Attachment 23

Fresh Water Supply, Sewage, and Wastewater Management Plan

(346 Pages)

Baffinland Iron Mines Corporation

DRAFT FRESH WATER SUPPLY, SEWAGE AND WASTEWATER MANAGEMENT PLAN

Phase 2 Proposal Revisions – FOR REVIEW PURPOSES ONLY

This Document provides Revisions to:
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Rev 6
March 31, 2019

Baffinland Iron Mines Corporation

Fresh Water Supply, Sewage, and Wastewater Management Plan

BAF-PH1-830-P16-0010

Rev 6

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Index of Major Changes/Modifications in Revision 6

Item No.	Description of Change	Relevant Section
1	Updated Baffinland Policies to current	3.0
2	Water management ponds	7.4
2	Updated Roles and Responsibilities tables (Table 12-1 & 12-2) to reflect current operations and organizational structure.	12.1
4	Updated Sewage Treatment Process	5.4
5	Updated Contingency Measures	10

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1 INTRODUCTION

This document describes the plan to manage the fresh water supply and wastewater for the various camp sites to be developed for the Mary River Project during the Project's construction and operation phases. Specifically, this document focuses on freshwater supply and wastewater treatment and disposal at Milne Port, the Mine Site, Steensby Port, and various ~~rail~~ temporary camps to be used during construction of the North and South Railways.

In accordance with annual reporting requirements, this plan has been updated to consider commitments made with respect to submissions received during the preliminary and technical review of various regulatory application documents as well as final submissions and issues raised during Public Hearing Processes.

~~The Fresh Water Supply, Sewage, and Wastewater Management Plan is an update to the existing plan and supersedes the BAF-PH1-830-P16-0010, Revision 5, dated March 2018. This Plan will continue to support the Membrane Biological Reactor (MBR) sewage treatment plants (STPs) installed in 2014 which service the Mine Site Complex (MSC) and Port Site Complex (PSC) camps, the MBR sewage treatment plant installed in 2018 to service the Sailiivik Camp, and continue to support the potable water supply and oily water treatment activities under the Type A Water Licence. This Plan will also support future upgrades and additions to the MBR STPs necessary to service future MSC, PSC and Sailiivik camp expansions at Mine Site and Milne Port.~~

This Plan should be used in conjunction with the Aquatic Effects Monitoring Plan (AEMP; Baffinland, 2019)[1] ~~(BAF-PH1-830-P16-0039)~~ and the Surface Water Sampling Program – Quality Assurance and Quality Control (QA/QC) Plan[2] (~~BAF-PH1-830-P16-0001~~Baffinland, 2017).

[1] ~~Baffinland Iron Mines Corporation. Mary River Project – Aquatic Effects Monitoring Plan, Rev. 1. March 2016.~~

[2] ~~Baffinland Iron Mines Corporation, Mary River Project - Sampling Program – Quality Assurance and Quality Control (QA/QC) Rev. 2, March 2017.~~

2 REGULATIONS, STANDARDS, AND CODES

As a minimum standard of acceptability, all actions undertaken will be compliant with appropriate sections of both Federal and Territorial legislation as indicated in the table below:

TABLE 2-1: APPLICABLE REGULATIONS, STANDARDS, AND CODES

TITLE	NUMBER/ACRONYM
American Water Works Association	AWWA
International Building Codes	IBC
National Sanitation Foundation	NSF
Health Canada Guidelines for Canadian Drinking Water Quality	GCDWQ
Northwest Territories Water Supply System Regulations	NWT Regulation 108-2009
Safe Drinking Water Act, 2002	Ontario Regulation 170/03
Nunavut Waters and Nunavut Surface Rights Tribunal Act, SC2 002, c. 10	--
Northwest Territories Water Act	NWTWA
Northwest Territories Water Regulations (SOR/93-303)	--
Ontario Drinking Water Quality Standards	--
Federal *Fisheries Act*	--
Canadian Environmental Protection Act (1999)	CEPA
CCME Water Quality Guidelines for the Protection of Aquatic Life	--
Ontario Guidelines for Sewage Works, 2008	--
CCME Guidelines for Compost Quality	--
Drinking Water System Components	NSF/ANSI Standard 61
Filtering Material	AWWA Standard B100
Granular Activated Carbon	AWWA Standard B604
Canada Occupational Health and Safety Regulations	OSH
Metal and Diamond Mining Effluent Regulations	MDMER

3 BAFFINLAND'S POLICIES

3.1 SUSTAINABLE DEVELOPMENT POLICY

At Baffinland Iron Mines Corporation (Baffinland), we are committed to conducting all aspects of our business in accordance with the principles of sustainable development & corporate responsibility and always with the needs of future generations in mind. Baffinland conducts its business in accordance with the Universal Declaration of Human Rights and ArcelorMittal's Human Rights Policy which applies to all employees and affiliates globally.

Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and with utmost respect for the cultural values and legal rights of Inuit. We expect each and every employee, contractor, and visitor to demonstrate courageous leadership in personally committing to this policy through their actions. The Sustainable Development and Human Rights Policy is communicated to the public, all employees and contractors and it will be reviewed and revised as necessary on a regular basis. These four pillars form the foundation of our corporate responsibility strategy:

1. Health and Safety
2. Environment
3. Upholding Human Rights of Stakeholders
4. Transparent Governance

1.0 HEALTH AND SAFETY

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness, where everyone goes home safe everyday of their working life. Why? Because our people are our greatest asset. Nothing is as important as their health and safety. Our motto is "Safety First, Always".
- We report, manage and learn from injuries, illnesses and high potential incidents to foster a workplace culture focused on safety and the prevention of incidents.
- We foster and maintain a positive culture of shared responsibility based on participation, behaviour, awareness and promoting active courageous leadership. We allow our employees and contractors the right to stop any work if and when they see something that is not safe.

2.0 ENVIRONMENT

- Baffinland employs a balance of the best scientific and traditional Inuit knowledge to safeguard the environment.
- Baffinland applies the principles of pollution prevention, waste reduction and continuous improvement to minimize ecosystem impacts, and facilitate biodiversity conservation.
- We continuously seek to use energy, raw materials and natural resources more efficiently and effectively. We strive to develop more sustainable practices.
- Baffinland ensures that an effective closure strategy is in place at all stages of project development to ensure reclamation objectives are met.

3.0 UPHOLDING HUMAN RIGHTS OF STAKEHOLDERS

- We respect human rights, the dignity of others and the diversity in our workforce. Baffinland honours and respects the unique cultural values and traditions of Inuit.
- Baffinland does not tolerate discrimination against individuals on the basis of race, colour, gender, religion, political opinion, nationality or social origin, or harassment of individuals freely employed.
- Baffinland contributes to the social, cultural and economic development of sustainable communities in the North Baffin Region.

- We honour our commitments by being sensitive to local needs and priorities through engagement with local communities, governments, employees and the public. We work in active partnership to create a shared understanding of relevant social, economic and environmental issues, and take their views into consideration when making decisions.
- We expect our employees and contractors, as well as community members, to bring human rights concerns to our attention through our external grievance mechanism and internal human resources channels. Baffinland is committed to engaging with our communities of interest on our human rights impacts and to reporting on our performance.

4.0 TRANSPARENT GOVERNANCE

- Baffinland will take steps to understand, evaluate and manage risks on a continuing basis, including those that may impact the environment, employees, contractors, local communities, customers and shareholders.
- Baffinland endeavours 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 measure and review performance with respect to our safety, health, environmental, socio-economic commitments and set annual targets and objectives.
- Baffinland conducts all activities in compliance with the highest applicable legal & regulatory requirements and internal standards.
- We strive to employ our shareholder's capital effectively and efficiently and demonstrate honesty and integrity by applying the highest standards of ethical conduct.

5.0 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
Workplace Conduct Policy
Inuktitut in the Workplace Policy
Site Access Policy
Hunting and Fishing (Harvesting) Policy
Annual Report to Nunavut Impact Review Board
ArcelorMittal Canada Sustainability and Corporate Responsibility Report

If you have questions about Baffinland's commitment to upholding human rights, please direct them to contact@baffinland.com.

Brian Penney
Chief Executive Officer
March 2016

3.2 HEALTH, SAFETY AND ENVIRONMENT POLICY

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 2018

4 FRESH WATER

4.1 GENERAL MITIGATION MEASURES FOR WATER USE

4.1.1 WATER INTAKES

4.1.1.1 ENGINEERING INTAKE STRUCTURES

Engineered intake structures are designed to minimize erosion, avoid sediment issues, and provide protection from ice and peak water flows. Care is taken to ensure that disturbance to aquatic environments is minimized during installation and maintenance of infrastructure. Riprap used in construction is clean, free of fine sediment, non-acid leaching, and non-metal generating.

4.1.1.2 SCREENS ON ~~INTAKE PIPES~~WATER TRUCK INTAKE HOSES

~~Intakes are screened in accordance with the Fisheries and Oceans Canada (DFO) Freshwater Intake End-of-Pipe Fish Screen Guideline (DFO Guideline, 1995) to ensure no entrainment or impingement of fish. It also requires a water withdrawal rate such that fish do not become impinged on the screen.~~

A fish screen is required under Section 30 of the *Fisheries Act*, where a water intake, ditch or canal constructed or adapted for conducting water from any Canadian fisheries. The fish screen is used to cover the water intake structure in order to prevent the passage or impingement of fish. The department of Fisheries and Oceans (DFO) provides a guideline titled, "Freshwater Intake End-of-pipe Fish Screen Guideline" to assist in the design and installation of fish screens. The following EPP provides a practical guideline (adapted from the DFO guideline) for implementing fish screens where fresh water is extracted from fish bearing waters at the Baffinland Project.

Freshwater will be extracted from fish bearing water for use in dust suppression around the project site, largely focusing on the Milne Inlet Tote Road (Tote Road) and the railway construction right-of-way (ROW). Dust suppression is completed using water trucks with a capacity of 8,000 US gallons, equivalent to 30,000 L (Baffinland, 2017). The water trucks are equipped with onboard water pumps (Bowie 3300 pumps) powered by the trucks' engines.

Fish present in freshwaters at the Baffinland Project include the Arctic Char and the Ninespine Stickleback. Fish screens are designed to protect fish with a minimum fork length of 25 mm and a maximum endurance time of 10 minutes, by limiting approach velocities to approximately 0.11 m/s.

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.

The following fish screen designs meet the above DFO criteria for water take during dust suppression activities:

- Cylindrical Screen: 0.10 m diameter and 0.85 m length
- Box Screen: 0.10 m x 0.10 m width and 0.68 m length
- Circular Screen: 0.59 m diameter
- Square Screen: 0.52 m width x 0.52 m length

Typical end of pipe installation guidelines (DFO, 1995):

- Screens should be in areas and depths of water with low concentrations of fish throughout the year.
- Screens should be located away from natural or man-made structures that may attract fish that are migrating, spawning, or in rearing habitat.
- The screen face should be oriented in the same direction as the flow.
- Ensure openings in the guides and seals are less than the opening criteria to make "fish tight".
- Screens should be located a minimum of 300 mm (12 in.) above the bottom of the watercourse to prevent entrainment of sediment and aquatic organisms associated with the bottom area.
- Structural support should be provided to the screen panels to prevent sagging and collapse of the screen.
- Large cylindrical and box-type screens should have a manifold installed in them to ensure even water velocity distribution across the screen surface. The ends of the structure should be made from solid materials and the end of the manifold capped.
- Heavier cages or trash racks can be fabricated out of bar or grating to protect the finer fish screen, especially where there is debris loading (woody material, leaves, algae mats, etc.). A 150 mm (6 in.) spacing between bars is typical.

Typical cleaning and maintenance procedures (DFO, 1995):

- Provision should be made for the removal, inspection, and cleaning of screens.
- Ensure regular maintenance and repair of cleaning apparatus, seals, and screens is carried out to prevent debris-fouling and impingement of fish.
- Pumps should be shut down when fish screens are removed for inspection and cleaning.
- Screens may be cleaned by methods such as air or water, backwashing, removal and pressure washing or scrubbing.
- Under certain site-specific winter conditions, it may be appropriate to remove screens to prevent screen damage.
- Flexible suction pipe may be used instead of solid, fixed piping for ease of screen removal and cleaning.
- Pump suction pressure can be measured to assess the need for screen cleaning.

If another type of mesh or screen design is used, the guidelines for designing these fish screens is provided in DFO's 1995 guideline. Examples of common screen shapes and typical installations of end of pipe installations also are provided in DFO's guideline (DFO, 1995).

4.1.1.3 SELECTION OF SHORT-TERM WATER TAKE LOCATIONS

Short-term water intake or water recycling from effluent discharges that meet Water Licence ~~will~~Criteria will be required at many locations for a variety of needs including concrete manufacture, drilling, and dust suppression, etc. A screening process will be used to confirm whether water sources are considered adequate as water take locations. Source selection begins by looking for the largest possible water body that is feasible for use. Lakes are considered first, followed by ponds and then large rivers. Streams and creeks will not be used for short-term water withdrawal without prior approval of the Water Licence Inspector. ~~The DFO guideline used for water taken from water bodies is to restrict removal of water to a maximum of 5% of the total volume.~~ During winter under ice conditions, water must be drawn from below two metres (2 m) of non-frozen water (as the top two metres (2 m) of water provides higher oxygenation for resident fish). During the open-water season, the water taking guideline states that no significant drawdown shall be caused. There must be no impact to fish or fish habitat.

4.1.1.4 WATER METERING AND WATER CONSERVATION MEASURES

Water meters are installed at strategic locations to monitor water consumption and enable the development of management strategies to reduce water usage/consumption. These strategies include the installation of low flow water taps, water use for drilling operation, etc.

Water withdrawn from approved water intake locations within the Project are to be recorded and reported to the site environment team. All personnel involved with water use activities are to follow ~~the~~ Type A Water Licence ~~(~~2AM-MRY1325 ~~– Amendment No.~~ (NWB, 2015~~1~~) to ~~i~~ensure that daily withdrawal limits are not exceeded. Controls that may be implemented to ensure daily limits are not exceeded include water meters, source location and limit signage, ongoing training of involved personnel in water taking, detailed water truck logs and effective communication between day shift and night shift operators.

4.2 FRESH WATER SOURCES

All fresh water for domestic camp use and industrial purposes, during Construction and Operations[1] Phases of the Project shall be obtained in amount and from sources listed in ~~the~~ Table ~~below~~4-1 (NWB, 2015).~~:~~ Domestic water use is for camp operations, and industrial uses are primarily for firewater or and smaller industrial uses.

Approved and proposed sources and volumes of water for dust suppression are presented in Table 4-2.

TABLE 4-1: WATER USE FOR DOMESTIC AND INDUSTRIAL PURPOSES DURING THE CONSTRUCTION AND OPERATION PHASES

Site	Source	Construction Phase	Operations Phase		
		Volume (m³/day)[1]	Domestic	Industrial	Combined
			Volume (m³/day)[1]		
Milne Port (Milne Inlet)	Phillips Creek (summer) Km 32 Lake (Winter)	367.5	~~367.5~~300	67.5	367.5
Mine Site (Mary River)	Camp Lake	657.5	~~355.4~~203.8	151.6	355.4
Steensby Port (Steensby Inlet)	ST 347 Km Lake 3 Km Lake	435.8	~~243.6~~101	142.6	243.6
Raven River	Camp Lake	145.2	N/A	N/A	N/A
Mid-Rail	Nivek Lake (Summer) Ravn Camp Lake (Winter)	79.5	N/A	N/A	N/A
Cockburn North (Tunnels Camp)	Cockburn Lake	101.4	N/A	N/A	N/A
Cockburn South Camp	Cockburn Lake	111.1	N/A	N/A	N/A
TOTAL		**1,898**	**~~966.5~~604.8**	**361.7**	**966.5**

~~*Source:~~ Type A ~~Water Licence (2AM-MRY1325 – Amendment No. 1).~~

~~[1]Baffinland began Early Revenue Phase operations in September 2014.~~

~~[2]Volumes~~ [1]Volumes by source are combined volumes for domestic and industrial purposes.

Suitable water sources for dust suppression along the Milne Inlet Tote Road and along adjacent North Railway (to be constructed) were reviewed. Table 4-2 outlines approved water sources under the Type A Water Licence.

Table 4-2 includes approved water sources which are smaller streams. Water can be extracted from these streams during June and July in any year, but in drier years, water withdrawals are prohibited during August and September. Consult the Environmental Coordinator or Superintendent before withdrawing waters from the streams listed in Table 4-2, to verify if it is a wet or dry year and if water withdrawals are authorized. The maximum water take allowed at each location and approximately how may loads (based on a 30,000L capacity water truck) of water it translates to is included in Table 4-2.

TABLE 4-2: WATER USE LOCATIONS AUTHORIZED FOR DUST SUPPRESSION

Source	Proposed Maximum Volume (m³/day)			Restriction
	Currently Authorized Water Take [1]	Additional Water Take Requested for Dust Suppression	Phase 2 Proposal Maximum Water Take [2]	
Phillip's Creek	212	-		None
Km 32 Lake	364	-		
CV128	579.5	-		
CV099	110	-		June – July only during low flow (less than mean flow) years
CV087	90	-		
CV078	75	15	90	
Katiktok Lake	318	-		None
BG50	150	65	215	
BG32	120	60	180	June – July only during low flow (less than mean flow) years
CV217	130	-		None
Muriel Lake	212	-		
David Lake	132	-		
BG17	75	-		June – July only during low flow (less than mean flow) years
CV233 (Tom River)	135	-		None
Camp Lake	86	-		
CWP1	-	-	140	
CWP2	-	-	110	
CWP3	-	-	55	
CWP4	-	-	75	
CWP5 (km26 Lake)	-	-	120	
CWP6	-	-	80	
CWP7	-	-	60	
CWP8	-	-	35	
CWP9	-	--	45	
CWP10	-	-	55	
CWP11	-	-	100	
CWP12	-	-	80	June – July only during low flow (less than mean flow) years
CWP13 (Sheardown Lake)	-	-	10	None

NOTES:

1. Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1)
2. Proposed water withdrawal volumes from TSD 13 for the Phase 2 Proposal (Knight Piesold Ltd., 2018).

Those ~~above~~ water sources that have been approved by the Nunavut Water Board (NWB, or the Board) as freshwater sources for dust suppression under Amendment No. 1 of the Water Licence are indicated separately from proposed water withdrawals associated with the Phase 2 Proposal in Table 4-2. Authorization by the ~~Water Board~~NWB in writing must be obtained prior to withdrawing water at these

sources listed above for any purpose other than dust suppression. Streams will not be used as a water source unless authorized and approved by the Board in writing. Additionally, no material shall be removed from below the ordinary High Water Mark (HWM) of any water body unless authorized. For remote fresh water requirements such as dust suppression, tunnelling, and geotechnical and exploration drilling, some water may be drawn by truck from nearby lakes and ponds and used directly for these purpose if the source is pre-approved by Baffinland's Type A Water Licence or by application to the Nunavut Water Board.~~s.~~

Sources that are restricted by low flow years (Table 4-2) will have a visual inspection completed by environmental personnel to determine if restrictions need to be put in place on a regular basis. Environment personnel will then perform instantaneous flow measurement by staff gauge monitoring if deemed necessary. The instantaneous flow estimate will be done by measuring the height of water on a staff gauge and applying it to the rating curves of the representative streams around the Project. This data will be compared to low flow indices from current monitoring locations for a representative stream to determine if it is a low flow year in consultation with a hydrologist. The Environment department will inform operators of any restrictions.

Monthly cumulative withdrawals from lakes represent less than 10% of the monthly outflow, unless site-specific conditions indicate that a greater water withdrawal will not be significant in the context of fish bearing habitat (i.e. Camp Lake).

Water used for the purposes of exploration drilling and domestic camp use at supporting satellite exploration camps will be withdrawn under the authorization of Baffinland's Exploration Type B Water Licence (2BE-MRY1421). Water withdrawn for domestic camp use at satellite exploration camps will be withdrawn from sources proximal to each camp. Total water use for all satellite exploration camps will not exceed 49 m^3 per day. Likewise, drill water will be withdrawn from water source(s) proximal to drilling targets and shall not exceed 250 m^3 per day. Therefore, the volume of water withdrawn for all purposes under this licence will not exceed 299 m^3 per day.

4.3 FRESH WATER SYSTEM PROCESS DESCRIPTION

The following sections describe the fresh water systems at the various Project sites. Water and sewage process flow diagrams for Milne Port and the Mine Site are presented in Appendix C.

Each site also includes a potable water treatment system which produces drinking water for the personnel at the site during construction and operation phases. These systems treat water to meet the Guidelines for Canadian Drinking Water Quality (Health Canada, 2017) as well as the Ontario Drinking Water Quality Standards (Government of Ontario, 2018a).

Minimum process equipment requirements are based upon the Northwest Territories Water Supply System Regulations~~, NWT Regulation 108-2009~~ (Government of the Northwest Territories, Department of Justice, 2012), Ontario Design Guidelines for Drinking Water Systems ~~2008~~(Government of Ontario,

2019a), Ontario Regulation 170/03 – Drinking Water Systems (Government of Ontario, 2018b), the Procedure for Disinfection of Drinking Water in Ontario (Government of Ontario, 2019b), as well as best management practices.

4.3.1 MILNE PORT

Currently onsite at Milne Port there are four~~two~~ existing camps that support operations and construction activities. These camps include the following:

- Port Site Complex (PSC) Camp;
- ~~Matrix or~~ Port Site Weatherhaven (PWH) Camp;
- 380-person ~~Port~~ Construction Camp; and
- Steensby Camp.

The PSC camp will be expanded in 2019/2020 from ~~330~~120 beds to ~~550~~330 beds with the addition of buildings from the relocated Mine Site Complex (MSC) camp.

Each camp contains a Potable Water Treatment Plant (PWTP) within or near the camp as well as freshwater tanks to store raw water being delivered. During construction of the Phase 2 Proposal, the Milne Port water sources will also supply water to a 68-bed construction camp to be located at KM40. The freshwater demand for construction and operation are shown on ~~drawing Milne Inlet –~~ the Port Site Water and Sewage Process ~~Supply Balance Block~~ Flow Diagram in Appendix C ~~of this plan~~.

A ~~raw~~ water truck draws raw water from either KM 32 lake (in winter/summer) or Phillips Creek (in summer) and delivers the water to a water storage tank near the camp. Water from this tank ~~will be~~ is used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within the tank ensures that fire water is always available in the tank. The Milne Port camp layout including the locations of potable water related infrastructure is presented in Appendix B.

The potable water treatment scheme consists of coagulation followed by media filtration and disinfection by ultraviolet radiation. The water then undergoes a secondary disinfection by sodium hypochlorite injection to ensure residual chlorine content at the point of use.

4.3.2 MINE SITE

Currently onsite at the Mine Site there are three camps that support construction, operations and site wide exploration activities. These camps include the Mine Site Weatherhaven (MWH) Camp, the Sailiivik Camp Complex, and the Mine Site Complex (MSC) Camp. The MSC Camp will be relocated to expand the PSC at Milne Port in 2019/2020. Each camp contains a Potable Water Treatment Plant (PWTP) within or near the camp as well as freshwater tanks to store raw water being delivered. The Sailiivik Camp will be adequate to support the Phase 2 Proposal through construction and operation. In addition, the PWTP at the Sailiivik Camp will supply potable water to a temporary KM84 camp during construction.

Fresh water supply for the ~~Mary River~~ Mine Site is obtained using an electric pump positioned inside a heated and insulated pump house on a raw water jetty on Camp Lake. Water is pumped directly from the lake source to water storage tanks located at both camps. Storage tanks that are not connected to this water line are filled from water trucks that draft water directly from the pump house. Water from these tanks will be used to provide fire water as well as meet the fresh water requirements of the site. A stand pipe within each tank ensures that fire water is always available in the tank. The Mine Site camp layout including locations of potable water related infrastructure is presented in Appendix B ~~of this Plan~~. The freshwater demand for the Phase 2 Proposal is shown on the Mine Site water and sewage process flow diagram in Appendix C.

Some fresh water requirements such as road dust suppression, exploration drilling, quarry dust suppression, and concrete and explosives manufacturing will be provided directly from Camp Lake and other nearby lakes using water trucks. Exploration drilling will continue throughout the construction and operation phases of the Project.

The potable water treatment scheme consists of coagulation followed by media filtration and disinfection by ultraviolet radiation. The water will then undergo a secondary disinfection by sodium hypochlorite injection to ensure residual chlorine content at the point of use.

4.3.3 TEMPORARY CAMPS

Two 68-bed temporary camps will be positioned at KM40 and KM84 during the construction of the railway. The quantities of water required for these camps is within the allowable water draw from one of the approved water sources for domestic uses (Phillips Creek, KM 32 Lake or Camp Lake) under the current Licence. Potable water for the KM40 Camp will be trucked from the Milne Port PWTP to water storage tanks at the camp. Potable water for the KM84 Camp is expected to be trucked from the Mine Site PWTP, but may come from Milne Port if needed to remain under daily water use limits. The daily water supply usage of each temporary camp is 17 m^3.

5 SEWAGE TREATMENT

5.1 SEWAGE GENERATION RATE

The estimated generation of sewage is based upon a per capita generation as shown ~~below~~in Table 5-1.~~:~~

TABLE 5-1: STP AVERAGE SEWAGE FLOW DESIGN BASIS

Parameter	Design Value	Source
Sewage Generation per Capita	300 L/person/day	Design Basis – Sewage Treatment Plant, Doc. No. H337697-4000-10-109-0002 (FEIS, Appendix 3B).

5.2 SEWAGE DISCHARGE CRITERIA

All sewage generated from relevant Project sites is directed to the Sewage Treatment Facilities or as otherwise approved by the ~~Nunavut Water Board~~NWB. As per the Type A Water Licence (~~2AM-MRY1325 – Amendment No. 1~~NWB, 2015) Baffinland is constructing and operating infrastructure and facilities designed to contain, withhold, divert, or retain Water and/or Waste in accordance with applicable legislation and industry standards. Effluent will be discharged such that surface erosion is minimized and no additional impacts are created. Effluent discharge locations will be regularly monitored for erosion and control measures will be implemented as required. ~~Regular monitoring of effluent discharge locations will monitor potential erosion and controls such as armouring, liner and pipe extensions will be evaluated on an as needed basis.~~ The quality of the sewage treatment plant effluent discharging to freshwater or directly into the ocean shall be in accordance with the applicable site discharge limits and the approved Type A Water Licence (~~2AM- MRY1325 - Amendment No. 1~~NWB, 2015) as listed in ~~the following table:~~Table 5-2.

Locations MP-01 and MP-01a discharge directly into the ocean, therefore ocean discharge criteria would apply.

Recycled water and use of reclaimed water from the various Treatment Facilities (MBRs, OWSs, etc.), surface water management ponds, and embankment dams and approved discharge locations may be used if waters meet appropriate discharge criteria for those facilities. Sludge generated from Sewage Treatment Facilities or any other facilities shall be incinerated using the Milne Port and Mine Site onsite incinerators, disposed of in the landfill with the appropriate approvals from authorities, or backhauled for disposal off site in Southern Canada.

TABLE 5-2: EFFLUENT DISCHARGE QUALITY LIMITS FROM SEWAGE TREATMENT FACILITIES

Parameter	Unit	Maximum Concentration of Any Grab Sample discharging into Freshwater (mg/L)	Maximum Concentration of any Grab Sample discharging into Ocean (mg/L)
		Monitoring Locations: MS-01, MS-01b, MS-01a, MS-MRY-04, MS-MRY-04A	Monitoring Locations: MP-01, MP-01A, SP-01, SP-01A,
BOD_5	mg/L	30	100
TSS	mg/L	35	120
Faecal Coliform	cfu/100 mL	1000 CFU /100 ml	10,000 CFU /100 ml
Oil and Grease	mg/L	No visible sheen	No visible sheen
pH	---	Between 6.0 and 9.5	Between 6.0 and 9.5
Ammonia (NH3-N)	mg/L	4.0	-
Total Phosphorus (MS-01, MS-01B, MS-MRY-04A)	mg/L	4.0	-
Total Phosphorus (MS-01a)	mg/L	1.0	-
Toxicity	---	Final effluent not acutely toxic	Final effluent not acutely toxic

*Source: Type A Water Licence (2AM-MRY1325 - Amendment No. 1) Table 4 and 5.

5.3 TREATED WASTEWATER GENERATION AND DISCHARGE/OUTFALL LOCATIONS

Treated sewage and wastewater for the Project are discharged to the ~~following~~ locations listed in Table 5-3.~~:~~

TABLE 5-3: APPROXIMATE TREATED EFFLUENT GENERATION AND DISCHARGE/OUTFALL LOCATIONS

Camp/Site	Discharge/Outfall Location		Coordinates
	Summer	Winter	
Milne Port	Ocean at Milne Inlet		N: 7976338 E: 503636
Mine Site	Sheardown Lake for Exploration Camp	Storage Pond	N: 7913630 E: 559733
	Discharge 1 to Mary River		N: 7911946 E: 562321
	Discharge 2 to Mary river		N: 7911938 E: 562342

Camp/Site	Discharge/Outfall Location		Coordinates
	Summer	Winter	
	Discharge 3 to Mary River		N: 7912010 E: 562249
Tote Road Work Sites	Conveyed to Mine Site or Milne Port Sewage Treatment		N/A
Steensby (Port)**	Ocean at Steensby Port		N: 7801412 E: 593378
Ravn River Area**	Conveyed to Mine Site Sewage Treatment		N/A
Mid-Rail Area**	Conveyed to Mine Site Sewage Treatment		N/A
Cockburn Tunnels Area**	Conveyed to Steensby Sewage Treatment		N/A
Cockburn South Camp**	Conveyed to Steensby Sewage Treatment		N/A

*Refer to Site Block Flow Diagrams in Appendix C for Milne Port and Mine Site anticipated annual effluent discharge.

** These sites are not expected to be active in the foreseeable future.

Each of the three STPs at Milne Port will share a common final discharge points, either the outfall represented by MP-01, or the PWSP represented by MP-01a.

Treated wastewater effluent will be discharged at a distance of least thirty-one metres (31 m) above the Ordinary ~~High Water Mark~~HWM of any water body or watercourse, or where direct flow into the adjacent water body or watercourse is possible, so that surface erosion is minimized and additional impacts are avoided.

5.4 SEWAGE TREATMENT PROCESS DESCRIPTION

The process description for the sewage treatment systems at each site are described in the sections that follow. Note that for design purposes originally a per capita sewage generation rate of 344 L/person/day had been considered, which is higher than the per capita potable water consumption rate of 300 L/person/day. This was to ensure that the sewage treatment systems would have a higher design allowance. For consistency 300 L/person/day will now be used for both potable water consumption and sewage generation. On average sewage generated per person ranges from approximately 100 to 300 ~~litres per~~ L/day. In addition, actual camp occupancy can be optimized based on potable water conservation measures that can be implemented to reduce per capita water consumption and reduce overall sewage generation from current rates.

5.4.1 MILNE PORT

The ~~onsite~~ existing STP for Milne Port is a ~~Membrane Biological Reactor (~~MBR~~)~~ facility that was installed in 2014. Raw sewage generated at the PSC camp is pumped directly via lift stations and sewage lines to the MBR facility at Milne Port. Raw sewage generated at the PWH camp is stored in a raw sewage bladder until it is transported using a vacuum truck to the Milne Port MBR for treatment.

Two additional STPs will be commissioned at Milne Port in 2019 and 2020 as part of current operations. STP #2 is the MBR facility currently servicing the MSC at the Mine Site, which will be relocated to Milne Port along with the MSC buildings in 2019 or 2020. STP#3 will be commissioned in 2019 next to the 380-person construction camp, which was approved as part of Baffinland's Production Increase Project Proposal (Stantec Consulting Ltd., 2018), and by the NWB under Modification Request No. 6 (NWB, 2019).

Treated effluent from the MBR sewage treatment plant is stored in a series of treated effluent tanks which collectively have a hydraulic retention time of eight hours (at minimum) based upon nominal flows. It is designed such that the effluent tank will be at a low-level during operation. This design allows for delay of discharge should sampling indicate that the effluent quality does not meet the applicable criteria. Such delay allows the effluent to be mixed, re-treated, and re-tested before discharge. Once sampling indicates that effluent is meeting discharge criteria the treated effluent stream is directed to discharge via truck or pipeline to the overland outfall discharge location (See Table 5-3 for coordinates). The discharge location at Milne Inlet is shown on the Milne Port Site Layout (~~refer to~~ Appendix B).

Should discharge of off-spec effluent be necessary from the treated effluent tanks due to volume, the off-spec effluent will be stored in the Milne Port polishing waste stabilization pond (PWSP). The off-spec effluent will be removed by vacuum truck and fed into the sewage plant feed tank for re-processing or treated by means of a pond treatment system (i.e. DAF system). Should there be high volumes of off-spec effluent greater than the capacity of the existing PWSP, the Type A Water Licence (~~2AM-MRY1325 – Amendment 1~~NWB, 2015) allows for the construction of a second PWSP to be built at Milne Port. This second PWSP (No. 2) would work in parallel with the existing PWSP and be treated in the same manner.

In the event that there is an electrical power outage that causes the sewage treatment plant to be completely inoperable, raw sewage will be diverted temporarily and trucked to the PWSP, until the sewage plant is operational. At that time, partially or untreated sewage from the PWSP(s) will be trucked back to the treatment plant for treatment or treated using an in-situ pond treatment system and discharged to the ocean outfall (~~Refer to~~ Appendix F - PWSP Effluent Discharge Plan). The PWSP Effluent Discharge Plan is used as a reference guideline by the onsite environmental team. Based on the water quality parameters observed in the PWSP and time of year, the PWSP will be discharged following Option #1 - Spring Discharge Plan or Option #2 - Summer Polishing Treatment Discharge Plan, approved by the NWB. Discharges from Project PWSPs will be monitored and treated as outlined in the PWSP Effluent Discharge Plan to ensure effluent discharged meets the applicable water quality criteria outlined in the Type A Water Licence. In the event that water treatment methods differ significantly from the PWSP Effluent Discharge Plan, Baffinland will seek third party consultation and approvals to determine the appropriate water treatment methods.

The sludge generated by the MBR is de-watered using a mechanical de-watering device, a filter press, and then incinerated or backhauled for disposal off site. Sludge is stored in an animal proof secure area. Odour generation is limited as a result of the sludge being aerobically digested, de-watered, and incinerated

regularly such that the sewage cake is not stored for significant periods. Odour control carbon vents are installed where deemed necessary. The incinerator design considered the solids content of the sludge from the dewatering device. Note that there is a potential option to dispose of de-watered sludge in the Mine Site landfill with the appropriate approvals from authorities. Sewage sludge also accumulates in the bottom of the lift stations that service the accommodations camps at Project sites. Regular maintenance of the lift stations includes the periodic removal of the accumulated sewage sludge.

The sewage treatment system basis as described above will be applicable for current and future construction and operations requirements. The site layout showing the location of camp, sewage treatment and ancillary facilities is presented in Appendix B.

5.4.2 MINE SITE

The ~~Mary River~~ Mine Site has two ~~Membrane Biological Reactor (~~MBR~~)~~ Sewage Treatment Plant (STP) facilities, one installed in 2014 and ~~one~~ another installed in 2018 specifically for the Sailiivik Camp Complex. The Rotating Biological Contactor (RBC) type STP (Seprotech manufactured), previously used to treat sewage from the Mine Site Weatherhaven camp, will eventually be decommissioned however in the interim it is being used as a temporary holding facility/surge tank for the Mine Site Weatherhaven camp. Raw sewage is transported from the RBC by vacuum truck to the MBR for treatment. In the meantime, the option to re-commission this plant remains, should the need arise, as the required approvals for this facility are still in place.

Treated effluent from the MBR sewage treatment plants is stored in a series of treated effluent tanks which collectively have a hydraulic retention time of 8 hours (at minimum) based upon nominal flows. It is designed such that the effluent tanks will be at a low-level during operation. This design allows for delay of discharge should sampling indicate that the effluent quality does not meet the applicable criteria. Such delay allows the effluent to be mixed, retreated, and retested before discharge. Once sampling indicates that effluent is meeting discharge criteria the treated effluent stream is directed to discharge via pipelines to the Mary River discharge location; one pipeline from the MSC MBR and one for the Sailiivik Camp Complex MBR (See Table 5-3 for winter and summer discharge co-ordinates). The discharge locations at the Mine Site are shown on the Mine Site Layout presented in Appendix B.

Riprap has been used at the discharge locations to reduce sedimentation and erosion at the discharge location and along the drainages upstream of Mary River. Specific discharge locations into Mary River can be seen on the Mine Site Layout found in Appendix B. The discharge strategy will be reviewed annually and optimized as necessary.

In the event that there is an electrical power outage that causes the sewage treatment plant to become inoperable, raw sewage will be temporarily trucked to local existing polishing waste stabilization ponds until the sewage plant comes on line again. Partially or untreated sewage from the PWSPs from this event will either be trucked back to the treatment plant for treatment/reprocessing or treated in situ at the

pond location (Refer to Appendix F - PWSP Effluent Discharge Plan). The PWSP Effluent Discharge Plan is used as a reference guideline by the onsite environmental team. Water quality parameters will be monitored in the spring and a discharge plan will be developed based on the determined water quality conditions. Discharges from Project PWSPs will be monitored and treated as outlined in the PWSP Effluent Discharge Plan to ensure effluent discharged meets the applicable water quality criteria outlined in the Type A Water Licence. In the event that water treatment methods differ significantly from the PWSP Effluent Discharge Plan, Baffinland will seek third party consultation to determine the appropriate water treatment methods.

The sludge generated at the MBR is dewatered using a mechanical dewatering device, a filter press, and then incinerated or backhauled for disposal off site. Sludge cake is stored in an animal proof secure area. Odour generation will be limited because the sludge will be aerobically digested, dewatered and incinerated regularly such that the sewage cake is not stored for significant periods. Odour control carbon vents are installed where deemed necessary. The incinerator design considered the solids content of the sludge from the dewatering device. Sewage sludge also accumulates in the bottom of the lift stations that service the accommodations camps at Project sites. Regular maintenance of the lift stations includes the periodic removal of the accumulated sewage sludge.

The MBR sewage treatment plant is designed to also process raw or partially treated sewage from Raven and Mid-Rail camps in the event these facilities have been constructed. The sewage could be transported to the Mary River permanent sewage treatment facility via vacuum truck.

The sewage treatment system basis as described above is adequate for current construction and operations requirements. The modular nature of the plants makes it very simple to add containerized plants for increased sewage treatment capacity. The site layout showing the location of camp, sewage treatment and ancillary facilities is presented in Appendix B.

5.4.3 TEMPORARY CAMPS

As noted in Section 4.3.3, two 68-bed temporary camps will be positioned at KM40 and KM84 during the construction of the railway. The daily sewage generation from each temporary camp will be 17 m^3. Sewage will be held in holding tanks and then transported by truck to one of the sewage treatment plants at Milne Port (Section 5.4.1) or at the Mine Site (Section 5.4.2).

6 OILY WATER/WASTEWATER TREATMENT

There are two sources of potentially oily water that have been identified at Milne Port and the Mine Site. There is the wash-water generated at the vehicle maintenance facilities, waste management building, emergency response garage, and truck wash, as well as the surface water that collects within the bulk fuel storage berms, hazardous waste storage berms, and Landfarm facilities at Project sites. Based on the different nature of these two wastewater sources, distinct discharge criteria (and treatment plans) have been developed for each.

6.1 OILY WATER TREATMENT DISCHARGE CRITERIA

All discharge from the Oily Water/Wastewater Treatment Facilities for monitoring stations MP-02, MS-02, and SP-02 will not exceed the following Effluent quality limits provided in Table 6-1 ~~below~~.

TABLE 6-1: EFFLUENT DISCHARGE LIMITS FOR OILY WATER TREATMENT FACILITIES

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
pH	6 – 9.5
TSS	35
Ammonia	4
Phosphorous	4
Benzene	0.370
Ethylbenzene	0.090
Toluene	0.002
Oil and Grease	15 and no visible sheen
Arsenic	0.50
Copper	0.30
Lead	0.20
Nickel	0.50
Zinc	0.50

*Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1) Table 6.

All discharge from Bulk Fuel Storage Facilities will not exceed the following effluent quality limits outlined in Table 6-2. Applicable Monitoring Stations include MP-03, MP-MRY-7, MS-03, MS-04, MS-MRY-6, SP-04 and SP-05.

TABLE 6-2: EFFLUENT DISCHARGE LIMITS FOR THE BULK FUEL STORAGE FACILITIES

Parameter	Maximum Concentration of any Grab Sample (mg/L)
Benzene	0.370
Toluene	0.002
Ethylbenzene	0.090
Lead	0.001
Oil and Grease	15 and no visible sheen

*Source: Type A Water Licence (2AM-MRY1325 Amendment No. 1) Table 8

All discharge from Landfarm Facilities, including the Contaminated Snow Containment Berms, will not exceed the following effluent quality limits outlined in Table 6-3. Applicable Monitoring Stations include MP-04, MS-05 and SP-06.

TABLE 6-3: EFFLUENT DISCHARGE LIMITS FOR THE LANDFARM FACILITIES

Parameter	Maximum Concentration of any Grab Sample (mg/L)
pH range	Between 6.0 and 9.0
Total Suspended Solids	15
Oil and Grease	15 and no sheen
Total Lead	0.001
Benzene	0.370
Toluene	0.002
Ethylbenzene	0.090

*Source: Type A Water Licence (2AM-MRY1325 - Amendment No. 1) Table 9

6.2 OILY WATER/WASTEWATER TREATMENT PROCESS DESCRIPTION

Oily water and wastewater generated by the Project shall be treated at the Oily Water/Wastewater Treatment Facilities allowed under the scope of the Licence. The process description for both oily water/wastewater treatment systems at each site are described in the sections that follow.

6.2.1 MILNE PORT

Oily water may be generated at the Milne Port from the following sources (this neglects minor oily water generated from accidental spills which will be handled by the Spill Contingency Plan):

- Vehicle maintenance and wash facilities (i.e. truck wash, snow/ice melt, equipment and floor wash down water).
- Bulk fuel storage facility (tank farm).

- Concrete sumps in buildings such as Maintenance Shops including the Rail Maintenance Shop, Waste Management Building, Emergency Response Building, etc.
- Lined containment facilities/berms (i.e. hazardous waste, product storage).

All possible sources listed above are shown in the Milne Port layout presented in Appendix B.

Any oily water generated from the Milne Port Bulk Fuel Storage Facility or other lined containment facilities is collected in sump(s) within each facility. The water is then treated directly by the prefabricated mobile oily water separator (OWS) contained within a 40' seacan or an on-site constructed oily water separator. The prefabricated mobile OWS uses a series of skimmers, filters, clay, and activated carbon to capture and remove hydrocarbons from oily water.

Wash and melt water generated at the vehicle and rail maintenance facilities, waste management building, and emergency response garage collects in each building's designated sump(s) by gravity flow. Suspended material in the wastewater settles out in the sump. All sump water collected in these buildings is collected and stored at engineered lined containment facilities until the water can be treated during the open water season using the mobile OWS system. Following treatment by the OWS, the treated effluent will be pH adjusted, if required, and resampled to ensure effluent water quality meets the applicable discharge criteria before the effluent is finally discharged to the receiving environment.

All effluent discharges of treated oily water/wastewater to the receiving environment will be discharged under intentions to meet effluent discharge criteria outlined in Section 6.1. Depending on the situation, treated oily water effluent may be blended with treated sewage and discharged, or discharged directly based on sampling.

6.2.2 MINE SITE

Oily water may be generated at the Mine Site from the following sources (this neglects minor oily water generated from accidental spills which will be handled by the Spill Contingency Plan):

- Vehicle maintenance and wash facilities (i.e. truck wash, snow/ice melt, equipment and floor wash down water).
- Bulk fuel storage facility (tank farm).
- Emulsion plant wash water
- Concrete sumps in buildings such as Maintenance Shops, Waste Management Building, Emergency Response Building, etc.
- Lined containment facilities/berms (i.e. hazardous waste, product storage).

All possible sources listed above are shown in the Mine Site layout presented in Appendix B.

Wash and melt water generated at the vehicle maintenance facilities, truck wash, waste management building, and emergency response garage collects in each building's designated sump(s) by gravity flow. Suspended material in the wastewater settles out in the sump. All sump water collected in these buildings

will be transferred to the Truck Wash Facility for treatment using the facility's oily water treatment plant, once it is fully commissioned. Prior to commissioning the Truck Wash Facility or in the event of a breakdown of that facility process, sump water will be transferred to Totes that will be stored in hazardous containment lined facilities. The water in these Totes will discharged and treated in lined berms utilizing the mobile OWS system or shipped off site for disposal at an accredited treatment facility.

The Truck Wash Facility is equipped with an oily water treatment plant as well as trays and a sump to capture all wash water generated at the facility, allowing it to recycle up to 90% of the water used. Wash water produced in the truck wash facility (truck washing, equipment and floor wash down) will flow by gravity and be collected in the trays and a local sump. Suspended material in the wastewater is removed using a series of sumps, settling tanks (de-muck tank) and filters. Free and emulsified oil in the wastewater is removed by the facility's oily water treatment plant which utilizes a series of skimmers, activated carbon and filters in order to substantially reduce oil levels in the recycled wastewater. The water is then reused by the facility to wash down equipment and vehicles. Should there need to be a discharge from the facility to the receiving environment, the wastewater is further treated with the facility's reverse osmosis unit and pH controller to ensure the final effluent meets all discharge criteria outlined in the Type A Water Licence.

Treated effluent from the truck wash's oily water treatment plant will be pumped to the discharge outfall at the Mary River or other on land location as agreed to by the Water Licence Inspector. Most water is recycled and reused within the facility. The separated waste oil will be stored in a local tank. Periodically, the oil from the tank will be drained and shipped off site or incinerated. Accumulated suspended solids will be periodically removed by bucket loader vehicle and sent to the Landfarm Facility for treatment if contaminated with hydrocarbons or the landfill if demonstrated to be non-hazardous.

Collected stormwater run-off from the Mine Site Bulk Fuel Storage Facility and/or other lined containment facilities (i.e. hazardous waste berms, etc.) will be treated using the mobile OWS system and discharged directly to the adjacent land surface. As mentioned prior, the mobile OWS system is a prefabricated mobile oily water separator contained within a 40' seacan. The mobile OWS system uses a series of skimmers, filters, clay and activated carbon to capture and remove oils and hydrocarbons from wastewater. Effluent from the mobile OWS will be sampled regularly to ensure effluent quality meets the applicable discharge criteria outlined in the Type A Water Licence.

Depending on the situation, effluent from either the mobile OWS system or the Truck Wash Facility may be blended with treated sewage prior to being discharged or will be discharged directly based on sampling.

The emulsion plant is equipped with its own wastewater treatment plant which utilizes an evaporation system to evaporate the water leaving solid residue and oil. This residue will be tested for toxicity and if necessary will be taken off-site for disposal at a licensed facility, otherwise the waste will be landfilled.

7 WATER MANAGEMENT PONDS

The water management ponds described in the sections below were constructed in 2015 to retain runoff water from the Milne Port ore stockpile pad and the Mine Site crushing pad, Run of Mine Stockpile (ROM), and waste rock stockpile.

In the event of abnormal conditions at an existing surface water management pond, Baffinland will consult an engineer for recommendations on required improvements or upgrades.

7.1 DISCHARGE CRITERIA

All discharge from the water management ponds (MS-06, MS-07, MS-08, MS-09, and SP-07) associated with the Project's mining operations (crushing, ore, and waste rock stockpiles) will not exceed the following effluent quality limits provided in Table 7-1.

In addition, effluent discharged from water management ponds at the Mine Site (MS-06, MS-07, MS-08, MS-09) will not exceed the effluent quality limits within the MDMER provided in Table 7-2. When the maximum limit for a parameter differs between the MDMER and Water Licence discharge criteria, the more conservative (lower) limit for the parameter ~~will be~~is adopted.

TABLE 7-1: EFFLUENT DISCHARGE LIMITS FOR OPEN PIT, STOCKPILES, AND SURFACE WATER MANAGEMENT PONDS

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
Total Arsenic	0.50
Total Copper	0.30
Total Lead	0.20
Total Nickel	0.50
Total Zinc	0.50
Total Suspended Solids	15
Oil and Grease	No visible sheen
Toxicity	Not acutely toxic
pH	6.0 – 9.5

*Source: Type A Water Licence (2AM-MRY1325 – Amendment No. 1) Table 10.

TABLE 7-2: EFFLUENT DISCHARGE LIMITS FOR OPEN PIT, STOCKPILES, AND SURFACE WATER MANAGEMENT PONDS

Parameter	Mean Monthly Limit (mg/L)[1]	Maximum Concentration of Any Grab Sample (mg/L)
Total Arsenic	0.50	1.00
Total Copper	0.30	0.60
Total Lead	0.20	0.40
Total Nickel	0.50	1.00
Total Zinc	0.50	1.00
Total Suspended Solids	15	30
Radium-226	0.37 Bq/L	1.11
pH	6 – 9.5	6 – 9.5
Toxicity	Not acutely toxic	Not acutely toxic
Un-ionized Ammonia	0.50	1.00

*Source: Metal and Diamond Mining Effluent Regulations, Schedule 4

[1] Parameters listed above are sampled weekly during discharge.

Additional parameters including sub-lethal toxicity, aluminum, cadmium, iron, mercury, molybdenum, selenium, nitrate, ammonia, chloride, chromium, cobalt, sulphate, thallium, uranium, phosphorus, manganese, hardness, alkalinity and specific conductance are also required under MDMER, however these parameters do not have a maximum water quality discharge limit but instead are used to provide additional information to assist in interpreting toxicity results and identifying potential effects on the receiving environment. For additional information on the MDMER requirements pertaining to the Project refer to Appendix H.

7.2 MILNE PORT STOCKPILE SURFACE WATER MANAGEMENT PONDS

The two (2) Milne Port stockpile surface water management ponds (east and west) were constructed to temporarily retain the runoff water from the Milne Port ore stockpile and crushing/screening area and to contain the sediment load. During normal operation, runoff from the stockpile area drains to the stockpile surface water management ponds. The ponds were designed with sufficient retention time to ensure the sediment would gravity-settle to the bottom of the pond and allow the runoff to be tested before the water reaches the overflow weirs. The ponds are equipped with overflow weirs designed to allow the unloaded surface water to drain through a controlled discharge to Milne Inlet. Alternatively, the pond can be pumped out using a portable pump arrangement.

An expansion of the current ore stockpiles will be undertaken in 2019 that will result in construction of twinned ponds #1 and #2 (ponds #1A and 2A, respectively), and construction of stage 1 of stormwater pond #3 along the west side of the ore stockpile area. The Phase 2 Proposal will involve construction of stage 2 of stormwater pond #3, and stormwater ponds at the crushing feed stockpile (pond #4) and the fines stockpile (pond #5). The Milne Port Phase 2 Proposal layout is presented in Appendix B. A site water balance process flow diagram showing stormwater management at Milne Port, as well as a piping and

instrumentation diagram showing how each pond is emptied and discharged, are presented in Appendix C.

Each of the stormwater ponds will ultimately be discharged from one of the two existing final discharge points (i.e., the beach area in front of Ponds #1 and #2).

In the case that the surface water management pond effluent quality does not meet the discharge criteria outlined in the Type A Water Licence by means of sediment gravity settling alone, additional treatment methods (i.e. flocculants, GAC, clay, filters, etc.) will be employed to ensure effluent compliance.

The ponds were designed to fit within the foreshore areas north of the stockpile area and therefore do not encroach near the shoreline.

7.3 TEMPORARY ORE STORAGE AREA SURFACE WATER MANAGEMENT POND

Phase 2 will involve establishing a temporary ore transfer area at km 56.8, to be used for 1 to 2 years during the construction phase. Runoff from temporary stockpiles will be collected in a settling pond. Effluent collected in this pond will be sampled to ensure it meets discharge criteria before applying the water to the Tote Road as part of dust suppression efforts as applicable discharge limits are met. A site layout is presented in Appendix B, and a water balance process flow diagram is presented in Appendix C.

7.4 MINE SITE ORE CRUSHER PAD SURFACE WATER MANAGEMENT POND

The ~~Mine Site~~ existing ore crusher pad surface water management pond at the Mine Site was completed in 2015. This pond is designed to temporarily retain the runoff water from the Mine Site Crusher Facility (CF) and contain the sediment load, particularly during seasonal freshet activities. During normal operation, runoff from the crusher area drains to the surface water management pond (west of the crusher pad). The pond is equipped with an overflow weir designed for extreme weather periods (e.g. greater than a 1 in 10-year, 24-hour design storm), allowing the unloaded surface water to drain through a controlled discharge to Sheardown Lake. H~~h~~owever, this is not the normal operating water-shed. The ponds were designed with sufficient retention time to ensure the sediment would gravity-settle to the bottom of the pond before the water reaches the overflow weir.

The pond is also equipped with a pump pad on the northwest side. The normal operation of the pond will be to test the water quality for MDMER and applicable Water Licence requirements and when on spec, control discharge using a portable pump arrangement. The pump arrangement connects into the treated effluent discharge pipeline for discharge to Mary River.

A new crusher facility and stormwater pond will be constructed to serve the rail load-out facility, at the location shown on the Mine Site Phase 2 Proposal layout in Appendix B. A site water balance process flow diagram showing stormwater management at the Mine Site is presented in Appendix C.

In the case that the surface water management pond effluent quality does not meet the applicable discharge criteria by means of sediment gravity settling alone, additional treatment methods (i.e. flocculants, GAC, clay, filters, etc.) will be employed to ensure effluent compliance.

7.5 MINE SITE RUN OF MINE STOCKPILE SURFACE WATER MANAGEMENT POND

The Mine Site Run of Mine (ROM) stockpile infrastructure, when constructed, will support Deposit No. 1 mining operations and is to be located off the Mine Haul Road ~~at km 107~~. Storm-water runoff originating in the ROM stockpile is intercepted by the Facility's perimeter collection ditches and directed to the ROM pond. The ROM pond is designed to temporarily retain the runoff and contain the sediment load, particularly during freshet activities. During normal operation, runoff from the ROM stockpile drains to the surface water management pond. The pond is equipped with an overflow weir designed for extreme weather periods (e.g. greater than a 1 in 200-year, 24-hour design storm), allowing the unloaded surface water to drain through a controlled discharge to the Mary River watershed.

In the case that the surface water management pond effluent quality does not meet the applicable discharge criteria by means of sediment gravity settling alone, additional treatment methods (i.e. flocculants, GAC, clay, filters, etc.) will be employed to ensure effluent compliance.

7.6 MINE SITE WASTE ROCK ~~STOCKPILE~~ FACILITY POND

The Waste Rock Facility Surface Water Management Pond (WRF pond) was constructed to support Deposit No. 1 mining operations and is located northeast of the Deposit No. 1 open pit. Seepage and stormwater runoff originating from the Waste Rock Stockpile is intercepted by the Facility's perimeter collection ditches and directed to the WRF pond. The WRF pond for the Mine Site was constructed in 2016 and is designed to temporarily retain surface water runoff. Water from the WRF Pond is pumped into the Water Treatment Plant (WTP) for pH adjustment, and subsequently discharged into a Geotube adjacent to the WTP for solids removal via filtering and settling (details in Appendix J – BAF-PHI-340-PRO-048 – Waste Pond Water Treatment Plant Operations).

The effluent from the Geotube is tested to ensure it meets MDMER and applicable Water licence Criteria and then controlled discharged intermittently using a portable pump arrangement. Sludge generated from the operation of the WRF WTP will be assessed for suitability of disposal within the WRF or disposed of off-Site at an appropriate waste receiving facility. Following the FDP, effluent passes through approximately 475 metres (m) of layflat hose and is discharged to the tundra of the approved receiving environment, the Mary River watershed. If required, effluent will be transported via layflat hose to the Mary River watershed.

In high rainfall periods (e.g. greater than a 1 in 10-year, 24-hour design storm), the pond is also equipped with an overflow weir on the north side designed to allow the unloaded surface water to drain through a

controlled discharge diversion channel. The pond was designed with sufficient retention time to ensure the sediment would gravity-settle to the bottom of the pond before the water reaches the overflow weir. However, Baffinland endeavors to control discharge water from the pond to meet MDMER monitoring requirements using pumping systems.

8 LANDFILL

8.1 DISCHARGE CRITERIA

All runoff and seepage from the Landfill Facilities at Monitoring Stations MS-MRY-13A, MS-MRY-13B and SP-08 will not exceed the following Effluent quality limits presented in the table below:

TABLE 8-1: EFFLUENT DISCHARGE LIMITS FOR THE LANDFILL FACILITIES

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
pH range	Between 6.0 and 9.5
Total As	0.5
Total Cu	0.3
Total Pb	0.2
Total Ni	0.5
Total Zn	0.5
TSS	15
Oil and Grease	No visible sheen

*Source: Type A Water Licence (2AM-MRY1325 - Amendment No. 1) Table 7

MINE SITE LANDFILL

The Mine Site Landfill Facility is located just south of the NE Basin of Sheardown Lake. Both facility's monitoring stations, MS-MRY-13A and MS-MRY-13B (as shown on Figure 6.2 in Appendix L), 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. Refer to the Mine Site Layout presented in Appendix B for the exact location of the monitoring stations and Landfill Facility.

8.3 MILNE PORT LANDFILL

The proposed landfill at Milne Port will be constructed within the exhausted Quarry Q1 following construction, as shown on Figure 6.1 in Appendix L The Milne Port landfill will be designed based on the design of the existing landfill at the Mine Site (Knight Piésold, 2008) and endeavour to be consistent with the Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories (Ferguson, Simek Clark, 2003). As with the existing landfill at the Mine Site, the new landfill at Milne Port will receive non-hazardous waste that cannot be incinerated. Appropriate surface water, erosion and sediment control measures will be implemented during operations. The landfill is not expected to significantly change the quality of surface waters in the area due to the inert nature of the waste and small landfill footprint. Because the landfill will be positioned within a rock quarry, no groundwater monitoring is proposed. A design report which includes an operations and maintenance

manual will be submitted to the NWB at least 60-days prior to construction, in accordance with Part G of the Water Licence.

9 OPERATIONS AND MAINTENANCE (O & M)

The project specific O & M Manual for Sewage Treatment Systems is provided by Newterra Ltd in Appendix D. Sample plans for operation and maintenance of the potable water and oily water systems are given below. These plans were provided by the vendors of potable and oily water treatment systems.

9.1 POTABLE WATER TREATMENT SYSTEM O & M PLAN

9.1.1 REGULAR MAINTENANCE SCHEDULE

The potable water system is fully automatic, and only requires limited supervision and regular maintenance.

The following maintenance schedule is subject to regulations from local government, and instructions from original equipment manufacturers.

The following maintenance schedule is common for all potable treatment plants.

TABLE 9-1: RECOMMENDED MAINTENANCE SCHEDULE- WATER TREATMENT PLANTS

Items	Description
Daily	• Alarm check. • Chemical storage level check. • Controller time check. • Pressure gauge check. • Total and free chlorine testing. • Turbidity check.
Monthly	• Turbidity analyzer check/calibration. • Residual chlorine/pH analyzer check/calibration.
Annual	• Filter media level check, and refill if required. • UV lamp replacement.

9.1.2 MONITORING PLAN

The monitoring plan is subject to local regulations of drinking water and other related codes. The following instruments will be provided to monitor the operation and performance of system.

- Inlet flow meter: to monitor feed flow, backwash flow, rinse flow and filtered flow.
- Effluent turbidity analyzer: to monitor turbidity in produced water.
- Effluent pH/residual chlorine analyzer: to monitor pH and residual chlorine of produced water.

The PLC system in control panel will totalize raw water, produced water, backwash water, chemical injection, pump running time etc.

Periodically sampling and lab test for raw water and treated water will be applied to ensure the treated water meeting drinking water standards. The frequency of the sampling and testing will be determined by the ministry and outlined in the certificate of approval.

9.2 MOBILE OILY WATER SEPARATOR (OWS) SYSTEM

9.2.1 SYSTEM OVERVIEW

The mobile OWS is a prefabricated system (Newterra Ltd.) housed in a 40' seacan and is designed to remove oil, grease and BTE compounds from hydrocarbon contaminated water. The unit includes an API type separator to remove free product, a bag filter for solids removal and three adsorption units (one clay, two granular activated carbon) for oil/grease and BTE removal. In the event that the contaminated water has lead concentrations that exceed the discharge limits outlined in Baffinland's Type A Water Licence, additional treatment barrels containing lead removal media are added to the end of the mobile OWS unit. Figure 9-1 shows the Process Flow Diagram for the OWS. The OWS (Newterra Ltd. model OWS-24) is sized for a water temperature of 7°C, specific gravity of 0.88 (diesel/furnace oil), TOG concentration of 50 mg/L and flow rate of 50 gpm.

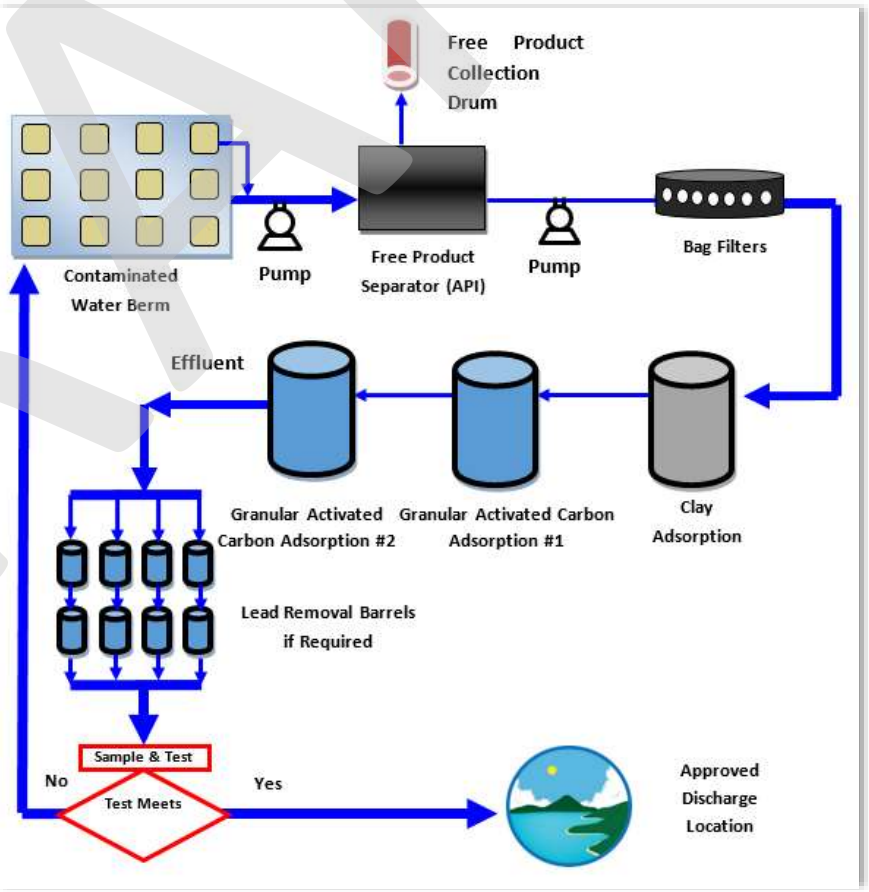


FIGURE 9-1: MOBILE OWS FLOW PROCESS DIAGRAM

9.2.2 OPERATION AND MAINTENANCE PLAN

For the O&M procedures and schedule relating to the mobile OWS unit, refer to the Baffinland Mobile Oily Water Separator (OWS) Manual provided in Appendix G.

9.3 OILY WATER TREATMENT PLANT (FOR VEHICLE WASH WATER) O & M PLAN

9.3.1 REGULAR MAINTENANCE AND MONITORING SCHEDULE

Regular system maintenance entails routine inspection of mechanical and electrical components. It is recommended that the system be inspected weekly to ensure that components are in good working order. Spare parts lists will be included with the Operations and Maintenance Manuals, with critical spare parts and system expendables highlighted. Recommended stock quantities will also be given.

Operational maintenance is mainly comprised of waste removal and expendable replacement in addition to some preventative maintenance on mechanical components. Maintenance activities, locations and their recommended frequencies are provided in Table 9-2.

TABLE 9-2: MAINTENANCE ACTIVITIES, LOCATIONS AND THEIR RECOMMENDED FREQUENCIES

Maintenance Task	Location	Frequency
Sludge/sediment removal	De-muck tank	Twice/week
Oil Removal	Waste oil storage	Weekly
Media change out	CMAFU-2	TBD
Media change out	DPL30	TBD
Filter change out	Reverse Osmosis Unit	TBD
Membrane cleaning	Reverse Osmosis Unit	TBD
Media change out (plates)	Oil Coalescing System	TBD
Pump seals	Various	Annually

Additional, non-routine maintenance will be required throughout the life of the equipment. The recommended spare parts list and appropriate site stock levels are designed to keep the system running continuously with only scheduled downtime.

In addition to maintenance, monitoring the system performance and effluent quality are also necessary. A flow totalizer will be used at the effluent discharge to accurately summate the volume of treated water being released. This in conjunction with the quality data from the various system flows will allow forecasting for media and consumable change-out as well as waste oil and sludge/sediment generation. Residual contaminants below the regulatory limits can also be used in conjunction with treated volumes to determine area loadings over certain periods of time.

Monitoring tasks, locations and frequencies are listed in the table below. The prefix, GI, in the task column denotes “General Inspection”. The Truck Wash Facility layout and component O & M manuals are presented in Appendix I.

TABLE 9-3: MONITORING TASKS, LOCATIONS AND FREQUENCIES

Monitoring Task	Location	Frequency
GI – solids/liquid separators (levels, appearance, pump operation)	De-muck system, CMAFU-2	Daily
Sample – solids/liquid separator effluent	CMAFU-2 effluent	TBD
GI – OWS (levels, appearance, dosing pump)	OWS room	Daily
Sample – OWS Inlet	CMAFU-2 effluent	TBD
GI – Chemical Treatment (tanks, totes, levels, appearance, mixers, dosing pumps, effluent pump, pressures)	Chemical room	Daily
GI – Filtration (units, pressures)	Reverse Osmosis Unit	Daily
GI – Media Vessels (units, pressures, backwash pump, treated water storage)	OCS Tank, DPL30	Daily
Sample – OWS outlet	DPL30 effluent	Quarterly/Monthly
Sample – Reverse osmosis effluent	Reverse Osmosis Unit effluent	Quarterly/Monthly
GI – Miscellaneous (vertical heaters, air compressors, air dryers, controls)	Various	Daily

A joint maintenance/monitoring log should be kept, to ensure that operational data and changes/responses are properly documented.

The monitoring guidelines are recommended as a minimum to ensure proper operation, health, safety and protection of the surrounding environment. If corporate or regional policies in effect or enacted require more stringent monitoring, the scope and schedule should be adjusted to meet these requirements.

10 CONTINGENCY MEASURES

Design criteria for the potable, sewage and oily water treatment systems and discharge criteria for surface water management ponds have been reviewed and revised to provide additional safety factors.

To effectively manage emergency responses, Baffinland has adopted a tiered emergency classification scheme (Figure 10-1). Each level of emergency, based on its severity, require varying degrees of response, effort, and support. Each level has distinct effects on normal business operations, as well as requirements for investigation and reporting. Levels of classification specific to spill response are as follows:

Level 1 (Low) – Minor accidental release of a deleterious substance with:

- No threat to public safety; and/or
- Negligible environmental impact to receiving environment.

Level 2 (Medium) – Major accidental release of a deleterious substance with:

- Some threat to public safety; and/or
- Potential Moderate environmental impact to receiving environment

Level 3 (High) – Uncontrolled hazard which:

- Jeopardizes project personnel safety: and/or
- Potential significant environmental impacts to receiving environment.

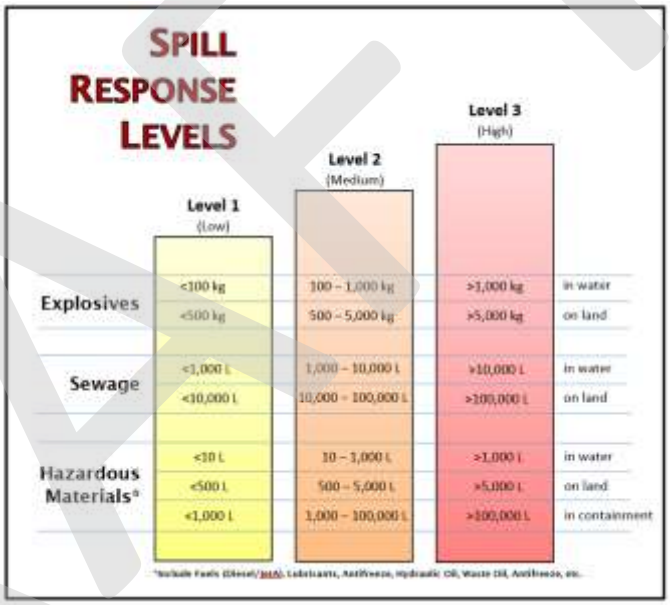


FIGURE 10-1: EMERGENCY SPILL REPONSE LEVELS

The sewage treatment systems are set back sufficiently from surface water bodies and are fully enclosed units. In the event of a spill of untreated or partially treated sewage from these facilities, Baffinland will follow the procedures in its Spill Contingency Plan and Emergency Response Plans. Sewage spills are treated the same as more immediately hazardous hydrocarbon-based spills.

Surface water management ponds are to be discharged in adherence to the MDMER and Type A Water License discharge criteria. Workers involved in the pumping operations will need to exercise caution setting up and operating the pump on the pond's liner. While installing the pump's intake hose on an inner tube in the pond, workers will be in particularly close proximity to the water. The workers should ensure they have dry, secure footing while performing this task. When compliant results are received from pre-discharge water samples, surface water management ponds can be discharged.

Discharge must be discontinued if internal or external results are approaching or exceed applicable water quality criteria. In the event of a spill of non-compliant water, Baffinland will follow the procedures in its Spill Contingency Plan and Emergency Response Plans (Appendix K MDMER Emergency Response Plan). In cases where water contained in the WRF Pond or CF Pond is determined to be non-compliant with applicable discharge limits, water contained in the pond(s) must be treated as per Baffinland's Waste Rock Management Plan (BAF-PH1- 830-P16-0029) and Waste Pond Water Treatment Plant Operations (BAF-PH1-340-PRO-048) to ensure compliance with the applicable discharge limits.

11 SAMPLING, MONITORING, AND REPORTING

Generally, sampling and monitoring of the potable and wastewater treatment systems will include the following:

- Regular sampling of sewage and wastewater discharge in accordance with water licence requirements.
- More frequent internal process sampling and monitoring to identify potential upset conditions early that could lead to non-compliance.
- Record of volumes of sewage and wastewater effluent discharged and sludge generated in accordance with water licence requirements.
- Completion of daily checklists related to the O & M requirements for the facilities and the reporting of any upset conditions that require action.
- Aquatic effects monitoring program to confirm/validate environmental predictions.

The monitoring program will identify upset conditions related to the sewage treatment plants which will be immediately reported to the Environmental and Surface Works Superintendent for corrective action.

11.1 POTABLE WATER SYSTEM MONITORING

Untreated freshwater will be sampled at active take locations and/or from the raw water tank at the potable treatment plants. Treated potable water will be sampled from the potable treatment plant effluent as well as several locations throughout the distribution system.

Samples shall be collected at active water take location for select analyses at frequencies specified in applicable regulations/guidelines. A typical list of parameters which may be tested includes the following:

Calcium, Magnesium, Sodium, Potassium, Aluminum, Arsenic, Boron, Barium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Selenium, Silver, Strontium, Thallium, Vanadium, Zinc, Tin, pH, Conductivity, Alkalinity as CaCO3, TDS (COND-CALC), TSS (total suspended solids), Turbidity, Phenols, N-NH3, SO4, Cl, Br,N-NO2, N-NO3, NO2 + NO3 as N, Mercury, Hardness as CaCO3, COD (chemical oxygen demand), Oil and Grease.

A comparison of the sampling results to the Guidelines for Canadian Drinking Water Quality (GCDWQ) will be completed.

11.2 SEWAGE TREATMENT SYSTEM MONITORING

Treated sewage effluent will be monitored and sampled at proposed locations specified in the Type A Water Licence (2AM-MRY1325 – Amendment No. 1). The effluent discharge criteria is summarized in Table 5-3.

11.3 OILY WATER TREATMENT SYSTEM MONITORING

Treated oily water effluent will be monitored and sampled at proposed locations specified in the Aquatic Effects Monitoring Program, BAF-PH1-830-P16-0039, (June 2014), and Type A Water Licence (2AM-MRY1325 – Amendment No. 1). The applicable effluent discharge criteria for oily water was summarized in Section 6.1 of this plan.

12 ENVIRONMENTAL RESPONSIBILITIES

12.1 ROLES AND RESPONSIBILITIES

Responsibilities for the management and monitoring of the surface water flows and effluents at the Project are as follows.

12.1.1 Chief Operations Officer (COO) / 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.

12.1.2 Mine Operations Manager / Superintendent

- Reports to the COO / General Manager
- Provides oversight for all Deposit No. 1 mining operations, including the operation, construction and maintenance of water and waste management infrastructure at Deposit No. 1 mining areas, ROM stockpile, Waste Rock Facility and along the Mine Haul Road, including culverts, ditches, surface water management ponds and associated water treatment systems.

12.1.3 Crushing Manager / Superintendent

- Reports to the COO / General Manager
- Provides oversight for all ore crushing operations, including the operation, construction and maintenance of surface water management infrastructure at Mine Site Crusher Facility, including culverts, ditches, surface water management ponds and any associated water treatment systems.

12.1.4 Site Services Manager / Superintendent

- Reports to the COO / General Manager
- Provides oversight for all Site Services operations, including the operation, construction and maintenance of water and waste management infrastructure and treatment systems at the Mine Site and Milne Port.
- Responsible for managing water retained in containment areas associated with Project bulk fuel facilities and hazardous materials/waste storage areas, including landfarm facilities.

12.1.5 Road Maintenance Manager / Superintendent

- Reports to the COO / 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.

12.1.6 Environment (Sustainable Development) Department

- Support the management of the Project 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 4 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.
- Report incidents to senior management and the appropriate regulatory agencies and stakeholders.
- Conduct inspections and monitoring to ensure compliance with applicable regulations and commitments.
- Provide training sessions to operational departments on the appropriate mitigation measures and strategies for managing surface water flows and effluents at the Project.

12.1.7 All Departmental Supervisors

- Reports to the 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.

12.1.8 All Project Personnel

All personnel Project personnel will be responsible to comply with the requirements of this Plan in the management of surface water flows and effluents at the Project.

12.2 TRAINING AND AWARENESS

Baffinland staff and contractors working on site will receive environmental training as part of the Site Orientation, to achieve a basic understanding of their obligations regarding environmental compliance with regulatory requirements, commitments and best practices.

Operations superintendents and contractor supervisors will be provided with this Management Plan, and will receive additional training with respect to the requirements outlined in this Plan. In addition, supervising level staff and sub-contractors will be provided with the Operational Environmental Standards (found in the Environmental Protection Plan) as a written guidance for their work.

Targeted environmental awareness training will be provided to both individuals and groups of workers assuming a specific authority or responsibility for environmental management or those undertaking an

activity with an elevated high risk of environmental impact. These will be delivered in the form of toolbox meetings or other means as appropriate.

The content of the environmental component of the site orientation and or Environmental Protection Plan training will include at a minimum:

a. Location of environmental sensitivities.
b. Location of additional information on environmental matters.
c. Due diligence responsibilities.
d. Responsibilities related to waste management, minimizing noise as necessary, road traffic rules, etc.
e. Principles and necessary steps to avoid encounters with bears or other wildlife and what to do if one such encounter occurs.

12.3 COMMUNICATION

The types of communications for which members of the team will participate include the following:

a. Formal written correspondence and meetings with stakeholders.
b. Site visits by community representatives.
c. Design, construction and planning meetings.
d. Field inspections and monitoring reports disseminated by the Environmental Superintendent.
e. Electronic communications.
f. Toolbox meetings.
g. Formal written correspondence and meetings with government regulatory bodies.
h. Formal environmental awareness training.

Communications will be appropriately recorded and filed for future reference. Where appropriate, the copies of communications will be forwarded to Senior Management and the Environmental Superintendent.

12.4 EXTERNAL COMMUNICATIONS

Effective forms of communication include the proactive notification to external stakeholders of Project activity. Project activity updates will be provided to the communities of North Baffin through various means including regular meetings, public notices and radio announcements as appropriate. Baffinland will maintain Community Liaison Offices to assist in this regard.

~~12.5 CONSTRUCTION~~

~~During the construction phase of the Project, the Baffinland Head of Health, Safety, Environment and Security will be responsible for implementing this Plan. This Management Plan will be updated to take into account the numerous construction sites, and types of construction equipment utilized.~~

~~12.6 OPERATION AND CLOSURE~~

~~For the operations and closure phases, Baffinland will revise its organizational structure to reflect the realities of the operation. The Head of Health, Safety, Environment and Security will be responsible for subsequent updates and implementation of the Plan.~~

~~12.7 MARY RIVER PROJECT ORGANIZATIONAL CHARTS~~

~~For further information regarding the Mary River Projects organizational structure in relation to the environment discipline, please refer to the Organization Chart (Table 12.1, 12.2).~~

13 REFERENCES

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

~~Baffinland, 2018~~

Baffinland Iron Mines Corporation, 2019. *Mary River Project – Aquatic Effects Monitoring Plan*. Doc. No. BAF-PH1-830-P16-0039, Rev. 2. May 1, 2019.

Baffinland Iron Mines Corporation, 2019. *Mary River Project - Sampling Program – Quality Assurance and Quality Control (QA/QC) Plan*. Doc. No. BAF-PH1-830-P16-0001, Rev. 2. March 2017.

Department of Fisheries and Oceans Canada (DFO), 1995. *Freshwater Intake End-of-Pipe Fish Screen Guideline*. Ottawa: Communications Directorate, Minister of Supply and Services Canada. Catalogue No. Fs 23-270 / 1995E.

Ferguson, Simek Clark Engineers & Architects, 2003. Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories. April 21, 2003. Yellowknife, Northwest Territories.

Government of Ontario, 2018a. Ontario Drinking Water Quality Standards. O. Reg. 169/03: Ontario Drinking Water Quality Standards under *Safe Drinking Water Act, 2002, S.O. 2002, c. 32*. https://www.ontario.ca/laws/regulation/030169.

Government of Ontario, 2019a. *Ontario Design Guidelines for Drinking Water Systems*. Updated on April 5, 2019. https://www.ontario.ca/document/design-guidelines-drinking-water-systems-0.

Government of Ontario, 2018b. *Ontario Regulation 170/03 – Drinking Water Systems*, under *Safe Drinking Water Act, 2002, S.O. 2002, c. 32*. https://www.ontario.ca/laws/regulation/030170.

Government of Ontario, 2019b. Procedure for Disinfection of Drinking Water in Ontario. Published: July 29, 2016 and updated: April 5, 2019. https://www.ontario.ca/page/procedure-disinfection-drinking-water-ontario.

Government of the Northwest Territories, Department of Justice, 2012. *Water Supply System Regulations, NWT Regulation 108-2009*. Last amended on March 6, 2012. http://canlii.ca/t/lg3q.

Health Canada (2017). *Guidelines for Canadian Drinking Water Quality—Summary Table*. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario.

Knight Piésold Ltd., 2008. *Baffinland Iron Mines Corporation – Mary River Project – Bulk Sampling Program Landfill Design and Operations.* Ref No. NB102-00181/10-6, Rev 1, March 31.

Knight Piéesold Ltd., 2018. *Baffinland Iron Mines Corporation – Mary River Project – Phase 2 Proposal – Technical Supporting Document No. 13 – Surface Water Assessment*. Ref. No. NB102-181/39-8, Rev. 4, October 3.

Nunavut Water Board, 2015. *Type A Water Licence 2AM-MRY1325 – Amendment No. 1*. July 30.

Nunavut Water Board, 2019. January 18, 2019 Letter to Baffinland, *RE: Licence No. 2AM-MRY1325 Type "A"; Mary River Project, Baffinland Iron Mines Corporation; Modification No. 3b - Milne Port Accommodations Camp Upgrade.*

Stantec Consulting Ltd., 2018. *Mary River Modification Application – Production Increase, Fuel Storage, and Milne Port Accommodations*. Project No. 121414789, April 23.

Appendix A
Table of Concordance with Type A Water Licence (2AM-MRY1325 - Amendment No. 1) Terms and Conditions

Table A-1 shows the Part, number and Condition of the Type A Water Licence (2AM-MRY1325 - Amendment No 1 and the location where the condition is located within the Freshwater Supply, Sewage and Wastewater Management Plan.

TABLE A-1: CONCORDANCE TABLE - TYPE A WATER LICENCE 2AM-MRY1325 AMENDMENT NO 1

Part	Number	Condition	Section/Commitment
B	11	The Licensee shall post signs in the appropriate areas to inform the public of the location of infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste. All signs must be in English, Inuktitut, and French.	Signage, written in English, Inuktitut, and French, will be posted inform the public of the location of infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste.
D	2	The Licensee shall submit to the Board for review and acceptance, at least sixty (60) days prior to construction or in a timeframe otherwise approved by the Board in writing, final design and for-construction drawings, stamped and signed by a Professional Engineer, for all infrastructure and/or facilities designed to contain, withhold, divert or retain Water and/or Waste, as authorized under the Licence.	60 days prior to construction. If more immediate timeline required, Baffinland will issue letter to NWB with early drawings.
	17	The Licensee shall submit a Construction Summary Report to the Board, within ninety (90) days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes, as authorized by the Board. The construction summary report shall be prepared by an Engineer(s) in accordance with Schedule D, Item 1.	90 days following the completion of any structure designed to contain, withhold, divert or retain Waters or Wastes, as authorized by the Board.
D	23	The Licensee shall construct and operate all infrastructure and Facilities authorized by the Board that are designed to contain, withhold, divert or retain Water and/or Waste, in accordance with all applicable legislation and industry standards.	Demonstrated and outlined by this plan.
E	3	The Licensee shall obtain all fresh Water for domestic camp use and industrial purposes, during the Construction Phase	Table 4-1

Part	Number	Condition	Section/Commitment
		of the Project, in amounts and from the sources described in Table 2, or from sources otherwise approved by the Board in writing. In addition to the source-specific limits prescribed in Table 2, the Licensee is authorized to use up to one thousand eight hundred and eighty-eight (1,888) cubic metres of Water per day, to a maximum of six hundred and eighty-nine thousand (689,000) cubic metres of Water annually, during the Construction Phase of the Project. Table 2: Water Use Authorized for Domestic and Industrial Purposes during Project Construction Phase Site / Source / Volume (m^3/day) / Combined Volume (m^3/year) Milne Port (Milne Inlet) / Phillips Creek (summer) / Km 32 Lake (winter) / 367.5 / ~ 134,000 Mine Site (Mary River) / Camp Lake / 657.5 / 240,000 Steensby Port (Steensby Inlet) / ST 347 Km Lake / 5 km Lake / 425.8 / 155,400 Ravn River / Camp Lake / 145.2 Mid-Rail / Nivek Lake (summer) / Ravn Camp Lake (winter) / 79.5 Cockburn North (Tunnels Camp) / Cockburn Lake / 101.4 Cockburn South Camp / Cockburn Lake / 111.1 Annual Total / ~ 689,000 m^3/Annually
E	5	The Licensee may recycle water and use reclaimed water from the various Treatment Facilities, surface water management ponds and embankment dams and approved discharge locations under the licence if such waters meet appropriate discharge criteria for those facilities.	5.2
E	6	The Licensee shall equip all Water intake hoses with screens of an appropriate mesh size, consistent with the requirements of Fisheries and Ocean Canada's (DFO) Freshwater Intake End-of-Pipe Fish Screen Guidelines (1995), to prevent the entrainment of fish are and shall withdraw Water at a rate such that fish do not become impinged on the screen.	4.1.1.2
E	8	Streams cannot be used as a water source unless authorized and approved by the Board in writing.	4.2
E	9	The Licensee shall notify the Inspector and the Board at least ten (10) days in advance of using Water from any sources not identified in the Application or requiring approval as per Part E, Item 8.	10 days in advance of using Water from any sources not identified in the Application or requiring approval.

Part	Number	Condition	Section/Commitment
E	10	The Licensee shall update or revise annually following the commencement of the Operations Phase and/or the Early Revenue Phase, the Project Blockflow Diagram Water Supply Balance information for the various Project sites, provided with the Application and submit for review of the Board. The submission shall be included with the Annual Report under Part B, Item 4.	The Plan is updated to include the planned construction numbers as well as the current Work Plan. Updates will be provided as required to include the Operations Phase.
E	11	The Licensee shall carry out weekly inspections of all structures designed to contain, withhold, divert or retain Waters or Wastes during periods of flow and maintain records of the inspections and findings, for review upon the request by the Board or an Inspector.	8
E	12	The Licensee shall not remove any material from below the ordinary ~~High Water Mark~~HWM of any water body unless authorized.	4.2
E	25	The Licensee is authorized to withdraw up to 1,500 m3 / day to a maximum of 547,500 m3 annually of Water specifically for use in dust suppression or control along the Tote Road during the Early Revenue Phase (ERP) of the Project. Water for dust suppression or control shall be obtained from the sources in accordance with thresholds established in Table 2-3. **Table 2-3: Water use Authorized for Dust Suppression** Site: Tote Road Source / Proposed Maximum Volume (m^3/day) / Restriction: Phillip's Creek — 212 — None Km 32 Lake — 364 — None CV128 — 579.5 — None CV099 — 110 — June –July only during low flow(less than mean flow) years CV087 — 90 — June –July only during low flow(less than mean flow) years CV078 — 75 — June –July only during low flow(less than mean flow) years Katiktok Lake — 318 — None BG50 — 150 — None BG32 — 120 — June –July only during low flow(less than mean flow) years CV217 — 130 — None Muriel Lake — 212 — None David Lake — 132 — June –July only during low flow(less than mean flow) years BG17 — 75 — June –July only during low flow(less than mean flow) years CV233 (Tom River) — 135 — None Camp Lake — 50 — None	Table 4-2

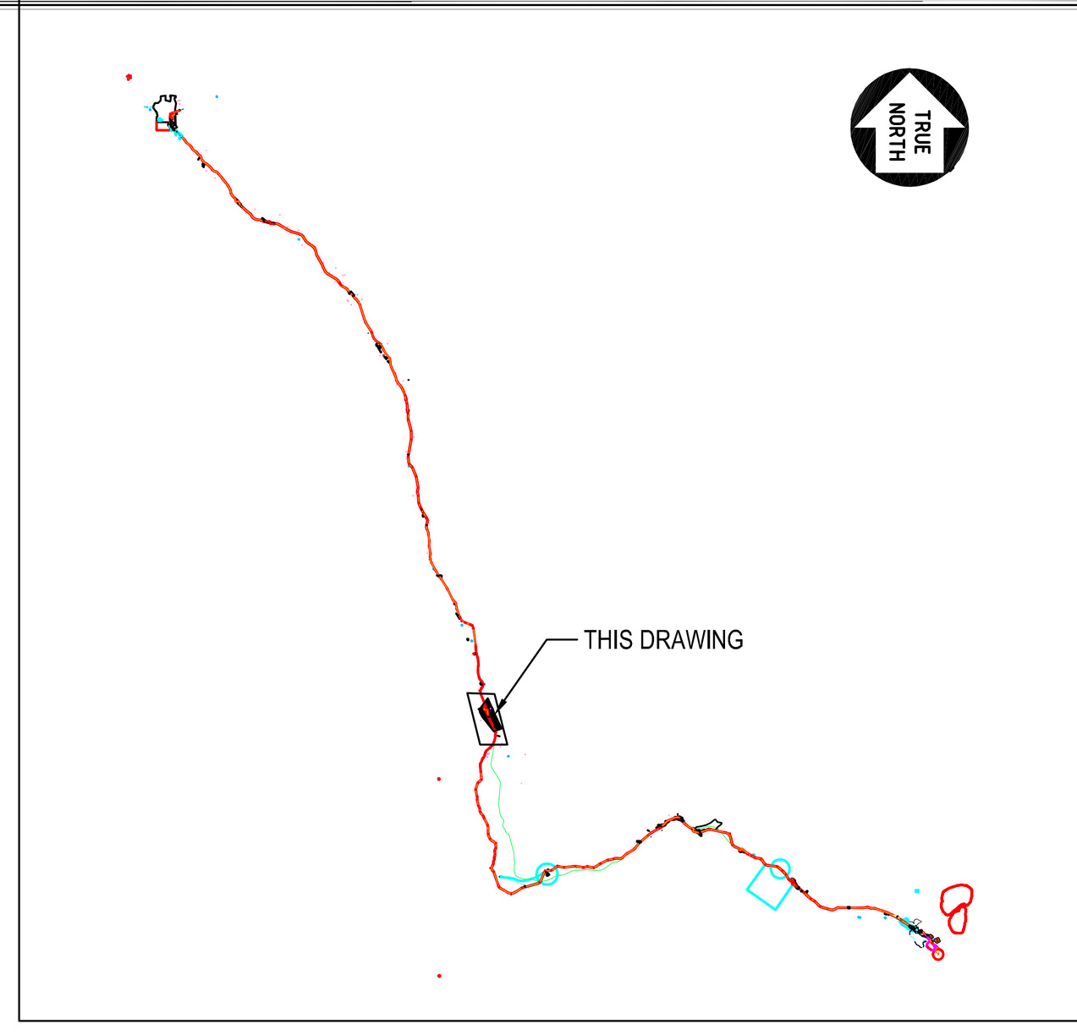
Part	Number	Condition	Section/Commitment
E	26	The Licensee shall obtain authorization from the Board in writing prior to using Water authorized under Part E, Item 25, for purposes other than that authorized in Part E, Item 25.	4.2
F	9	The Licensee shall treat oily water and wastewater generated by the Project at the Oily Water/Wastewater Treatment Facilities authorized under the scope of the Licence.	6.3
F	11	The Licensee shall provide at least ten (10) days' notice to the Inspector prior to planned Discharges from any Waste Management Facility, Oily Water/Wastewater Treatment Facilities, Sewage Treatment Facilities, and any other relevant facilities associated with the Project. The notice shall include the estimated volume proposed for Discharge and the location and description of the receiving environment.	10 days prior to the commencement of any treated effluent discharge.
F	12	The Licensee shall, unless otherwise approved by the Board in writing, discharge effluent at a distance of least thirty-one (31) metres above the Ordinary ~~High Water Mark~~HWM of any Water body, where direct flow into the Water body is not possible, such that surface erosion is minimized and no additional impacts are created.	Section 5.3
F	14	The Licensee shall direct all Sewage generated from the relevant Project sites to the Sewage Treatment Facilities or as otherwise approved by the Board in writing.	5.2
F	15	The Licensee shall treat all Sewage waste generated at the Ravn River and Mid-Rail camps and Sewage generated at the Cockburn North and Cockburn South camps at either the Mine Site Sewage Treatment Facility or the Steensby Port Sewage Treatment Facility, unless otherwise approved by the Board in writing.	Appendix E
F	16	The Licensee shall provide to the Board for review, at least sixty (60) days prior to installation, detailed specifications and operational requirements for the Sewage storage tanks proposed for the Railway camps.	60 days prior to installation
F	17	All discharge from the Sewage Treatment Facilities including the Polishing Waste Stabilization Ponds directly into fresh Water bodies at Monitoring Stations MP-01, MP-01a, MP-	Table 5-2

<table>
<tr><th>Part</th><th>Number</th><th>Condition</th><th>Section/Commitment</th></tr>
<tr><td></td><td></td><td>MRY-04, MP-MRY-04a, MS-01, MS-01a, MS-MRY-04, MS-MRY-04a, and/or from monitoring stations as otherwise approved by the Board in writing, must not exceed the following Effluent quality limits:
Table 4: Effluent Quality Discharge Limits for Sewage Treatment Facilities to Freshwater Receiving Environment
<table><tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr><tr><td>BOD_5</td><td>30</td></tr><tr><td>Total Suspended Solids</td><td>35</td></tr><tr><td>Faecal Coliform</td><td>1000 CFU/100 mL</td></tr><tr><td>Oil and Grease</td><td>No visible sheen</td></tr><tr><td>pH</td><td>Between 6.0 and 9.5</td></tr><tr><td>Ammonia (NH3-N)</td><td>4.0</td></tr><tr><td>Total Phosphorous (MS-01)</td><td>4.0</td></tr><tr><td>Total Phosphorous (MS-01a)</td><td>1.0</td></tr><tr><td>Toxicity</td><td>Not acutely toxic</td></tr></table>(Note that treated effluent discharge from MP-01 and MP-01a is directed to the ocean, therefore ocean discharge criteria (F18) would therefore apply)</td><td></td></tr>
<tr><td>F</td><td>18</td><td>All discharge from the Sewage Treatment Facilities including the Polishing Waste Stabilization Ponds at Monitoring Stations SP-01, SP-01a, and/or from monitoring stations as otherwise approved by the Board in writing, directly into the ocean or to ditches flowing into the ocean shall not exceed the following Effluent quality limits:
Table 5: Effluent Quality Discharge Limits for Sewage Treatment Facilities to the Ocean
<table><tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr><tr><td>BOD_5</td><td>100</td></tr><tr><td>Total Suspended Solids</td><td>120</td></tr><tr><td>Faecal Coliform</td><td>10,000 CFU/100 mL</td></tr><tr><td>Oil and Grease</td><td>No visible sheen</td></tr><tr><td>pH</td><td>Between 6.0 and 9.5</td></tr><tr><td>Toxicity</td><td>Not acutely toxic</td></tr></table>(Note that treated effluent discharge from MP-01 and MP-01a is directed to the ocean, therefore the above ocean discharge criteria are applied for these locations)</td><td>Table 5-2</td></tr>
<tr><td>F</td><td>19</td><td>Sludge generated from the Sewage Treatment Facilities or any other facilities shall be confirmed to be non-hazardous and the results provided to the Board for review prior to disposal at any Landfill Facility or as otherwise approved by the Board in writing.</td><td>5.2</td></tr>
</table>

<table>
<tr><th>Part</th><th>Number</th><th>Condition</th><th>Section/Commitment</th></tr>
<tr><td>F</td><td>20</td><td>All discharge from the Oily Water/Wastewater Treatment Facilities at Monitoring Stations MP-02, MS-02, SP-02 must not exceed the following Effluent quality limits:
Table 6: Effluent Quality Discharge Limits for Oily Water Treatment Facilities
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr>
<tr><td>pH</td><td>Between 6.0 and 9.5</td></tr>
<tr><td>TSS</td><td>35</td></tr>
<tr><td>Ammonia</td><td>4.0</td></tr>
<tr><td>Phosphorous</td><td>4.0</td></tr>
<tr><td>Benzene</td><td>0.370</td></tr>
<tr><td>Ethylbenzene</td><td>0.090</td></tr>
<tr><td>Toluene</td><td>0.002</td></tr>
<tr><td>Oil and Grease</td><td>15 and no visible sheen</td></tr>
<tr><td>Arsenic</td><td>0.50</td></tr>
<tr><td>Copper</td><td>0.30</td></tr>
<tr><td>Lead</td><td>0.20</td></tr>
<tr><td>Nickel</td><td>0.50</td></tr>
<tr><td>Zinc</td><td>0.50</td></tr>
</table></td><td>Table 6-1</td></tr>
<tr><td>F</td><td>21</td><td>All discharge from the Landfill Facilities at Monitoring Stations MS-MRY-13a, MS-MRY-13b and SP-08 must not exceed the following Effluent quality limits:
Table 7: Effluent Quality Discharge Limits for the Landfill Facilities
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr>
<tr><td>pH</td><td>Between 6.0 and 9.5</td></tr>
<tr><td>Total As</td><td>0.5</td></tr>
<tr><td>Total Cu</td><td>0.3</td></tr>
<tr><td>Total Pb</td><td>0.2</td></tr>
<tr><td>Total Ni</td><td>0.5</td></tr>
<tr><td>Total Zn</td><td>0.5</td></tr>
<tr><td>Total Suspended Solids</td><td>15</td></tr>
<tr><td>Oil and Grease</td><td>No visible sheen</td></tr>
</table></td><td>Table 5-4</td></tr>
<tr><td>F</td><td>22</td><td>All discharge from the Bulk Fuel Storage Facilities at Monitoring Stations MP-03, MP-MRY-7, MS-03, MS-04, MS-MRY-6, SP-04 and SP-05 must not exceed the following Effluent quality limits:
Table 8: Effluent Quality Discharge Limits for the Bulk Fuel Storage Facilities
<table>
<tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (ug/L)</th></tr>
<tr><td>Benzene</td><td>370</td></tr>
<tr><td>Toluene</td><td>2</td></tr>
<tr><td>Ethylbenzene</td><td>90</td></tr>
<tr><td>Lead</td><td>1</td></tr>
<tr><td>Oil and Grease</td><td>15,000 and no visible sheen</td></tr>
</table></td><td>Table 5-5</td></tr>
<tr><td>F</td><td>23</td><td>All discharge from the Landfarm Facilities at Monitoring Stations MP-04, MS-05 and SP-06 must not exceed the following Effluent quality limits:</td><td>Table 5-6</td></tr>
</table>

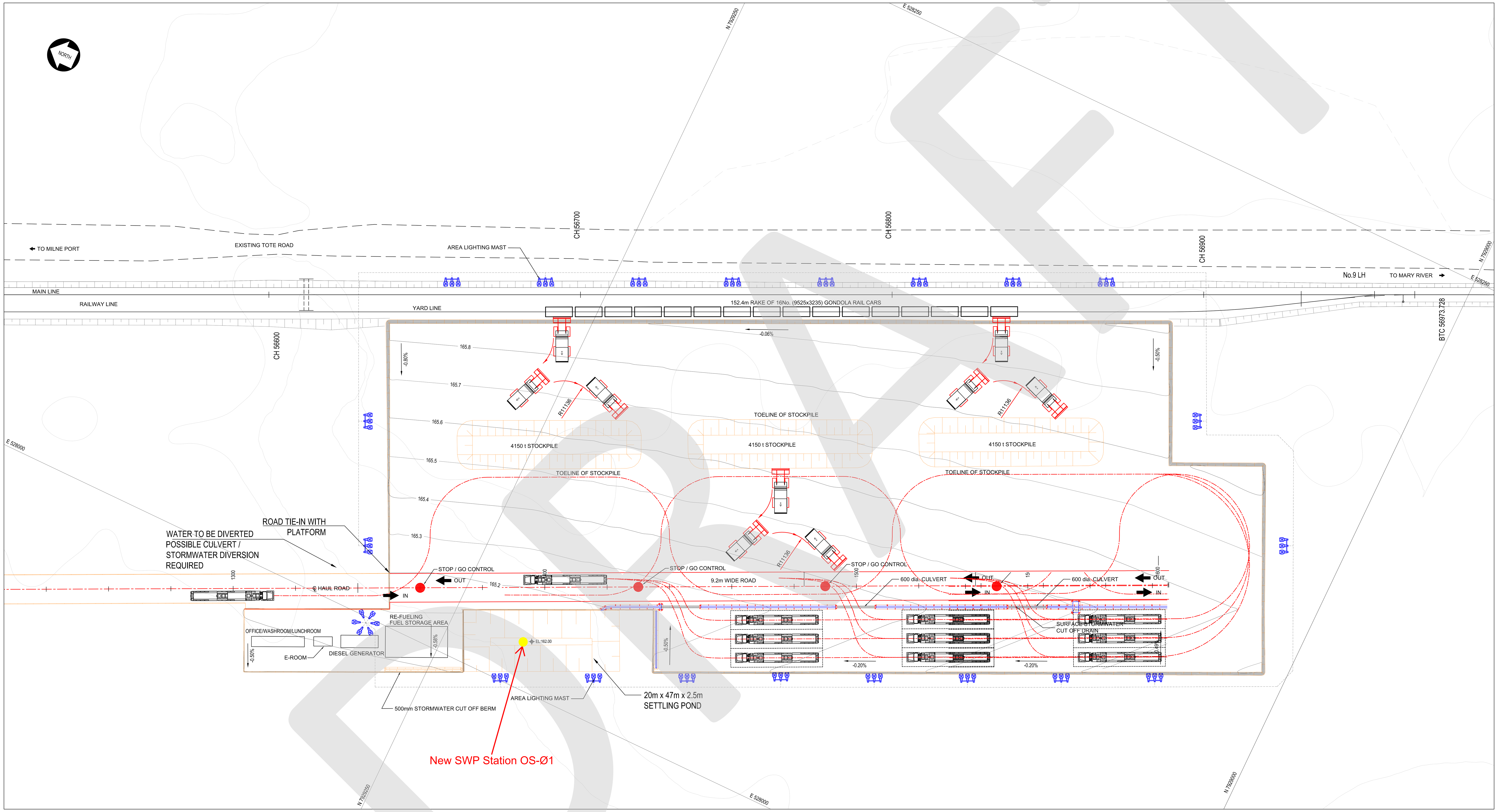
<table>
<tr><th>Part</th><th>Number</th><th>Condition</th><th>Section/Commitment</th></tr>
<tr><td></td><td></td><td>Table 9: Effluent Quality Discharge Limits for the Landfarm Facilities
<table><tr><th>Parameters</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr><tr><td>pH</td><td>Between 6.0 and 9.0</td></tr><tr><td>Total Suspended Solids</td><td>15</td></tr><tr><td>Oil and Grease</td><td>15 and no sheen</td></tr><tr><td>Total Lead</td><td>0.001</td></tr><tr><td>Benzene</td><td>0.370</td></tr><tr><td>Toluene</td><td>0.002</td></tr><tr><td>Ethylebenzene</td><td>0.090</td></tr></table></td><td></td></tr>
<tr><td>F</td><td>24</td><td>All Discharge from the Bulk Sample Open Pit, Bulk Sample Weathered Ore Stockpile, Bulk Sample Processing Stockpile Area and Bulk Sample Stockpile Area Seepage and runoff from the at Milne Inlet at Monitoring Stations MS-MRY-09, MS-MRY-10, MS-MRY-11, MP-MRY-12 and/or monitoring stations as otherwise approved by the Board shall not exceed the following Effluent quality limits:
Table 10: Effluent Quality Discharge Limits for Open Pit, Stockpiles, and Sedimentation Ponds
<table><tr><th>Parameter</th><th>Maximum Concentration of Any Grab Sample (mg/L)</th></tr><tr><td>Total Arsenic</td><td>0.50</td></tr><tr><td>Total Copper</td><td>0.30</td></tr><tr><td>Total Lead</td><td>0.20</td></tr><tr><td>Total Nickel</td><td>0.50</td></tr><tr><td>Total Zinc</td><td>0.50</td></tr><tr><td>Total Suspended Solids</td><td>15.0</td></tr><tr><td>Oil and Grease</td><td>No visible sheen</td></tr><tr><td>Toxicity</td><td>Not acutely toxic</td></tr><tr><td colspan="2">The waste discharge shall have a pH of between 6.0 and 9.5</td></tr></table></td><td>Table 5-7</td></tr>
<tr><td>F</td><td>26</td><td>All discharge from the Ponds associated with the Run of Mine Ore Stockpile, Ore Stockpile, West and East Sediment Ponds at Monitoring stations MS-06, MS-07, MS-08 MS-09 and SP-07 shall not exceed the Effluent quality limits of Part F, Item 25</td><td>5.3 and Table 5-7</td></tr>
</table>

Appendix B
Site Layouts ~~(Mine Site and Port Site)~~



KEY PLAN

N.T.S.



LOADING PLATFORM LAYOUT

SCALE 1:500

NOTES:

1. LIDAR SURVEY PROVIDED BY PHOTSAT (2016)
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METERS.
3. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 0.5m.
4. ALL DIMENSIONS SHOWN ARE IN METERS, UNLESS OTHERWISE SPECIFIED.

LEGEND:

198	CONTOUR
	NEW TREATED EFFLUENT

DRAWING No.	DRAWING TITLE
H353004-30000-224-273-0032-0001	TEMPORARY LOADOUT CROSS SECTION
H353004-30000-224-271-0029-0003	HAUL ROAD LAYOUT AND PROFILE 800m to 1600m
H353004-30000-224-271-0029-0002	HAUL ROAD LAYOUT AND PROFILE 0.0m to 800m

REFERENCE DRAWINGS

NAME
SIGNATURE
ENG REG NUMBER
REVISION DATE
ORIGINAL DATE
REG. PROFESSIONAL

INTERNAL/CLIENT REVIEW

No.	DESCRIPTION	BY	CHK'D	DATE
A	INTERNAL / CLIENT REVIEW	WR	FVB	2017/02/03

REVISIONS

HATCH

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	S VAN DER WALT	NR	2018/03/21
DESIGNER	S VAN DER WALT	NR	2018/03/21
CHECKER	A AQUIL		.
DESIGN COORD.	A AQUIL		.
RESP. ENG.	F VAN BILJON		.
LEAD DISC. ENG.	F VAN BILJON		.
AREA LEAD	F VAN BILJON		.
ENG. MANAGER			.
AREA MANAGER			

DRAWING APPROVAL STATUS: INTERNAL / CLIENT REVIEW

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER EXPANSION PROJECT

RAIL SITE (56km)
RAIL TEMPORARY LOADING FACILITY

SCALE 1:2000 OR AS NOTED

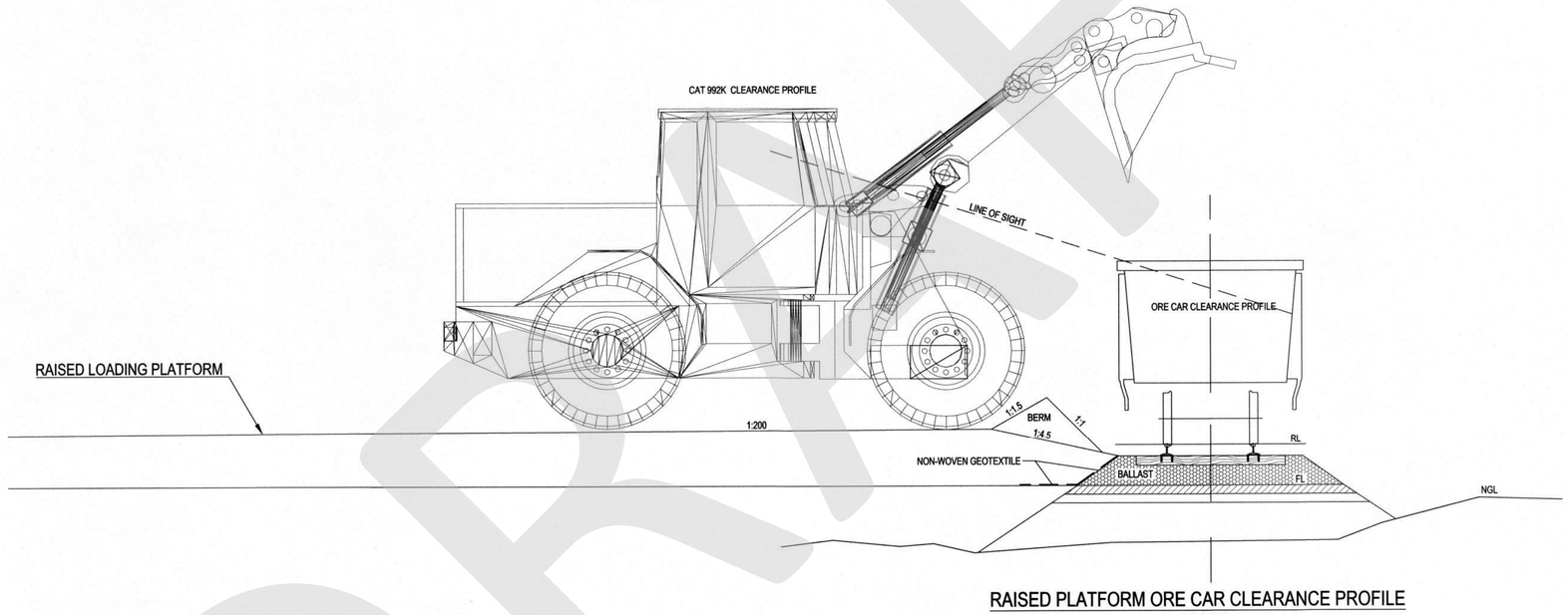
DWG. No. H353004-30000-224-271-0029-0001

REV A

SHEET SIZE: A0

DWG. No. H353004-30000-224-271-0029-0001

DWG. No. H353004-30000-224-273-0032-0001



RAISED PLATFORM ORE CAR CLEARANCE PROFILE

SCALE 1:50

NOT FOR CONSTRUCTION

No.	DESCRIPTION	BY	CHK'D	DATE
0	APPROVED FOR USE	WR	FVB	2017/02/03

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	S VAN DER WALT	NR	2018/04/06
DESIGNER	S VAN DER WALT	NR	2018/04/06
CHECKER	A Aquil		2018/05/04
DESIGN COORD.	A Aquil		2018/05/04
RESP. ENG.	F VAN BILJON		2018/05/08
LEAD DISC. ENG.	F VAN BILJON		2018/05/08
AREA LEAD	F VAN BILJON		2018/05/08
ENG. MANAGER	D STANGER		2018/05/09
CLIENT	F PITTMAN		2018/05/08

DRAWING APPROVAL STATUS: APPROVED FOR USE

HATCH

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

RAIL SITE (56 km)
RAIL TEMPORARY LOADOUT
CROSS SECTION

DRAWING No.	DRAWING TITLE
H353004-30000-224-271-0029-0001	RAIL TEMPORARY LOADING FACILITY

REFERENCE DRAWINGS

REG. PROFESSIONAL

REVISIONS

SCALE 1:50 OR AS NOTED

DWG. No. H353004-30000-224-273-0032-0001

REV 0

SHEET SIZE: A1

$USERNAME$
$DATE$
$FILE$

$TIME$

SAVED: I:\1\02\00181\53\A\Acad\FIGS\B18 R0, 5/2/2019 2:11:37 PM , CVALENTI PRINTED: 5/2/2019 2:20:28 PM, Layout1, CVALENTI
XREF FILE(S): X-B-SI~~-MONI-LOCA-2019; X-N-TOPO-BASE-LAND-USE~~CLAS; C-PH02-YR21-MILNE-PORT; X-C-TOPO-MILN-INDEX IMAGE FILE(S):

502 500 E | 503 000 E | 503 500 E | 504 000 E | 504 500 E

7 977 000 N | 7 976 500 N | 7 976 000 N | 7 975 500 N | 7 975 000 N

MILNE INLET

PHILLIPS CREEK

SHIPLOADER NO. 2
CAPE-SIZE ORE DOCK NO. 2
FREIGHT DOCK
ORE DOCK NO. 1
SHIPLOADER NO. 1
BARGE RAMP
MARINE FUEL MANIFOLD BUILDING
SEWAGE EFFLUENT PIPE DISCHARGE
HTO CABIN
STORMWATER POND NO. 2
STORMWATER POND NO. 2A
STORMWATER POND NO. 1A
STORMWATER POND NO. 1
MP-06
MP-05
MP-C-E
MP-C-H
MP-C-F
MP-HWB-
MP-03
FUEL TANK FARM
MP-02
SERVICE AREA
TREATED SEWAGE EFFLUENT PIPELINE
STORMWATER POND #3
NEW CONVEYOR BERM
RWSP-No. 1
MP-01A
MP-HWB-3
MP-HWB-4
MP-HWB-2
MP-01
PORT SITE COMPLEX
PSC EXPANSION
LAYDOWN LP-2
MP-07
MP-C-B (NOTE 6)
FINE ORE STOCKPILES
PORT SITE WEATHERHAVEN CAMP
EASTERN CLEARWATER POND
LUMP ORE STOCKPILES
LAND FARM
SNOW DUMP
MP-04
MP-04A
QUARRY Q1 EXTENTS
MP-C-B01 (NOTE 6)
MP-10B
MP-10A
MAINT. BUILDING
SPOILS DISPOSAL LOCATION 1
SUMMER WATER SUPPLY FROM PHILLIPS CREEK
MP-MRY-2
MP-Q1-02 (NOTE 5)
380 PERSON CAMP
LAYDOWN W10A AND W10B
ROTARY CAR DUMPER
MP-Q1-01 (NOTE 5)
RAILYARD AND WORKSHOP
SOUTHERN BYPASS
STORMWATER POND #4
MP-11
CRUSHING AND SCREENING PLANT
MP-08
CRUSHING FEED STOCKPILE
TRANSFER CONVEYOR
ORE TRANSFER TOWER
MP-C-C (NOTE 6)
FINES STOCKPILE AREA
LAYDOWN LP-7
MP-09
MP-12
STORMWATER POND #5
FUEL CONTAINMENT BERM
MP-03
MP-C-F
MP-HWB-1
HAZARDOUS WASTE BERM
MAINTENANCE BUILDING
MP-02
MAINTENANCE BUILDING
FUEL TANK FARM
LANDFILL
TOTE ROAD (OLD ALIGNMENT)
TREATED SEWAGE EFFLUENT PIPELINE
SPOILS DISPOSAL LOCATION 2
POLISHING WASTE STABILIZATION POND
MP-01A
PWSP-No. 1
ACCOMMODATION COMPLEX
WASTE MANAGEMENT BUILDING
MP-HWB-2
MP-01
WASTE MANAGEMENT FACILITY

NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PROPOSED MILNE PORT INFRASTRUCTURE PROVIDED BY HATCH MAY 25, 2018.
4. CONTOUR INTERVAL IS 2.5 m.
5. DRAINAGE CHANGES PROPOSED, SO QUARRY QI SNP STATIONS EXPECTED TO CHANGE IN 2019 WITH CONFIRMATION BY WATER RESOURCES OFFICER.
6. STATION RELOCATION PROPOSED; TO BE CONFIRMED WITH WATER RESOURCES OFFICER.

LEGEND:

- WATER
- SPOILS DISPOSAL LOCATION
- INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
- WASTE STORAGE AREA
- ROAD
- WATER LICENCE SURVEILLANCE NETWORK PROGRAM (SNP) STATION
- PROPOSED SURVEILLANCE NETWORK PROGRAM STATION
- COMMERCIAL LEASE BOUNDARY
- PROJECT DEVELOPMENT AREA (PDA)
- PDA EXPANSION FOR PHASE 2 PROPOSAL
- FORESHORE LEASE BOUNDARY / MARINE PDA
- RIVER/STREAM/DRAINAGE
- TREATED SEWAGE EFFLUENT PIPELINE

SCALE A: 100 50 0 100 200 300 400 500 m

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

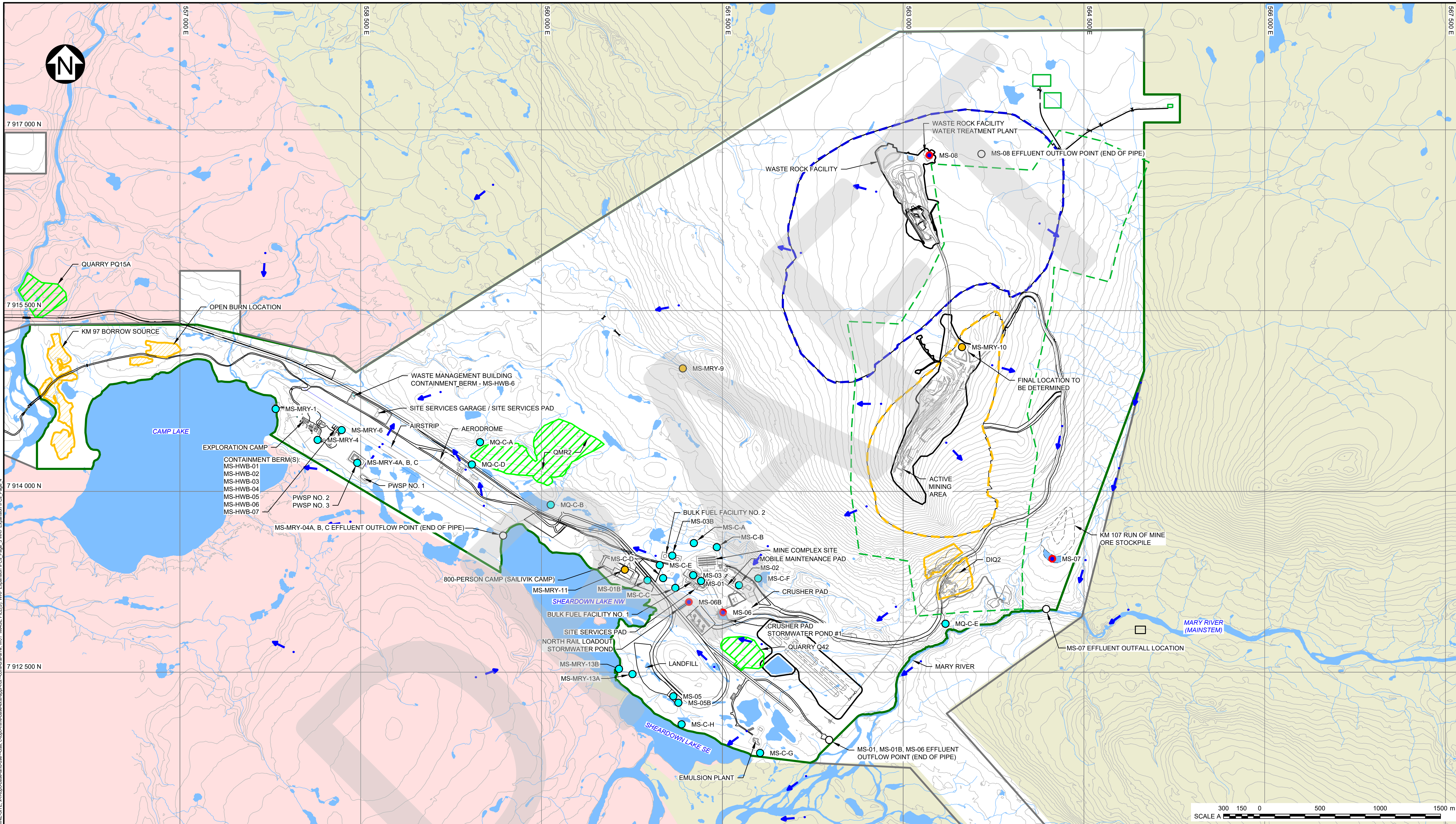
PHASE 2 PROPOSAL
MILNE PORT LAYOUT SHOWING
WATER LICENCE MONITORING STATIONS

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	02MAY'19	ISSUED WITH REPORT	RAC	CJV	SRA

Knight Piésold CONSULTING

P/A NO. NB102-181/53 | REF NO. 3

FIGURE 6.1 | REV 0



LEGEND:

- EXISTING BORROW AREA
- QUARRY
- INUIT OWNED LAND SURFACE AND SUBSURFACE
- INUIT OWNED LAND SURFACE ONLY
- CONTOUR
- WATER
- QIA SURFACE COMMERCIAL LEASE BOUNDARY
- POTENTIAL DEVELOPMENT AREA BOUNDARY
- ULTIMATE DEPOSIT NO. 1 PIT LIMITS
- ULTIMATE WASTE ROCK STOCKPILE LIMITS
- SURVEILLANCE NETWORK PROGRAM (SNP) STATION
- SNP STATION / METAL AND DIAMOND MINING EFFLUENT REGULATIONS (MDMER) FINAL DISCHARGE POINT
- INACTIVE SNP
- EFFLUENT OUTFLOW POINT (END OF PIPE)
- DRAINAGE DIRECTION

NOTES:

1. COORDINATE GRID IS UTM NAD83, ZONE 17.
2. DETAILED WATER AND CONTOURS FROM EAGLE MAPPING (2005). CONTOUR INTERVAL IS 10 m.
3. CURRENT MINE AREA FROM THE WASTE DUMP TO THE CRUSHER PAD, AND DITCHES ALONG THE HAUL ROAD PROVIDED BY BIM (MARCH 12, 2018).
4. ALL OTHER SITE INFRASTRUCTURE PROVIDED BY HATCH (AUGUST 2, 2016). AND SIMPLIFIED BY KP STAFF (JAN, 2018).

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	02MAY'19	ISSUED WITH REPORT	RAC	CJV	SRA

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

PHASE 2 PROPOSAL
MINE SITE LAYOUT SHOWING
WATER LICENCE MONITORING STATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/53	3

FIGURE 6.2 REV 0

Appendix C

~~Block Flow Diagrams –~~ Milne Port and Mine Site Water and Sewage Process Flow Diagrams

Stream No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Stream Description	RAW WATER FROM KM32 LAKE	RAW WATER TO FIRE TANKS	FIRE WATER TO PSC	RAW WATER TO PSC	POTABLE WATER TO PSC	SEWAGE FROM PSC TO RECEIVING TANK	TREATED EFFLUENT FROM STP # 1 & 2	POTABLE WATER TO STP #1 SCREEN WASH	RAW WATER TO MATRIX CAMP	SEWAGE FROM MATRIX CAMP	POTABLE WATER TO STEENSBY CAMP	SEWAGE FROM STEENSBY CAMP	RAW WATER TO REMOTE WASHROOMS
Fluid	RAW WATER	RAW WATER	RAW WATER	RAW WATER	POT. WATER	SEWAGE	TREATED EFFLUENT	POT. WATER	RAW WATER	SEWAGE	POT. WATER	SEWAGE	RAW WATER
Units	m³/day	m³/day	m³/hour	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day
Current Permit Limit	367.5	-	-	-	-	-	-	-	-	-	-	-	-
Calculated Flow (Average)	231	One off fill	113	74	66	66	110	1	31	31	5	5	5
Calculated Flow (Maximum)	280	One off fill	113	91	83	83	135	1	38	38	6	6	5

Stream No.	14	15	16	17	18	19	20	21	22	23	24	25
Stream Description	SEWAGE FROM REMOTE WASHROOMS	CONST. & ROAD DUST SUPPRESSION	RAW WATER TO CONSTRUCTION CAMP	SEWAGE FROM CONSTRUCTION CAMP	TREATED EFFLUENT FROM STP # 3	POTABLE WATER TO STP #2 SCREEN WASH	TREATED EFFLUENT FROM STP # 1 & # 2 TO LICENSED DISCHARGE	BACKWASH WATER TO RECEIVING TANK	BACKWASH WATER TO STP # 3	POTABLE WATER TO STP #3 SCREEN WASH	RAW WATER TO KM 40 TOTE ROAD CAMP	SEWAGE FROM TOTE KM 40 ROAD CAMP TO STP #3
Fluid	SEWAGE	RAW WATER	RAW WATER	SEWAGE	TREATED EFFLUENT	POT. WATER	TREATED EFFLUENT	WASTE WATER	WASTE WATER	POT. WATER	RAW WATER	SEWAGE
Units	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day	m³/day
Current Permit Limit	-	Note 1	-	-	-	-	-	-		-		
Calculated Flow (Average)	5	20	88	76	102	1	110	6	6	1	14	14
Calculated Flow (Maximum)	5	21	108	95	124	1	135	6	6	1	17	17

FOR USE

HATCH

Baffinland

DRAWING No.	DRAWING TITLE
H353004-40000-221-282-0001	MILNE PORT WATER & SEWAGE PFD - SUPERCEDED BY THIS DRAWING

REFERENCE DRAWINGS

REG. PROFESSIONAL (J.M. WIKSTON, LICENSEE, NT/NU)

No.	DESCRIPTION	BY	CHK'D	DATE
2	DORMITORIES AND STP FROM MSC, ADDITION OF RECEIVING TANK AND NEW WATER TANKS	HV	PC	01-04-2019
1	APPROVED FOR USE	HV	PC	21-08-2018
0	APPROVED FOR USE	HV	PC	07-08-2018

REVISIONS

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	H VINCENT	NR	06-06-2018
DESIGNER		NR	
CHECKER	P CHERRY		2019-04-09
DESIGN COORD.	R GOOSEN		2019-04-08
RESP. ENG.	J Wikston		2019-04-11
LEAD DISC. ENG.	P CHERRY		2019-04-09
AREA LEAD	V LAVRIC		2019-04-11
ENG. MANAGER	R GOOSEN		2019-04-08
AREA MANAGER	T ATIBA		2019.04.12

DRAWING APPROVAL STATUS: Approved for Use

BAFFINLAND IRON MINES LP
MARY RIVER EXPANSION PROJECT

PORT SITE
WATER AND SEWAGE
PROCESS FLOW DIAGRAM

SCALE NTS OR AS NOTED | DWG. No. H353004-40000-270-282-0001-0001 | REV 2

SHEET SIZE: D

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