquatic effects monitoring programs, refer to Baffinland's Aquatic Effects Monitoring Plan (BIM-5200-PLA-0023).

9.4.2 Tote Road

Surface water and aquatic ecosystem monitoring programs specific to the Tote Road focus on meeting the monitoring requirements stipulated by Baffinland's Type 'A' Water Licence and DFO authorizations for water crossings as well as fulfilling commitments made to stakeholders and regulators.

9.4.2.1 Type 'A' Water Licence

Type 'A' Water Licence monitoring requirements for surface water along the Tote Road focus on:

- The monitoring of water volumes withdrawn from approved water sources along the Tote Road, outlined in Tables 2, 3, and 4of the Type 'A' Water Licence; and,
- The monitoring of water quality of surface water drainage downstream of active quarries and borrows sources.

Volumes of water withdrawn from approved water sources along the Tote Road are monitored using inline flow meters and/or flow rate extrapolation. Water withdrawal limits for approved water sources along the Tote Road are outlined in Tables 3 and 4 of the Type 'A' Water Licence and discussed further in the FWSSWMP (BIM-5200-PLA-0022).

Monitoring requirements for developed quarries and borrow sources stipulated by the Type 'A' Water Licence are discussed in Section 9.7 of this Plan.

9.4.2.2 Annual Assessment of Tote Road Fisheries Crossings

In accordance with Baffinland's DFO authorizations, Letters of Advice and other related amendments, Baffinland continues to conduct an annual assessment each year of identified fisheries water crossings along the Tote Road (HADD and compensation crossings). Annual assessments are conducted by a Professional Fisheries Biologist to confirm compliance with Baffinland's Fish Habitat No-Net-Loss and Monitoring Plan (Knight Pièsold, 2007) by assessing the presence of fish, changes in quality of fish habitat and condition of fish passage at each identified fisheries crossing. Concerns identified during the annual assessment are promptly addressed by the Road Maintenance Department. It should be noted that two (2) fisheries crossings at the Mine Site (CV-187, CV-186) are included in this annual assessment.

9.4.2.3 Tote Road Monitoring Program (TRMP)

The Tote Road Monitoring Program (TRMP) was developed to monitor the water quality of surface water flows at select water crossing (culverts, bridges) along the Tote Road, with a primary focus on monitoring total suspended solids (TSS) concentrations upstream and downstream of Tote Road water crossings. Monitoring data collected under the TRMP is used by the Project to:

- Inform Project operations of potential water quality impacts from Project activities at water crossings along the Tote Road;
- Guide and prioritize Tote Road maintenance work, corrective actions and improvements projects for surface water management infrastructure;
- Adjust mitigation measures and management strategies for Project activities along the Tote Road; and,
- Expand the Project's understanding of natural water quality conditions along the Tote Road (upstream) and the natural factors that contribute to changes in surface water quality.

Water crossings monitored under the TRMP have been selected to give a geographically representative sample set of water crossings for each given watershed intersected by the Tote Road (Phillips Creek, Ravn River, Mary River). In selecting the Tote Road water crossings within each watershed, the following factors were considered:

- Key depositional habitats downstream of the Tote Road (e.g. fish habitat);
- Areas historically prone to sedimentation events;
- Historical borrow source locations; and,
- Existing monitoring locations and programs.

In addition to TSS, the TRMP monitors for additional parameters, including total and dissolved metals, nutrients, oil & grease, and routine chemistry, such as dissolved anions (e.g. chloride), turbidity and total dissolved solids (TDS). See Table 9.4 for a full list of analytical parameters.

Table 9-4 Tote Road Monitoring Program – Analytical Parameters

Parameter Type	Units
pH	pH units
Total Suspended Solids (TSS)	mg/L
Total Dissolved Solids (TDS)	mg/L
Conductivity	µS/cm
Oil & Grease	mg/L
Hardness	mg/L as $CaCO_3$
Alkalinity	mg/L as $CaCO_3$
Chloride (Cl^-)	mg/L
Ammonia	mg/L N
Total Phosphorus	mg/L N
Nitrate (NO_3^-)	mg/L N
Nitrite (NO2)	mg/L N
Dissolved Organic Carbon (DOC)	mg/L N
Total Organic Carbon (TOC)	mg/L N
Total and Dissolved Aluminum	mg/L
Total and Dissolved Arsenic	mg/L
Total and Dissolved Cadmium	mg/L
Total and Dissolved Chromium	mg/L
Total and Dissolved Cobalt	mg/L
Total and Dissolved Copper	mg/L
Total and Dissolved Iron	mg/L
Total and Dissolved Lead	mg/L
Total and Dissolved Manganese	mg/L
Total and Dissolved Mercury	mg/L
Total and Dissolved Molybdenum	mg/L

Parameter Type	Units
Total and Dissolved Nickel	mg/L
Total and Dissolved Phosphorus	mg/L
Total and Dissolved Thallium	mg/L
Total and Dissolved Uranium	mg/L
Total and Dissolved Zinc	mg/L

9.4.2.4 Evaluation Criteria and Decision Rules

TRMP results are evaluated using a combination of:

1. Paired upstream/downstream comparisons at each monitored crossing (including consideration of flow and hydrometeorological conditions during sampling);

2. Background context based on upstream measurements and/or established baseline ranges for naturally variable, highly erodible streams; and

3. Applicable reference benchmarks (e.g., relevant water quality guideline values) for parameters where such benchmarks are used in the TRMP.

The primary decision rule for TSS focuses on whether downstream concentrations are elevated relative to upstream at the same crossing beyond defined TRMP action levels and/or whether results indicate an acute sedimentation risk based on magnitude, persistence, and field observations (e.g., visible plume, sediment deposition, habitat smothering potential).

9.4.2.5 Action Levels and Action Response Framework

The TRMP uses action levels as internal management triggers to initiate defined investigation and corrective action steps. Action levels are not effluent limits and do not, on their own, indicate non-compliance. When action levels are met, the

Project implements the response actions summarized in Table 9.5 to (a) confirm data quality and natural drivers, (b) identify potential Project-related sources, and (c) implement timely mitigation and follow-up monitoring where warranted.

Table 9.5 TRMP Action Levels and Response Actions (Summary)

Action Level	Trigger criteria	Response Actions
Level 1 – Elevated	TSS and/or turbidity elevated at downstream relative to upstream beyond screening threshold; or single parameter result above reference benchmark with no corroborating indicators	Confirm QA/QC; review hydrology/weather; field notes/photos; targeted crossing inspection (ditches, outfalls, erosion controls); implement minor maintenance if needed; consider increased sampling at next event
Level 2 – High/Repeated	Elevated downstream vs upstream persists across events; or magnitude suggests increased sedimentation risk; or multiple lines of evidence (TSS + turbidity + visual plume)	Prompt inspection and source evaluation; implement corrective works (ditch/culvert inlet/outlet stabilization, sediment controls, borrow/stockpile controls, drainage improvements); increase monitoring frequency until conditions normalize; document actions and outcomes
Level 3 – Acute	Severely elevated sample and/or clear evidence of sediment deposition or risk to sensitive habitat; or confirmed infrastructure failure contributing sediment	Immediate notification/escalation per internal response protocols; implement immediate controls/repairs; stabilize source; implement short-interval verification monitoring; capture incident documentation and corrective

Action Level	Trigger criteria	Response Actions
		action record; evaluate need for additional mitigations

The evaluation criteria, action levels, and response framework used to interpret TRMP results and initiate actions are summarized above to support review within the Water Licence management framework, while maintaining alignment with the Project's broader Tote Road monitoring and management requirements. The Roads Management Plan (BIM-5200-PLA-0027) provides further implementation procedures supporting the TRMP (e.g., sampling logistics, inspection forms, maintenance workflows, corrective action work processes, and roles/responsibilities).

9.4.2.6 Water Crossing Construction Monitoring

In order safely and effectively transport ore from the Mine Site to Milne Port, the Project roads network, including the Tote Road, continues to be upgraded to address concerns regarding surface water drainage, sedimentation and erosion, operations and safety.

Monitoring associated with construction activities at Project water crossings is detailed in the Roads Management Plan (BIM-5200-PLA-0027), including sampling frequency, monitored parameters, response action frameworks and action levels.

To limit the potential water quality impacts of maintenance and construction activities at Project water crossings during periods of flow, in water work will be avoided whenever feasible, with the majority of water crossing maintenance and construction planned and occurring before the onset of freshet (mid-May) and following freeze up (September/October).

9.4.3 Steensby Port

The construction of Steensby Port and associated railway has not commenced to date. As a result, water quality or quantity monitoring programs have not been initiated at the Steensby Port location. This plan will be updated prior to the commencement of construction of Steensby Port and the associated railway to reflect planned surface water management and monitoring.

9.5 Groundwater Monitoring

9.5.1 Regulatory Context

Water Licence Part E, Conditions 27(a) and 27(b) require the Surface Water and Aquatic Ecosystem Monitoring Plan (SWAEMP) to:

> *(a) Provide a synthesis of groundwater activity onsite, including groundwater quality analysis and interpretation; and*
>
> *(b) Describe the frequency of upgradient and downgradient monitoring at selected shallow groundwater monitoring locations and identify potential areas and triggers for implementing additional groundwater monitoring.*

In addition, Project Certificate Condition 23 requires Baffinland to maintain groundwater monitoring at the Project.

This section fulfills these requirements in a manner that reflects the actual hydrogeologic setting of the Mary River region, where continuous permafrost controls subsurface water movement and where “groundwater,” in the conventional hydrogeologic sense, is functionally absent.

9.5.2 Hydrogeologic Overview and Groundwater Activity at Site

9.5.2.1 Groundwater in the Mary River Setting

The Mary River Mine is underlain by continuous permafrost exceeding 600 m in thickness, which acts as a regional confining layer. The only thawed subsurface zone is the seasonal active layer, which typically reaches a thickness of less than 2 m, depending on surface material, snowpack, and local thermal conditions.

As a result:

- There is no saturated aquifer beneath the active layer.
- There is no hydraulic connection to deeper groundwater systems.
- Subsurface water movement is ephemeral, shallow, seasonal, and strongly governed by thaw depth and surface conditions.

This understanding is consistent with the conceptual model documented in the 2024 Groundwater Monitoring Report and aligns with Arctic permafrost literature.

9.5.2.2 Summary of Groundwater Activity Observed to Date

Since 2017, Baffinland has installed shallow monitoring wells and drive-point piezometers in areas where the active layer is expected to temporarily convey water, particularly near:

- The Mine Site Non-Hazardous Waste Landfill, and
- The Mine Site Hazardous Waste Berm Facility.

Data from 2017–2024 show:

- Water is present in monitoring locations only during late summer (typically August–early September).
- Many monitoring locations are dry, frozen, or damaged due to frost-jacking or ice lensing.

- Where water is present, it represents meltwater mixed with aggregates, not true groundwater.
- Results show localized influences from onsite facilities but no evidence of persistent or mobile contaminant plumes.

These findings confirm that the monitoring wells function as seasonal active-layer water sampling points, not groundwater wells.

9.5.2.3 Interpretation Framework for Groundwater Quality (Licence 27a)

Given the hydrogeologic setting and the nature of the samples:

- Groundwater analytical results are interpreted as reflecting active-layer porewater, not an aquifer.
- Interpretation focuses primarily on:
  - Comparison to background (upgradient) monitoring points,
  - Temporal trends, and
  - Relevance to potential pathways to surface water, which remains the ultimate receptor.

Comparison to Federal Interim Groundwater Quality Guidelines (FIGQGs) may be used for *screening purposes only*, recognizing that:

- FIGQGs are designed for true groundwater systems,
- They assume aquifer conditions, continuous saturation, and
- They are not directly applicable to shallow, frozen–thawing seasonal porewater.

Therefore, where FIGQGs are referenced, this is done cautiously and only to assist in qualitative interpretation.

9.5.3 Pinpointing Monitoring Priorities and Activation Triggers

9.5.3.1 Monitoring Locations

Shallow groundwater monitoring will remain focused on the two risk-based Mine Site locations:

- Non-Hazardous Waste Landfill
- Hazardous Waste Berm Facility

At each, Baffinland will maintain a minimum of one upgradient and one downgradient active-layer monitoring point.

Additional monitoring locations may be considered in the future if:

- Thermistor data indicate a sustained increase in active-layer thickness;
- Geotechnical inspections identify permafrost degradation or new flow pathways;
- Surface water monitoring identifies localized changes in water quality;
- Consultant recommendations, based on annual/biannual program review, support targeted expansion.

This approach ensures monitoring remains risk-based and adaptive.

9.5.3.2 Monitoring Frequency

Due to frozen conditions, monitoring locations yield water only in the late summer. Accordingly:

- Annual sampling will occur during late August to early September, which represents the maximum thaw period and provides the only viable opportunity for sample collection.

Additional sampling outside this period may be considered if conditions permit, but is not expected annually.

9.5.3.3 Analytes and Laboratory Methods

Water samples (when water is present) will be analyzed for:

- General chemistry (pH, conductivity, major ions)
- Nutrients (nitrate, nitrite)
- Dissolved and total metals
- Petroleum hydrocarbons (as applicable to the facility)

These parameters align with those relevant to potential migration to surface water and potential waste facility influences.

9.5.4 Triggers for Additional Monitoring

Triggers for enhanced monitoring may include:

Thermal / Permafrost Indicators

- Active-layer depth increase exceeding normal interannual variability;
- Thermistor readings showing extended thaw season or warming trend.

Geotechnical / Visual Indicators

- New seepage, damp zones, or settlement adjacent to waste facilities;
- Frost-jacking or structural movement of well casings.

Surface Water Indicators

- Elevated sample results, particularly for TSS at relevant following deployment of monitoring programs;
- AEMP results showing localized increasing trends of COPCs.

Groundwater Quality Indicators

- Sustained, multi-year increases in key parameters relative to background, including a temporal increase year over year.

These triggers do not automatically require redesign of the network; rather, they initiate additional site assessment, potential temporary expansion of monitoring, and/or consultation with qualified professionals.

9.5.5 Adaptive Management Framework

When a trigger is exceeded, Baffinland will apply the following process:

1. Verification – Confirm the observation through resampling or inspection.
2. Diagnosis – Determine potential cause and pathway.
3. Targeted Response –
    - Increase monitoring at the affected location,
    - Conduct additional site inspections,
    - Review facility containment features,
    - Implement mitigations as required.
4. Reporting – Summarize findings in annual reporting to NWB and relevant agencies.
5. Iterative Improvement – Modify monitoring approach as informed by annual consultant review.

This process ensures responsiveness while avoiding unnecessary system-wide redesign.

9.5.6 Ongoing and Future Improvements

Baffinland is committed to continuous improvement of the groundwater component of the SWAEMP. Planned or potential enhancements include:

- Additional thermistor strings in high-priority areas;
- Improved well construction techniques to reduce frost-jacking;
- Periodic consultant review of monitoring network effectiveness;
- Integration of groundwater observations into the broader adaptive management and TARP framework.

These commitments reflect a progressive, evidence-based approach consistent with NIRB's precautionary principle

9.6 Type 'B' Water Licence Monitoring

Surface water monitoring requirements stipulated under the Type B Water Licence are related to exploration and geotechnical drilling programs and the establishment of satellite camps required to support these programs. Due to temporary and transitory nature of drilling programs, water quality monitoring programs will be established for drilling programs on as needed basis and in accordance with the monitoring requirements outlined in the Type 'B' Water Licence. Proposed water quality monitoring programs will be included in Baffinland's notification(s) to regulators and stakeholders for planned drilling programs and satellite camps.

9.7 Monitoring at Project Quarries and Borrow Sources

Aggregate and sand for the Project may be sourced from a number of approved borrow pits and quarries located at the Mine Site, Milne Port and along the Tote Road. Baffinland's Water Licence prescribes the conditions applying to the development of quarries and borrow pits. Baffinland manages the potential environmental effects of borrow pit and quarry development and operation through the Borrow Pits and Quarries Management Plan (BIM-5200-PLA-0025) and individual borrow source and quarry specific plans (BIM-5200-PLA-0031, BIM-5200-PLA-0033 and BAF-PH1-830-P16-0017). Monitoring locations for developed quarries and borrows sources are documented in the individual borrow source and quarry specific management plans.

Table 9-6 Project Quarries and Borrow Sources – Water Licence Monitoring Stations

Monitoring Station	Description	UTM Coordinates (NAD83) Easting (m)	Northing (m)	Status
MP-Q1-01	Downstream of Q1	503838	7974473	Active
MP-Q1-02		503827	7975418	Active
TR-BP-01	Borrow Pit at KM97	556021	7914684	Active
TR-BP-02	Borrow Pit at KM53	527171	7932085	Active
MQ-C-A	Downstream of QMR2	559478	7914398	Active
MQ-C-B		560076	7913889	Active
MQ-C-D		559421	7914221	Active
MQ-C-E	Downstream of D1Q2	563351	7912902	Not Active

In accordance with Part I, Items 22 of the Type 'A' Water Licence, during periods of flow and following major precipitation events, Baffinland conducts monthly water quality monitoring of surface water flows downstream of active quarries and borrows sources. Water quality parameters that are monitored are in accordance with Part I, Item 21 of the Type 'A' Water Licence.

In accordance with Part D, Item 14 of the Type 'A' Water Licence, during construction, weekly water quality sampling is also completed where it is determined that surface water runoff from active quarries flows directly or indirectly into a water body, to ensure that water quality of the flows is in compliance with the water quality criteria outlined in Table 1 of the Type A Water Licence.

As required, Baffinland will implement best management practices including sediment and erosion control measures installed as per Section 5 of this Plan. Berms and other drainage control measures shall be established where necessary to minimize or prevent surface runoff from nearby water bodies

entering active quarries and borrow sources. Details regarding specific mitigation measures are provided in the above-mentioned quarry management plans.

9.8 Event Based Monitoring

9.8.1 Purpose and Linkages to the AEMP / CREMP

Event-based monitoring is implemented in response to unique or unplanned occurrences that may have the potential to influence site conditions. Unlike routine monitoring programs, which are scheduled at set intervals, event-based monitoring is triggered by specific circumstances (e.g., freshet, extreme rainfall, releases of non-compliant effluent, or other natural or project-related activities) that could alter environmental conditions over short time scales. The primary intent is to determine whether such events have resulted in measurable changes to surface water quality and, where applicable, to other aquatic ecosystem components.

Surface water quality monitoring at the Mary River Project is implemented through both the Surface Water and Aquatic Ecosystem Management Plan (SWAEMP) and the Aquatic Effects Monitoring Plan (AEMP), which includes the Core Receiving Environment Monitoring Program (CREMP). These frameworks serve complementary but distinct purposes:

- **SWAEMP**

  is an operational management plan under the Type A Water Licence. It governs how drainage, runoff, non-point discharges, and erosion are managed so that surface water quality and quantity remain compliant under normal and variable hydrological conditions, and it provides the logistical and regulatory flexibility to implement responsive, event-driven sampling.
- **AEMP / CREMP**

  provides the scientific basis for evaluating mine-related influences on water and sediment quality and biota within aquatic environments near the Mine site and downstream of effluent discharge, using statistically robust, long-term datasets. The CREMP dataset formed the foundation for the 2025

assessment of relationships between rainfall/discharge and water quality conditions submitted to QIA (Minnow 2025), demonstrating its strength for understanding broader seasonal and inter-annual patterns.

Given these distinct but complementary roles, event-based monitoring sits at the interface of the SWAEMP and AEMP/CREMP frameworks. Baffinland proposes that:

- the operational implementation of event-based water quality monitoring, including the definition of real-time triggers and associated sampling actions, is conducted under the SWAEMP, and
- the interpretation of event-based data and assessment of mine-related effects is completed using the AEMP/CREMP (and, where applicable, EEM) datasets for context, including comparison to relevant water quality guidelines and AEMP benchmark values.

This approach preserves the AEMP/CREMP's primary function as a long-term aquatic effects program (including MDMER requirements), while satisfying the Water Licence requirement to incorporate event-based monitoring triggers and assessment methods and ensuring that responsive, event-driven sampling is embedded within the operational surface water management framework that is best suited to implement it.

9.8.2 Overview of Event-Based Monitoring

Baffinland will implement event-based monitoring activities under the SWAEMP on a case-by-case basis in response to unique or unanticipated events at the Project site, in accordance with applicable Management Plans (e.g., Erosion and Sediment Control, Spill Contingency, Tailings and Water Management). Event-based monitoring will:

- focus primarily on surface water quality, reflecting the nature of Project activities, existing monitoring networks, and the sensitivity of downstream aquatic environments;

- be designed to enable direct comparison with historical datasets from the SWAEMP, AEMP/CREMP, and Environmental Effects Monitoring (EEM) programs; and
- be used to inform adaptive management, including evaluation of the effectiveness of mitigation measures under both expected (e.g., freshet) and unexpected (e.g., extreme rainfall beyond historical norms) conditions.

The following subsections define the rainfall-triggered event-based monitoring framework and describe how other event types will be addressed.

Rainfall-Triggered Event-Based Monitoring

Baffinland evaluated potential Spearman's correlations between precipitation and discharge endpoints and aqueous concentrations of key nutrients and metals (total ammonia, nitrate, nitrite, TKN, and total aluminum, arsenic, cadmium, chromium, copper, iron, lead, nickel, and zinc) across the Mary River study area. The assessment demonstrated that:

- only a small proportion of comparisons between rainfall/discharge endpoints and water quality parameters exhibited strong ($\rho \leq -0.6$ or ≥ 0.6) and statistically significant relationships; and
- prolonged rainfall (30-day means and/or maxima) was generally associated with higher aqueous concentrations of total ammonia in some mine-proximal lakes (Camp, Sheardown, and Mary lakes).

These findings indicate that, while rainfall and discharge do not exert strong, consistent effects on all parameters at all locations, there is potential for rainfall-driven changes in specific parameters (e.g., total ammonia) during periods of sustained precipitation. On this basis, Baffinland will implement rainfall-triggered, event-based surface water quality monitoring under the SWAEMP as follows.

Rainfall Trigger

- **Trigger condition**:

  Cumulative precipitation of ≥ 16.0 mm recorded at the Mine site meteorological station over any rolling 3-day period during the open-water season (June through September).

  – This trigger is based on the 90th percentile 3-day rainfall statistic for periods with precipitation (> 0 mm), calculated from Mine-site meteorological data collected from 2013–2024.

  – Use of a 90th percentile threshold is intended to focus event-based monitoring on approximately the top 10% of most extreme rainfall events, while maintaining operational feasibility.

- **Spatial scope**:

  Rainfall-triggered sampling will prioritize mine-proximal lakes, downstream receiving environments, and exposure areas already monitored under the SWAEMP, CREMP, and EEM programs to maximize continuity with existing datasets.

Actions Following Trigger Exceedance

Once the rainfall trigger is exceeded:

- **Action 1 – Post-Event Sampling:** Schedule event-based surface water sampling within 24–48 hours of trigger exceedance to assess immediate rainfall-related effects on water quality at 7 shown in Table 9-6.
- **Action 2 – Rolling Trigger Evaluation:**

  After the initial trigger exceedance:

  – Restart the rolling 3-day cumulative rainfall calculation.

  – If the 16.0 mm / 3-day trigger is not exceeded during the subsequent 3-day period, monitoring reverts to routine programs.

  – If the trigger is exceeded again after a further 3 days, Action 1 (post-event sampling) will be repeated.

Table 9-7 Event-Based Monitoring Stations (aligned with AEMP)

Study System	Water Body	Water Quality Station		
		Station Identifier	Easting	Northing
Mary River	Mary River	C0-10	560669	7911633
Camp Lake System	Camp Lake Tributary	K0-01	557390	7915030
	Camp Lake	JL0-02	557615	7914750
Sheardown Lake System	Sheardown Lake NW Tributary 1	D1-00	560329	7913512
	Sheardown Lake NW	DD-Hab9-Stn1	560259	7913455
	Sheardown Lake SE Tributary 9	D9-1	561848	7911860
	Sheardown Lake SE	DL0-02-4	561511	7911832

This approach is intended to capture both short-term responses to intense rainfall events and potential cumulative effects during extended wet periods, without creating an impractical sampling burden.

Assessment and Integration with AEMP / CREMP

Event-based rainfall monitoring results will be:

- compared to applicable water quality guidelines and AEMP benchmark values;
- evaluated in the context of long-term CREMP/AEMP and EEM datasets, including temporal plots of rainfall and water quality to determine whether event-based data are capturing peaks and subsequent recovery; and
- used to refine the rainfall trigger and/or sampling frequency over time, where justified, to optimize detection of rainfall-related effects on water quality while balancing operational constraints.

By locating the rainfall trigger and operational response framework within the SWAEMP, and using CREMP/AEMP datasets for interpretation and reporting, this approach directly responds to the Water Licence requirement for event-based monitoring and quantifiable triggers, while maintaining the functional clarity of the AEMP as an effects-monitoring program rather than an operational response plan.

9.8.3 Other Event Types

In addition to rainfall-triggered events, Baffinland may implement event-based monitoring in response to other site-specific conditions, including but not limited to:

- **Freshet:**
  During freshet, Verification Monitoring Sites may be sampled on a monthly basis, pursuant to Schedule I of the Water Licence, to assess water quality during periods of elevated runoff.
- **Non-compliant or atypical discharges:**
  Where non-compliant effluent, atypical discharges, or unusual field observations (e.g., visible turbidity plumes, odour, or staining) are identified, event-based monitoring may be initiated in accordance with the applicable Management Plan(s) and internal action levels.
- **Other extreme weather or operational events:**
  For other extreme events (e.g., rapid snowmelt, extreme wind-driven resuspension, structural failures of erosion and sediment controls), Baffinland will assess the potential for short-term changes in water quality and may initiate event-based sampling and/or other ecological monitoring as advised by subject matter experts, where appropriate.

For non-rainfall events, specific triggers and monitoring designs will be developed based on the nature of the event, the environmental receptors potentially affected, and relevant regulatory thresholds or internal action levels. Where appropriate, Baffinland will engage subject matter experts to define suitable monitoring approaches.

9.8.4 Reporting and Adaptive Management

Event-based monitoring results will:

- be integrated into annual reporting under the SWAEMP and AEMP, as appropriate, including interpretation relative to applicable guidelines and AEMP benchmark values;
- support adaptive management, including potential refinements to erosion and sediment control measures, water management practices, and/or monitoring designs; and
- provide documentation of the timing and magnitude of rainfall and other events, and the corresponding water quality response (or lack thereof), to demonstrate compliance with the Water Licence and to inform future updates to the SWAEMP and AEMP.

9.8.5 Health and Safety

The safety of Baffinland personnel remains the highest priority. If an event is deemed unsafe for field crews (e.g., severe weather, unsafe access conditions), event-based monitoring may be postponed, modified (e.g., reduced site coverage), or not conducted. Any such decisions, along with the rationale and implications for data collection, will be documented in the relevant monitoring and annual reports.

9.9 Changes to Monitoring Programs

Conditional to the Project's construction and/or operations activities, it may be determined that additional monitoring stations may need to be established to effectively assess, and adequately monitor site-specific surface runoff and effluents. In these cases, Baffinland will provide notification to the NWB and other relevant agencies, and update this Plan accordingly.

10. Data Management and Reporting

10.1 Data Management

The on-site Environmental Superintendent in concert with the corporate Sustainable Development team is responsible for data management and reporting related to surface water management and monitoring. The data management system includes conducting routine inspections and monitoring, and forwarding results to appropriate parties as prescribed by Baffinland's applicable approvals, permits and authorizations.

10.2 Reporting

Table 10-1 summarizes the reporting associated with the monitoring programs outlined Section 9 of this Plan.

Table 10-1 Reporting Summary for Monitoring Programs

Monitoring Program	Applicable Regulatory Instrument	Reporting
Type 'A' Water Licence (Schedule I; Part I)	Type 'A' Water Licence	Monthly Monitoring Reports Annual QIA & NWB Report for Operations
Fisheries Crossings Assessment	Applicable DFO Authorizations and Letters of Advice	Annual DFO Tote Road Monitoring Report Annual QIA & NWB Report for Operations
Tote Road Monitoring Program	-	Annual QIA & NWB Report for Operations
Snow Stockpile Monitoring	-	Annual QIA & NWB Report for Operations

Monitoring Program	Applicable Regulatory Instrument	Reporting
MDMER (Effluent and Receiving Environment Water Quality Monitoring)	MDMER	Quarterly Effluent Monitoring Reports Annual ECCC MDMER Report
MDMER (Biological EEM)	MDMER	Annual QIA & NWB Report for Operations Annual ECCC MDMER Report (for applicable years)
AEMP (excluding Dustfall Program)	Type 'A' Water Licence Project Certificate	Annual QIA & NWB Report for Operations
Groundwater Monitoring	Project Certificate	Annual NIRB Report
Type 'B' Water Licence (Part B, Item 6)	Type 'B' Water Licence	Annual QIA & NWB Report for Exploration and Geotechnical Activities
Dustfall Program	Type 'A' Water Licence Project Certificate	Annual Terrestrial Environment Monitoring Report
Event Based Monitoring	Type 'A' Water Licence	Annual QIA &NWB Report for Operations

11. References

BIM-5200-PLA-0006 – Snow Management Plan

BIM-5200-MAN-0002 - Landfill Operation Maintenance and Monitoring Manual

BIM-5200-PLA-0001 - Landfarm Operation Maintenance and Monitoring Manual

BIM-5000-POL-0001 – Health, Safety and Environment Policy

BIM-5000-POL-0005 – Sustainable Development Policy

BIM-5200-PLA-0025 - Borrow Pit and Quarry Management Plan

BIM-5200-PLA-0003 – Environmental Protection Plan

BIM-5200-PLA-0022 – Fresh Water Supply, Sewage and Wastewater Management Plan

BAF-PH1-830-P16-0017 - Q1 Quarry Management Plan

BIM-5200-PLA-0027 – Roads Management Plan

BIM-5200-PLA-0029BIM-5200-PLA-0029 – Phase 1 Waste Rock Management Plan

BIM-5200-PLA-0030 – Life of Mine Waste Rock Management Plan

BIM-5200-PLA-0031 – Borrow Source Management Plan – Kilometer 97

BIM-5200-PLA-0012 – Spill Contingency Plan

BIM-5200-PLA-0023 – Aquatic Effects Monitoring Plan

BIM-5200-PLA-0033 - QMR2 Quarry Management Plan

Baffinland Iron Mines Corporation (Baffinland), 2012. *Mary River Project - Final Environmental Impact Statement*. February.

Baffinland Iron Mines Corporation (Baffinland), 2013. *Mary River Project - Early Revenue Phase - Addendum to the Final Environmental Impact Statement*. June.

Fisheries and Oceans Canada, 2001. *Policy for the Management of Fish Habitat*. Cat. No. Fs 23-98/1986E ISBN 0-662-15033-3. January 9.

Golder Associates Ltd. (Golder), 2016. *Dust Mitigation Action Plan*.

Golder Associates Ltd. (Golder), 2017. *Mary River Project - Tote Road Earthworks Execution Plan*. April. Rev. 0. Report Number: 1667708.

Knight Piésold 2007. *Baffinland Iron Mines Corporation - Mary River Project - Bulk Sampling Program - Fish Habitat No Net Loss and Monitoring Plan*. Ref. No. NB102-00181/10-4, Rev. 0, August 30.

Nunavut Water Board (NWB), 2025. *Licence No. 2AM-MRY2540*

Wright, D.G., and G.E. Hopky, 1998. Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters. Can. Tech. Rep. Fish. Aquat. Sci. 2017: iv + 34p.

Appendix A Corporate Policies

Baffinland Iron Mines Corporation

Health, Safety and Environment Policy

BAF-PH1-800-POL-0001

Rev 2

Approved By: **Brian Penney**

Title: **Chief Executive Officer**

Date: **April 20th, 2022**

Signature: 

DOCUMENT REVISION RECORD

Issue Date MM/DD/YY	Revision	Prepared By	Approved By	Issue Purpose
05/07/15	0	EM	TP	For Use
03/07/16	1	JS	BP	Minor edits
04/20/18	2	TS	SA/BP	Minor edits
04/20/22	3	TS	BP	Minor edits

This Baffinland Iron Mines Corporation Policy on Health, Safety and Environment is a statement of our commitment to achieving a safe, healthy and environmentally responsible workplace. We will not compromise this policy for the achievement of any other organizational goals.

We implement this Policy through the following commitments:

- Continual improvement of safety, occupational health and environmental performance
- Meeting or exceeding the requirements of regulations and company policies
- Integrating sustainable development principles into our decision-making processes
- Maintaining an effective Health, Safety and Environmental Management System
- Sharing and adopting improved technologies and best practices to prevent injuries, occupational illnesses and environmental impacts
- Engaging stakeholders through open and transparent communication.
- Efficiently using resources, and practicing responsible minimization, reuse, recycling and disposal of waste.
- Reclamation of lands to a condition acceptable to stakeholders.

Our commitment to provide the leadership and action necessary to accomplish this policy is exemplified by the following principles:

- As evidenced by our motto “Safety First, Always” and our actions Health and Safety of personnel and protection of the environment are values not priorities.
- All injuries, occupational illnesses and environmental impacts can be prevented.
- Employee involvement and active contribution through courageous leadership is essential for preventing injuries, occupational illnesses and environmental impacts.
- Working in a manner that is healthy, safe and environmentally sound is a condition of employment.
- All operating exposures can be safeguarded.
- Training employees to work in a manner that is healthy, safe and environmentally sound is essential.
- Prevention of personal injuries, occupational illnesses and environmental impacts is good business.
- Respect for the communities in which we operate is the basis for productive relationships.

We have a responsibility to provide a safe workplace and utilize systems of work to meet this goal. All employees must be clear in understanding the personal responsibilities and accountabilities in relation to the tasks we undertake.

The health and safety of all people working at our operation and responsible management of the environment are core values to Baffinland. In ensuring our overall profitability and business success every Baffinland and business partner employee working at our work sites is required to adhere to this Policy.

Brian Penney
Chief Executive Officer
April 2022

Baffinland Iron Mines Corporation

BIM-5000-POL-0005 SUSTAINABLE DEVELOPMENT POLICY

DOCUMENT REVISION RECORD

BIM-5000-POL-0005 Sustainable Development Policy	Issue Date: 2025-07-02	Page 1 of 7
Department of Relevance / Site Wide	Next Review date: 2027-06-27	Revision: 1.01
Document Owner: HSEST Systems and Document Controller	Document Approver: Vice President, Sustainable Development	

Issue Date MM/DD/YY	Rev #	Prepared By	Reviewed By	Approved By	Description of change and purpose of issue
05/07/15	0	EM		TP	For use
03/07/16	1	JS		BP	Minor edits
05/09/25	2	R. Chakravorty	C. Oliver	M. Lord-Hoyle	Updated the entire Policy, and moved to new template.

TABLE OF CONTENTS

PURPOSE

Baffinland Iron Mines LP (Baffinland or the Company) conducts its business in accordance with the principles of our Sustainable Development Policy ("Policy"), which is underpinned by the Universal Declaration of Human Rights, United Nations (UN) Sustainable Development Goals, and Canada's commitments to the Paris Agreement.

The sustainability of our operations is strengthened by our commitment and responsibility to protect the environment, to operate safely, in a fiscally responsible manner and with utmost respect for the cultural values, Inuit Qaujimajatuqangitiq (IQ) and legal rights of Inuit.

SCOPE

We expect each and every employee, contractor, and visitor to value, honour and commit to this Policy through their actions.

The six pillars of our Sustainable Development Policy are:

1) Health and Safety
2) Environment
3) People, Rights Holders and Cultural Integrity
4) Supply Management and Economic Development
5) Climate Action
6) Transparent Governance

OUR PILLARS

1. HEALTH AND SAFETY

- Our motto is “Safety First, Always.” We consider people as our greatest assets and Health and Safety of our workforce and affected communities is a foundational value. This value is further bolstered by our Health, Safety and Environment Policy.
- We strive to achieve the safest workplace for our people and remain free from occupational injuries and illnesses.
- We lead with a culture of collective responsibility and promote courageous leadership through active participation, responsible behaviour, and risk awareness.

2. ENVIRONMENT

- We integrate western science and IQ knowledge through community engagements and consultations, environmental and socio-economic working groups and monitoring programs to assess project related effects, minimize impacts and preserve marine, terrestrial and freshwater life, conserve biodiversity and support community well-being.
- We continuously seek to undertake initiatives to use energy, raw materials and natural resources more efficiently, and implement technologies to enhance our environmental conservation practices and reduce our footprint.
- We evolve our Interim Closure and Reclamation Plan to meet reclamation objectives effectively through all stages of project operations and development.

3. PEOPLE, RIGHTS HOLDERS AND CULTURAL INTEGRITY

- We uphold human rights and dignity of all individuals with utmost respect, guided by UN Guiding Principles on Business and Human Rights and acting in accordance to Nunavut Land Claims Agreement.
- We strive to build strong and lasting relationships with the affected Inuit communities. We honour and respect the unique values and traditions of Inuit and work in partnership to incorporate IQ across our business practises, and our Mission, Vision and Values were developed to directly align with Inuit Societal Values.
- We are committed to the well-being of affected communities and aim to create positive and lasting impact. We actively engage, develop and provide support systems dedicated to physical, mental and emotional well-being, as well as foster inclusion and preservation of cultural practices.
- We do not tolerate discrimination or harassment of any form against individuals, including employees and contractors on the basis of race, colour, sexual orientation, gender identity, religion, political opinion, nationality or social origin and are committed to advance equity, diversity and inclusion of historically under-represented groups within our workforce and culture.
- We expect our employees and contractors, community members, and workers in our value chain to bring human rights concerns to our attention through our established channels. We are committed to engaging with our communities of interest on our human rights impacts and to report and improve on our performance.

4. SUPPLY MANAGEMENT AND ECONOMIC DEVELOPMENT

- We are focused on advancing social, cultural and economic development of our communities of interests.
- We work with affected Inuit communities to develop socio-economic self-reliance through our support for local enterprises, skills development programs and job creation initiatives contributing to long term success and well-being of the community.
- We are committed to building resilient and transparent supply chains to uphold responsible business practices that enhances our economic impact on our communities and lowers business risks.
- We expect our suppliers to conform to our Code of Business Conduct and uphold internationally recognised human rihgts standards. While we operate in Canada, we actively engage with our value chain to minimize the risk of any violations.

5. CLIMATE ACTION

- As a Canadian critical mineral producer of high grade iron ore, we contribute to the manufacting of low carbon steel in support of global net zero transition.
- We are committed to adopt viable technologies for improving energy efficiency, reducing greenhouse gas emissions, reducing our carbon footprint and adapt to climate change.
- We work to ensure that our operations support the needs and vision of future generations of Nunavummiut.

6. TRANSPARENT GOVERNANCE

- We implement steps within our operations to understand, evaluate and manage risks on a continuing basis, including those that may impact the environment, employees, contractors, local communities, consumers and shareholders.
- We endeavour to ensure that adequate resources are available and that systems are in place to implement risk-based management systems, including defined standards and objectives for continuous improvement.
- We monitor, review and report our performance with respect to our safety, health, environmental, socio-economic commitments and set annual targets and objectives.
- We are dedicated to effectively and efficiently utilizing our shareholder's capital while demonstrating honesty and integrity by applying the highest standards of ethical conduct. Our Code of Business Conduct reinforces our commitment to uphold and exceed legal and regulatory requirements in all aspects of our business practices.
- We are committed to transparency in our operations, underscored by robust monitoring programs and disclosure practices. Our monitoring programs lead the body of research for this region of the Arctic and are evaluated by technical working groups comprised of government bodies, regulators and local authorities.

FURTHER INFORMATION

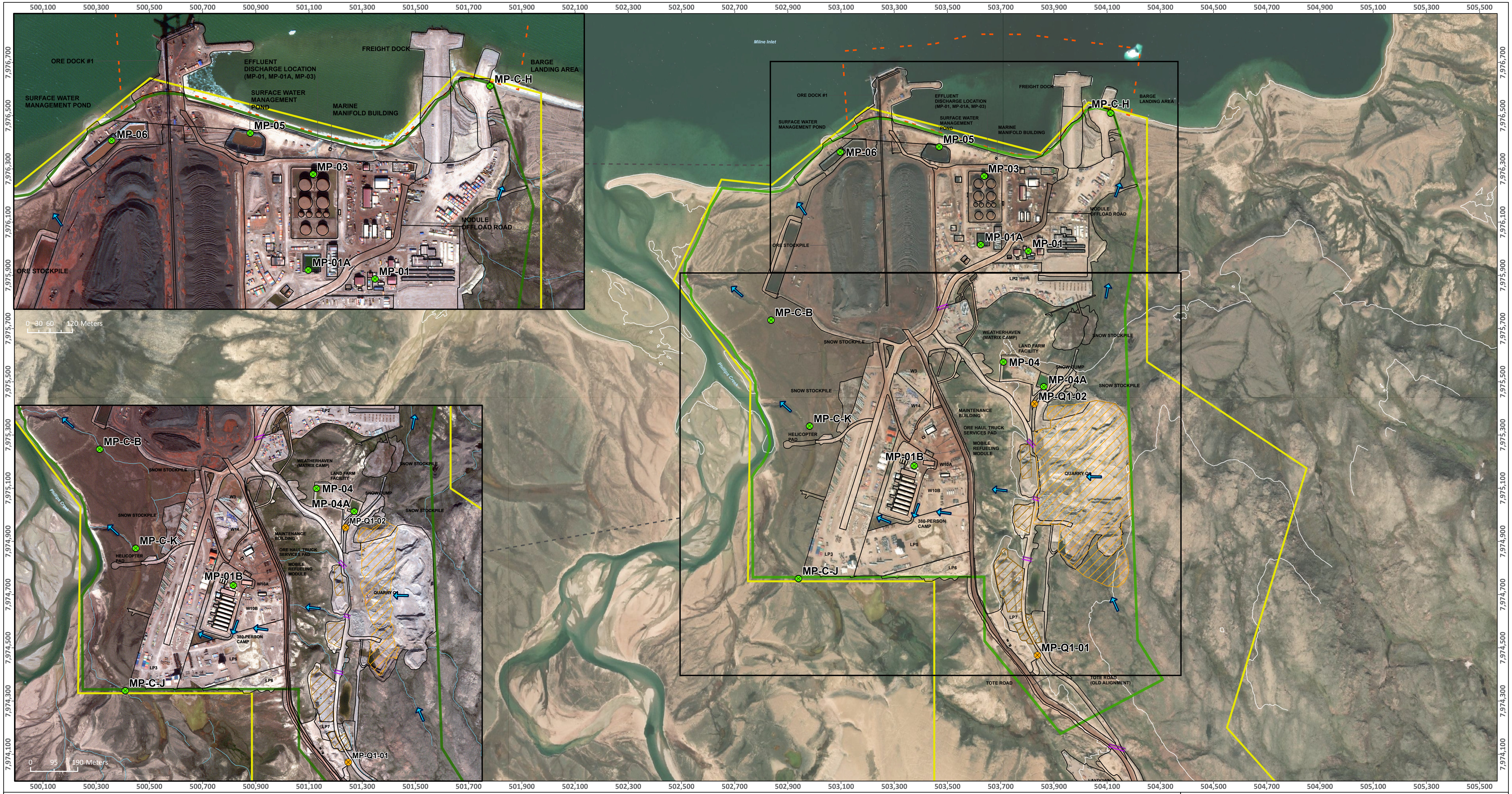
Please refer to the following policies and documents for more information on Baffinland's commitment to operating in an environmentally and socially responsible manner:

Health, Safety and Environment Policy

Equity, Diversity and Inclusion in the Workplace Policy

Code of Business Conduct

Appendix B Site Drainage and Monitoring Figures



LEGEND

- Borrow Area
- Quarry Area
- Project Development Area
- Commercial Lease Boundary
- Current Infrastructure
- Drainage Direction
- MDMER Monitoring Location
- SNP Monitoring Location
- Quarry and Borrow Source Location
- Culvert
- 50m Contours
- Watercourse

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Milne Port Drainage and Water Licence Monitoring Stations

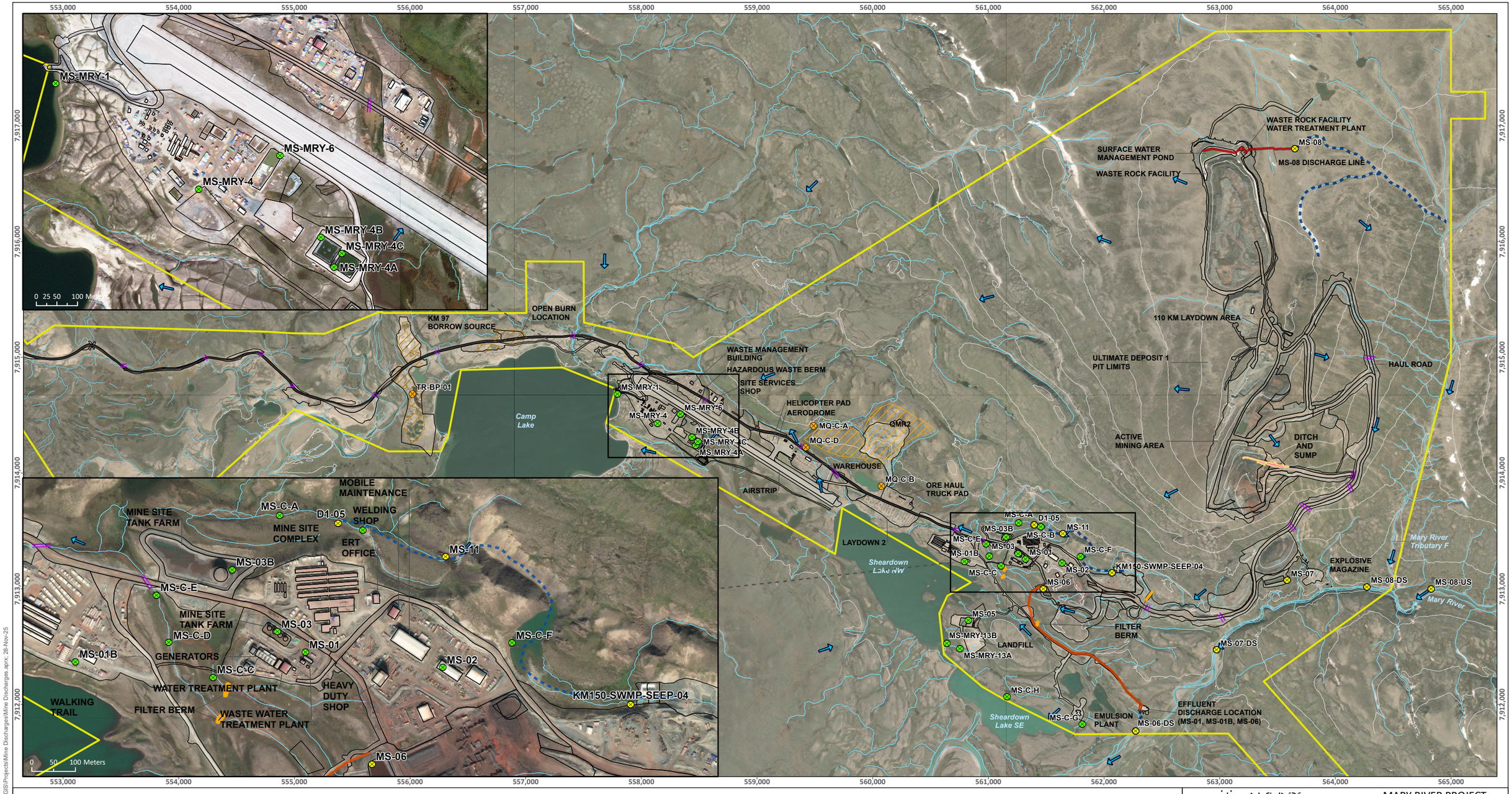
Projection: NAD 1983 UTM ZONE 17N.
Inset Maps: © 2025 PhotoSat Information Ltd.
Imagery is representative as of August 2025.

0 45 90 180 270 360 Meters
Scale 1:14,000

N

Baffinland

ᑎᑎᕋᐅᓯᖃᐅᓯᖅ FIGURE 1



LEGEND

- Borrow Area
- Quarry Area
- Project Development Area
- Commercial Lease Boundary
- Current Infrastructure
- Drainage Direction
- MDMER Monitoring Locations
- SNP Monitoring Locations
- Quarry and Borrow Source
- Culvert
- HDPE Pipe
- Overland Surface Water Flow
- Lay Flat Hose
- 50m Contours
- Watercourse

ᓄᓇᕗᑦ ᐅᓴᖅᑭᑎᑦ MARY RIVER PROJECT

Mine Site Drainage and Water Licence Monitoring Locations

Projection: NAD 1983 UTM ZONE 17N.
Inset Maps: © 2025 PhotoSat Information Ltd.
Imagery is representative as of August 2025.

0 105 210 420 630 840 Meters
Scale 1:32,000

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Baffinland

ᑎᑎᕋᐅᓯᖏᑦ FIGURE 2

SAVED: C:\Users\Kristina.Poirier\Documents\ArcGIS\Projects\Mine Discharges\Mine Discharges.aprx, 28-Nov-25

Appendix C Tote Road and Steensby Crossings

As required by Part E Item 27 of the Type A Water Licence, the following tables are provided. However, it is important to the note that only selected crossings were subject to detailed fish and fish habitat investigations, and therefore some values have not been measured for sites where no investigation was performed. Nonetheless, all crossings were evaluated to some extent. The Baffinland and consultant sources reviewed in preparation for this summary tables include, but are not limited to, the following:

- Knight Piésold Ltd. (2007). Baffinland Iron Mines Corporation, Mary River Project bulk sampling program, fish habitat no net loss and monitoring plan (Ref. No. NB102-00181/10-4). Knight Piésold.
- Knight Piésold Ltd. (2008). Mary River Project bulk sampling program – Tote Road upgrades, fish habitat monitoring 2008 report to the Department of Fisheries and Oceans. Prepared for Baffinland Iron Mines Corporation.
- Baffinland Iron Mines Corporation. (2012). Mary River Project: Final environmental impact statement (Appendix 7C).
- North/South Consultants Inc. (2018). Baffinland Iron Mines Corporation, Mary River Project – Phase 2 proposal: North Railway freshwater habitat survey. North/South Consultants Inc.
- Baffinland Iron Mines Corporation. (2024). Mary River Project: 2023 Tote Road dish habitat monitoring annual report.
- Baffinland Iron Mines Corporation. (2025). Mary River Project: 2024 Tote Road fish habitat monitoring annual report.

Moreover, the information provided herein is subject to change as the project progress through annual reviews the development of the Steensby Rail Project.

Appendix C.1 List of sites evaluated and assessed in freshwater watercourses along the Tote Road

Crossing ID'S	Type of Crossing	Closest KM Marking	Wetted Width US (m)	Approxomite Average Depth US (m)	Wetted Width DS (m)	Approxomite Average Depth DS (m)	Wetted Width (m) at crossing	Approxomite Average Depth (m) at crossing	Fish Bearing Status	Fish Species	Potential Use Life Stages	Crossing Likely Connected To Which Fish Bearing Waterbodies	Rationale
CV-187	Culvert	103	4.0-9.1	0.08	11.0	0.18-0.25			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Sheardown Lake System	
CV-186	Culvert	103	3.2-3.8	0.10-0.15	4.6-4.7	0.05-0.10			Yes	Arctic Char & Ninespin Stickleback	Rearing & Migration	Sheardown Lake System	
CV-185	Culvert	102							No			Sheardown Lake System	No fish habitat and appears to have little or no water even in spring
CV-184	Culvert	101.5							No			Camp Lake System	No fish habitat and appears to have little or no water even in spring
BG-01	Culvert	100	4.0-25.60	0.30-0.40	5.0-23.77	0.10-0.20			Yes	Arctic Char & Ninespin Stickleback	Rearing & Migration	Camp Lake System	
CV-225	Culvert	99	3.8-27.43	0.10-0.50	7.0-19.20	0.12-0.20			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Camp Lake System	
CV-224	Culvert	98	6.7-10.8	0.07	3.6-9.5	0.08-0.10			Yes	Arctic Char	Rearing & Migration	Camp Lake System	
CV-223	Culvert	97	54.8-117.0	0.25-0.30	39.1-117.0	0.20-0.30			Yes	Arctic Char	Rearing & Migration	Camp Lake System	
KM97 Bridge	Bridge	97							Yes	Arctic Char	Rearing & Migration	Camp Lake System	
BG-02	Culvert	96							No			Camp Lake System	No fish habitat
BG-03	Culvert	96							Yes	Ninespine Stickleback & potentially Arctic Char	Spwaning & Rearing	Camp Lake System	
CV-001	Culvert	95	22.9	0.50	1.4	0.08			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Camp Lake System	
BG-04	Culvert	95	20.1	0.50	9.1-12.8	0.15-0.20			Yes	Arctic Char	Rearing & Migration	Camp Lake System	
CV-002	Culvert	94							No			Camp Lake System	Very little water even in spring
BG-07	Culvert	94							No			Camp Lake System	Very little water even in spring
CV-003	Culvert	94							No			Camp Lake System	No fish habitat and appears to have relativly step drop downstream from crossing and almost no water even in spring
CV-004	Culvert	93.5							No			Camp Lake System	Very little water even in spring and mostly runoff
CV-219	Culvert	93							No			Camp Lake System	No fish habitat and gradient relativly steep
CV-221	Culvert	93							No			Camp Lake System	No fish habitat and gradient relativly steep
CV-220	Culvert	93							No			Camp Lake System	No fish habitat and gradient relativly steep
BG-09	Culvert	93							No			Camp Lake System	Habitat marginal in spring in lower reacges though still frozen at the end of June
BG-10	Culvert	92.5							No			Camp Lake System	No fish habitat and gradient relativly steep and relativly little water already
BG-11	Culvert	92.5							No			Camp Lake System	Habitat marginal in spring in lower reaches, though still frozen at the end of June, and gradient a little steep
CV-005	Culvert	92.5							No			Camp Lake System	Habitat marginal at best and only during spring
BG-12	Culvert	92							No			Camp Lake System	Habitat marginal at best and only during spring, very little water even in spring, still frozen at end of June, and higher gradient
CV-006	Culvert	92							No			Camp Lake System	
BG-13	Culvert	92					6.0-5.8	0.24-0.45	No	Arctic Char & Ninespine Stickleback	Spawning, Rearing, & Migration	Camp Lake System	
BG-14	Culvert	91.5					9.3-9.8	0.02-0.25	No	Arctic Char & Ninespine Stickleback	Spawning, Rearing, & Migration	Camp Lake System	
BG-15	Culvert	91.5							No			Camp Lake System	Habitat marginal at best and only during spring, very little water even in spring, still frozen at end of June, and higher gradient
BG-16	Culvert	91.5	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Camp Lake System	Non suitable water depth and non suitable substrate
BG-17	Culvert	91	8.0-11.9	0.25	3.3-8.0	2.5			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Camp Lake System	
BG-18	Culvert	91							No				Habitat marginal at best and only during spring, but little water even in spring and still frozen
BG-19	Culvert	91							No			David Lake System	Habitat marginal at best and only during spring, but little water even in spring
CV-008	Culvert	90.5							No			David Lake System	Habitat marginal at best and only during spring
BG-20	Culvert	90.5							No			David Lake System	Marginal at best and only during spring, may be inaccessible due to potential downstream barrier (steep gradient)
BG-21	Culvert	90.5							No			David Lake System	Habitat marginal at best and only during spring, but little water even in spring and still frozen
BG-22	Culvert	90							No			David Lake System	Habitat marginal at best and only during spring, but little water even in spring and still frozen
CV-009	Culvert	90							No			David Lake System	Habitat marginal at best and only during spring
CV-011	Culvert	90							No			David Lake System	No fish habitat, also seems to have impassable steep rocky barrier downstream of crossing
CV-010	Culvert	89							No			David Lake System	No fish habitat, also seems to have impassable steep rocky barrier downstream of crossing

Crossing ID'S	Type of Crossing	Closest KM Marking	Wetted Width US (m)	Approxomite Average Depth US (m)	Wetted Width DS (m)	Approxomite Average Depth DS (m)	Wetted Width (m) at crossing	Approxomite Average Depth (m) at crossing	Fish Bearing Status	Fish Species	Potential Use Life Stages	Crossing Likely Connected To Which Fish Bearing Waterbodies	Rationale
CV-012	Culvert	89							No			David Lake System	No fish habitat, also seems to have impassable steep rocky barrier downstream of crossing
BG-23	Culvert	89							No			David Lake System	Habitat marginal in spring in lower reaches, though still frozen at the end of June, and higher gradient
BG-24	Culvert	89	2.30-6.50	0.09-0.30	1.8-5.5	0.15-0.40			Yes	Arctic Char	Spawning, Rearing, & Migration	David Lake System	
CV-218	Culvert	89							No			David Lake System	Habitat marginal at best in spring
BG-25	Culvert	88							No			David Lake System	Habitat marginal at best in spring in lower reaches, and water levels relativly low
CV-014	Culvert	88							No			David Lake System	Habitat marginal at best and only during spring
CV-013	Culvert	88							No			David Lake System	No fish habitat, also seems to have impassable steep rocky barrier downstream of crossing
BG-26	Culvert	88							No			David Lake System	Habitat marginal at best in spring in lower reaches, and water levels relativly low
CV-015	Culvert	88							No			David Lake System	Habitat marginal at best and only during spring
BG-27	Culvert	87.5	5.0	0.05	5	0.05			Yes	Arctic Char	Rearing	David Lake System	
CV-016	Culvert	87.5							No			David Lake System	No fish habitat
BG-28	Culvert	87	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			David Lake System	No fish habitat
CV-017	Culvert	87							No			David Lake System	Habitat marginal at best and only during spring in lower reaches
CV-018	Culvert	87							No			David Lake System	No fish habitat
CV-019	Culvert	86.5							No			David Lake System	Habitat marginal at best and only during spring in lower reaches
CV-020	Culvert	86.5					Visited but Visited but Not Measured	Visited but Not Measured	No			David Lake System	No fish habitat and relativly little water already
CV-022	Culvert	86							No			David Lake System	No fish habitat
CV-021	Culvert	86							Yes	Arctic Char & Ninespin Stickleback	Spawning & Rearing	David Lake System	
BG-29	Culvert	85.5	5.1-5.6	0.20-0.25	2.3	0.3			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	David Lake System	
BG-30	Culvert	85.5	~1.0-2.0	0.15-0.20	~2.0-3.0	0.1			Yes	Arctic Char & Ninespin Stickleback	Spawning & Rearing	David Lake System	
CV-023	Culvert	85							No			David Lake System	Little water so likely dries up, non suitable water depth, non suitable mesohabitat, and non suitable substrate
BG-31	Culvert	82	Visited but Not Measured	Visited but Not Measured	~0.5-3.0	0.05			No			Muriel Lake System	
CV-216	Culvert	80.5	22.9-29.3	0.03	6.4-28.0	0.03	Visited but Not Measured	Visited but Not Measured	Yes	Arctic Char	Rearing & Migration	Muriel Lake System	
CV-217	Culvert	80	Lake	Lake	71.3-137.1	0.35-0.50			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Muriel Lake System	
CV-215	Culvert	80					Visited but Not Measured	Visited but Not Measured	Yes	Artic Char & potentially Ninespine Stickleback	Spwaning & Rearing	Muriel Lake System	
KM80 Bridge	Bridge	80							Yes	Artic Char & potentially Ninespine Stickleback	Spwaning & Rearing	Muriel Lake System	
CV-214	Culvert	79					6.5-1.7	0.03-0.15	Yes	Artic Char & potentially Ninespine Stickleback	Spwaning & Rearing	Muriel Lake System	
CV-213	Culvert	78.5							No			Muriel Lake System	Habitat marginal at best and only during spring, higher gradient
BG-32	Culvert	78	4.0	1.00	3.8	<1.00			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Muriel Lake System	
CV-030	Culvert	77.5	-	-	-	-			Yes	Arctic Char & Ninespin Stickleback	Rearing & Migration	Muriel Lake System	
CV-032	Culvert	77							No			Muriel Lake System	No fish habitat
CV-031	Culvert	77							No			Muriel Lake System	Little water so likely dries up
BG-33	Culvert	77							Yes	Arctic Char & Ninespin Stickleback	Spawning & Rearing	Muriel Lake System	
CV-033	Culvert	76.5							No			Muriel Lake System	No fish habitat and appears to have little or no water even in spring
CV-212	Culvert	75							Yes	Artic Char & potentially Ninespine Stickleback	Spwaning & Rearing	Muriel Lake System	
CV-211	Culvert	74							Yes			Muriel Lake System	
CV-036	Culvert	73.5							No			Muriel Lake System	
CV-037	Culvert	73.5							No			Muriel Lake System	
CV-038	Culvert	73.5							No			Muriel Lake System	
CV-039	Culvert	73.5							No			Muriel Lake System	
CV-040	Culvert	73	8.7-22.9	0.05-0.25	6.8-27.4	0.10-0.25			Yes	Arctic Char	Rearing	Muriel Lake System	
CV-210	Culvert	72.5							No			Muriel Lake System	Habitat marginal at best in lower reaches and only in spring
CV-041	Culvert	69.5							No			Ravn River	Habitat marginal at best in lower reaches and only in spring
CV-042	Culvert	69.5							No			Ravn River	Habitat marginal at best in lower reaches and only in spring

Crossing ID'S	Type of Crossing	Closest KM Marking	Wetted Width US (m)	Approxomite Average Depth US (m)	Wetted Width DS (m)	Approxomite Average Depth DS (m)	Wetted Width (m) at crossing	Approxomite Average Depth (m) at crossing	Fish Bearing Status	Fish Species	Potential Use Life Stages	Crossing Likely Connected To Which Fish Bearing Waterbodies	Rationale
CV-043	Culvert	67.5							No			Ravn River	Habitat marginal at best in lower reaches and only in spring, also non suitable water depth, non suitable mesohabitat, and non suitable substrate
CV-044	Culvert	67							No			Ravn River	No fish habitat
CV-045	Culvert	67							No			Ravn River	No fish habitat
CV-046	Culvert	67	1.7	0.10	2.2	0.08			No			Ravn River	Steep gradient 100m upstream, non suitable water depth, and non suitable mesohabitat
CV-047	Culvert	67							No			Ravn River	Non suitable mesohabitat
CV-048	Culvert	66.5	3.3-6.4	0.08-0.20	8.8-10.1	0.05-0.15			No			Ravn River	Subsurface flow 50 to 200m downstream
CV-209	Culvert	66							No			Ravn River	No fish habitat
CV-208	Culvert	65.5							No			Ravn River	No fish habitat
CV-049	Culvert	64	12.0-27.4	0.07-0.15	12.0-12.8	0.10-0.20			Yes	Arctic Char	Spawning, Rearing, & Migration	Ravn River	
BG-50	Culvert	64	45.7-61.0	0.15-0.25	44.8-61.0	0.10-0.20			Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Ravn River	
CV-056	Culvert	63.5							No			Ravn River	No fish habitat, appears to have little or no water even in spring, and there is a steep drop downstream
CV-050	Culvert	63.5							No			Ravn River	No fish habitat, appears to have little or no water even in spring and steep drop downstream
CV-051	Culvert	63.5							No			Ravn River	No fish habitat, appears to have little or no water even in spring and steep drop downstream
CV-052	Culvert	63.5							No			Ravn River	No fish habitat, appears to have little or no water even in spring and steep drop downstream
CV-053	Culvert	63							No			Ravn River	No fish habitat, appears to have little or no water even in spring and steep drop downstream
CV-054	Culvert	63							No			Ravn River	Habitat marginal at best in lower reaches and only during spring
CV-055	Culvert	63	1.1	0.02	1.1	0.02			No			Ravn River	Not accessible from nearby Philips Creek, non suitable water depth, non suitable mesohabitat, and steep gradient 50m downstream
KM62 Bridge	Bridge	62							Yes	Arctic Char & Ninespin Stickleback	Spawning, Rearing, & Migration	Ravn River	
CV-057	Culvert	61.5	1.0	0.30	1.0	0.30			Yes	Arctic Char	Rearing	Ravn River	
CV-058	Culvert	61	3.1-6.5	0.50	1.8-2.0	0.15-0.20			Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-059	Culvert	61	5.5	0.25	4.1	0.1	2.0-2.7	0.06-0.10	Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-060	Culvert	60	3.6-6.0	0.20-0.30	3.6-8.5	0.15-0.30	5.4-8.8, 1.5	0.11-0.44	Yes	Arctic Char	Rearing & Migration	Philips Creek System - Katiktok Lake	
CV-061	Culvert	59							Yes	Artic Char & potentially Ninespine Stickleback	Spawning & Rearing	Philips Creek System - Katiktok Lake	
CV-062	Culvert	58							No			Philips Creek System - Katiktok Lake	Habitat marginal at best in lower reaches and only during spring
CV-063	Culvert	57							No			Philips Creek System - Katiktok Lake	
CV-064	Culvert	56.5							No			Philips Creek System - Katiktok Lake	Habitat marginal at best in lower reaches and only during spring
CV-065	Culvert	56.5							No			Philips Creek System - Katiktok Lake	Habitat marginal at best in lower reaches and only during spring
CV-066	Culvert	56.5							No			Philips Creek System - Katiktok Lake	No fish habitat, appears to have little or no water even in spring and relativly steep
CV-067	Culvert	56							No			Philips Creek System - Katiktok Lake	Habitat marginal at best in lower reaches and only during spring
CV-068	Culvert	56							No			Philips Creek System - Katiktok Lake	No fish habitat, appears to have little or no water even in spring and relativly steep
CV-069	Culvert	56							No			Philips Creek System - Katiktok Lake	No fish habitat, appears to have little or no water even in spring
CV-070	Culvert	56							No			Philips Creek System - Katiktok Lake	No fish habitat, appears to have little or no water even in spring
CV-071	Culvert	55							No			Philips Creek System - Katiktok Lake	Habitat marginal in lower reaches and only during spring
CV-072	Culvert	55	4.1-12.8	0.1	2.8-15.5	0.14-0.30			Yes	Arctic Char	Spawning, Rearing, & Migration	Philips Creek System - Katiktok Lake	
CV-073	Culvert	55							No			Philips Creek System - Katiktok Lake	
CV-074	Culvert	55							No			Philips Creek System - Katiktok Lake	
CV-075	Culvert	54							No			Philips Creek System - Katiktok Lake	Non suitable water depth and non suitable mesohabitat
CV-076	Culvert	54	1.9	0.1	6.2-6.4	0.1			Yes	Arctic Char	Rearing & Migration	Philips Creek System - Katiktok Lake	
CV-077	Culvert	54							No			Philips Creek System	Habitat marginal at best and only during spring
CV-078	Culvert	52	9.1-21.0	0.15-0.20	17.4-25.8	0.06-0.30			Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-079	Culvert	52	3.9-8.7	0.20-0.25	13.7-19.6	0.08-0.15			Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-207	Culvert	52	3.9	0.15	4.1	0.15			No	Arctic Char	Rearing & Migration	Philips Creek System	Habitat marginal at best in lower reaches and only during spring
CV-080	Culvert	51							No			Philips Creek System	Habitat marginal at best in lower reaches and only during spring

Crossing ID'S	Type of Crossing	Closest KM Marking	Wetted Width US (m)	Approxomite Average Depth US (m)	Wetted Width DS (m)	Approxomite Average Depth DS (m)	Wetted Width (m) at crossing	Approxomite Average Depth (m) at crossing	Fish Bearing Status	Fish Species	Potential Use Life Stages	Crossing Likely Connected To Which Fish Bearing Waterbodies	Rationale
CV-081	Culvert	50.5							No			Philips Creek System	
CV-082	Culvert	50	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Non suitable water depth
CV-206	Culvert	49							No			Philips Creek System	Habitat marginal at best in lower reaches and only during spring
CV-083	Culvert	48							No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, habitat marginal at best in lower reaches, and only during spring
CV-084	Culvert	47							No			Philips Creek System	No fish habitat
CV-085	Culvert	46.5							No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, habitat marginal at best in lower reaches and only during spring
CV-086	Culvert	46	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, non suitable mesohabitat, steep gradient
CV-087	Culvert	46	10.0	0.10	10	0.1			No			Philips Creek System	Non suitable water depth, non suitable mesohabitat, and steep gradient 100m downstream
CV-088	Culvert	46							No			Philips Creek System	Little water
CV-089	Culvert	45							No			Philips Creek System	No fish habitat
CV-090	Culvert	45							No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, non suitable mesohabitat
CV-205	Culvert	44							No			Philips Creek System	No fish habitat
CV-091	Culvert	43							No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable mesohabitat
CV-092	Culvert	43	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Non suitable water depth, non suitable mesohabitat, and non suitable substrate
CV-093	Culvert	42	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, and non suitable mesohabitat
CV-094	Culvert	41.5	2.0-10.4	0.10-0.20	6.8-8.2	0.15-0.25			No	Arctic Char	Not Fish Bearing	Philips Creek System	Not accessible from nearby Philips Creek, non suitable mesohabitat, and falls 30m downstream
CV-095	Culvert	41	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Non suitable water depth and non suitable mesohabitat
CV-096	Culvert	41							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-097	Culvert	39							No			Philips Creek System	
CV-098	Culvert	38.5							No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, and non suitable mesohabitat
CV-099	Culvert	38	8.0-36.6	0.12-0.25	7.3-9.1	0.15-0.40			Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-100	Culvert	37							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-101	Culvert	37							No			Philips Creek System	
CV-102	Culvert	36	11.9	0.05	12.8	0.03			Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-103	Culvert	36							No			Philips Creek System	
CV-204	Culvert	35							No			Philips Creek System	
CV-203	Culvert	34	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System - KM32 Lake	Non suitable water depth
CV-104	Culvert	34	5.7-6.0	0.1	3.0-6.0	0.05-0.08			Yes	Arctic Char	Rearing & Migration	Philips Creek System - KM32 Lake	
CV-105	Culvert	33							No			Philips Creek System - KM32 Lake	
CV-106	Culvert	33	1.4	<0.05	1	<0.05			Yes	Arctic Char	Rearing & Migration	Philips Creek System - KM32 Lake	
CV-107	Culvert	33							No			Philips Creek System - KM32 Lake	
CV-202	Culvert	33	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System - KM32 Lake	Non suitable water depth, no fish habitat, loss of connection 10m downstream, and no surface flow upstream
CV-108	Culvert	32.5							No			Philips Creek System - KM32 Lake	Habitat marginal at best in lower reaches and only in spring, little water
CV-109	Culvert	32.5							No			Philips Creek System - KM32 Lake	No fish habitat
CV-110	Culvert	32							No			Philips Creek System - KM32 Lake	No fish habitat
CV-111	Culvert	32	6.2-7.0	0.05-0.08	5.5-6.4	0.05-0.07			Yes	Arctic Char	Rearing & Migration	Philips Creek System - KM32 Lake	

Appendix C.1 Tote Road Watercourse Crossings

Crossing ID'S	Type of Crossing	Closest KM Marking	Wetted Width US (m)	Approxomite Average Depth US (m)	Wetted Width DS (m)	Approxomite Average Depth DS (m)	Wetted Width (m) at crossing	Approxomite Average Depth (m) at crossing	Fish Bearing Status	Fish Species	Potential Use Life Stages	Crossing Likely Connected To Which Fish Bearing Waterbodies	Rationale
CV-112	Culvert	31.5	3.1-3.5	0.07	1.9-2.1	0.08-0.10			Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-113	Culvert	30.5	1	0.08	3.5	0.04			No			Philips Creek System	Non suitable water depth, loss of connection 150m upstream, and steep gradient 25m upstream
CV-201	Culvert	30.5							No			Philips Creek System	
CV-114	Culvert	30	8.0-12.2	0.05-0.08	6.0-8.0	0.05-0.07			Yes	Arctic Char	Rearing & Migration	Philips Creek System	
CV-200	Culvert	29							No			Philips Creek System	
CV-115	Culvert	28	2.7	0.03	1.6	0.05			Yes	Artic Char & potentially Ninespine Stickleback	Rearing	Philips Creek System - KM27 Lake	
CV-116	Culvert	27.5							No			Philips Creek System - KM27 Lake	
CV-117	Culvert	27							No			Philips Creek System - KM27 Lake	Not accessible from nearby Philips Creek, non suitable water depth, and son suitable mesohabitat
CV-199	Culvert	26.5							NO			Philips Creek System	
CV-198	Culvert	26							No			Philips Creek System	
CV-118	Culvert	26							No			Philips Creek System	
CV-197	Culvert	25							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-119	Culvert	24	Visited but Not Measured	Visited but Not Measured	1.2-27.0	0.50-1.00			No			Philips Creek System	Non suitable water depth, non suitable mesohabitat, steel gradient 100m downstream, and no fish habitat upstream
CV-120	Culvert	23.5	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Non suitable depth, and no fish habitat
CV-121	Culvert	23							No			Philips Creek System	No fish habitat
CV-122	Culvert	22							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-123	Culvert	21.5							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-124	Culvert	20.5							No			Philips Creek System	
CV-125	Culvert	20.5	200.0	1.00	1.5-2.0	0.02-0.10			No			Philips Creek System	Non suitable water depth
CV-126	Culvert	19							No			Philips Creek System	
CV-127	Culvert	18							No			Philips Creek System	
CV-128	Culvert	17.5	44.0-64.0	0.50-1.00	41.1-45.7	0.50-1.00			Yes	Arctic Char	Spawning, Rearing, & Migration	Philips Creek System	
KM17 Bridge	Bridge	17							Yes	Arctic Char	Spawning, Rearing, & Migration	Philips Creek System	
CV-129	Culvert	17	9.8-12.8	0.10-0.15	22.6-25.6	0.05-0.40			Yes	Arctic Char & Ninespin Stickleback	Rearing & Migration	Philips Creek System	
CV-196	Culvert	15							No			Philips Creek System	No fish habitat
CV-130	Culvert	15							No			Philips Creek System	
CV-195	Culvert	14.5							No			Philips Creek System	No fish habitat
CV-131	Culvert	14					Visited but Not Measured	Visited but Not Measured	No			Philips Creek System	The entire area is dry and there is never aquatic habitat at this crossing
CV-132	Culvert	14							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-133	Culvert	14							No			Philips Creek System	No fish habitat
CV-134	Culvert	13.5							No			Philips Creek System	No fish habitat, appears to have little or no water even in spring and high gradient
CV-135	Culvert	13							No			Philips Creek System	No fish habitat, appears to have little or no water even in spring and high gradient
CV-136	Culvert	13							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-137	Culvert	13							No			Philips Creek System	No fish bearing, possible marginal habitat in spring but has little water even in the spring
CV-138	Culvert	12.5							No			Philips Creek System	
CV-139	Culvert	12.5							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water

Appendix C.1 Tote Road Watercourse Crossings

Crossing ID'S	Type of Crossing	Closest KM Marking	Wetted Width US (m)	Approxomite Average Depth US (m)	Wetted Width DS (m)	Approxomite Average Depth DS (m)	Wetted Width (m) at crossing	Approxomite Average Depth (m) at crossing	Fish Bearing Status	Fish Species	Potential Use Life Stages	Crossing Likely Connected To Which Fish Bearing Waterbodies	Rationale
CV-140	Culvert	12							No			Philips Creek System	No fish habitat
CV-141	Culvert	12							No			Philips Creek System	No fish habitat
CV-142	Culvert	12							No			Philips Creek System	No fish habitat
CV-143	Culvert	12							No			Philips Creek System	No fish habitat
CV-144	Culvert	12							No			Philips Creek System	No fish habitat
CV-145	Culvert	12							No			Philips Creek System	No fish habitat
CV-146	Culvert	11.5	2.4	0.1	2.4	0.1	Visited but Not Measured	Visited but Not Measured	No			Philips Creek System	Not accessible from nearby Philips Creek and falls 50m downstream
CV-147	Culvert	11							No			Philips Creek System	No fish habitat
CV-148	Culvert	11							No			Philips Creek System	Habitat marginal at best and only during spring in lower reaches
CV-149	Culvert	11							No			Philips Creek System	No fish habitat
CV-150	Culvert	10.5							No			Philips Creek System	Habitat marginal at best and only during spring in lower reaches
CV-151	Culvert	10.5	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, steep gradient 100m downstream
CV-152	Culvert	10	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	No fish habitat, steep gradient 10m upstream, and non suitable water depth
CV-153	Culvert	10	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Non suitable water depth and no fish habitat
CV-154	Culvert	9.5	4.5	0.15	2.6-3.0	0.04			Yes			Philips Creek System	Not accessible from nearby Philips Creek, steep gradient 25m upstream, and insufficient flow 100m downstream
CV-155	Culvert	9							No			Philips Creek System	Habitat marginal at best in lower reaches and only in spring, little water
CV-156	Culvert	9							No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, and non suitable mesohabitat
CV-157	Culvert	9	5.0-5.2	0.08	1.2-1.5	0.03-0.05			No			Philips Creek System	Not accessible from nearby Phiips Creek, non suitable water depth, steep gradient 100m downstream, and 25m upstream
CV-158	Culvert	9							No			Philips Creek System	Low water and high gradient
CV-159	Culvert	8	3.9	0.15-0.20	1.2	0.03			No			Philips Creek System	Non suitable water depth and steep gradient 500m downstream
CV-161	Culvert	8							No			Philips Creek System	
CV-162	Culvert	8							No			Philips Creek System	No fish habitat
CV-163	Culvert	8							No			Philips Creek System	No fish habitat, impassable drop, and has little water
CV-164	Culvert	7							No			Philips Creek System	No fish habitat, impassable drop, and has little water
CV-165	Culvert	7							No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth
CV-166	Culvert	6	3.1	0.08	1.3-1.4	0.1			No			Philips Creek System	Not accessible from nearby Phiips Creek, non suitable water depth, and steep gradient 500 downstream
CV-167	Culvert	6	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	No fish habitat
CV-168	Culvert	6							No			Philips Creek System	No fish habitat
CV-169	Culvert	5.5					Visited but Not Measured	Visited but Not Measured	No			Philips Creek System	
CV-170	Culvert	5	2.7	0.10	1.1	0.04			No			Philips Creek System	Not accessible from nearby Phiips Creek, non suitable water depth, no channel 250m downstream, and deep pool 25m upstream
CV-171	Culvert	5							No			Philips Creek System	No fish habitat
CV-172	Culvert	4							No			Philips Creek System	No fish habitat
CV-173	Culvert	4	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured	Visited but Not Measured			No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, and non suitable mesohabitat
CV-174	Culvert	4							No			Philips Creek System	Habitat marginal at best in lower reaches and only during spring
CV-175	Culvert	2.5							No			Philips Creek System	
CV-176	Culvert	2.5	0.8-2.0	0.05-0.07	1.2-1.9	0.03-0.05			No			Philips Creek System	Not accessible from nearby Philips Creek, non suitable water depth, non suitable mesohabitat, and steep gradient 100m downstream
CV-177	Culvert	2.5							No			Philips Creek System	No fish habitat
CV-178	Culvert	2.5							No			Philips Creek System	No fish habitat
CV-179	Culvert	1.5							No			Philips Creek System	
CV-182	Culvert	1							No			Philips Creek System	No fish habitat and appears to have little or no water even in spring

Appendix C.2 List of sites surveyed in freshwater habitat along the Steensby Railway alignment and Steensby Port: 2021-2024.

Table C-2. List and fish habitat designations of sites surveyed in freshwater habitat along the Steensby Railway alignment and Steensby Port: 2021-2024.

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
MCV-2-2	MCV-2-2	Stream	Culvert	Rail	561977	7912294	N	N
MCV-2-3	MCV-2-3	Stream	Culvert	Rail	561865	7912353	N	N
MCV-2-4	MCV-2-4	Stream	Culvert	Rail	561798	7912464	N	N
MCV-2-5	MCV-2-5	Stream	Culvert	Rail	561724	7912483	N	N
MCV-2-6	MCV-2-6	Stream	Culvert	Rail	561636	7912823	N	N
MCV-2-7	MCV-2-7	Stream	Culvert	Rail	561375	7913010	N	N
MCV-2-8	MCV-2-8	Stream	Culvert	Rail	561079	7912945	N	N
MCV-2-10	MCV-2-10	Stream	Culvert	Rail	561567	7912403	N	N
BR-000-1	BR-0-1	Stream	Bridge	Rail	562663	7911931	Y	Y
CV-000-0a-Y	MCV-0-2	Stream	Culvert	Rail	563441	7911548	P	P
NEW 1	NEW 1	Stream	Culvert	Rail	563562	7911476	P	Y
CV-000-1a-Y	CV-0-1	Stream	Culvert	Rail	563724	7911305	Y	Y
CV-000-2-Y	CV-0-3	Stream	Culvert	Rail	563790	7911225	Y	Y
CV-0-6-N	CV-0-6	Stream	Culvert	Rail	563811	7911201	P	P
CV-000-3a-Y	CV-0-4	Stream	Culvert	Rail	563897	7911097	Y	Y
CV-000-3b-Y	CV-0-5	Stream	Culvert	Rail	563937	7911049	Y	Y
CV-001-2-Y	CV-1-1	Stream	Culvert	Rail	564724	7910401	Y	P
LE-001-2-Y	-	Lake	Pond Encroachment	Rail	564736	7910386	Y	P
CV-002-1	CV-2-1	Stream	Culvert	Rail	565501	7910056	N	N
CV-002-2	CV-2-2	Stream	Culvert	Rail	565754	7909825	N	N
CV-003-1	CV-3-1	Stream	Culvert	Rail	565969	7909656	Y	P
CV-003-2	BR-3-2	Stream	Bridge	Rail	566714	7909225	P	P
CV-004-1	BR-4-1	Stream	Bridge	Rail	567003	7908968	Y	P
CV-004-2	CV-4-2	Stream	Culvert	Rail	567119	7908862	P	P
CV-004-2b	CV-4-4	Stream	Culvert	Rail	567155	7908830	N	N
CV-004-3	CV-4-3	Stream	Culvert	Rail	567394	7908607	N	N
CV-005-1	CV-5-1	Stream	Culvert	Rail	567693	7908394	N	N
CV-005-2	CV-5-2	Stream	Culvert	Rail	568005	7908253	N	N
CV-005-3	CV-5-3	Stream	Culvert	Rail	568090	7908208	N	N
CV-006-1a	CV-6-4	Stream	Culvert	Rail	568533	7907966	Y	P
CV-006-1	BR-6-5	Stream	Bridge	Rail	568558	7907952	Y	P
CV-006-1b	BR-6-1	Stream	Bridge	Rail	568608	7907925	Y	P
CV-006-2	CV-6-2	Stream	Culvert	Rail	568744	7907850	N	N
CV-006-3	BR-6-3	Stream	Bridge	Rail	569021	7907669	Y	P
CV-007-1	CV-7-1	Stream	Culvert	Rail	569321	7907451	Y	P
CV-007-2	CV-7-2	Stream	Culvert	Rail	569676	7907238	N	N
CV-007-3	BR-7-3	Stream	Bridge	Rail	584027	7900633	Y	P

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
CV-008-1	BR-8-1	Stream	Bridge	Rail	570136	7906946	Y	P
CV-008-1c	CV-8-3	Stream	Culvert	Rail	570399	7906778	N	N
CV-008-1b	CV-8-1	Stream	Culvert	Rail	570450	7906745	N	N
BR-008-1	BR-8-2	Stream	Bridge	Rail	570787	7906530	Y	P
CV-008-2	CV-8-2	Stream	Culvert	Rail	570899	7906458	N	N
CV-009-0	CV-9-1	Stream	Culvert	Rail	571362	7906063	N	N
CV-009-1	CV-9-2	Stream	Culvert	Rail	571541	7905888	P	N
CV-009-2-Y	CV-9-3	Stream	Culvert	Rail	571681	7905756	N	N
CV-009-3-Y	CV-10-1	Stream	Culvert	Rail	571905	7905606	N	N
CV-010-1-Y	CV-10-2	Stream	Culvert	Rail	572333	7905371	N	N
NEW 12	NEW 12	Stream	Culvert	Rail	572407	7905330	N	N
CV-011-1	CV-11-1	Stream	Culvert	Rail	572639	7905172	N	N
BR-011-1	BR-11-1	Stream	Bridge	Rail	573084	7904925	Y	P
CV-011-2	CV-12-1	Stream	Culvert	Rail	573813	7904722	N	N
NEWCULV-1	CV-12-2	Stream	Culvert	Rail	573913	7904695	N	N
CV-012-1	CV-12-3	Stream	Culvert	Rail	574004	7904658	N	N
CV-012-2	CV-12-4	Stream	Culvert	Rail	574242	7904527	P	P
CV-013-1	CV-13-1	Stream	Culvert	Rail	574988	7904117	P	P
CV-013-2	CV-13-2	Stream	Culvert	Rail	575202	7904021	N	N
CV-014-1	CV-14-1	Stream	Culvert	Rail	575522	7903864	N	N
CV-014-2	CV-14-2	Stream	Culvert	Rail	575671	7903774	P	P
CV-014-3	CV-14-3	Stream	Culvert	Rail	575880	7903649	N	N
CV-014-4	CV-15-1	Stream	Culvert	Rail	576276	7903497	N	N
CV-015-1-Y	CV-15-2	Stream	Culvert	Rail	576871	7903191	N	N
CV-016-1-Y	CV-16-1	Stream	Culvert	Rail	577085	7903097	Y	P
CV-016-2-R	CV-16-2	Stream	Culvert	Rail	577419	7902952	N	N
CV-016-2a-R	CV-16-3	Stream	Culvert	Rail	577685	7902836	P	P
CV-016-4-R	CV-16-4	Stream	Culvert	Rail	577811	7902781	Y	P
NEWCULV-2	CV-16-7	Pond	Pond Infill + Culvert	Rail	577833	7902772	Y	P
LE-017-1-R	CV-17-1	Pond/Stream	Pond Encroachment + Culvert	Rail	578074	7902655	Y	Y
CV-017-1-Y	CV-17-3	Stream	Culvert	Rail	578340	7902503	P	P
CV-017-2-Y	CV-17-2	Stream	Culvert	Rail	578736	7902279	N	N
CV-018-1-R	CV-18-1	Stream	Culvert	Rail	578854	7902211	Y	P
CV-018-2-R	CV-18-2	Stream	Culvert	Rail	579066	7902110	N	N
CV-019-1	CV-19-1	Stream	Culvert	Rail	579871	7901941	N	N
NEWCULV-3	CV-19-2	Stream	Culvert	Rail	580162	7901846	N	N
CV-019-2	CV-19-3	Stream	Culvert	Rail	580386	7901690	N	N

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
LE-019-1	CV-19-4	Pond	Pond Encroachment + Culvert	Rail	580638	7901631	N	N
CV-019-4	CV-20-3	Stream	Culvert	Rail	580929	7901529	N	N
CV-020-1	CV-20-1	Stream	Culvert	Rail	581157	7901432	N	N
CV-020-2	CV-20-2	Stream	Culvert	Rail	581345	7901380	N	N
CV-021-1a	CV-21-1	Stream	Culvert	Rail	581640	7901290	N	N
CV-021-1b	CV-21-2	Stream	Culvert	Rail	581786	7901233	N	N
CV-021-2a	CV-21-3	Stream	Culvert	Rail	582564	7901017	N	N
CV-022-1	CV-22-1	Stream	Culvert	Rail	582843	7900967	N	N
CV-022-2	CV-22-2	Stream	Culvert	Rail	583059	7900918	N	N
CV-022-3	CV-22-3	Stream	Culvert	Rail	583227	7900891	N	N
CV-022-5	CV-22-5	Stream	Culvert	Rail	583533	7900807	N	N
NEWCULV-4	CV-23-3	Stream	Culvert	Rail	583883	7900684	N	N
CV-023-1	BR-23-1	Stream	Bridge	Rail	584027	7900633	Y	P
CV-024-1-R	CV-24-1	Stream	Culvert	Rail	584840	7900384	N	N
LE-024-2-R	CV-24-2	Pond	Pond Encroachment + Culvert	Rail	585145	7900250	N	N
CV-024-1c	-	Stream	Culvert	Rail	585180	7900227	N	N
CV-024-2	CV-24-3	Stream	Culvert	Rail	585256	7900158	N	N
BR-025-1	BR-25-1	Stream	Bridge	Rail	585381	7900048	Y	P
CV-R01	CV-25-1	Stream	Culvert	Rail	585836	7899669	N	N
CV-R02	CV-26-1	Stream	Culvert	Rail	586172	7899455	N	N
CV-R02b	CV-26-2	Stream	Culvert	Rail	586529	7899075	N	N
CV-R03	CV-26-3	Stream	Culvert	Rail	586671	7899019	N	N
CV-R03c/R04	CV-27-1	Stream	Culvert	Rail	587200	7898807	N	N
CV-027-2	CV-27-2	Stream	Culvert	Rail	587469	7898624	Y	Y
CV-R05	CV-27-3	Stream	Culvert	Rail	587558	7898563	N	N
CV-R06	CV-27-4	Stream	Culvert	Rail	587681	7898478	P	Y
CV-R07	CV-28-1	Stream	Culvert	Rail	588152	7898234	Y	Y
CV-R07b2	CV-28-2	Stream	Culvert	Rail	588627	7898080	P	P
CV-R07b3	CV-28-3	Stream	Culvert	Rail	588768	7897987	Y	Y
CV-R07c2	CV-29-1	Stream	Culvert	Rail	589582	7897719	Y	P
CV-R07f	CV-30-1	Stream	Culvert	Rail	590302	7897484	N	N
CV-R07d	CV-31-1	Stream/Pond	Stream Culvert Crossing + Pond Encroachment	Rail	590821	7897272	N	N
NEW 21	NEW 21	Stream	Culvert	Rail	591139	7897198	N	N
CV-R08	CV-31-2	Stream	Culvert	Rail	591338	7897149	N	N
CV-R08b	CV-32-1	Stream	Culvert	Rail	591789	7897040	N	N

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
CV-R08c	CV-32-2	Stream	Culvert	Rail	592427	7896817	N	N
CV-R08d	CV-33-1	Stream	Culvert	Rail	592755	7896647	N	N
CV-R08e	CV-33-2	Stream	Culvert	Rail	593293	7896458	N	N
CV-R08f	CV-34-1	Stream	Culvert	Rail	593590	7896432	N	N
CV-R09-R	CV-34-2	Stream	Culvert	Rail	593792	7896357	N	N
CV-R10-Y	CV-34-4	Stream	Culvert	Rail	594267	7896175	N	N
CV-R11-Y	CV-35-6	Stream	Culvert	Rail	594558	7896151	N	N
CV-R13-Y	BR-35-1	Stream	Bridge	Rail	594824	7896031	Y	P
CV-R14-Y	CV-35-2	Stream	Culvert	Rail	594979	7895906	N	N
CV-R15-Y	CV-35-3	Stream	Culvert	Rail	595102	7895572	N	N
CV-R16-Y	BR-36-1	Stream	Bridge	Rail	595092	7895426	Y	Y
CV-R17-Y	CV-36-1	Stream	Culvert	Rail	595075	7895231	N	N
CV-R18-Y	CV-36-2	Stream	Culvert	Rail	595102	7894910	N	N
CV-R19	-	Stream	Stream Infill	Rail	595300	7894405	N	N
CV-R20	-	Stream	Stream Infill	Rail	595335	7894316	N	N
LE-R36	-	Pond	Pond Infill	Rail	595377	7894215	N	N
CV-R21	BR-37-1	Stream	Bridge	Rail	595451	7894042	Y	Y
CV-R23-Y	CV-38-1	Stream/Pond	Stream Culvert Crossing + Pond Encroachment	Rail	595645	7893518	N	N
LE-R36c-Y	CV-38-4	Ponds	Pond infill + culvert	Rail	595656	7893432	N	N
CV-038-2-Y	CV-38-2	Stream/Pond	Stream Culvert Crossing + Pond Encroachment	Rail	595694	7893118	N	N
LE-38-Y	-	Pond	Pond Encroachment	Rail	595687	7892982	P	P
LE-R38a-Y	CV-38-3	Pond/Stream	Culvert Stream Crossing + Pond Infill	Rail	595731	7892796	Y	Y
CV-039-2d-Y	CV-38-5	Stream	Culvert	Rail	595736	7892755	Y	Y
CV-039-2c-Y	CV-39-1	Stream/Low Point	Culvert	Rail	595747	7892659	P	P
CV-039-2b-Y	CV-39-4	Stream/Low Point	Culvert	Rail	595757	7892572	P	P
LE-R38d-Y	-	Pond	Pond Encroachment	Rail	595772	7892472	N	N
CV-039-2-Y	CV-39-2	Pond	Pond Encroachment + Culvert	Rail	595806	7892360	N	N
LE-R38c-Y	CV-39-3	Pond	Pond Encroachment + Culvert	Rail	595978	7892069	N	N
CV-R24-Y	CV-40-1	Stream	Culvert	Rail	596472	7891650	P	P
LE-R39c-Y	-	Pond	Pond Encroachment	Rail	596799	7891392	N	N

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
LE-R39d-Y	CV-40-5	Pond	Pond Encroachment + Culvert	Rail	596869	7891225	P	Y
CV-R27-Y	CV-40-4	Stream	Culvert	Rail	596889	7891176	P	Y
CV-R28-Y	CV-41-1	Stream	Culvert	Rail	597223	7890375	N	N
CV-R29-Y	CV-42-1	Stream	Culvert	Rail	597419	7889764	Y	P
LE-R40	-	Pond	Pond Encroachment	Rail	597330	7889378	N	N
CV-R30	CV-43-1	Stream	Culvert	Rail	597271	7888579	N	N
CV-R31	CV-44-1	Stream	Culvert	Rail	597363	7888228	N	N
CV-R32-Y	CV-44-2	Stream	Culvert	Rail	597528	7887519	N	N
CV-R33-Y	BR-44-1	Stream	Bridge	Rail	597488	7887336	Y	P
CV-R33b-Y	CV-45-1	Stream	Culvert	Rail	597118	7886948	N	N
CV-R34-Y	BR-46-1	Stream	Bridge	Rail	596731	7886473	Y	Y
CV-044-1-Y	CV-44-4	Stream	Culvert	Rail	596549	7885801	Y	Y
CV-044-3-Y	CV-44-6	Stream	Culvert	Rail	596556	7885022	Y	Y
CV-045-1	CV-45-2	Stream	Culvert	Rail	597156	7884190	N	Y
LE-047-1	CV-46-2	Stream/Pond	Culvert Stream Crossing + Pond Encroachment	Rail	597765	7883345	P	Y
CV-047-1	CV-47-1	Stream	Culvert	Rail	598224	7882684	P	Y
CV-047-1a	CV-47-2	Stream	Culvert	Rail	598259	7882557	N	N
LE-048-1	CV-48-1	Pond	Pond Encroachment + Culvert	Rail	598058	7881600	N	N
CV-049-1	CV-49-1	Stream	Culvert	Rail	597961	7881470	N	N
CV-049-2	CV-49-2	Stream	Culvert	Rail	597789	7881236	P	Y
LE-049-3	-	Pond	Pond Encroachment	Rail	597493	7880832	P	Y
CV-049-3	CV-49-3	Stream	Culvert	Rail	597452	7880776	P	Y
CV-050-1	CV-50-1	Stream	Culvert	Rail	597348	7880635	P	Y
CV-050-2	CV-50-2	Stream	Culvert	Rail	596938	7880077	P	Y
CV-051-1	CV-51-1	Stream	Culvert	Rail	596681	7879663	N	N
CV-051-2	BR-51-1	Stream	Bridge + Stream Encroachment	Rail	596662	7879362	P	Y
CV-051-3	CV-51-2	Stream	Culvert	Rail	596675	7879162	P	Y
CV-052-1	CV-52-1	Stream	Culvert	Rail	596976	7878567	N	N
LE-052-2	-	Pond	Pond Encroachment	Rail	597248	7878366	N	Y
CV-052-2	CV-52-2	Stream	Culvert	Rail	597276	7878344	P	Y
CV-053-1	CV-53-1	Stream	Culvert	Rail	597674	7878068	P	Y
CV-056-1	CV-56-1	Stream	Culvert	Rail	598812	7875712	P	Y

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
LE-057-1	CV-57-1	Pond	Pond Encroachment + Culvert	Rail	599439	7874631	N	N
BR-057-1	BR-57-1	Stream	Bridge	Rail	599446	7874415	P	Y
LE-057-2	CV-57-3	Pond	Pond Encroachment + Culvert	Rail	599399	7874248	P	Y
BR-059-1	BR-59-1	Stream	Bridge	Rail	598853	7872527	P	Y
CV-060-1	CV-60-1	Stream	Culvert	Rail	598645	7871711	N	N
NEWCULV-20	CV-61-1	Stream	Culvert	Rail	598360	7870973	N	N
CV-062-1	CV-62-1	Stream	Culvert	Rail	598221	7869603	Y	Y
CV-063-1	CV-63-1	Stream	Culvert	Rail	598603	7868734	P	P
CV-064-1	CV-64-1	Stream	Culvert	Rail	598994	7867841	P	Y
CV-065-2	CV-65-2	Stream	Culvert	Rail	599244	7867273	P	Y
CV-065-2a	CV-65-3	Stream	Culvert	Rail	599296	7867152	P	P
CV-067-1	CV-67-1	Stream	Culvert	Rail	600283	7866024	N	N
CV-068-1	CV-68-1	Stream	Culvert	Rail	601069	7865449	N	N
CV-069-1	CV-69-1	Stream	Culvert	Rail	601905	7864754	N	N
CV-069-1b	CV-69-3	Stream	Culvert	Rail	601927	7864716	N	N
CV-069-2	CV-69-2	Stream	Culvert	Rail	602126	7864368	N	Y
CV-071-1	CV-71-1	Stream	Culvert	Rail	602564	7862409	N	Y
NEWCULV-23	CV-72-1	Stream	Culvert	Rail	603051	7861146	N	Y
CV-073-1	CV-73-1	Stream	Culvert	Rail	603093	7861081	N	Y
NEWCULV-24	CV-73-2	Stream	Culvert	Rail	603369	7860787	N	N
LE-074-1	-	Pond	Pond infill	Rail	603758	7860038	N	N
CV-074-1	CV-74-1	Stream	Stream Infill + Culvert	Rail	603759	7859894	N	P
CV-075-1-Y	CV-75-1	Stream	Culvert	Rail	603759	7859338	N	N
CV-075-1b-Y	CV-75-2	Pond	Pond Encroachment + Culvert	Rail	603770	7859218	N	N
CV-075-2-Y	BR-75-1	Stream	Bridge	Rail	603962	7858904	N	P
CV-076-1	BR-76-1	Stream	Bridge	Rail	604251	7858661	N	Y
CV-076-2	BR-76-2	Stream	Bridge	Rail	604304	7858627	N	Y
CV-076-3	BR-76-3	Stream	Bridge	Rail	604396	7858569	N	Y
CV-076-4-Y	CV-76-4	Stream	Culvert	Rail	604923	7858087	N	N
CV-077-1-Y	CV-77-1	Stream	Culvert	Rail	605010	7857945	N	N
CV-077-2-Y	CV-77-2	Stream	Culvert	Rail	605069	7857828	N	N
CV-078-1	BR-78-1	Stream	Bridge	Rail	605518	7856472	N	Y
CV-078-2	CV-78-2	Stream	Culvert	Rail	605517	7856239	N	P
CV-078-3	CV-78-3	Stream	Culvert	Rail	605514	7856111	N	N

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
CV-079-1	CV-79-1	Stream	Culvert	Rail	605510	7855881	N	N
CV-079-2	CV-79-2	Stream	Culvert	Rail	605523	7855671	N	N
CV-079-3	CV-79-3	Stream	Culvert	Rail	605537	7855480	N	N
CV-079-4a	CV-80-1	Stream	Culvert	Rail	605545	7855100	N	N
CV-080-1c	CV-80-2	Stream	Culvert	Rail	605532	7854918	N	P
CV-080-2	CV-80-3	Stream	Culvert	Rail	605515	7854691	N	N
CV-080-3	CV-80-4	Stream	Culvert	Rail	605509	7854495	N	N
CV-080-4	CV-80-5	Stream	Culvert	Rail	605508	7854446	N	N
CV-080-5	CV-80-6	Stream	Culvert	Rail	605503	7854222	N	N
CV-081-1	CV-81-1	Stream	Culvert	Rail	605499	7854094	N	N
NEWCULV-27	CV-81-2	Stream	Culvert	Rail	605499	7854055	N	N
CV-081-2	CV-81-3	Stream	Culvert	Rail	605498	7854035	N	N
CV-081-3	CV-81-4	Stream	Culvert	Rail	605496	7853943	N	N
CV-081-4a	CV-81-5	Stream	Culvert	Rail	605490	7853694	N	N
CV-081-5b	CV-81-6	Stream	Culvert	Rail	605511	7853419	N	P
CV-081-5a	CV-81-7	Stream	Culvert	Rail	605555	7853309	N	P
CV-081-6a	CV-81-8	Stream	Culvert	Rail	605624	7853205	N	N
CV-081-6b	CV-81-9	Stream	Culvert	Rail	605651	7853174	N	N
CV-082-1a	CV-82-1	Stream	Culvert	Rail	605768	7853073	N	N
CV-082-2a	CV-82-2	Stream	Culvert	Rail	605905	7852966	N	P
CV-082-4a	CV-82-4	Stream	Culvert	Rail	606113	7852803	N	N
CV-082-4b	CV-82-5	Stream	Culvert	Rail	606150	7852772	N	N
CV-083-3a	CV-83-2	Stream	Culvert	Rail	606430	7852073	N	N
CV-084-1	CV-84-1	Stream + Low Point	Culvert + Stream Encroachment	Rail	606387	7851178	N	Y
CV-084-2	CV-84-2	Stream	Culvert	Rail	606406	7850978	N	N
CV-084-3	CV-84-3	Stream	Culvert	Rail	606398	7850783	N	N
CV-084-4	CV-84-4	Stream	Culvert	Rail	606364	7850546	N	N
CV-086-1	BR-86-1	Stream	Bridge	Rail	606190	7848859	N	N
CV-087-1	CV-87-1	Stream	Culvert	Rail	606285	7848016	N	N
CV-89-2	CV-89-1	Stream	Culvert	Rail	606384	7846148	N	N
CV-89-1	CV-89-2	Stream	Culvert	Rail	606308	7845777	N	N
BR-091-1	BR-91-1	Stream	Bridge	Rail	605958	7843777	N	N
BR-092-1	BR-92-1	Stream	Bridge	Rail	606358	7842768	N	N
CV-093-1-Y	CV-93-1	Stream	Culvert	Rail	606508	7842480	N	N
CV-093-2	CV-93-2	Stream	Culvert	Rail	606645	7842252	N	N
BR-095-1	BR-95-1	Stream/Lake	Bridge	Rail	607955	7840786	Y	Y
AR-050a	-	Pond	Pond Encroachment	Rail	608042	7840734	Y	Y

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
AR-050b	-	Pond	Pond Encroachment	Rail	608100	7840695	Y	Y
BR-096-1	BR-96-1	Stream	Bridge	Rail	608539	7840210	N	N
BR-096-2	BR-96-2	Stream	Bridge	Rail	608671	7839714	Y	P
BR-099-1-Y	BR-99-1	Stream	Bridge	Rail	608400	7837169	N	N
CV-101-1	CV-101-1	Stream	Culvert	Rail	607062	7836073	N	N
CV-103-1	CV-103-1	Stream	Culvert	Rail	605056	7834683	N	N
BR-105-1	BR-105-1	Stream	Bridge	Rail	604138	7833859	N	N
CV-105-1	CV-105-1	Stream	Culvert	Rail	603374	7833550	N	N
CV-107-1	CV-107-1	Stream	Culvert	Rail	601556	7833054	N	N
CV-109-2-Y	CV-110-1	Stream	Culvert	Rail	600338	7831480	N	N
CV-110-1-Y	CV-110-3	Stream	Culvert	Rail	599901	7830940	N	N
CV-111-1-N	CV-111-1	Stream	Culvert	Rail	599568	7830654	N	N
LE-111-1-N	-	Lake	Lake Encroachment	Rail	599371	7830561	Y	Y
CV-111-1-Y	BR-111-1	Stream	Bridge	Rail	599062	7830205	N	N
CV-114-1	CV-114-1	Stream	Culvert	Rail	597593	7827853	N	N
CV-115-2	CV-115-2	Stream	Culvert	Rail	597061	7826880	N	N
CV-117-1	CV-117-1	Stream	Culvert	Rail	597975	7825749	N	N
CV-117-2	CV-117-2	Stream	Culvert	Rail	598195	7825569	Y	P
CV-117-3	CV-117-3	Stream	Culvert	Rail	598229	7825515	P	P
CV-117-4	CV-117-4	Stream	Culvert	Rail	598236	7825502	P	P
CV-118-1	CV-118-1	Stream	Culvert	Rail	598366	7825258	N	N
CV-118-1a	CV-118-2	Stream	Culvert	Rail	598527	7824914	N	N
CV-118-2	CV-118-3	Stream	Culvert	Rail	598594	7824544	Y	P
CV-119-1	CV-119-1	Stream	Culvert	Rail	598585	7824286	N	N
CV-119-2	CV-119-2	Stream	Culvert	Rail	598530	7823963	N	N
CV-119-2a	CV-119-3	Stream	Culvert	Rail	598538	7823771	N	N
CV-119-2b	CV-119-5	Stream	Culvert	Rail	598543	7823656	N	N
CV-119-3	CV-119-4	Stream	Culvert	Rail	598604	7823370	N	N
CV-120-1	CV-120-1	Stream	Culvert	Rail	598628	7822781	N	N
CV-121-1	CV-121-1	Stream	Culvert	Rail	598588	7822254	N	N
CV-121-2	CV-121-2	Stream	Culvert + Stream Infilling	Rail	598564	7822101	N	N
CV-121-4	CV-121-4	Stream	Culvert	Rail	598521	7821860	N	N
CV-121-5	CV-121-5	Stream	Culvert	Rail	598367	7821401	N	N
CV-123-1	CV-123-1	Stream/Pond	Culvert Stream Crossing + Pond Infill	Rail	598379	7820280	N	N
CV-123-2	CV-123-2	Stream	Culvert	Rail	598448	7820129	N	N
CV-123-3	BR-123-1	Stream	Bridge	Rail	598464	7819900	Y	P

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
CV-123-3a	CV-123-5	Stream	Culvert	Rail	598462	7819849	N	N
CV-123-4a	BR-123-2	Stream	Bridge	Rail	598456	7819645	Y	P
CV-123-7a	CV-123-4	Stream	Culvert	Rail	598454	7819563	Y	P
CV-124-1a	CV-124-1	Stream	Culvert	Rail	598447	7819358	Y	P
CV-124-2a	BR-124-1	Stream	Bridge	Rail	598446	7819296	Y	P
CV-124-3a	BR-124-2	Stream	Bridge	Rail	598443	7819201	Y	P
CV-124-4a	CV-124-2	Stream	Culvert	Rail	598433	7818882	N	N
CV-124-5a	CV-124-3	Stream	Culvert	Rail	598419	7818734	N	N
CV-125-2-N	CV-125-2	Stream	Culvert	Rail	598198	7818098	N	N
CV-125-3-N	CV-125-3	Stream	Culvert	Rail	598374	7817642	N	N
CV-126-1a-N	CV-125-4	Stream/Pond	Culvert Stream Crossing + Pond Encroachment	Rail	598464	7817535	N	N
CV-126-1-N	CV-126-1	Stream	Culvert	Rail	598547	7817385	P	P
NEWCULV-29-Y	CV-126-2	Stream	Culvert	Rail	598495	7816616	N	N
LE-127-1-Y	CV-127-1	Pond	Culvert + Pond Infill	Rail	598551	7816264	P	Y
LE-127-1a-Y	-	Pond	Pond Encroachment	Rail	598565	7816170	P	P
LE-127-2-Y	CV-127-2	Pond	Culvert + Pond Infill	Rail	598583	7816058	P	Y
LE-127-2a-Y	-	Pond	Pond Encroachment	Rail	598591	7816008	P	P
LE-127-2c-Y	-	Pond	Pond Encroachment	Rail	598592	7815955	P	Y
LE-127-2d-Y	-	Pond	Pond Encroachment	Rail	598604	7815924	P	P
LE-127-2f-Y	-	Pond	Pond Encroachment	Rail	598598	7815910	P	Y
LE-127-2h-Y	CV-127-3	Pond	Pond Infill + Culvert	Rail	598611	7815884	P	P
LE-129-0a-Y	-	Pond	Pond Encroachment	Rail	599031	7814814	P	P
LE-129-0b-Y	-	Pond	Pond Encroachment	Rail	599082	7814768	N	N
LE-129-1-Y	CV-129-1	Stream	Culvert + Stream Encroachment	Rail	599396	7814504	Y	Y
LE-129-2-Y	-	Stream	Stream Encroachment	Rail	599491	7814420	Y	Y
CV-131-1	CV-131-1	Stream	Culvert	Rail	600628	7812715	Y	Y
LE-131-1	CV-131-2	Pond	Culvert + Pond infill	Rail	600654	7812575	P	Y
LE-132-1	CV-132-1	Pond	Culvert + Pond Infill	Rail	600776	7812192	P	Y
CV-133-1	CV-133-1	Stream	Culvert	Rail	601019	7811337	N	N
CV-133-2	CV-133-3	Stream	Culvert	Rail	600856	7810616	P	P

Table C-2. - continued -

NSC Site ID	Systra/ Ausenco Site ID	Waterbody Type	Project Interaction	Area	UTMs		Fish Habitat (Y/N/P)	
					Easting	Northing	Arctic Char	Ninespine Stickleback
CV-134-1	CV-134-1	Stream	Culvert	Rail	600613	7810410	N	N
CV-134-2	CV-134-2	Stream	Culvert + Stream Infilling	Rail	600454	7810352	N	N
LE-134-1	-	Pond	Pond Encroachment	Rail	600381	7810342	N	N
LE-134-2	CV-134-4	Pond	Pond Encroachment + Culvert	Rail	599854	7810263	N	N
CV-136-2-Y	CV-136-2	Stream	Culvert	Rail	598557	7809065	N	N
BR-137-1	BR-137-1	Stream	Bridge	Rail	598658	7807994	Y	P
CV-138-1	CV-138-1	Stream	Culvert	Rail	598854	7806967	N	N
CV-139-1-N	CV-139-1	Stream	Culvert	Rail	598825	7806766	P	P
CV-140-1	CV-140-1	Stream	Culvert	Rail	598126	7805596	N	N
BR-141-1	BR-141-1	Stream	Bridge	Rail	597537	7805040	Y	Y
CV-142-1	CV-142-1	Stream	Culvert	Rail	597200	7804424	N	N
CV-142-2	BR-142-2	Pond/Stream	Bridge + Pond Encroachment	Rail	596946	7803843	Y	Y
CV-143-1	CV-144-1	Stream	Culvert	Rail + Access Road	595845	7803114	N	N
CV-143-2a	CV-144-2	Stream	Culvert	Rail	594939	7802768	Y	Y
CV-143-2b	CV-144-3	Stream	Culvert	Rail	594926	7802754	Y	Y
CV-144	BR-146-1	Stream	Bridge	Rail	594414	7801226	Y	Y
CV-148-1-N	CV-148-1	Stream	Culvert	Rail + Access Road	595645	7800368	P	P
SPS-29a	CV-149-1	Stream	Culvert	Rail + Access Road	596395	7800173	P	Y
CV-145	CV-150-2	Stream	Culvert	Rail + Access Road	595419	7800142	Y	Y
AR-CV-144-2	CV-144-5	Stream	Culvert	Access Road	594864	7802781	Y	Y
SP-AR-001	CV-AR-001	Stream	Culvert	Access Road	595390	7801813	N	N
SP-AR-002	CV-AR-002	Stream	Culvert	Access Road	595616	7801473	Y	P
SP-AR-004	CV-AR-004	Stream	Culvert	Access Road	595316	7799972	Y	Y
AS-S1	CV-AS-S1	Stream	Culvert	Airstrip	595464	7801896	N	N
AS-S2	CV-AS-S2	Stream	Culvert	Airstrip	595739	7801551	P	P
LFarm-S1	-	Stream/Low point	Infill	Land Farm	594153	7801934	N	N
StIsland	-	Pond	Infill	Steensby Island Infrastructure	-	-	N	N
3 Km Lake	3 Km Lake	Lake	Infill	Water Intake	596773	7800322	Y	Y
10 Km Lake	10 Km Lake	Lake	Infill	Water Intake	596438	7804652	Y	Y
Cockburn Tunnels Camp	-	Lake	Infill	Water Intake	604157	7834140	Y	Y
South Cockburn Camp	-	Lake	Infill	Water Intake	597623	7820530	Y	Y
Mid-rail Camp	-	Lake	Infill	Water Intake	595536	7876410	Y	Y

Appendix D Snow Management Plan and Water Quality and Sampling Requirements

D.1 Purpose and Linkage to the SWAEMP

This Appendix summarizes the water quality and sampling requirements of the Snow Management Plan (SMP) and describes how snow management–related monitoring is integrated into the Surface Water and Aquatic Ecosystem Management Plan (SWAEMP).

The SMP outlines practices for managing snow accumulation at the Mary River Project to:

- Protect the health and safety of Project personnel; and
- Maintain compliance with Project approvals, including:
  - Project Certificate No. 005, Amendment No. 1
  - Type 'A' Water Licence 2AM-MRY2540
  - Commercial Lease No. Q13C301

From a SWAEMP perspective, the key functions of the SMP are to:

- Control the siting and management of snow stockpiles to minimize effects on surface water quality and aquatic habitat;
- Define snowmelt runoff monitoring locations, frequency, and parameters;
- Establish inspection and Trigger–Action–Response Plan (TARP) processes to detect and respond to water quality and erosion issues associated with snowmelt.

D.2 Water Quality Monitoring for Snowmelt and Surface Runoff

D.2.1 Monitoring Objectives

Water quality monitoring under the SMP is designed to:

- Characterize snowmelt and surface water runoff from snow stockpiles at the Mine Site and Milne Port;
- Provide early detection of sediment and contaminant releases associated with snow management activities;

- Assess the effectiveness of snow stockpile siting criteria and erosion/sediment control measures; and
- Provide data to the SWAEMP for assessment of potential effects on surface water and aquatic ecosystems.

Monitoring stations are primarily located immediately down-gradient of key snow stockpiles and infrastructure where snowmelt runoff is expected to enter surface drainage pathways.

D.2.2 Monitoring Network – Mine Site

Snowmelt from Mine Site snow stockpiles are monitored at the following locations:

Table D-1. Mine Site Snowmelt Monitoring Locations

Station ID	Description	Easting (m)	Northing (m)	Monitoring Frequency	Primary Purpose
MS-SN-01	Mine Site Weatherhaven Snow Stockpile Runoff	557779	7914407	Monthly	Monitor runoff from Weatherhaven snow stockpile
MS-SN-02	LDFG-MID, West Snow Stockpile Runoff	561097	7912884	Monthly	Monitor runoff from west snow stockpile
MS-SN-03	Mine Site Warehouse Snow Stockpile Runoff	559803	7913756	Monthly	Monitor runoff from warehouse area snow stockpile

Station ID	Description	Easting (m)	Northing (m)	Monitoring Frequency	Primary Purpose
D1-05	Sheardown Tributary 1 (Mine Haul Road station)	561397	7913553	Monthly	Monitor tributary receiving runoff from haul road and associated snow stockpiles

All coordinates are UTM NAD83, Zone 17 W.

D.2.3 Monitoring Network – Tote Road

Snowmelt along the Tote Road snow stockpiles are monitored at the following locations:

Table D-2 Tote Road Snowmelt Monitoring Locations

Station ID	Description	Easting (m)	Northing (m)	Monitoring Frequency	Primary Purpose
TR-SN-01	Tote Road KM37 Snow Stockpile Runoff	521593	7949160	Monthly	Monitor runoff from snow stockpile
TR-SN-02	Tote Road KM63 Snow Stockpile Runoff	529344	7926819	Monthly	Monitor runoff from snow stockpile

Station ID	Description	Easting (m)	Northing (m)	Monitoring Frequency	Primary Purpose
TR-SN-03	Tote Road KM63 Snow Stockpile Runoff	538726	7920503	Monthly	Monitor runoff from snow stockpile
TR-SN-04	Tote Road KM86 Snow Stockpile Runoff	546478	7919895	Monthly	Monitor runoff from snow stockpile
TR-SN-05	Tote Road KM92 Snow Stockpile Runoff	551307	7916785	Monthly	Monitor runoff from snow stockpile
TR-SN-06	Tote Road KM92 Snow Stockpile Runoff	554983	7914446	Monthly	Monitor runoff from snow stockpile

Station ID	Description	Easting (m)	Northing (m)	Monitoring Frequency	Primary Purpose
TR-SN-07	Tote Road KM85 Snow Stockpile Runoff	537466	7920200	Monthly	Monitor runoff from snow stockpile

All coordinates are UTM NAD83, Zone 17 W.

D.2.3 Monitoring Network – Milne Port

Snowmelt from Mine Site snow stockpiles are monitored through the SNP.

D.3 Reporting and Integration into SWAEMP

Annual reporting:

- Resulting actions from Snow Stockpile monitoring and relevant inspection/audit findings, are reported annually in the QIA & NWB Annual Report for Operations.

Adaptive management and plan updates:

- Monitoring and inspection outcomes are reviewed regularly to determine:
  - Whether snow stockpile locations and ESC measures are effective;
  - Whether water quality in the surrounding region may be potentially impacted; and
  - Whether modifications to SMP practices or SWAEMP monitoring design are warranted.

- Management reviews required under Baffinland's HSE Management Framework provide a formal mechanism for integrating SMP monitoring results into SWAEMP, and for updating either plan when necessary to maintain compliance and environmental protection.