MARY RIVER PROJECT
FINAL ENVIRONMENTAL IMPACT STATEMENT

VOLUME 10
ENVIRONMENTAL MANAGEMENT

APPENDIX 10D-10
BIOPHYSICAL ENVIRONMENT

SHIPPING AND MARINE WILDLIFE MANAGEMENT PLAN

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SECTION 1.0 - INTRODUCTION

1.1 PURPOSE

The Baffinland Iron Mines Corporation (Baffinland) was formed specifically to develop the Mary River Iron Ore Deposit Project (the Project) on the coast of Nunavut. The proposed development, the largest planned in the history of Nunavut, is located about 160 km south of the community of Pond Inlet (Mittimatalik) and 1000 km northwest of Iqaluit, the capital of Nunavut (Figure 1).

The viability of the proposed Project depends on the constant supply of iron ore to overseas markets requiring shipping on a 12 month-per-year basis. Accordingly, the Shipping and Marine Wildlife Management Plan (SMWMP) has been developed to:

- Address the issues of concern to Inuit with respect to shipping;
- Establish rules and procedures applicable to open water and winter shipping during the construction, operational and decommissioning phases of the Project; and,
- Provide for Inuit involvement in the planning, environmental management and decision-making processes related to shipping.

The SMWMP is a part of the Baffinland Environmental Management System (EMS) and reflects the Baffinland commitments respecting shipping. Specifically, the SMWMP:

- Describes the means whereby Baffinland will ship construction materials and equipment to the site and export iron ore from the Steensby Port Site;
- Describes the management of the shipping operation, including the design and contract of a dedicated Iron Ore carrier to be employed for year round operations at the Steensby Port Site.
- Addresses the management, routing and operation of ships and describes how the vessels will navigate through and in the vicinity of ice; and.
- Describes the monitoring and mitigation measures to be employed in addressing concerns related to marine wildlife, including mammals and birds.

It is noted that in all matters of marine transportation, the Master of the vessel has an overriding obligation to protect the safety of his vessel, crew and the environment for which he is ultimately responsible and, notwithstanding anything contained in this SMWMP, the Master will always be guided by this principle.

DUNDAS HARBOUR
ARCTIC BAY
NANISIVIK MINE
POND INLET
MILNE PORT
MINE SITE
MILNE INLET TOTE ROAD
PROPOSED RAILWAY
STEENSBY PORT
STEENSBY INLET
AGU BAY
TALOYOAK
SIORARSUK PENINSULA
IGLOOLIK
ROWLEY ISLAND
GJOA HAVEN
KUGAARUK
GARRY BAY
HALL BEACH
PILING BAY
BAFFIN BAY
NUNAVUT SETTLEMENT AREA BOUNDARY
CLYDE RIVER
BAFFIN ISLAND
QIKIQTARJUAQ
PRINCE CHARLES ISLAND
CAPE JERMAIN
MELVILLE PENINSULA
FOXE BASIN
PANGNIRTUNG
REPULSE BAY
SOUTH HAMPTON ISLAND
CORAL HARBOUR
CAPE DORSET
IQALUIT
KIMMIRUT
LABRADOR SEA
HUDSON STRAIT
QUAQTAQ
AKULIVIK
NOMINAL SHIPPING ROUTE
0
250,000
500,000
750,000
1,000,000
1,250,000
1,500,000
8,250,000
8,000,000
7,750,000
7,500,000
7,250,000
7,000,000
6,750,000

LEGEND:
- COMMUNITY
- NANISIVIK MINE (DECOMMISSIONED)
- MILNE INLET TOTE ROAD
- PROPOSED RAILWAY ALIGNMENT
- NUNAVUT SETTLEMENT AREA BOUNDARY
- NOMINAL SHIPPING ROUTE - YEAR-ROUND
- NOMINAL SHIPPING ROUTE - OPEN WATER SHIPPING ONLY
- AREA OF EQUAL USE AND OCCUPANCY NUNAVUT AND NUNAVIK
- WATER
- SIRMILIK NATIONAL PARK

NOTES:

1. BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.
2. UTM (NAD83) ZONE 17 AND IS IN METRES. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.

SCALE 50 25 0 50 100 150 200 250 km

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

PROJECT LOCATION MAP

REF NO. BL_Vol1_GIS_001
FIGURE 1 REV 0

FIGURE ID: BL_Vol1_GIS_001 Project Location Map Figure 1.mxd

1.2 REGULATORY FRAMEWORK

Canada is an active member of the International Maritime Organization (IMO) and is a signatory to IMO agreements such as the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), the International Loadline Conventions, the International Safety Management Code (ISM) and the IMO International Convention for the Control and Management of Ships' Ballast Water and Sediment. The majority of operations described in this SMWMP are marine or port-related and are federally regulated by Transport Canada through the Canada Shipping Act & various International Regulations augmented by various Shipping Notices and Publications.

Up-to-date versions of these Acts and Regulations are available on the internet on the Transport Canada Site – www.tc.gc.ca.

1.2.1 Applicable Legislation, Regulations, Acts and Guidelines

The transportation of all cargoes between Canadian ports as may be applicable is regulated by the Government of Canada through legislation, including:

- Canada Shipping Act;
- IMO Code for the Safe Handling of Bulk Cargoes;
- Canada Labour Code;
- IMDG Code for the Safe Handling of Dangerous Goods;
- Canadian Transportation Accident Investigation and Safety Board Act;
- Canadian Transportation Act;
- Canadian Transportation of Dangerous Goods Act;
- Department of Transport Act;
- Marine Transportation Security Act;
- Navigable Waters Protection Act;
- Oceans Act;
- Arctic Waters Pollution Prevention Act and Regulation;
- Safe Containers Convention Act; and
- Ballast Water Control and Management Regulations

The following regulations issued under the Canada Shipping Act regulate Canadian vessel operations and foreign vessels while operating in Canadian waters:

- Aids to Navigation Protection Regulations;
- Air Pollution Regulations;
- Boat and Fire Drill Regulations;
- Charts and Nautical Publications Regulations;
- Dangerous Chemicals and Noxious Liquid Substances Regulations;
- Classed Ships Inspection Regulations;
- Collision Regulations;
- Crew Accommodation Regulations;
- Dangerous Bulk Materials Regulations;
- Dangerous Goods Shipping Regulations;
- Eastern Canada Vessel Traffic Services Zone Regulations;
- Fire Detection and Extinguishing Equipment Regulations;
- Garbage Pollution Prevention Regulations;

- Home-Trade, Inland and Minor Waters Voyages Regulations;
- Hull Inspection Regulations;
- Marine Transportation Security Regulations;
- Life Saving Equipment Regulations;
- Marine Certification Regulations;
- Marine Crewing Regulations;
- Marine Machinery Regulations;
- Navigating Appliances and Equipment Regulations;
- Non Canadian Ship Safety Order;
- Oil Pollution Prevention Regulations;
- Pilot Ladder Regulations;
- Pollutant Discharge Reporting Regulations;
- Pollutant Substances Regulations;
- Response Organizations and Oil Handling Facilities Regulations;
- Safe Working Practices Regulations;
- Safety Management Regulations;
- Ship Station Radio Regulations;
- Ship Station Technical Regulations;
- Ships' Tonnage Survey and Measurement Fees Regulations;
- Shipping Casualties Reporting Regulations;
- Shipping Inquiries and Investigations Rules;
- Ships' Crews Food and Catering Regulations;
- Ships' Elevator Regulations;
- Steering Appliances and Equipment Regulations;
- Tackle Regulations;
- Vessel Traffic Services Zones Regulations; and
- VHF Radiotelephone Practices and Procedures Regulations.

1.3 BAFFINLAND'S COMMITMENTS

Baffinland will provide the necessary human, material and financial resources to implement and maintain the Health, Safety and Environment Management System. Baffinland's Sustainable Development Policy is presented below.

SUSTAINABLE DEVELOPMENT POLICY

At Baffinland Iron Mines Corporation, we are committed to conducting all aspects of our business in accordance with the principles of sustainable corporate responsibility and always with the needs of future generations in mind. Everything we do is underpinned by our responsibility to protect the environment, to operate safely and fiscally responsibly and to create authentic relationships. We expect each and every employee, contractor, and visitor to demonstrate a personal commitment to this policy through their actions. We will communicate the Sustainable Corporate Policy to the public, all employees and contractors and it will be reviewed and revised as necessary on an annual basis. These four pillars form the foundation of our corporate responsibility strategy:

1.0 HEALTH AND SAFETY

- We strive to achieve the safest workplace for our employees and contractors; free from occupational injury and illness from the very earliest of planning stages. Why? Because our people are our greatest asset. Nothing is as important as their health and safety.
- 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 and awareness. We allow our workers and contractors the right to stop any work if and when they see something that is not safe.

2.0 ENVIRONMENT

- We employ a balance of the best scientific and traditional Inuit knowledge to safeguard the environment.
- We apply the principles of pollution prevention 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 pioneering new processes and more sustainable practices.
- We understand the importance of closure planning. We ensure that an effective closure strategy is in place at all stages of project development and that progressive reclamation is undertaken as early as possible to reduce potential long-term environmental and community impacts.

3.0 INVESTING IN OUR COMMUNITIES AND PEOPLE

- We respect human rights and the dignity of others. We honour and respect the unique culture, values and traditions of the Inuit people.
- We contribute to the social, cultural and economic development of sustainable communities adjacent to our operations.
- 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.

4.0 TRANSPARENT GOVERNANCE

- We will take steps to understand, evaluate and manage risks on a continuing basis, including those that impact the environment, employees, contractors, local communities, customers and shareholders.

- We 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 environmental, safety, health, socio-economic commitments and set annual targets and objectives.
- We conduct all activities in compliance with the highest applicable legal requirements and internal standards
- We strive to employ our shareholder's capital effectively and efficiently. We demonstrate honesty and integrity by applying the highest standards of ethical conduct.

Tom Paddon
President and Chief Executive Officer
September 2011

1.4 RELATIONSHIP TO OTHER MANAGEMENT PLANS

This plan should be viewed in concert with the following additional plans that have been prepared for the EIS:

- Environmental Protection Plan (EPP)
- Emergency and Spill Response Plans (Fuel Storage Facility Oil Pollution Emergency Plan – Milne Inlet and Steensby Port)
- Closure Plan

1.5 UPDATE OF THIS MANAGEMENT PLAN

The Shipping and Marine Wildlife Management Plan will be updated as required on the basis of management reviews (as outlined in Section 5), incident investigations, regulatory changes or other Project related changes. Commencement of the Construction Phase will be a major milestone for the Project. The Shipping and Marine Wildlife Management Plan will be updated with input from the Engineering, Procurement and Construction Management (EPCM) contractor in order to reflect the complexities of the Construction Phase.

SECTION 2.0 - TARGETED VALUED ECOSYSTEM COMPONENTS

Valued Ecosystem Components (VECs) are defined as aspects of the biophysical environment considered to be "of vital importance to a particular region or community" (NIRB 2009).

The following VECs can be expected to interact with the shipping activities associated with the Project. Each is listed below with a brief comment on the nature of the anticipated interaction:

Air Quality

Vessel machinery, including the main engines will discharge exhaust gas to the atmosphere. Cargo transfer, especially of iron ore will release some quantities of dust to the atmosphere

Noise and Vibration

Vessel machinery as well as the movement of the vessel through water and ice will create noise and vibration that will propagate through the atmosphere as well as through the water.

Birds

Marine bird Indicator Species are snow geese (*Chen caerulescens*), common (*Somateria mollissima*) and king eiders (*Somateria spectabilis*), and red-throated loons (*Gavia stellata*) (AMEC 2010).

Vessel discharges (air emissions, sewage, solid waste, ballast water), the sight of the vessels and their movement, as well as vessel noise and vibration has the potential to interact with birds and affect life cycle activities. Accidental spills and releases, especially of hydrocarbons have the potential to induce direct mortalities.

Marine Environment (water and sediment quality)

Vessel discharges (sewage, solid waste, ballast water) have the potential to alter water and sediment quality.

Marine Environment (wildlife and habitat)

Of the twenty-two marine mammal species known or expected to occur along the proposed shipping routes into Steensby and Milne inlets and along the proposed shipping routes in Baffin Bay and Davis Strait, seven were selected as indicator species in the EIS: ringed seal (*Pusa hispida*), bearded seal (*Erignathus barbatus*), walrus (*Odobenus rosmarus*), beluga whale (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), bowhead whale (*Balaena mysticetus*), and polar bear (*Ursus maritimus*).

With the exception of one population of beluga whales (Ungava Bay population listed as 'Endangered' and perhaps extirpated), all populations of cetaceans selected as indicator species are listed as a species of 'Special Concern' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC); polar bears are also listed as 'Special Concern'. Ringed seals are currently listed as 'Not At Risk' by COSEWIC while bearded seals have not been reviewed by COSEWIC. None of the marine mammal indicator species are currently listed on the *Species at Risk Act* (*SARA*).

Vessel discharges (sewage, solid waste, ballast water), the sight of the vessels and their movement, vessel noise and vibration, as well as accidental spills and releases have the potential to interact with marine wildlife and affect life cycle activities. Collisions have the potential to induce direct mortalities.

Culture, Resources and Land Use

Vessel traffic through landfast ice, as well as port traffic associated with construction and operation have the potential to alter resource harvesting and land use patterns.

SECTION 3.0 - SHIPPING OPERATION

3.1 VESSELS

All iron ore carriers engaged with Baffinland will comply with current Canadian and applicable international legislation. Canada is a signatory to the International Maritime Organization (IMO) agreements and it follows that foreign vessels certified as being IMO compliant will meet Canadian Standards.

In order to ensure that all tonnage chartered for operation in Steensby Inlet is in compliance with the Baffinland Shipping and Wildlife Management Plan, each vessel considered for the work will receive a limited audit of their condition, certification and operation of their International Safety Management System (ISM) prior to being placed on charter. All vessels which utilize the Steensby Port Site Terminal and the Milne Inlet Port must comply with Baffinland environment, health and safety policies and general site rules while at the Terminal.

3.1.1 Dedicated Iron Ore Carrier Specifications

The ±190,000 DWT icebreakers will be designed as Polar Class 4 vessels, which relate to Canadian classification between a CAC 3 and CAC 4 design. Appendix 1 provides a conceptual sketch of the vessel.

These ships will have approximate dimensions of:

- length – 329 m;
- beam – 50 to 53 m; and
- maximum draft of 20 m when fully loaded.

The ore carrier will have the following design features:

- Twin nozzle propellers (7.5 to 8.0 m diameter);
- Twin rudders (one behind each propeller) – approximately 11 m high by 6 m wide;
- Full power: 42,500 hp per shaft with engine running at constant 78 rpm; and
- Shaft centreline approximately 6.5 to 7.0 m above vessel baseline.

While also a subject of ongoing evaluation, it is expected that at least one of the icebreaking ore carriers will be equipped with an additional fuel tank holding in the order of 5 ML of diesel fuel, in addition to the ship's own fuel tank to act as back up to the planned fuel sea lift during the open water season.

The ore carriers will be powered by marine fuel oil (380 cSt).

3.1.2 Charter Vessel Specifications

Baffinland has established a protocol for selecting chartered iron ore carriers. The standard is identical to the specifications for the dedicated iron ore carriers and includes the requirement to have appropriate ice class, Canadian Arctic class (or equivalent) and familiarity with AIRSS to operate in the ice conditions forecast to be encountered during the projected period of the voyage into Steensby Inlet.

An Ice Information Contractor will be engaged to forecast the ice condition in Steensby Inlet at the time of the vessel's planned loading and will advise what, if any, ice class is required for any vessel chartered to load at Steensby Port Site at that time.

The dedicated iron ore carrier is the most difficult vessel to replace because of its stringent specification. However, vessels for summer duty are reasonably common, providing the fuel deliveries can be contracted to a suitable tanker and there are some new Canadian tankers coming into service. Charter vessels will also have an IMO approved BWTS.

A copy of the protocol and specification for chartered iron ore carriers is included in Appendix 2.

3.1.2.1 Pre-Charter Audit/Inspection of Charter Iron Ore Carriers

All foreign-registered ships entering Canadian ports are liable to be inspected by Transport Canada to ensure compliance with the regulations and to confirm that the ships are safe for their crew and the environment when they proceed to sea. All of the major shipping countries have similar port state inspections. Ships failing to pass inspection can be held until they have been repaired and achieve compliance.

Baffinland will arrange for each candidate vessel (foreign and domestic) to be assessed before being placed on charter, to ensure that the vessel is capable of operating in the ice conditions that are forecast for Steensby Inlet during the period of operation. Appendix 3 provides a copy of the Baffinland pre-charter bulk carrier ice capability assessment. In order to ensure that the chartered vessel can load and carry the iron ores safely and efficiently, vessels that meet the required criteria for navigating in the forecast ice conditions will undergo a limited audit to ensure conformance with the ISM system before the vessel is chartered. This limited audit will be an adaptation of the ISM internal audit and the ship inspection will follow the Transport Canada port state inspection format. A copy of the Baffinland pre-charter bulk carrier inspection checklist and limited audit is provided in Appendix 4.

3.2 SHIPPING ACTIVITY

Shipping activity will occur during both Construction and Operation phases of the project:

3.2.1 Construction

During construction, containerized equipment and materials will be shipped to both Milne Inlet and Steensby Port Site. Personnel, equipment and materials will also be flown into the Mine Site, Steensby Port Site and Milne Inlet airstrips. Items bound for the Mine Site will be shipped to Milne Inlet during open water (August to early October) and then transported over the Milne Inlet Tote Road year-round, with possible short interruptions during storms and when driving conditions are unsafe. A temporary dock at Steensby Port and a floating dock at Milne Inlet will be constructed to facilitate rapid off-loading of ships delivering supplies other than fuel. The floating dock at Milne Inlet will continue to be used periodically (less than one vessel per year) during operation.

Ships will not be serviced at either Milne Inlet or Steensby Port Site.

Fuel (diesel, gasoline and jet fuel) will be delivered to both port locations by tankers which will be off-loaded into holding tanks using the commonly-employed floating hose fuel transfer method. Both ports will have a Transport Canada approved OPEP which will be reviewed and resubmitted annually. Milne Port OPEP (SD-ERP-002) is provided in Volume 10, Appendix 10C-2 and Steensby Port OPEP (SD-ERP-003) is in Volume 10 Appendix 10C-3.

The potential for accidental releases during ship-to-land transfer has been identified as a risk and, consistent with prudent practice, the shipping contractor will establish appropriate loading and off-loading procedures using guidance from legislation such as the *Arctic Waters Pollution Prevention Act*, *Arctic Shipping Pollution Prevention Regulation,* and the *Regulation for the Prevention of Pollution from Ships and Dangerous Chemicals* to prevent or quickly contain any spills or releases of fuel during ship-to-land transfers. Port contingency and vessel-specific response plans will be developed to address issues relating to:

- Appropriate fuel intake devices that prevent overflows;
- Spill fuel collection and recycling or destruction facilities, where applicable;
- Infiltration and other devices including porous pavement, soak-away pits or dry wells, seepage or infiltration trenches, percolation basins, catch basins, to contain spills.

To facilitate bulk fuel deliveries, a land-based permanent fuel tank farm will be constructed at Steensby Port Site within the first year of construction. The existing bladder tank farms at Milne Inlet and the Mine Site will continue to be utilized and additional steel tanks will be constructed in Year 2 of construction to provide additional capacity at both locations.

Sealifts in Years 3 and 4 of construction and Year 1 of operation will be carried out to demobilize equipment as the construction activity winds down.

Table 1 presents the estimated volume of vessel traffic at Mine Inlet and at Steensby Port Site from the initiation of Construction through to completion in Year 3, as well as the approximate tonnage of materials to be delivered each year. The estimated number of voyages each year is based on use of conventional sealift ships, of around 7,000 to 16,000 DWT capacity. Larger ships or barges may be used depending on cost and availability.

Table 1 Shipping Traffic During Construction

Location	Estimated Maritime Transportation	Year 1	Year 2	Year 3	Year 4
Milne Inlet	**Freight Vessels**	**20**	**20**	**3**	**3**
	Freight (tonnes)	165,000	95,000	43,000	46,000
	Fuel (tankers or barges)	**2**	**3**	**3**	**3**
	Total Fuel Volume (ML)	20	30	30	30
Steensby Port Site	**Freight Vessels**	**22**	**20**	**7**	**4**
	Freight (tonnes)	206,000	150,000	107,000	80,000
	Fuel (tankers or barges)	**2**	**4**	**4**	**3**
	Total Fuel Volume (ML)	40	35	35	120

To provide rapid and efficient unloading of a large volume of equipment and materials at Steensby Port early in the construction phase, two floating construction docks will be installed during the open-water season. One dock will be situated on the island to facilitate construction of the ore dock and ore handling systems, and the other on the mainland to support all other construction activities at Steensby Port. A single floating freight dock will be constructed at Milne Inlet during the early construction period to facilitate the timely offloading of equipment and materials from the ships.

A freight forwarding team will be responsible for receiving all cargo in the port of discharge, for customs documentation, for obtaining customs clearance, and for directing freight to the consolidation point. The Milne Inlet site will be equipped with laydown areas and warehousing. Most materials will arrive containerized and will be stored in laydown areas before overland transport to the Mine Site. Warehousing will accommodate less than load (LTL) materials for consolidation and possibly containerization.

3.2.2 Operations

During the Operations Phase, dedicated voyages to re-supply materials and equipment will travel to Steensby Port Site during the open water season using ships of the type currently used to support the Mary River Project and other northern sealift operations. Diesel fuel will arrive on the dedicated ore carriers, supplemented in the summer by fuel tankers as necessary. Other fuels will be delivered by normal sealift tankers to the Steensby Port Site during the open water season. Shipping to Milne Inlet will occur infrequently throughout the operations phase and only during open water, for example to deliver oversized equipment that cannot be transported via the railway from Steensby Port Site.

The economic viability of the Baffinland Project requires the constant supply of iron ore to customers, and therefore shipping of iron ore to market must occur on a 12 month-per-year basis. Iron ore will be shipped from Steensby Port Site using the route presented in Figure 3 and 4. The ore carriers will maintain a digital record of their travel routes within the RSA. Baffinland will compile this information for each vessel and submit a report to Environment Canada annually.

Baffinland has engaged Fednav, a Canadian ship owner and operator, to assist with meeting shipping operations requirements.

The dedicated fleet of icebreaking cape-size ore carriers will transport most of the ore to market supplemented by the use of ships chartered on the open market during the open water season. The ships will operate in accordance with two primary legal instruments regulating ship traffic in the Canadian Arctic: the *Canada Shipping Act*, and the *Arctic Waters Pollution Prevention Act*, and their associated regulations.

Vessel docking will be assisted in the ice-free period by harbour tugs and lines personnel on the docks. Traditionally, Fednav has operated ice-breaking bulk carriers in Canada's Arctic for several decades without the assistance of tugs or ice breakers. Consideration is being given to chartering one or more ice management vessels in the first year of operation, to evaluate whether these support vessels improve ice management at the ore dock. In addition, two to four ice-capable harbour tugs will be available to assist in maneuvering at dockside.

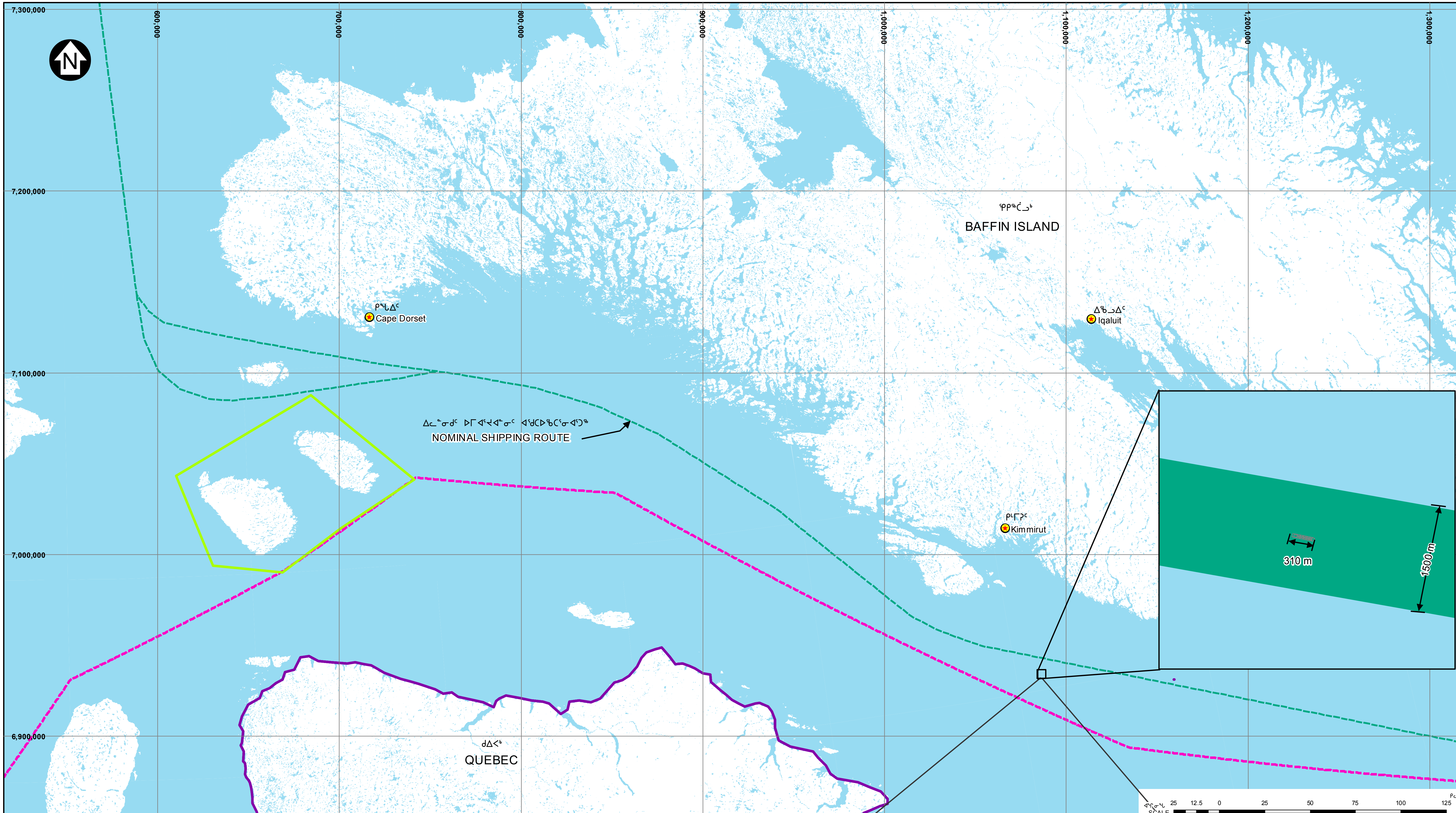

Figure ID: BL_Vol10_GIS_002 Proposed Shipping Route Through Hudson Strait Figure 2.mxd

LEGEND:

- WATER
- NUNAVUT SETTLEMENT AREA / NUNAVIK MARINE REGION BOUNDARY
- NOMINAL SHIPPING ROUTE
- AREA OF EQUAL USE AND OCCUPANCY NUNAVUT AND NUNAVIK
- COMMUNITY

NOTES:

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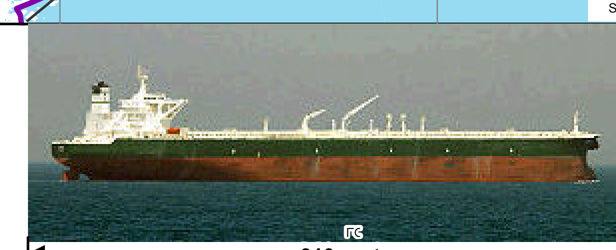
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METRES.



BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

PROPOSED SHIPPING ROUTE THROUGH HUDSON STRAIT

Baffinland Iron Mines Corporation

REF NO. BL_Vol10_GIS_002

FIGURE 2 REV 0

N

400,000
500,000
600,000
700,000
800,000

7,800,000
7,700,000
7,600,000
7,500,000
7,400,000

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NINA BANG LAKE

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STEENSBY INLET CAMP
AND PROPOSED PORT

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STEENSBY INLET

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MURRAY MAXWELL BAY

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IKPIK BAY

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ROWLEY ISLAND

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HALL BEACH

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SPICER ISLANDS

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PRINCE CHARLES ISLAND

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NOMINAL SHIPPING ROUTE

330 m
1500 m

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310 METRES

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SCALE A
150 75 0 150 300 450 600 ᑭᓕᒥ km

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SCALE B
20 10 0 20 40 60 80 100 km

ᑐᑭᑦᓴᖏᑦ **LEGEND:**

- ᒋᓇᐅᖅ WATER
- ᓄᓇᕗᑦ ᐃᓗᐊᖏᓂ NUNAVUT INUIT SETTLEMENT AREA BOUNDARY
- ᐃᓕᓐᓂᑦ ᐅᒥᐊᓕᖏᓂᑦ ᐊᖑᑕᐅᓂᓂᑦᑐᖅ NOMINAL SHIPPING ROUTE
- ᑭᖓᐊᓂ ᐊᖑᒍᑎ ᐅᓱᒃᑕᑦᐱᑦ MILNE INLET TOTE ROAD
- ᓄᓇᓱᐅᑎᑦᑕᑦ ᐊᖑᑎᑎᓂᐊᖏᑕᖏᓐᓇ PROPOSED RAIL ALIGNMENT
- ᐊᑦᓴᑎᒥᑦ ᐊᑐᑕᐅᓇᓱᑐᑦ ᓄᓇᕗᑦᑎᐅᓂᑦ ᐊᒪᓗ ᓄᓇᕗᒥᐅᓂᑦ AREA OF EQUAL USE AND OCCUPANCY NUNAVUT AND NUNAVIK
- ᓄᓇᓕᒃ COMMUNITY

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NOTES:

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   BASE MAP: © HER MAJESTY THE QUEEN IN RIGHTS OF CANADA, DEPARTMENT OF NATURAL RESOURCES (2004). ALL RIGHTS RESERVED.
2. ᓄᓇᖕᓂᑦ ᑎᑎᕋᒪᓂᖅ ᒪᓕᕐᔪᖅ
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BAFFINLAND IRON MINES CORPORATION

ᓄᓕᒋᓂ ᐅᓱᖃᕋᓱᐃᔪᖅᑐᑦ MARY RIVER PROJECT

ᐅᒥᐊᖏᓐᓇᐊᑦ ᐊᖑᑎᑎᕋᒪᓱᖅᖢᖅ **PROPOSED SHIPPING ROUTE**
ᓴᓂᖃᐅᓱᑦ ᑕᓪᓕᖅᖢᖅᓯᑦ **THROUGH FOXE BASIN**

Baffinland Iron Mines Corporation

REF NO. BL_Vol10_GIS_003

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Figure ID: BL_Vol10_GIS_003 Proposed Shipping Route Through Foxe Basin Figure 3.mxd

3.2.2.1 Ship Loading and Unloading

Ships loaded with equipment and supplies for a full year of Project operation will dock at the freight dock and be unloaded during the open water season. Most goods will be transported in containers that will limit spills and facilitate transfer from ship to shore and transport to the Mine Site. Fuel will be transported in tankers.

Fuel for shipping will be purchased only from accredited suppliers that can provide assurance that the fuel used for shipping conforms to Canadian regulations (*Benzene in Gasoline Regulations, 1997; Contaminated Fuels Regulations, 1991; Gasoline Regulations, 1990; Fuel Information Regulations, No. 1, 1999; Sulphur in Diesel Fuel Regulations, 2002; Sulphur in Gasoline Regulations, 1999*).

Lump and fine ore stockpiles will be loaded on shiploaders through mobile equipment (front-end loaders) and a conveyor. Ships will be loaded at a maximum capacity of 3,000 to 5,000 tonnes per hour with minimal trimming of the cargoes. The shiploader will operate at an average rate of 2,000 to 2,500 tonnes/hr for 20 hours per day providing a daily capacity of 40,000 to 50,000 tonnes depending upon the ship being loaded.

After the shipping season has been concluded the barges at Milne Inlet will be moved to shore or to a safe designated area until the start of the following year's shipping season.

3.2.2.2 Schedule

Once in operation, the Project will require the transportation of approximately 18 million tonnes of iron ore per annum. Shipping operations at Steensby Port will handle all the iron ore shipping on a 12 month-per-year basis and will require dedicated icebreaking ore carriers to complete 102 year-round voyages (i.e., 204 transits) between Steensby Port Site and the European terminal in the course of each year.

The ice-free period in Milne Inlet typically extends from July 15 to 20 through October 15 to 20. No iron ore will be shipped from Milne Inlet. Any vessels using Milne Inlet will be for the delivery of oversized equipment and are expected to occur periodically throughout the operation phase of the Project (less than one vessel per year).

3.2.2.3 Safety

The safety of the ship, her crew and the environment is a primary concern of Baffinland who recognize that the waters in which the ore carriers and other support vessels operate are subject to severe storms, icebergs, pack ice and land-fast ice throughout a large part of each year. Baffinland requires that the ship-owner/operator of the candidate ships and other ships will have as priorities safety of life, protection of the environment, and the preservation of ship and cargo.

Whereas Baffinland and the ship's managers wish to obtain the maximum efficiency in all of its chartered ship operations, it is recognized that the Master of a ship has sole responsibility for the safety of the ship, crew and cargo, and the protection of the environment. The Master has the authority to adjust speed, heave to, deviate, seek shelter or enter a port of refuge to re-stow cargo or seek medical assistance should environmental conditions or the condition of the vessel, the machinery, safety of the crew or cargo require such a precaution. Under such circumstances the Master shall immediately report the circumstances and his intentions to the charterer and the ship manager's "Designated Person Ashore" and maintain a full record of the event and actions taken to secure the safety of the ship.

Baffinland will require that the candidate ship-owner/operator have a safety and operating management system based on the principles of the International Safety Management Code (ISM Code). The objective of the ISM Code is to ensure safety at sea, prevention of human loss of life or injury and avoidance of marine environment pollution. To achieve this objective, the Code requires that the ship-owner/operator share fully with the vessel personnel the responsibility to maintain a safe ship. The Code establishes a clear and concise safety management system, including, as examples, the following functional requirements:

- **A safety and environmental protection policy.** By considering the nature of the waters that vessels are to travel within, standards of watch keeping are reinforced with additional lookouts on the bridge and engineers in the machinery space. The maneuvering ability of machinery and the operation of steering gear are tested prior to arrival or departing in a passage where navigation is restricted or where the route is close to shore. Strict measures regarding the handling and transfer of bunker and cargoes are established. Masters will be required to navigate within established channels.
- **Levels of authority and lines of communication defined.** This ensures that safety remains a high priority and that the lines of communication between shore and ship personnel remain open. Responsibilities are clearly defined and contacts to provide the ship with round the clock shore support are mandatory.
- **Procedures for reporting accidents and non-conformities with the Code.** The method of recording non-conformities, establishing corrective measures, and ensuring open dialogue between all parties is to be documented and reviewed.
- **Procedures to prepare for and respond to emergency situations.** Ships must have a set of operating manuals that supplement and support regulatory requirements and vendor instructions. These manuals evolve from standard practices and procedures, and they are to be tailored to individual ships. The objective is to document and provide guidance and instruction on the safe handling and operation of all shipboard equipment. Clear instruction is provided with regard to pre-arrival and departure check lists, navigation, handling of cargoes, bunkering, stability conditions, and the stresses imposed and acceptable to each concentrate carrier. The manuals are a concise guide for both ship and shore personnel to ensure safe operation, with emergencies considered and responses planned.

In addition, ship and shore personnel engaged in operations must be aware of hazards arising from cargo operations and from the materials and iron ores being handled. This includes the provision of Material Safety Data Sheets (MSDS) information and any additional training required.

3.2.2.4 Canadian Charts and Publications

All vessels entering Canadian ports, whether Canadian or foreign registered, are required to carry charts and marine publications as set out in the Canadian Charts and Nautical Publications Regulations 1995.

Note 1:

Details of Canadian routes and reporting requirements are set out in the Annual Notice to Mariners which is normally re-issued every April.

Note 2:

In order to maintain the above listed items corrected up-to-date, the vessel must obtain copies of the Weekly Notices to Mariners.

3.2.2.5 Ice Navigation

Enfotec Technical Services, the ice navigation consulting arm of Fednav, conducted an ice and marine shipping assessment in support of the Project (Enfotec 2010). This assessment provided a description of the ice conditions that occurred along the access route to potential port sites for the Mary's River iron ore Project at Milne Inlet, Nanasivik, East of Baffin Island (collectively the North Baffin Sites) and Steensby Inlet, Nunavut. The study included a detailed analysis of the series of winter ice atlases of the region compiled by the Canadian Ice Service since 1990, as well as numerous satellite images, to delineate areas of old ice concentration, ridged and pressured ice, as well as shear zone locations. The ice study supported the selection of Steensby Port Site as a port location, defined the proposed shipping lanes, and determined the appropriate ice class of the proposed vessels.

Ice conditions along the shipping route (extracted from Enfotec 2010) are as follows:

- The waterway in the access to the proposed Steensby Port Site develops land-fast ice each winter. The southern anchor of the shore fast ice reaches Koch Island. The boundary between the land-fast ice and the mobile pack ice of the northern Foxe Basin represents a diverging ice edge over the winter with the result that an open water lead is usually present off the fast ice edge. The additional benefit of this diverging condition is that no shear ridge occurs along the landfast ice edge in winter. There is an average of 35 nautical miles of landfast ice leading to the Steensby Port Site;
- The closest ice thickness measurement station to Steensby Port Site is located to the southwest at Hall Beach. Measurements at this station have recorded average ice thickness at the end of the winter's growth of 192 cm with extremes of over 250 cm. These thicknesses average 5% to 10% more than those recorded at Pond Inlet. The landfast ice is very level with few ridges or leads and there is no possibility that old ice can become entrained in the landfast ice as can be the case in Eclipse Sound;
- The first sign of the spring break-up is the widening of the leads found in northern Foxe Basin and along the south coast of Baffin Island during the month of April and May as solar radiation increases in the region;
- Ice reduction is slow and gradual during the months of June and July as Hudson Strait clears of sea ice and the ice edge in the Foxe Basin retreats northward;
- The landfast ice of Steensby Port Site starts to fracture in late June along the southern portions and progresses to complete fracture of the Inlet by the fourth week of July;
- The pack ice of the Foxe Basin continues to reduce during the months of August and September as strips and patches of ice in the basin gradually melt. In rare cool summers some of this remnant pack ice will remain in the Foxe Basin to become second year ice by October 1;

- Sea ice can commonly occur in the access channels up until the month of September before clearing. The incidence of first year ice surviving the summer's melt has reduced in recent years and now only occurs approximately in 10% of summers; and
- Freeze-up starts in late October with new/young ice expanding southward from northern Foxe Basin and extending eastward through Hudson Strait by December.

3.2.2.6 Winter Routing

The total annual estimated 204 transits by the icebreaking ore carrier fleet to and from Steensby Port Site correspond to some 136 transits that will occur during the period November through June, when air temperatures result in the formation of ice within the ship track. Evidence of the ship track in the mobile pack ice south of the Steensby Port Site fast ice edge will quickly disappear due to the movement of the ice by winds and tide.

3.2.2.7 Routes Through Landfast Ice

Within the landfast ice of Steensby Port Site, the ship track will remain throughout the winter. As a result of the extreme cold, the ship track will quickly begin to refreeze following the passage of the vessel and, due to the frequency of transit through the track, ice formation will be continuous resulting in the build-up of rubble in the track over time. Consequently, the width of the disturbed ice will gradually widen from the initial track of 50 metres to a zone up to 1.5 km wide by late winter.

3.2.2.8 Ship Track Markings

In sections of the track through landfast ice, markers will be established as a caution for travellers who may be on snowmobile and using the area for hunting, travel or other activities. Reflective highway markers will be used and placed along the outer edge of the ship track with the line of markers aligned approximately 500 m clear of the actual ships track. The markers are fibreglass construction approximately 1.5 m long 150 mm wide and 50 mm thick. The surfaces are coated with high visibility reflective paint; Red markers will be used on the eastern boundary and green markers to the west (red right returning). The markers will be placed early each winter season when the ice is safe for snowmobile travel. Weekly patrols will be carried out to ensure the markers are operational and to observe for any signs of travel or other usage in the area of the ships track. Late in each season, the markers will be removed and stored for subsequent re-deployment.

Public notices will be issued to advise communities and travellers of the installation and removal of the markers, informing of their general location and colour coding.

3.2.2.9 Pack Ice Transit

Evidence from the MV Arctic (another ore transport ship providing winter transport through Hudson Strait) transit of Hudson Strait in winter indicates that the ship track is indiscernible in the pack ice within six hours of the ship passing.

3.2.2.10 Coast Guard Ice Breaker Assistance

It is not expected that vessels travelling to Steensby Port Site will require icebreaker escort. However, in the event of need, requests for icebreaker support will be made to the Canadian Coast Guard (CCG) or NORDREG.

3.2.2.11 Inuit Advisors

Local residents with extensive knowledge of the area may be called upon to assist in an advisory capacity to the ship's Master and provide information such as:

- Local tidal information;
- Environmentally sensitive areas or life cycle activities of birds and mammals along the route and possible means to avoid them;
- Harvesting cycles and fishing activities;
- Travel patterns and level of activity;
- Land mass identification;
- Local ice information; and
- Communication with ice monitors.

In addition, the Inuit Advisor may monitor and report on the ship's performance with regard to environmental matters. A checklist can be developed to identify compliance issues and activities that can be viewed and audited. At the end of a voyage, the completed form would be co-signed by the Inuit Advisor and the Ships Master or their representative. The signed-off form would be submitted to the Baffinland Marine Transportation Management Team for review and action, as necessary. The frequency of trips by the Inuit Advisor would probably not exceed one to two a month. The participation rate would be reviewed and adjusted annually as experience is gained with vessel performance.

Inuit Advisors would be selected, and, if necessary, trained for ice observation and monitoring in order to provide reliable and timely information to the ship. As necessary, the Inuit Advisors would use observations from on-ice travel and other available information to enhance safety and expedite travel.

3.3 INSURANCE AND COMPENSATION

3.3.1 Insurance

The ship owner is responsible for insuring the ship hull and machinery. Baffinland will require the owner to have in place cargo insurance to satisfy the carrier's responsibilities under the *Canadian Carriage of Goods by Water Act.* In addition there will be a requirement for the vessels to have standard Protection and Indemnity insurance covering third party claims, including pollution cover, to satisfy the requirements for clean-up, civil liberty and compensation for pollution as required under Part XVI of the *Canada Shipping Act.*

3.3.2 Compensation

The *Canada Shipping Act*, under Part XVI provides the authority and the legislative process for addressing Civil Liability and Compensation for Pollution. This section is in compliance with the *International Convention on Civil Liability for Oil Pollution Damage*, concluded in Brussels on November 29, 1669 and as amended by any protocol that is in force for Canada.

The Civil Liability and Compensation section of the *Canada Shipping Act* establishes the responsibility and procedures for polluters to compensate affected parties for liabilities. It further provides for and requires the ship owner to provide a guarantor under a contract of liability insurance or other similar security relating to a ship owner's liability under the *Canada Shipping Act.*

Section 702 of the Act provides the authority to establish the Canadian Ship-source Oil Pollution Fund. In addition, Canada supports the *"Fund Convention*" meaning the *International Convention on the Establishment of an International Fund for Compensation for Oil* concluded in Brussels on December 18, 1971, and the Protocol concluded in London on November 19, 1976.

The *Canada Shipping Act* through Part XVI establishes the liability of the ship owner for pollution. Section 677. (1) states that the Owner of the ship is liable for the following:

- For oil pollution damage from the ship;
- For costs and expenses incurred by:
  - The Minister of Fisheries and Oceans;
  - A response organization to whom a certificate of designation has been issued pursuant to subsection 660.4(1);
  - Any other person in Canada;
  - Any person in a state, other than Canada, that is a party to the Civil Liability Convention. In respect of measures taken to prevent, repair, remedy or reduce oil pollution damage from the ship, including measures taken in anticipation of a discharge of oil from the ship, to; or
  - The extent that the measures taken and the costs and expenses are responsible, and for any loss or damage caused by such measures; and
- For costs and expenses incurred:
  - By the Minister of Fisheries and Oceans in respect of Measures taken to pursuant to paragraph 678(1) (a) in respect of an monitoring, or in relation to the direction of the taking measures or their prohibition, pursuant to paragraph 678 (1) (b) or (c), or
  - By any other person in respect of measures the person was directed to take, or prohibited from taking, pursuant to paragraph 678 (1) (b) or (c), to the extent that the measures taken and the costs and expenses are reasonable, and for any loss or damage caused by such measures.

Under the Act, the Minister is provided with the authority to take necessary measures, as the Minister deems appropriate. Section 678. (1) states that where the Minister believes on reasonable grounds that a ship has discharged, is discharging or is likely to discharge a pollutant, the Minister may:

- Take such measures as the Minister deems necessary to repair, remedy, reduce or prevent pollution damage from that ship, including the removal or destruction of the ship and its contents, and may sell or otherwise dispose of the ship and its contents;

- Monitor the measures taken by any person to repair, remedy, reduce or prevent pollution damage from the ship; or
- Where the Minister considers it necessary to do so, direct any person to take measures referred to in paragraph (b), or prohibit any person from taking such measures.

Baffinland will continue to develop policies that will provide safe operations and all events will be planned with the intent of reducing, to the greatest degree possible, accidental discharges.

3.3.3 Identification of Third Party Liabilities

Section 712 of Part XVI of the *Canada Shipping Act* provides the instrument for claims for loss of income due to a pollution event for:

- An individual who derives income from:
  - Fishing;
  - The production, breeding holding or rearing of fish; or
  - The culture or harvesting or marine plants.
- The owner of a fishing vessel who derives income from the rental of fishing vessels to holders of commercial fishing licenses issued in Canada;
- An individual who derives income from the handling of fish on shore in Canada directly after the landing thereof from fishing vessels;
- A person who fishes or hunts for food or animal skins for his own consumption or use;
- A person who rents or charters boats in Canada for sport fishing; or
- A worker in a fish plant in Canada.

A person affected as a, result of a discharge of oil from a ship and whose losses are not recoverable otherwise under any other law, may, within a prescribed time limit, file a claim with the Administrator for past or future loss.

3.4 EXPERIENCE OF OTHERS; LESSONS LEARNED

The following discussion addresses the experience with winter shipping for two northern Canada mining projects – Voisey's Bay and Raglan. The focus of this text is on the applicability of lessons learned to the Mary River Project and the implications for shipping to Steensby Port and Milne Inlet.

3.4.1 Voisey's Bay

Voisey's Bay Nickel Company, now Vale Newfoundland and Labrador Ltd. (VNL) began operation of a nickel-copper-cobalt mine and concentrator operation at Voisey's Bay Labrador in 2005. Ore is mined from an open pit mine, processed on site and shipped to markets in the south. Approximately 1,250,000 tonnes of nickel-copper-cobalt concentrates and some 150,000 tonnes of copper concentrate are shipped out annually. Most of the nickel-copper-cobalt concentrates and all of the copper concentrate is shipped in the "open water" season - that period when no land-fast ice is present. Up to four cargoes are shipped

through land-fast ice in the January to March period. The mine is a fly-in/fly-out operation, employing approximately 450 people working on a two-week rotation. The shipping Port in Edwards Cove, Anaktalak Bay is approximately 35km south of Nain, the closest community to the mine site. The east-west shipping route crosses seven travel routes used by small boats and snowmobiles that transit to cabins or other communities along the coast.

During construction, all shipping was carried out during the open water season. Mine and mill production started in 2005 with the first winter shipping in January 2006. At the time it was first proposed, the Voisey's Bay project was within the overlapping land claim areas of the Labrador Inuit Association (LIA) and the Innu Nation. The LIA land claim has subsequently been settled and the territory around which the Project is located is now known as Nunatsiavut and is governed by the Nunatsiavut Government. The Innu Nation land claim is still under negotiation with the federal and provincial governments. Impact Benefits Agreements have been signed between VNL and both aboriginal organizations.

Impacts Benefit Agreement

In March, 1999, following completion of the environmental assessment and release of the Panel report, the Government of Canada and the Government of Newfoundland and Labrador gave the Company approval to proceed with the project. The next step was the negotiation of Impacts and Benefits Agreements with the Innu Nation and the LIA. Agreement on the IBA between the LIA and the Company was reached in 2002 and included a commitment that the Company and LIA would negotiate a Shipping Agreement to address the terms and conditions of shipping in open water and through land-fast ice in winter. Inuit ratified the IBA in June, 2002 and the IBA was signed in July of that same year. As follow-up, a Shipping Agreement was negotiated and signed within one year following the signing of the IBA. The Shipping Agreement addressed a number of issues, including:

- Ship design;
- A test run into land-fast ice along the proposed shipping route using the MV Arctic;
- The construction of "ice bridges" across the ship's track;
- The schedule for winter shipping and the identification of sensitive periods;
- Identification and agreement on a shipping route as well as safe anchorages along the route;
- Design of an environmental effects monitoring plan for the marine environment; and
- Use of local Inuit Advisor/Monitors on board ships.

The Shipping Agreement sets out terms and conditions to apply to winter shipping that are: grounded in Inuit experience; require Inuit involvement in the implementation and ongoing monitoring of winter shipping; and respect and protect the relationship of Inuit to the sea, sea ice and the marine resources while taking into account the operational needs of the project. (Rowell and Metcalfe, 2005)

Operations

After four years of operation, there have been few unanticipated consequences associated with winter shipping; however, it has been noted that the ice-freeze rates of the 30m wide ship's track has been slower than predicted. Rather than the two to five hours predicted in the EIS, the track has taken up to several days to re-freeze resulting in subsequent delays in the provision of safe crossing sites. During the winter of 2006 the *MV Umiak 1* made eight transits of Anaktalak Bay between January 23 and February 21 (Sikumiut 2008a). In terms of weekend travel, of the eight weekend days, there were four

with unsafe track. Three out of four weekends had some period of time where the track was unsafe and there was one occasion when the track was unsafe for the entire weekend. Similarly, in 2007 of the eight transits of the *MV Umiak 1* between January 23 and April 4, there were seven weekend days with unsafe crossings and seventeen with safe crossings. In total, six out of twelve weekends had some period of time where the track was unsafe, including one weekends where the track was unsafe for the entire period (Sikumiut, 2008a).

VNL provides the local community residents along the North Coast with information on vessel transits through a variety of means, including Notices to Mariners, public radio broadcasts, posted signs, web-site notification and a dial-in phone number. Each year, in advance of the winter shipping season, a series of public open-house style meetings are held to inform people of the winter plans and to receive feedback on aspects of the shipping program (provision of notices, placement of markers, signs and crossings, use of the detour).

For those who choose to do so, a detour route has been made available so that travelers can come ashore at the Edwards Cove port and follow a designated trail around the dock to reach the opposite side of the ships track. As compensation for the extra travel distance, gas is made available at the Port Site for snowmobiles.

VNL has contracted an Inuit company to carry out its Ship's Track Maintenance Program. A work team marks the ship's track to ensure it is visible to the public. Up to approximately 70 km of track are marked annually with green markers on the south side and red on the north side. A higher density of markers is provided around the port area where the area of disturbed ice is relatively greater due to vessel turning and docking maneuvers. These markers provide the traveling public with a better sense of the track presence and orientation, thereby adding an extra element of safety.

The Inuit company also establishes and marks the safe crossing locations at designated locations along the route. In 2007 VNL commissioned the development of a pontoon-type bridge in order to shorten the period of time it takes before snowmobile traffic can safely resume crossing the track. A prototype was successfully tested and a full system fabricated and deployed in the 2008 winter shipping season (Sikumiut, 2009). The pontoon units take between two and four hours to deploy and about the same amount of time for recovery by two three-person work crews (one each side) using snowmobiles and some specialty equipment (line throwers, winches). A second unit is to be placed into operation for the 2011 shipping season.

Community Monitoring

Socioeconomic surveys (Sikumiut 2008a, Sikumiut 2008b) conducted in 2007 as part of the environmental effects monitoring program for the project have identified the following concerns expressed by survey respondents (residents of Nain) regarding winter shipping:

- The Ship's winter track has restricted spontaneity about when and where to travel.
- Safety concerns regarding ice thickness in the track had led some to choose not to travel across the track, but to use a detour, or not to travel at all.
- Reduction in amount of travel people do due to the presence of the Ship's track.

- Concerns regarding the reliability of the signal equipment (beacons and poles) used at designated crossing locations.
- Some felt that the signage used at main crossing locations included too much information and was not explicit enough.
- Some expressed a continuing concern that the presence of winter shipping would reduce the amount of time spent in the country, and hence the access to wild food.
- Some secondary effects were raised as concerns, including the reduced opportunity to pass on traditional knowledge to younger generations, as well as a potential reduction of women's role as women have more responsibilities on the land than in the community.
- There was an expressed wish among some respondents for improved communications to the public regarding track crossings.

It is evident from these responses that there are individuals in Nain who are being affected, (or perceive that they are being affected) by the project and that, while the mitigation measures implemented for the ship's track have been effective, some residual effect remains. During community meetings held at the end of each winter shipping season, residents have expressed strong support for the use of the pontoon crossings and many felt that this device and its rapid deployment appears to have addressed many of their concerns. The use of an aboriginal company to provide the ship track maintenance service was seen as a very positive step. In fact, the most popular means of checking on vessel transits and condition of the track was through direct contact with the contractor's Inuit field personnel.

Lessons Learned and Project Implications

In the context of shipping in northern Labrador (Voisey's Bay) the following observations of relevance to this Project can be made:

- As a safety measure the ships track through land-fast ice in areas of other (snowmobile) traffic is clearly marked to ensure it is visible to travellers. Similar markings might be practical in the approaches to Steensby Inlet.
- The provision of "safe crossing" locations across the ships track is reliant on timely track refreeze rates, and this timing is variable given the weather conditions experienced near the Voisey's Bay Project Site.
- In order to deal with the issue of variable timing of ice refreezing, pontoon ice bridges have been successfully developed and deployed, however the mechanics of such an operation might not be practical for application in a situation of high frequency marine traffic and a relatively wide ships track (52m vs. 30m).
- The provision of a detour route provides safe passage, albeit longer travel time, around the ship track. Such a route needs to be clearly marked and easily accessible for travellers.

- In order to avoid disruption in ice formation and to protect local ringed seal populations during whelping, shipping is suspended during two specified six week periods (December- mid-January during freeze-up and early-April-mid May).
- In order to utilize local aboriginal knowledge, local Inuit Advisor/Monitors are required aboard selected vessels and trips.
- Both VNL and the Inuit have benefitted from the Project. VNL has been able to develop the mine and extract and ship the nickel concentrate to market, economically and efficiently. The Inuit have benefitted through provisions of the IBA, direct employment at Site and through increased opportunities for Inuit businesses and other induced economic benefits.
- Despite various mitigation measures, there is still some concern expressed by residents over the restricting winter travel caused by the presence of the ships track.

3.4.2 Raglan Mines

The Raglan nickel-copper mine is situated near the Hudson Strait, on the north shore of the Ungava Peninsula, in Nunavik. The concentrate is shipped from Deception Bay via Hudson Strait. The mine began production in 1997 after more than 30 years of exploration, negotiation, and development. In August 2006, Xstrata PLC acquired ownership of Falconbridge Limited and has been operating the Raglan mine under the Xstrata Nickel business unit since that time. Today, the nickel and copper-producing facility operates three underground mines and one open-pit mine. The ore is crushed and treated at the Raglan Mill and the concentrate is trucked 100 km to the Deception Bay Port where it is stored and transferred to ships for transport. The nearest Inuit villages to the Raglan site are Salluit and Kangiqsujuaq. The current mine life is estimated at more than 30 years (NR Canada website http://www.nrcan.gc.ca/smm-mms/abor-auto/htm/rgl-07-eng.htm).

In 1995, the Raglan Agreement was signed between the mine operator, the Qaqqalik Landholding Corporation of Salluit, the Salluit community, the Nunaturlik Landholding Corporation of Kangiqsujuaq, the Kangiqsujuaq community, and Makivik Corporation, which oversees the political, social, and economic development of Nunavik. The agreement includes profit-sharing measures and trust fund payments over an 18-year period. The agreement also guarantees preferential hiring and contracting to local, qualified Inuit employees and businesses. The Raglan Committee meets several times each year to discuss environmental concerns and to report on the progress of the agreement. Inuit representatives from Salluit, Kangiqsujuaq, and Makivik Corporation occupy half of the committee's six seats with mining company officials holding the balance.

Environmental Mitigation Measures:

Environmental mitigation measures were identified in the project Environmental Impact Statement (Falconbridge, Raglan EIS 1994). Measures to reduce the effects of winter shipping include the following:

- The number of ship voyages for supplying of goods and shipping of concentrate is limited to six per year (three in winter).

- Shipments are not made during the period from mid-March to mid-June to avoid seal whelping (delivery and nursing of seal pups) as well as the period during which hunting activities are favoured.
- "S" movement of ship through the ice will facilitate ice re-formation and prevent early ice break-up of Deception Bay ice cover. Such movement allows for "pieces to fit together like a jigsaw puzzle".
- Staff will take training courses on procedures to follow in order to prevent any risk of accidental hydrocarbon spills.
- Local communities are advised of the schedule and route of vessels accessing Deception Bay during the ice season to minimize the risk of snowmobiles encountering open channels and to minimize interference with hunting and fishing activities.
- A protocol will be set up for advising of the passage of ice breakers in high risk areas, particularly Deception Bay and the boundary of Hudson Strait and Deception Bay, in order to minimize safety risks to area snowmobilers. The protocol will consider the nature of the ice cover in the bay and the time required for refreezing of the path cut by the icebreakers during the various seasons. Some mitigation measures, in particular the creation of ice bridges at passages chosen by Inuit users, will be applied by work crews to ensure safe passage in the ship's path.

Lessons Learned

In 2002, as part of an ongoing dialogue towards developing the Shipping Agreement between Voisey's Bay Nickel Company and the Labrador Inuit Association, a site visit to the Raglan Mine was undertaken by representatives of both parties to gain a better understanding of the effects of winter shipping. The observations of this team serve as a good overview of lessons learned from winter shipping at the Raglan Mine site. The observations and conclusion presented in Site Visit Report (Dicker *et al*. 2002) include the following:

- A 25 day old ship track was very easy to see from the ice (and from the ship's radar) due to the roughness of the area as compared with the undisturbed landfast ice. The track was also difficult to cross due to the rough surface.
- The MV Arctic travelled easily through Deception Bay through 0.6m thick land-fast ice at a speed of 11 knots.
- The ship had little effect on the land-fast ice outside the width of the vessel itself. Cracks tended to run parallel to the track, not perpendicular. The ice adjacent to the track did not tend to separate and move into the track.
- Standing 50 -100m from the vessel as it travelled through the land-fast ice, it was possible to feel a slight vibration in the ice and hear the vessel. The most notable noise was from the breaking ice, however overall the noise level seemed quite low.
- The MV Arctic can stay within the previous track on each winter passage, so that the disturbed area is little greater than one ship width (approximately 22.5m). Even though the refrozen ice within the track can be thicker than the surrounding undisturbed land-fast ice, the edges of the track tend to be

the thickest areas, so that the vessel tends to stay within these two edges, except when the ship manoeuvres to dock and where it makes a "star" turn on departure.

- The ice left behind the vessel in the track was quite broken up and consisted of a range of about 2 – 3 m sized pans down to "slob" (frazil). The refreeze rate of the track was such that at least twenty-four hours would be required before a snowmobile could cross. The roughness of the track would also impede travel.
- We observed the process of establishing the ice bridge once the vessel had pushed back a pile of rubble. A crossing location is selected where the ice has become well consolidated, but is relatively smooth. A two- person team from Saluit use ice chisels to knock down the ridges and rough spots to produce a clear path. The "Ice Bridge" signs are placed in chiselled holes on either side of the track. The entire operation took about thirty minutes.
- In the ice bridge location (where the ship had pushed up the pieces), we crossed on foot within 24 hours after the ship had passed by. Once the rough ice was chiselled, the snowmobiles passed as well.
- Hunters showed up within one hour of completion of the ice bridge; however it is not clear whether this was a coincidence or evidence that the communication protocol was working efficiently.

The site visit team also identified two other issues:

- According to the Captain, ballast water transfer procedure is fairly routine and does not impede ship progress. In any case, it is a simple matter to confirm that ballast water exchange has occurred (e.g., by testing salinity).[1]
- The flagging material and the swivel arrangement that is used to mark the road at the Raglan site appear to be a good solution to the severe wind and temperature conditions along the road route.

Ballast water (freshwater) taken on at Quebec City is exchanged for salt water in the Gulf of St. Lawrence and as required by Ballast Exchange Guidelines is exchanged again off Labrador outside the continental shelf.

SECTION 4.0 - MITIGATION MEASURES

The planned operation of vessels serving the Project will involve a series of measures designed to detect, reduce or eliminate negative environmental effects, including pollution reduction as well as preparedness capability to address unplanned event. Also included in this chapter is a description of measures to address Port Security, including smuggling, an activity that could have negative socio-economic effects.

4.1 ONBOARD WASTE MANAGEMENT

All vessels will have Waste Management Plans for sewage and solid waste.

4.1.1 Sewage

All vessels are to be fitted with an approved sewage treatment plant which operates to Canadian standards or a holding tank with sufficient capacity to meet the grey and black water requirements of the ship for the duration of her time in port. A diesel-fired incinerator for incinerating oil waste and sludge from the sewage plant will be installed in the incinerator room on board. Vessels will not discharge effluent from treated sewage while at Steensby Port or Milne Port.

4.1.2 Solid waste

In accordance with MARPOL and the *Arctic Waters Pollution Prevention Act,* no solid waste materials or garbage will be disposed of in Canadian waters. As no facility exists to dispose of foreign or Canadian ship waste materials or garbage at either Steensby Port Site Terminal or Milne Port, such materials will either be incinerated or retained onboard and later disposed of in accordance with Canadian and International regulations.

4.2 BALLAST WATER MANAGEMENT

Ballast is water taken on in chambers of vessels mainly to stabilize sea-going vessels by adding weight to them and maintaining a specified draft (the depth a vessel sits in the water). Vessels empty of cargo take on much more ballast than a fully laden ship. For icebreakers, ballasting is also used to keep the ice draft of the vessels constant, and to stabilize the ship, thereby optimizing stresses in different loading conditions.

In order to reduce or eliminate the risk of invasive aquatic species and pathogens being introduced into Canadian waters as a result of shipping, all ships will exchange ballast water in accordance with the *Ballast Water Control and Management Regulations* (Transport Canada 2006). The regulations require that ships transiting to Canadian ports exchange ballast water at sea in deep water away from coastal zones. This measure limits the potential for foreign harmful aquatic organisms or pathogens to be released in Canadian waters where they may colonize.

Baffinland is committed to conducting both a mid ocean exchange and using an IMO and North American (Canadian) Coast Guard approved BWTS to treat ballast water. Ballast water will be exchanged in the mid-North Atlantic Ocean, which is part of the same ocean regime as Steensby Port. The ballast water exchange will occur as per IMO Ballast Water Convention Regulation D-1 and as described in Section 6(1) of the Canadian Ballast Water Control and Management Regulations. The exchanged ballast water will

then be treated by the BWTS onboard the vessel during the remainder of the voyage. While the specific BWTS has yet to be chosen, typical system involves a combination of the following techniques:

- Filtration (e.g., wedge wire, weave wire, membranes, hydro cyclones, flocculation and disc filter);
- Mechanical/Physical Mechanism (e.g., cavitation, vacuum, ultraviolet (UV) light, heat, oxygen stripping, and acoustic treatment); and
- Active Substance (e.g., ozone, sea water electrolysis, sea water electrodialysis, electro-dialysis, additives, and catalyst).

Upon arrival at the port, the ships will discharge the treated ballast water to allow for loading the ship with ore. During winter the full ballast is required to assist in ice breaking and so the entire amount of ballast water (approximately 200,000 m^3) will be discharged at the ore dock. During summer, the ships may discharge ballast water along the shipping route before arriving at the dock. In such cases only a partial load of ballast (in the order of 70,000 m^3) will be discharged at the ore dock.

Ballast Water Management Plans are specific to individual ships. Appendix 5 outlines the major elements and requirements of a plan acceptable to Baffinland. Appendix 6 outlines the IMO Ballast Water Treatment System Approval process.

4.2.1 Anti-fouling Management

Fouling is the unwanted growth of biological material such as barnacles and algal on the surface of a hull submersed in water. Vessels not protected by an anti-fouling system may gather up to 150 kg fouling per square meter in less than six months at sea (IMO 2002). Even a small amount of fouling can lead to an increase of 40 to 50 % in fuel consumption. Fouling of vessel also acts as a method by which non-native organisms may enter into new waters.

Baffinland is committed to meeting the IMO International Convention on the Control of Harmful Anti-fouling Systems on Ships. As per Annex I of the convention (and Schedule 6 of the Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals (2007-86)), the anti-fouling system will

- not bear organotin compounds on their hulls or external parts or surfaces; or
- bear a coating that forms a barrier to such compounds leaching from the underlying non-compliant anti-fouling systems.

In order to reduce or eliminate the risk of invasive aquatic species and pathogens being introduced into Canadian waters as a result of fouling of vessels, an anti-fouling system will be in place on all vessels that will arrive and depart from Milne and Steensby Port. The anti-fouling systems used have yet to be determined but will comply with the anti-fouling convention as well as be approved under the Pest Management Regulatory Agency of Canada and Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals (2007-86). This convention prohibits the use of dangerous organotin chemicals in anti-fouling systems. Any anti-fouling system that has a component listed under Annex I of the convention will not be used. The potential anti-fouling systems include:

- Organotin-free polishing type paint;
- Organotin-free ablative type paint;
- Organotin free conventional type paint;

- Biocide-free silicon type paint; and
- Other biocide-free paints.

As the iron ore carriers to be constructed for the Project will exceed 400 gross tonnage, and undertake international voyages, the vessels will require an International Anti-fouling System Certification. Surveys will be conducted on new vessels to verify that the anti-fouling system complies with the IMO convention.

4.2.1.1 Anti-fouling Sampling

Sampling of the anti-fouling system will follow the Guidelines for Brief Sampling of Anti-fouling Systems on Ships (MEPC.104(49)). The number of samples taken will be representative of the ship's hull and occur at areas where the anti-fouling system is intact. A minimum of four (4) sample points, equally spaced down the length of the hull will be taken.

Sampling of the anti-fouling system will occur quarterly each year, as well as when the vessels are dry-docked. Sampling will not occur where the anti-fouling coating is visibly damaged or on block mark areas on the flat bottom of the ship (where intact anti-fouling system is not applied). Sampling adjacent to or below areas of damaged anti-fouling coating should also be avoided.

When an appropriate sample point on the hull has been selected, any fouling present should be removed with water and a soft sponge or cloth. Any organisms collected will be delivered to an accredited laboratory for species identification. If the sampling is occurring during dry-dock, sampling should occur after the hull has been water washed.

The number of samples taken at each sample site will allow for a retention quantity for back-up and storage. For dry samples, triplicate specimens of paint at each sampling point should be taken approximately 10 cm from each other. Should more than one type of anti-fouling system be present on the vessels, sampling will be taken from all anti-fouling systems when access is possible.

Samples will be sent to accredited and recognized laboratories meeting the ISO 17025 standard.

4.2.2 Monitoring and Sampling

A ballast water monitoring plan will be developed and incorporated into the Environmental Monitoring Program. The goal of the ballast water monitoring plan will be to ensure that the BWTS is working properly and to identify any non-native organisms that may be present within the discharged ballast water and waters surrounding the ports. Water chemistry data will also be collected in a separate monitoring program and will be incorporated into the results where applicable.

Monitoring and sampling plans for treated ballast water discharge will follow IMO Guidelines for Ballast Water Sampling (G2) MEPC.173(58) and will be integrated into the Project AEEM Program. Monitoring and sampling of ballast water will occur onboard the vessel itself as well as within Steensby Port. Sampling onboard the vessel will occur in order to verify that a mid-ocean transfer has occurred as well as to ensure that the ballast water treatment system is fully functional and in compliance. Onboard sampling will occur along the ballast water discharge line in order to capture an accurate representation of the treated ballast water that will be discharged. The sampling locations will be taken into consideration during the design of the vessel and selection of ballast water treatment system.

Sampling protocols will be created and strictly followed to ensure quality control and assurance. To date the IMO does not recommend a specific sampling or analysis protocol. As more information becomes available and testing regimes are developed by manufacturers and nation members of the IMO, the sampling and analysis protocols will be updated to reflect any changes. Due to the fact that concentrations of organisms vary throughout the ballast water, it is recommended that, if possible, sampling should occur at various locations during the ballast water discharge process (Gollasch, 2006). At least two random samples will be conducted during sampling events.

In addition to the analysis of water samples, integrated water samples will be collected for phytoplankton analysis. Plankton net surveys for zooplankton and larval fish will also be conducted and residual sediment in the ballast tanks will be sampled to test for phytoplankton resting stages.

Monitoring and sampling protocols will be designed in consultation with appropriate provincial and federal agencies. In addition to the onboard sampling, control sites within Steensby Inlet and impact sites that are anticipated to interact with discharged treated ballast water within Steensby Port will be sampled. This program will be implemented as part of AEMP for the Project.

Samples will be analyzed at an accredited laboratory to determine whether the ballast water treatment system is functioning properly. Results will be reported annually.

4.2.3 Mitigation

The introduction of non-native species will be mitigated by the installation and operation of an IMO approved BWTS.

4.3 FUEL AND DANGEROUS GOODS

As there is a total prohibition in place with respect to the discharge of any oil, oily water or dangerous goods in Arctic waters, all vessels will:

- Comply with the *Oil Pollution Prevention Regulations* and maintain an approved shipboard oil pollution emergency plan (SOPEP);
- Have oil spill clean-up materials available onboard the vessel at all times;
- Conduct exercises with the Terminal staff at regular intervals to ensure ship and shore can co-operate to minimize the damage from any spill of fuel;
- Maintain an up-to-date oil transfer record book covering the disposal of engine room sludge and the discharge of oily water through a separator;
- Maintain a separate record book for oil cargo and the treatment and disposal of cargo slops;
- Provide copies of the Ships' Oil Spill Response Plans to Baffinland;
- Conduct exercises to test the ship and shore joint capability to handle an oil pollution incident in accordance with the provisions of the Ships' Oil Spill Response Plan and the Baffinland Oil Pollution Emergency Plan (OPEP);

- Ensure that all hazardous materials are stored and handled as per information provided in Material Safety Data Sheets (MSDS); and
- Ensure that all dangerous goods are transported as per requirements under the *Transportation of Dangerous Goods Act* and R*egulations.*

4.4 SECURITY

Security issues include both port security and smuggling prevention.

4.4.1 Port Security

Port security is governed by the Port Securities Transportation Act (Transport Canada). The aim of this legislation is to reduce the risk of security threats by preventing unlawful interference with the marine transportation system. This is achieved, in part by conducting background checks on marine workers who perform certain duties or who have access to certain restricted areas.

4.4.2 Smuggling Prevention

Customs and Immigration clearance are required for:

- Foreign registered vessels arriving from or sailing to an overseas destination; and
- Canadian registered vessels arriving from an overseas port.

Measures to prevent smuggling include:

- Bonded lockers are to be locked and sealed by Customs and Immigration officials on the vessel's arrival.
- The Master of each ship will inform crew that no alcohol or tobacco is permitted to be taken ashore.
- Any crew member who, on disembarking the vessel is found to be carrying alcohol or drugs, or is suspected of being under the influence of alcohol or drugs, will be returned onboard the vessel by security staff and will face disciplinary action.

4.5 MARINE WILDLIFE

The Project Environmental Assessment will make predictions as to the effect of the anticipated Project-environment interactions. From this will flow an Environmental Effects Monitoring Program which will serve to confirm the effects predictions made, as well as to evaluate the effectiveness of mitigation measures.

Potential interactions between shipping activity and marine mammals are generally related to either the issue of human-generated noise or direct impacts from accidental events such as collisions or hydrocarbon spills. Onboard monitoring and mitigation programs are designed to address these two phenomena. The text which follows describes a typical mitigation and monitoring program. This will be modified and updated as the specific monitoring plans are developed. Baffinland will work with the QIA and other relevant agencies in developing a marine mammal management framework.

4.5.1 Marine Mammals

During consultations for the Project, one of the key concerns was the potential effects of shipping on marine mammals. The issues identified included:

- Influence of noise on whales, seals, and walrus;
- Changes in landfast ice habitat for seals; and
- The risk of vessel collision with marine mammals.

These effects have been assessed in this EIS (Volume 8). In addition, the effects of construction activities which introduce noise into the marine environment were assessed in detail. An accidental release of fuel from a vessel could also affect marine mammals but preventative measures and contingency planning substantially reduces the risk of such an event.

4.5.1.1 Interactions and Potential Effects

Noise

Vessels are major contributors to background sound in the ocean. While in transit, ships emit underwater noise from their various components, including onboard machinery and propellers. Noise spectra from large ships, like the ore carriers proposed by Baffinland, are generally dominated by propeller cavitation noise. Vessels transiting through ice also create noise from the ice breaking process but most of the increase in sound level is due to the increased load on the vessel and increased cavitation. The dominant tones from large vessels are typically less than 100 Hz (Richardson *et al*. 1995). Radiated noise is roughly related to ship size, speed, and mode of operation.

The environmental effects of noise on marine mammals are highly variable, and can be categorized as follows (based on Richardson *et al*. 1995):

- The noise may be too weak to be heard at the location of the animal (i.e., lower than the prevailing ambient noise level, the hearing threshold of the animal at relevant frequencies, or both);
- The noise may be audible but not strong enough to elicit any overt behavioural response (i.e., the animal may tolerate it); or
- The noise may elicit subtle behavioural reactions (such as changes in respiration) or other changes that are detectable only by statistical analysis, up to active avoidance reactions.

Upon repeated exposure, animals may habituate, i.e., exhibit diminishing responsiveness. Alternately, disturbance effects may persist, especially in cases where the sounds are highly variable in characteristics, unpredictable in occurrence, and associated with situations that the animal perceives as a threat.

Any human-made (anthropogenic) noise that is strong enough to be heard has the potential to reduce (mask) the ability of marine mammals to hear natural sounds at similar frequencies, including calls from other animals, echolocation sounds, and environmental sounds such as surf noise or ice noise.

Very strong sounds have the potential to cause temporary or permanent reduction in hearing sensitivity, or other physical or physiological effects. Received sound levels must far exceed the animal's hearing threshold for any temporary threshold shift to occur. Received levels must be even higher for a risk of

permanent hearing impairment. Marine mammals are not expected to be exposed to sound levels from shipping that would be high enough to cause hearing impairment.

Change in Ice Habitat

Ore carriers travelling along the Steensby Inlet shipping route will change the ice; however in pack ice any changes will be temporary. Changes in the landfast ice will however persist for the duration of the ice-covered period. In Steensby Inlet, an estimated 136 km^2 of landfast ice at the ore dock and along the shipping route will be changed so that it is likely to be less suitable for the creation of ringed seal lairs and perhaps breathing holes. This is a relatively small proportion of the landfast ice available to seals along and near the shipping route. There is potential to modify the shipping route through the landfast ice (during spring only) if monitoring reveals that large pieces of landfast ice prematurely leave the Inlet as a result of icebreaking. Following a zig-zag pattern within landfast ice can serve as a practical mitigation measure to reduce or eliminate this phenomenon. The reduction of vessel speed through the melting ice may also be employed as a means to moderate the bow-wave and wake effects on the ice.

Collisions

Collisions between ships and marine mammals occur infrequently. Laist *et al*. (2001) reported that such events usually occur when vessels are travelling at a rate of speed greater than 14 kt. In order to prevent collisions from occurring, the maximum speed will be 14 kt. During the October to June period when the ore carriers will be travelling through pack ice and some landfast ice, the ship speed is expected to average 7 kts. During the open water period, the ore carriers will travel at a maximum speed of 14 kt, while the supply vessels transiting into Milne Inlet will reduce their speed to 10 kt.

During consultations for the Project, community members expressed their concern about the effect of icebreakers on ringed seal pups in the landfast ice. It was noted that Steensby Inlet provides habitat for seal whelping and that icebreakers which transit through areas with seal lairs might kill the pups (Arctic Bay Working Group and Public Meeting; Hall Beach Public Meeting; Igloolik Marine Mammal Workshop; Pond Inlet Working Group and HTO Meeting). On the other hand, the risk of collisions with adult seals, walrus, whales and especially polar bears was considered to be very low.

Spills

Spilled oil may affect marine wildlife through dermal contact, inhalation, ingestion and/or fouling of baleen plates. Potential effects will be short-lived due to the high volatility and relatively small volume of the spilled oil (diesel or kerosene) and confinement to surface water. No significant adverse effects are anticipated for marine mammals as a result of small volume accidental spills. Following clean-up, surface water quality will be sampled from locations of spills annually.

4.5.1.2 Mitigation Measures for Shipping

In Volume 8 of the EIS, specific mitigation measures for each the marine mammal species were discussed. The mitigation measures are summarized below.

Table 2 Mitigation Measures for Marine Mammal

Project Activity	Mitigation Measure(s)	Species
Construction Phase		
Dock construction: blasting (Steensby only), drilling (Steensby only), dredging, and vessel traffic near dock sites	• Docks to be designed to minimize footprint. • Blasting control plan as per DFO blasting guideline (e.g., Wright and Hopky, 1998); meeting 100 kPa overpressure limit; • Monitoring for marine mammals in the blasting safety zone (500 m); • Drilling in late April/early May. Reduce vessel idling at dock site	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale, Polar Bear
	• Bubble curtain system	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale
	• Blasting in late May to ensure that pupping and nursing periods are avoided; • Acoustic seal deterrent to prevent seals from entering blast zone	Ringed Seal, Bearded Seal
	• Use of bear monitors for on-ice activities	Polar bear
Vessel traffic to/from Milne and Steensby ports (open-water period only)	• Maintain constant speed and course when possible. • Reduce vessel speed in Milne Inlet. • Reduce vessel idling. Vessel to be designed to limit noise output.	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale, Polar Bear
Aircraft Overflights	• Maintain altitude of 450 m over marine waters when possible. • Aircrafts prohibited from flying over marine mammals for sightseeing or photography.	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale, Polar Bear
	• Aircraft prohibited from flying over walrus haulouts for sightseeing or photography; • walrus haulouts to be identified on maps prior to flights.	Walrus
Operation of worker camps	• Educate workers on bear safety; • Work areas to be kept clean of garbage, food scraps and toxic materials; • Use of bear deterrent devices	Polar Bear

Table 2 Mitigation Measures for Marine Mammal (Cont'd)

Project Activity	Mitigation Measure(s)	Species
Operations Phase		
Vessel traffic to/from Milne Port (open-water period only)	• Maintain constant course and speed when possible. • Reduce vessel idling time at dock. • Vessel to be designed to limit noise output.	Ringed seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale, Polar Bear
	• Reduce vessel speed in Milne Inlet	Ringed Seal, Bearded Seal, Beluga, Narwhal, Bowhead Whale
Vessel traffic to/from Steensby Port, including ice management at the dock	• Reduce vessel idling time at dock. • Minimize footprint of ice disturbance at ore dock and along shipping route. • Reduce vessel speed in pack ice and landfast ice. • Shipping lane in landfast ice to be delimited with markers. • Vessel to be designed to limit noise output. • Marine mammal observers to be on select vessels to identify response and behaviours from shipping activities. by marine mammals	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale
	• Commence ice breaking activity prior to period of lair and breathing hole creation	Ringed Seal, Bearded Seal
	• Maintain constant course and speed when possible.	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale, Polar Bear
Aircraft Overflights	• Maintain altitude of 450 m over marine waters when possible. • Aircrafts prohibited from flying over marine mammals for sightseeing or photography.	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale, Polar Bear
	• Aircraft prohibited from flying over walrus haulouts for sightseeing or photography; • walrus haulouts to be identified on maps prior to flights.	Walrus
Operation of worker camps	• Educate workers on bear safety; • Work areas to be kept clean of garbage, food scraps and toxic materials; • Use of bear deterrent devices	Polar Bear

Table 2 Mitigation Measures for Marine Mammal (Cont'd)

Project Activity	Mitigation Measure(s)	Species
Closure Phase		
Vessel traffic: sealift removal of equipment and materials	• Maintain constant speed and course when possible; • reduce vessel idling; • vessel to be designed to reduce noise output	Ringed Seal, Bearded Seal, Walrus, Beluga, Narwhal, Bowhead Whale, Polar Bear
	• Reduce vessel speed in Milne Inlet	Ringed Seal, Bearded Seal, Beluga, Narwhal, Bowhead Whale
Operation of worker camps	• Educate workers on bear safety; use of bear deterrent devices	Polar Bear

4.5.1.3 Monitoring

The objectives of a marine mammal monitoring program include:

- to collect information on the occurrence and distribution of marine mammals along the shipping routes;
- to record the reactions of marine mammals to shipping operations, including icebreaking;
- to confirm the predictions made in the Project EIS; and
- to assess the effectiveness of mitigation measures.

The program can also record the ship's operational parameters, e.g., speed, to assist in the interpretation of the collected data.

Observers

Inuit Advisors/Monitors would likely require training for safety certification as well as in data collection and recording. Training programs would combine classroom sessions and onboard instruction. A trainer might also accompany the Inuit Advisor/Monitor during their first trip on the ore carrier to provide at-sea training in marine mammal (and seabird) data recording. The at-sea training would build on the classroom work and allow for "real-time" training situations.

Training topics and required capabilities include marine mammal identification (as well as seabird identification) of species which occur in the Arctic as well as the NW Atlantic, distance estimation, operation of handheld GPS, reticle binoculars, and computer software (Microsoft Word and Excel). Information and briefings on working in a confined setting, aboard ships, could also be provided to Inuit Advisor/Monitor candidates.

Observers would likely be required to have the following certificates: WHMIS, First Aid, and Transport Canada Marine Emergencies Duties (MED), and Transport Canada Marine Medical. In addition, Inuit Advisor/Monitors would be required to have a valid passport.

Data Collection

Standard monitoring and data collection protocols for marine mammals would be followed (e.g., Moulton and Mactavish 2004; Abgrall *et al*. 2008). Data fields typically collected during marine mammal surveys are provided in Table 3.

A viewing area is to be selected from which the Inuit Advisor/Monitor could conduct dedicated surveys and make daily observations. An observation viewing area of at least 180° should be selected. A wider angle of view is preferable if it can be replicated on a daily basis. Observations should also be conducted from an elevated position. Ship-based observations are usually best conducted from the bridge or bridge wings. If possible, observations should be conducted from the same location for each survey.

Inuit Advisor/Monitors would be tasked with monitoring the occurrence and behavior of marine mammals near the shipping vessel. The waters around the vessel would be scanned using 7 x 50 Fujinon binoculars (or similar brand and model) equipped with reticles to measure depression angle relative to the horizon. The reticle markings, together with the known height of the observer above sea level, enable the observer to determine distances to the observed marine mammals. The use of "Big Eye" binoculars (high-powered binoculars mounted to the ship) onboard the ore carriers will also be considered as their usage would increase the detectability of mammals far ahead of the vessel.

The Inuit Advisor/Monitor primary marine mammal monitoring duties would include watching for and identifying marine mammals, recording their numbers, species, age class/sex (when possible), distances from and reactions to the vessel, and reporting the results. Operational information to be collected would include time/date, vessel position, speed, direction of travel and weather conditions (visibility, sea state, ice conditions) at regular intervals, typically every 30 minutes (Table 3).

Data fields and collection protocols would be discussed with interested parties (e.g., DFO and other agencies) prior to implementation.

Table 3 Marine Wildlife Survey Data

Data Fields For Vessel-based Marine Wildlife Surveys.		
Watch and Survey Effort	**Environmental Variables**	**Animal Sightings**
• date • time • latitude, longitude (at least every 30 minutes) • observer name • observer location • vessel name • vessel travel direction • vessel speed • vessel activity • comments	• wind force (Beaufort scale) • swell (m) • weather (e.g., precipitation) • wind direction • visibility (km) • water depth (m) • sun glare (angle and description) • sightability (i.e., relative ability to detect marine mammals based on conditions) • ice cover (% within 2000 m) • ice type • comments	• date • time • latitude, longitude • species • certainty of ID • binocular reticle marking and distance when first observed, and closest point of approach • behavior, including response to vessel • number of individuals, including age class/sex when possible • bearing from observer location • animal's travelling direction relative to ship heading • animal's movement direction relative to vessel • animal description • comments

Reporting

It is anticipated that Inuit Advisor/Monitors would record data onto a paper form during the monitoring program (the use of direct electronic data entry will also be considered). To minimize errors during data recording and computer entry, field records would be entered into a custom Microsoft Excel database. Both written and computer records would be checked manually by the observers during periods when they are not on watch. Copies of the written records and Excel databases would be forwarded to the Baffinland Environment Health and Safety (EH&S) Superintendent for review and possible follow-up based on the observations. In addition, reporting mechanisms would be in place so that observers can immediately report to the Deck Officers should they observe potential effects on marine mammals which are threatening, e.g., collision.

Review of the marine mammal data and discussions with the Inuit Advisor/Monitors would serve to determine if a need exists to modify shipping routes and/or vessel speeds in order to reduce or eliminate the potential for creating severe effects on marine mammals.

Relevant information in the monitoring program will be made available to the general public using established communication mechanisms.

4.5.2 Marine Birds

There is a small potential for planned shipping activities to interact with marine birds either directly (e.g., through collisions) or indirectly (e.g., through habitat alteration or contaminant discharge). An unplanned event such as an oil spill could result in mortalities and, depending on time of year and location, these effects could be severe. Monitoring programs would aim to produce a detailed understanding of potential and actual interactions between shipping and marine birds. It would also provide an opportunity to investigate the effectiveness of proposed mitigation measures.

4.5.2.1 Interactions and Potential Effects

From a shipping perspective, AMEC (2010) reported several potential impacts, including:

- Frequent but brief and localized disturbance of open-water marine foraging and brood-rearing areas due to ship traffic along the shipping lanes;
- The alteration of local marine water quality or food supply due to contamination from bilge water, grey water, or ballast water discharges from ships;
- The accidental introduction of other chemical contaminants into the marine waters from the ports or ships, and the subsequent potential for direct (poisoning) and indirect (food chain effects) mortality to birds;
- Direct mortalities due to collisions; and
- Fuel or oil spills resulting in mortalities and long-term loss of foraging and brood-rearing habitat.

4.5.2.2 Mitigation

While the potential impacts to Snow Geese, Common Eider, King Eider and Red-throated Loon are anticipated to be localized to the Steensby Port site, Canada's *Migratory Birds Convention Act* (1917, 1994) regulates the protection of these marine bird species and prevents the disturbance or destruction of these birds, their nests, eggs and habitats. As such these species will require consideration and protection during all Project activities conducted between May and October. These mitigation measures are discussed in the Marine Birds Mitigation Monitoring Plan as well as in Volume 6.

The general mitigation measures to be implemented for marine birds for the vessel include:

- Routing ships to maximize distances between the ships and shorelines to remain at least 2 km from seabird colonies;
- Handling ship discharges in a way that conforms with the *Canada Shipping Act* and the *Arctic Waters Pollution Prevention Act*; and
- Developing effective oil spill emergency response plans in accordance with the *Arctic Waters Pollution Prevention Act*.

4.5.2.3 Monitoring

The objectives of a marine bird monitoring program would include:

- to collect information on the occurrence and distribution of marine birds along the shipping routes;
- to record the reactions of marine birds to shipping operations, including icebreaking;
- to confirm the predictions made in the Project EIS; and
- to assess the effectiveness of mitigation measures.

The program would also record the ship's operational parameters, e.g., speed, to assist in the interpretation of any the collected data.

Data Collection and Reporting

The numbers, species and distribution of marine birds would be monitored and documented on an ongoing basis by trained Inuit Advisor/Monitors. Using a selection of voyages, and employing standard seabird observation watches, information would be collected as described in Section 4.5.1.3 and Table 3 above.

Inuit Advisor/Monitors would accompany a selection of vessel transits, during which time standard watches would be carried out to record seabird observations along the route within the Regional Study Area.

Copies of data sheets would be forwarded to Baffinland for review and possible follow-up based on the observations.

4.5.3 Mitigation

Communications on vessel traffic would be maintained through Baffinland or their designated representative and the Inuit Advisor/Monitors on the ore carriers and other traffic, via marine radio at sea. Results from monitoring would be used to determine the need to adjust routes or vessel speeds in order

to avoid concentrations of marine wildlife. Relevant information would be made available to the general public using established communication mechanisms.

Any observed impacts would be reported immediately to Baffinland by the Inuit Advisor/Monitor, and, depending on the nature of the impact, the necessary mitigations would be undertaken without delay.

4.6 SAFETY OF PERSONS TRAVELING ALONG THE PROJECT SHIPPING ROUTES

Measures to ensure the safety of persons traveling by snowmobiles, sledges, and boats along Project shipping routes include the following:

- In order to maintain the integrity of the ice, the ship will follow, to the extent possible, in the ice track broken during the previous passage;
- In areas of landfast ice, the route will be marked by reflective poles on either side. This activity will normally be done by contractors working from snowmobiles;
- A well marked detour will be provided at Steensby Port to enable snowmobile traffic to pass from one side of the ship track to the other;
- Notices will be provided of each vessel transit to inform others of the route, timing and related matters associated with each ships' passage; and
- Public meetings will be held each year to:
    - consult on the experience of the previous winter shipping season;
    - identify any opportunities to reduce or avoid travel conflicts; and
    - discuss plans for the upcoming season.

SECTION 5.0 - ROLES AND RESPONSIBILITIES

The following describes Roles and Responsibilities related to shipping operations in support of the Baffinland Project.

5.1 BAFFINLAND MARINE TRANSPORTATION MANAGEMENT TEAM

Baffinland will establish a Marine Transportation Management Team who will work under the direction of the Operation Manager. This Marine Transportation Management Team, which has expertise in shipping, environmental protection, safety, ice navigation and emergency response, will be established to manage all aspects of the marine transportation system, from the operations in Steensby Port Site and Milne Inlet to the Quebec terminal and elsewhere as detailed in this SMWMP.

5.1.1 Membership

The members of the Marine Transportation Management Team (and their location) are:

- Baffinland Operation Manager - On Site
- Baffinland Steensby Port Superintendent - On Site
- Baffinland Milne Port Superintendent - On Site
- Baffinland Maintenance Superintendent - On Site
- Baffinland Environment, Health and Safety Superintendent - On Site
- Ship Operations Manager - Montreal
- The Master of the Iron Ore Carrier - Onboard vessel

5.1.2 Priorities

With respect to shipping, the priorities of the team will be:

- The safety of life;
- The protection of the marine environment; and
- The preservation of the ship and her cargo.

The following outlines the Roles and Responsibilities of the Marine Transportation Management Team. Note: Individual team member Roles and Responsibilities are presented in Section 5.1.4.

5.1.3 Roles and Responsibilities of the Team

The overall responsibilities of the Marine Transportation Management Team are:

- To manage and schedule shipments of cargoes in and out of Steensby Port Site, Milne Inlet and the Southern Supply Port;
- To be responsible for operating the Iron Ore Carrier and chartering and scheduling the Carriers;
- To ensure, prior to chartering a Carrier, a pre-charter audit and/or inspection is carried out on the vessel to confirm the condition of the vessel and that it is managed and operated in accordance with the ISM system with all certificates up to date; and
- To ensure that, wherever appropriate, the interfaces between the Terminal and the ships' emergency response plans are compatible.

The specific responsibilities of the Marine Transportation Team are listed below.

5.1.3.1 Hydrographic Information and Navigation Aids

The Marine Transportation Management Team will ensure:

- That hydrographic issues affecting the terminals or ships are brought to the attention of the responsible parties and those affected by the changes (i.e., Ships' Masters, Berthing Advisors, Inuit Advisor/Monitors); and
- That Baffinland-owned port aids to navigation are regularly maintained and confirmed as being operational and accurate.

5.1.3.2 Cargo Documentation

The Marine Transportation Management Team will establish:

- A documentation system for the cargoes including Bills of Lading, Cargo Quality Certificates, Cargo Manifests and MSDS information; and
- A system whereby advice of dangerous or hazardous materials cargoes is provided to the Ship's Master in good time to develop a cargo plan which provides safe and secure stowage always within the vessel's capacity.

5.1.3.3 Training

The Marine Transportation Management Team will ensure:

- That the bulk loading operators are properly trained in the operation of the loading system and are capable of distributing the cargo throughout the holds as level as practical;
- That the ship and shore personnel engaged in loading and discharging the vessel are trained in the safe practices of stevedoring, crane operation and slinging of cargo; and
- That the personnel carrying out ship track marking are trained in safe practices for working on ice.

5.1.3.4 Services

- The Marine Transportation Management Team will provide:
- A Linesmen to assist vessels to berth in Steensby Port Site;
- A Berthing Advisor to assist in vessel berthing and departure from the port;
- Inuit Advisor/Monitors for selected passages of both the dedicated and non-dedicated iron ore carriers; and
- A ship track marking service to delineate the outer edge of the area where ice breaking is occurring in the vicinity of the port.

Note: Currently there is no pilotage service available for the voyage through Steensby Inlet to Steensby Port site. However, in the event that a compulsory pilotage service is introduced, Baffinland will discontinue the provision of Berthing Advisors for the non-dedicated iron ore carriers;

5.1.3.5 Communications

The Marine Transportation Management Team will ensure:

- That the Baffinland Logistics Officer is informed of any delay to the vessel's schedule caused by mechanical defect, ice, heavy weather or diversion to assist a vessel in distress, and is informed of the vessel's revised estimated time of arrival at its destination; and
- That communications between the vessel and the loading terminals, emergency services, security staff and relevant authorities is established and that short-range VHF communications involved in cargo operations between ship and shore is effectively managed.

5.1.3.6 Safety

- Safety is a major responsibility. The Marine Transportation Management Team will ensure that ship and shore personnel engaged in operations are aware of hazards arising from cargo operations and from the materials and iron ores being handled. This includes the provision of MSDS information and any additional training and information (e.g., safety plan, tool box meetings, hazard analysis) required; and
- The Marine Transportation Management Team will ensure that all personnel are provided with and shall wear the appropriate personal protection equipment (PPE) which shall be suitable for the task at hand under the existing weather conditions.

5.1.3.7 Ice Monitoring

The Marine Transportation Management Team will monitor ice conditions and promulgate ice and navigation information within the Baffinland operations and to the local communities.

5.1.3.8 Emergency Response

The Marine Transportation Management Team will:

- Be the source of expertise and technical review in the development of the terminal contingency and emergency response plans (Milne Port OPEP – SD-ERP-002, and, Steensby Port OPEP SD-ERP-003);
- Co-ordinate assistance should a vessel experience a problem which cannot be dealt with by the ship's crew or the Ship's Master alone; and
- Be informed of any incident onboard the vessel which may result in a lost time accident or dangerous occurrence. All such incidents will be investigated by the Ship's Safety Officer and be reported to the Baffinland Health & Safety Superintendent. At no time can such investigation interfere with a formal Accident Investigation by Transport Canada and does not relieve the vessel from the Transport Canada reporting system.

Detailed emergency response procedures are outline in the Milne Port OPEP (SD-ERP-002) and the Steensby Port OPEP (SD-ERP-003).

Note: Within Steensby Inlet limited local assistance from the Steensby Port Site Terminal is possible. Beyond this area the vessels shall depend on the Coast Guard Emergency Response and Rescue facilities.

5.1.3.9 Monitoring Report

Produce an annual Monitoring report which will include:

- a record of all ship tracks taken along both shipping routes covering the entire shipping season;
- an overlay of ship tracks onto available ice imagery to identify shore leads and polynyas;
- a comparison of recorded ship tracks to the nominal shipping route and
- all onboard observations of marine mammal and seabird from reports.

5.2 TEAM MEMBER ROLES AND RESPONSIBLITIES

5.2.1 Baffinland Operation Manager

The Operation Manager has overall responsibility for all marine transportation aspects of the SMWMP. In particular, the Baffinland Operation Manager is responsible for:

- Appointment and leadership of the Marine Transportation Management Team;
- Protecting the safety and health of all persons working on the Project and protecting the environment by taking all reasonable actions including following appropriate codes and regulations; and
- Taking reasonable actions to address Inuit concerns respecting shipping and overseeing and being accountable for the implementation of the Company's commitments and obligations regarding shipping.

5.2.2 Baffinland Port Superintendent

The Baffinland Steensby Port Superintendent and the Milne Port Superintendent have overall responsibility for the export of iron ores and the re-supply and return shipment operations at Steensby Port Site and Milne Inlet respectively. The Steensby Port Superintendent is also responsible for liaison with the Southern Supply Port. Specifically, the Baffinland Port Superintendents are responsible for:

- Coordinating the schedule of all vessels used to support the above operations. The Port Superintendent controls the scheduling of supply, export and return cargo;
- Ensuring that all chartered vessels are audited, inspected and are shown to operate to the requirements Baffinland for vessels engaged to export cargoes from or deliver goods to the Project. The vessels must meet the agreed specifications for operations within the time frame and ice conditions expected during the charter;
- Maintaining direct communication with the Ship Operations Manager and the managers of iron ore chartered ships to advise the quantities and timing of each shipment;

- The operation of the port security system. The port at Steensby Port Site will be registered as an approved port compliant with the Canadian and IMO ISPS Regulations; and
- The safety of shore-based marine related employees, site facilities, the quay and equipment supplied or operated to support the transportation operations.

In addition, the Baffinland Port Superintendents have specific responsibilities as listed below.

5.2.2.1 Environment, Health and Safety

The Baffinland Port Superintendents are responsible for:

- The care of the marine and immediate shore environment;
- Ensuring that the vessels using the Terminal comply with the environmental undertakings set out by Baffinland;
- Ensuring that operations at the interface between ship and shore are carried out with due regard to the safety and health of employees and the preservation of the environment; and
- From time to time, participating in vessel inspections to ensure that environmental requirements are met.

5.2.2.2 Fuel Transfer & Emergency Response

The Baffinland Port Superintendents shall:

- Ensure the implementation of the Transport Canada approved OPEP for each Port (see Appendix 10C-2 for Milne and Appendix 10C-3 for Steensby);
- Ensure that the Steensby Port Site facilities and procedures for receiving fuel are compatible with those on the ship;
- Establish and agree on an oil offloading procedure with the vessel. This is addressed in the Baffinland Environment Protection Plan and is part of the vessel's procedures for the discharge of oil cargoes;
- Manage the Baffinland oil spill cleanup contract capabilities;
- Arrange for the provision and maintenance of oil spill containment and recovery equipment suitable to contain/recover a spill from a vessel in Steensby Inlet or Milne Inlet; and
- Arrange and supervise oil spill exercises to maintain ship and shore ability to deploy the oil containment boom and other equipment quickly and efficiently.

5.2.3 Baffinland Maintenance Superintendent

The Maintenance Superintendent is responsible for the operation of a number of local manpower contracts which service the iron ore plant and iron ore storage and support the port and shipping operations as required. These services include, but are not limited to, the following:

- Providing local contractors to train and provide Inuit Advisor/Monitors;

- Ensuring that Inuit Advisor/Monitors are made aware of vessel schedules when arriving and departing from the Terminal;
- Ensuring adherence to the Baffinland communication protocol;
- Providing local weather and ice information in the port and Terminal area to every nominated vessel within 24 hours of that vessel's ETA in Steensby Port Site and continuously update this information whilst the vessel is approaching and transiting Steensby Inlet;
- Arranging for the regular inspection and maintenance of Baffinland-owned aids to navigation provided for the designated routes; and
- Gathering any hydrographic or navigation aid information which the Ship's Master may become aware of in the course of transiting in or out of Steensby Inlet and ensuring that the information is passed to the Canadian Coast Guard and Hydrographic Office.

5.2.4 Baffinland Marine Transportation Supervisor

On a day-to-day basis the port services at Steensby Port and Milne Inlet Port are operated by the Marine Transport Supervisors who report to the Port Superintendent. These individuals manage the shore crew who are engaged in support operations related to the storage of iron ores ashore and are the direct point of contact for the Ship's Master using the ports. The duties and responsibilities of the Marine Transport Supervisors are listed below.

5.2.4.1 Ship Entry and Port Clearance

The Marine Transport Supervisors provides notice to Customs and Immigration of the estimated arrival and departure times of foreign flag vessels and arranges transportation and accommodation for the persons providing these services as may be necessary.

5.2.4.2 Shore Cargo Operations

The Marine Transport Supervisor:

- Provides crews to handle the vessel's mooring lines at the berth on arrival;
- Arranges shore activities associated with the arrival, berthing, discharge and loading of cargo; and
- Boards vessels to agree the order of discharge, confirms the contents of cargo fuel tanks and the order of discharge and loading with the Ship's Master.

5.2.4.3 Safety

The Marine Transport Supervisor:

- Participates in a joint ship and shore briefing and safety meeting on the order and method of discharge and highlights any special handling procedures for dangerous or hazardous cargoes, safety, health or, environmental concerns;
- Is responsible for the maintenance, inspection and operation of fire systems installed at the quay;

- Has the authority to stop or shut down any operation which is considered hazardous or which may result in damage to the iron ore cargo. For example, heavy rain, snow, ice accumulation, windblown iron ores, or vessels improperly secured against the weather; and
- Is a first line responder in the case of an oil spill from ship or shore.

5.2.4.4 Communications

The Marine Transport Supervisor:

- Establishes communications between ship and shore to suit every aspect of the cargo operation;
- Provides VHF radios for crew communication with stevedores; and
- Makes contact with vessels and agrees the boarding location and boarding method for the Inuit Advisor/Monitor and ensures that this information is passed to the Inuit Advisor/Monitor.

5.2.4.5 Documentation

The Marine Transport Supervisor:

- Is responsible for recording the numbers and quantities of cargo received and loaded to the ship and recording damage or shortages. Notice of damage and shortages is to be brought to the Master's attention in writing;
- Receives and acknowledges receipt of protests from the Masters of vessels alleging damage to the vessel or quay; and
- Provides cargo documentation, bills of lading and certificates for iron ores, signs cargo manifests for re-supply cargo and provides a manifest for all return cargo. Cargo figures will be confirmed by means of a draft survey conducted jointly by the ship's staff and the Marine Transport Supervisor.

5.2.4.6 Cargo Handling Equipment

The Marine Transport Supervisor:

- Provides, maintains and certifies slings and lifting equipment used by the vessel's cranes;
- Is responsible for the care, maintenance and certification of the cargo fuel hoses and the receipt of fuel discharged by the vessel; and
- Maintains and operates the mooring boat and any winches, lines, spill containment booms or other equipment which are part of the mooring system on the quay.

5.2.4.7 Cargo Operations

The Marine Transport Supervisor:

- Provides the manning and equipment required to remove general cargo offloaded by the ship's cranes. All cargo to be removed from the quay to the storage area; and
- Is responsible for the operation of the iron ore loading system including:

- The training of the bulk loader operators and instruction on requirements to distribute cargo evenly in each hold, maintain weight control and not to exceed planned quantity in each hold;
- Providing the vessel with cargo quality certificates; and
- Providing the crew and equipment, if necessary, to trim iron ores to the Master's requirements.

Note: The Ship's Master may only accept goods which are properly identified, packaged and are accompanied by the appropriate documentation. Acceptance is also subject to the vessel being able, in the sole opinion of the Master, to provide the stowage required to carry the goods safely.

5.2.5 Baffinland EH&S Superintendent

The EH&S Superintendent responsibilities include:

- Development and Maintenance of the Site Environmental Protection Plan, including port and marine aspects;
- Conduct of and reporting on all required environmental monitoring programs, including environmental effects and compliance monitoring to marine operations;
- Development of Oil Spill Contingency Plans;
- Development of Site Closure and Progressive Remediation Plans;
- Assistance and support in the development of an Emergency Response Plan, including associated training, exercises and equipment purchases;
- The provision of an auditing service, where necessary, to the Project with respect to environment, health and safety compliance;
- The provision of health and safety systems and standards for various aspects of marine transportation and cargo handling operations at the Project site; and
- The securing of consulting services, where necessary, to the Project with respect to environment, health and safety.

5.2.6 Ship Operations Manager

The Ship Operations Manager will:

- Liaise with the Port Superintendent and the vessel's Master to establish the maximum quantities and grades of cargo which can be safely loaded on the ship on each occasion, taking into account the season and the amounts of fuel, lubricants and stores and any return cargo which will remain onboard when the vessel sails from the Baffinland Terminal. The Ship Operations Manager will work though the Baffinland Port Superintendent to ensure safe and efficient cargo operations between ship and shore with full regard for the preservation of the environment; and
- Keep the Port Superintendent advised of any delays to the vessel, whether caused by ice, weather or mechanical fault.

In addition, the Ship Operations Manager will be responsible for the items listed below.

5.2.6.1 Designated Person Ashore

- The Ship Operations Manager will have a Designated Person Ashore (DPA) as required by the ISM system. The DPA or his deputy is the point of contact for the ship in the event of any emergency onboard and it is the DPA's duty to call out the Company's Emergency Response Team;
- On a day-to-day basis the DPA is a member of the ISM system ashore and is directly involved in the safety of the ship and its crew;
- Should the ship managers fail to respond to safety concerns such as may be minuted in the ship's safety committee meetings, the DPA is responsible to take the concerns as far as may be required to get legitimate concerns addressed; and
- The Ship Operations Manager/DPA will be responsible for the shipboard oil pollution emergency plan (SOPEP) and the contract with the ECRC oil spill cleanup organization.

5.2.6.2 Emergency Response Team

- The Ship Operations Managers will maintain an experienced onboard Emergency Response Team provided with the information required to support the ship in an emergency. An emergency response center outfitted with the necessary ship drawings, specifications, contingency plans, communications systems and contact numbers for relevant emergency support services is maintained in the ship managers offices; and
- The Emergency Response Team will be familiar with the vessel's contingency plans and responsible for supporting the Ship's Master by arranging assistance such as tug support, casualty evacuation, contacting the next of kin, dealing with the media, and related actions.

5.2.7 Master of the Iron Ore Carrier

The Master is responsible at all times for the safe navigation and operation of the vessel within the applicable laws of Canada, having special responsibility for the safety of life, the safety of the ship and the preservation of the environment. In order to meet these responsibilities, the Master has full authority to take whatever action which the Master considers necessary to successfully complete the voyage. This includes adjusting speed, seeking shelter, accepting assistance or deviating to save life. In addition, the Master has the responsibilities listed in the sections below.

5.2.7.1 Ship Loading/Discharge

The Master:

- Decides when it is safe to sail and when it is safe to enter the port and berth or when to bring the ship to anchor to await better weather;
- Is responsible for the provision of the cargo plan plus the loading, safe stowage and protection of all cargo carried onboard from the time the cargo is loaded over the ship's side until it is discharged over the ship's side; and

- Is responsible for ensuring that the vessel safely loads the intended cargo for the planned voyage. On completion the Master agrees all quantities of cargo loaded or discharged and signs the appropriate documentation before the vessel sails.

5.2.7.2 Steensby Inlet Environment

- Through Baffinland and the Ship Operations Manager, the Master shall be made aware Baffinland requirements and obligations that may affect navigation and will ensure the ship's compliance with all of the identified environmental concerns whilst at sea or in port; and
- The Master will co-operate to the extent practicable with the Inuit Advisor/Monitor to ensure the protection of the environment, wildlife and any fishing, sealing or other sensitive operations within the Steensby Inlet routing system.

5.2.7.3 ISM System

The Master is responsible for:

- The operation of the ISM system onboard ship maintaining the established relationships with the Ship Operations Manager and/or the Designated Person Ashore; and
- Ensuring that regular safety meetings are held and that actions minuted at these meetings are passed to the ship managers for action and that actions agreed by the ship managers are put into effect onboard.

Note: Fire and Abandon Ship exercises shall be held in accordance with Transport Canada Regulations. Additional exercises will be arranged to ensure the crew's familiarity with the contingency plans established for the vessel including joint exercise with the shore managers.

5.2.7.4 Accident Reporting

- In the event of an accident causing personal injury or loss of life, oil spill, or other incident within Steensby Inlet the Ship's Master will immediately inform the port emergency control system requesting such assistance as may be practical; and
- Outside of Steensby Inlet the Master shall report the incident verbally and later in writing to the nearest Transport Canada reporting station.

5.2.7.5 Passage Planning

- The Master approves the passage plan taking account of routing for ice, weather, etc. and advises Baffinland of expected departure and arrival at the destination terminal or Steensby Port Site;
- The Master decides when to sail, retracing to the extent possible the agreed route used to enter the port during the winter season; and
- The Master reports the vessel's departure to NORDREG and confirms the latest ice information and planned route. The system is reversed on the return voyage.

5.2.7.6 Communication

- The Master is responsible for the provision of daily position and progress reports to the Ship Operations Manager and Baffinland. The estimated time of arrival at the pilot station / ice edge / destination / berth will be updated every 24 hours and every 4 hours within the last 24 hours before arrival;
- Changes to the estimated times shall be reported by the Master to the Terminal in order that the provision of mooring gangs, and cargo handlers can be properly coordinated;
- The Master provides the Terminal with a formal Notice of Readiness to Load/Discharge; and
- The Master of a foreign flag vessel, or the vessel's agent, is responsible to ensure that Customs, Immigration and Port formalities are completed before sailing.

SECTION 6.0 - PERFORMANCE INDICATORS AND THRESHOLDS

The environmental (including socio-economic) issues related to shipping have been summarized in Section 2.0, organized in terms of Valued Environmental Components (VECs) and the associated Indicators.

Subsequent sections of the Management Plan describe the operations that comprise marine shipping and include the specific actions to be taken with respect to mitigation and monitoring for potential environmental effects. In order to guide day-to-day operation of the shipping activity, the organization structure and associated roles and responsibilities of personnel engaged in shipping are defined, in particular with respect to achieving compliance with the Management Plan.

This section provides, in a table summary, a listing of the identified environmental issues and concerns associated with Shipping for the Project.

The relevant performance indicator associated with each issue is referenced (e.g., government regulated standard, International Standard or convention, EIS commitment or condition, Company-generated requirement). The applicable threshold(s) for achieving compliance with Baffinland performance standards are stated in as quantifiable manner as possible,

This table will be reviewed and revised on a regular basis and as a consequence of:

- Completion of the Project Environmental Assessment;
- The collection of information from monitoring programs;
- Changes to applicable standards and regulations; and
- Improved Project definition through engineering design and detailed planning.

Table 4 Performance Indicators and Thresholds

VEC	Concerns/Issues	Indicator	Threshold
Air Quality	Ship emissions	Routine maintenance records	Compliance with regulated standards
Marine Wildlife	Noise and Vibrations	Noise envelope in the water; marine mammal behavioral responses	To be established through EEM design.
Marine Water and Sediment Quality	Onboard ship wastewater treatment	Ship records	Zero discharge at sea
	Ship solid waste management	Ship records	Zero discharge at sea
	Oily water treatment	Ship records	Zero discharge at sea
	Dangerous Goods and HazMat – spills	Ship documentation	Zero discharge at sea
	Oil Spill	Ship documentation	Zero discharge *Arctic Waters Pollution Prevention Act*; compliance
	Introduction of Invasive species	Ship onboard documentation	Adherence to Ballast Water Management Plan
Land and Resource Use	Altered travel patterns due to ships track	Information and communication in affected communities Number of complaints related to shipping	To be established through EEM design.

SECTION 7.0 - MONITORING AND REPORTING REQUIREMENTS

7.1 ENVIRONMENTAL EFFECTS MONITORING

Baffinland will carry out monitoring of the effects of shipping as set out in the marine section of the Environmental Effects Monitoring Plan approved by the Government of Canada and the Government of Nunavut, as amended from time to time.

7.2 REPORTING REQUIREMENTS

The responsibilities for reporting and documentation by various teams and individuals are discussed in the noted Sections of this Shipping and Marine Wildlife Management Plan.

7.2.1 Marine Transportation Management Team:

Cargo Documentation - Section 5.1.3.2

Communications - Section 5.1.3.5

Monitoring Report – Section 5.1.3.9

7.2.2 Port Superintendent

Liaison with Vessel Owners/Managers – Section 5.2.2

7.2.3 Marine Transportation Supervisor:

Communications- Section 5.2.4.4.

Cargo Documentation – Section 5.2.4.5

Damage Reports– Section 5.2.4.5

7.2.4 EH&S Superintendent

Environmental Monitoring – Section 5.2.5

7.2.5 Ship Master

Accident Reporting – Section 5.2.7.4

Position/Progress Reports/ETAs – Section 5.2.7.6

Notice of Readiness (Load/Discharge) – Section 5.2.7.1

Cargo Plan - Section 5.2.7.1

Communications – Section 5.2.7.6

In addition, the following documentation is required:

7.2.6 Port Information Manual

Baffinland will produce a Port Information Manual to provide the Ship's Masters with an overview of the environment (particularly the ice regime) and port operations, as well as procedures required by

Baffinland when navigating to Steensby Port Site or Milne Inlet Port. Additional copies of the Port Information Manual will be maintained at each Terminal.

7.2.7 Vessel Operations Manuals

All vessels navigating to Steensby Port Site or Milne Inlet Port will have operations manuals developed according to the ISM Code principles.

7.2.8 Baffinland Plans and Procedures

As part of its Environmental Management System (EMS), Baffinland has developed a number of plans and procedures. These include an Emergency Response Plan and a variety of Standard Operating Procedures for the Steensby Port Site Terminal and the Milne Inlet Port. Copies of all relevant Baffinland procedures and EMS plans will be maintained at each Terminal and be accessible through the Marine and Air Transport Supervisor.

7.2.9 Cargo Documentation and Other Shipping-Related Documentation

Copies of necessary cargo documentation forms will be supplied by Baffinland and maintained at the Steensby Port Site Terminal. Copies of other necessary shipping-related forms will be obtained by Baffinland and maintained at the Terminal.

SECTION 8.0 - ADAPTIVE STRATEGIES

8.1 EMERGENCY AND CONTINGENCY PLANS

8.1.1 Accidental Spills of Fuels and Chemicals

Ships travelling to the Steensby Port Site and Milne Inlet on behalf of the Baffinland Project will have prevention and response equipment for accidental spills, and will have in place a Shipboard Oil Pollution Emergency plan (SOPEP) in conformity with the International Maritime Organization (IMO) as approved by the Det Norske Veritas Classification AS on behalf of the Government of Canada. Onboard environmental protection equipment will include containment booms, absorbent pads and oil spill dispersant. Any spills of petroleum or other hazardous materials will also be reported to the Environmental Emergencies 24 Hour Report Line.

8.1.2 Extreme Weather Conditions

Site conditions play an important role in the planning and execution of the Project. Northern Baffin Island has a semi-arid arctic climate with less than 200 mm of annual precipitation and an annual average temperature of about -15 ºC. The area experiences bitter cold in the wintertime and 24-hour darkness from November to January. Summers bring 24-hour daylight from May to August, but continued cool to cold conditions. Winter brings landfast ice in the marine inlets and along the coastline and sea ice in the main channels. The Ship's Master is responsible at all times for the safe navigation and operation of the vessel within the applicable laws of Canada, having special responsibility for the safety of life, the safety of the ship and the preservation of the environment. In order to meet these responsibilities, the Master has full authority to take whatever action which the Master considers necessary to successfully complete the voyage. This includes adjusting speed, seeking shelter, accepting assistance or deviating to save life.

8.1.3 Malfunctions During Shipping Operations and Reporting Action Procedures

In the event of a malfunction or other incident during shipping operations within Steensby Inlet the Ship's Master will immediately inform the port emergency control system requesting such assistance as may be practical. Outside of Steensby Inlet the Master shall immediately report the incident verbally and later in writing to the nearest Transport Canada reporting station.

8.1.4 Unforeseen Events

During shipping operations unforeseen events or unanticipated interactions with the environment may occur, which may require intervention by the Ship's Master. Baffinland has adopted an adaptive management strategy for all phases of the Project which will prepare Project personnel to identify, resolve and learn from any unforeseen events. One of the main principles of an effective adaptive management strategy is to expect the unexpected and to be prepared to act quickly and decisively when it occurs. Examples of unforeseen events associated with Project shipping activities might include unanticipated startle reactions by marine mammals or unexpected attraction to ship's lighting by seabirds. If an unforeseen event were to occur, corrective actions would be taken by the Master of the vessel to avoid or reduce any adverse effects. In the case of the examples provided, these actions might include adjusting ships speed to reduce noise, or to maintain essential lighting only, in sensitive areas. Any such events,

the subsequent corrective action taken and the degree of success will be documented to allow others to learn from these experiences, thus ensuring continual improvement.

8.2 ENVIRONMENTAL MONITORING

Baffinland is committed to the implementation of an environmental effects monitoring (EEM) program, in part to confirm the predictions of environmental effects. The results of the monitoring programs outlined in the specific EEM programs will provide information that will serve to modify, add or eliminate mitigation measures. Additional monitoring programs may be developed, if required, and could lead to the implementation of adaptive management measures.

8.2.1 Marine Wildlife Monitoring

The response of marine wildlife to vessel transits is predicted to be not significant. However, should on-vessel observations indicate that this is not the case, additional mitigation measures would be considered and implemented as necessary.

Such measures would be developed in accordance with adaptive management techniques, and could include:

- Launch studies to ascertain the reason or cause for observed behavioural changes;
- Improved Noise Reduction at source if determined to be a factor for behavioural changes;
- Route or speed alterations of transiting vessels; or
- Other measures as might be recommended as a consequence of the monitoring program.

SECTION 9.0 - REFERENCES

1. Abgrall, P., A.L. Lang, and V.D. Moulton. 2008. Marine mammal and seabird monitoring of Husky Energy's 3-D seismic program in the Jeanne d'Arc Basin, 2006 and 2005-2006 combined. LGL Rep.
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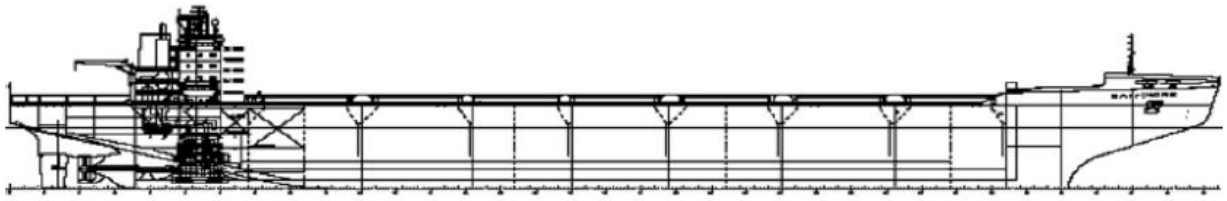
APPENDICES

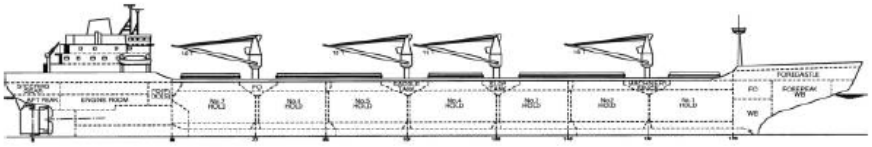
APPENDIX 1

Iron Ore Carrier

Proposed ±190,000 DWT Capacity Ice-breaker



28,000 DWT Capacity MV Arctic (Owned and Operated by Fednav)



	Mary River	MV Arctic	Difference
Length Overall (m)	329.0	220.8	149%
Beam (m)	52.0	22.9	127%
Depth (m)	27.0	15.2	78%
Draft (m)	20.0	11.5	74%
Displacement (mt)	248,000	41,300	500%
Ore Cargo (mt)	±190,000	28,500	595%

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	-	ISSUED WITH REPORT	-	-	-

BAFFINLAND IRON MINES CORPORATION

MARY RIVER PROJECT

ICE BREAKING ORE CARRIER
CONCEPTUAL DESIGN

Knight Piésold CONSULTING

PIA NO. NB102-181/25 | REF. NO. 8

FIGURE 3-3.9 | REV A

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APPENDIX 2

Alternate Iron Ore
Vessel Selection Protocol and Specifications

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Alternate Iron Ore Vessel Selection Protocol and Specifications

1.0 Application of Vessel Selection Protocol

Baffinland will utilize this vessel selection protocol for the selection of bulk cargo vessels that are adequate for all expected conditions when utilized as an alternate vessel for the transport of iron ore from the Steensby Port Site Terminal when the dedicated iron ore carriers are not available or when market conditions dictate the use of non-dedicated vessels

2.0 Vessel Selection Protocol Components

This vessel selection protocol is comprised of the following components:

1. Minimum general requirements for all alternate iron ore vessels; and

2. Minimum ice navigation requirements for all alternate iron ore vessels required for shipping through waters which may contain ice during the Open Water Shipping Season,

3.0 Minimum Specifications for Vessel Selection

This vessel selection protocol defines minimum specifications for selecting suitable vessels to:

1. Safely transport iron ore during the Winter Shipping Season;

2. Safely transport iron ore during the Open Water Shipping Season; and,

3. Ensure adequate vessel performance under all expected conditions.

4.0 Minimum General Requirements for Alternate Iron Ore Carriers and Iron Ore Carriers

All vessels chartered by Baffinland as iron ore carriers or as an alternate vessel for the transport of iron ore will meet the general vessel requirements listed below:

1. All vessels will be confirmed to be compatible with the (Steensby or Milne Inlet as applicable) Port Site Terminal and able to unload and load the required cargos in a safe manner;

2. All vessels will meet all applicable requirements of the Canada Shipping Act;

3. All vessels will comply with IMO regulations under the Safety of Life at Sea Convention (SOLAS) of 1974 (and later amendments), or the equivalent Canadian standards defined in the Canadian Shipping Act;

4. All vessels will be equipped with navigation equipment and appliances as specified in the "Standards for Navigating Appliances and Equipment" (TP3668E) issued by the Marine Safety Directorate of Transport Canada or navigation equipment, which is compliant with the IMO standards (SOLAS 1974) and normally referred to as "convention" ships. Specific equipment will include:

    a. A standard and a steering magnetic compass;

    b. One gyrocompass for normal operations with repeaters located at the main steering location and at the emergency steering position;

    c. Two navigational radars, each capable of independent operation, one of which operates in the 9GHz frequency band;

    d. An automatic radar plotting aid;

    e. Electronic position fixing equipment suitable for use at all times throughout the voyage to establish and update the ship's position by automatic means;

    f. One echo sounder (sounding apparatus);

    g. A device to indicate speed and distance;

    h. An approved daylight-signaling lamp;

    i. An internal communications system;

    j. Suitable navigation charts for the port site at Steensby Port Site and for the shipping routes; and,

    k. At least one pair of binoculars.

5. Baffinland will require ships to comply with the regulations governing discharge of solid and liquid waste specified in the Canadian Arctic Water Pollution Prevention Act (AWPPA). Ships will be required to have adequate holding tanks or containers for on-board retention of bilge water, oil waste, sewage water and solid waste. Baffinland will show preference to ships, which have facilities to contain grey water when in Canadian waters;

6. All vessels will be equipped to comply with ballast water handling in compliance with the Baffinland Inuit Impacts and Benefits Agreement.

7. All vessels will have communication equipment that meets the Canadian Shipping Act, Ship Station (Radio) Technical Regulations, 1999 or as it may be amended from time to time, which specifies that all radio equipment on-board a ship shall:

    a. Meet the applicable performance standards set out in International Maritime Organization Resolution A.694(17), entitled General Requirements for Shipborne Radio Equipment Forming

Part of the Global Maritime Distress and Safety System (GMDSS) and for Electronic Navigational Aids;

b. Be certified by a country to which the Safety Convention applies as having passed the tests set out in standard IEC 945 of the International Electrotechnical Commission, entitled Maritime Navigation and Radio communication Equipment and Systems - General Requirements: Methods of Testing and Required Test Results; and,

c. Be the subject of a technical acceptance certificate if one is required under subparagraph 5(1)(a)(iv) of the Radio Communication Act.

8. All vessels shall have the following specific communication equipment as a minimum:

   a. VHF radio telephones;

   b. VHF radio installations;

   c. MF/HF radio installations; and,

   d. INMARSAT ship earth station.

9. All vessels will have on board the equipment, procedures and resources for use in the event of an oil spill as required to comply with the applicable regulations under the Canada Shipping Act, Part XV;

10. All vessels will be required to have a shipboard oil pollution emergency plan (SOPEP) that complies with the requirements under MARPOL convention;

11. Baffinland will show preference to vessels that do not use anti-fouling paints that contain Tributylin (TBT); and,

12. All vessels will comply with the Canadian Shipping Act requirements for Pilot Ladder Regulations (Sor/78-218), which specify that every ship shall be equipped with a pilot ladder or alternatively a mechanical pilot hoist and stipulate the type of ladder to be used, the materials of construction, the dimensions, the location and the means of securing.

5.0 Additional Ice Navigation Requirements for Alternate Iron Ore Carriers During the Winter Shipping Season

In addition to meeting its requirements, all vessels chartered by Baffinland for use as an alternate vessel for the transport of iron ore from the Steensby Port Site Terminal during the Winter Shipping Season when the dedicated iron ore carrier is not available will meet the following additional ice navigation requirements:

1. Vessels will be selected that respect Inuit concerns regarding the impact of the vessel on the land-fast ice related to the width of the vessel and the ice breaking bow form;

2. Baffinland will not select vessels that use anti-fouling paints that contain Tributylin (TBT) without prior consultation ; and,

3. Vessels will not be selected that require ice breaker support within the land-fast ice without prior consultation

APPENDIX 3

Baffinland Pre-Charter Bulk Carrier Ice Capability Assessment

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BAFFINLAND PRE-CHARTER BULK CARRIER ICE CAPABILITY ASSESSMENT

1.0 General

The Baffinland pre-charter bulk carrier ice capability assessment will be carried out prior to finalization of any charter.

2.0 Application of the Vessel Selection Protocol

The vessel selection protocol applies to vessels engaged in the export of iron ore according to the season during the planned period of the charter.

3.0 Minimum Specifications for Vessel Selection

These are the minimum requirements for vessel selection according to the season during the planned period of the charter.

4.0 Criteria for Determining Vessel Performance in Ice

This is based on the Arctic Ice Regime Shipping System (AIRSS) calculation of ice numerals and Canadian Arctic Class or equivalent.

5.0 Minimum Requirements for Carriers and Alternate Iron Ore Carriers

The minimum requirements will be specified in the Baffinland original request to brokers for proposals for vessels, taking account of the season and projected ice conditions during the period of the charter.

6.0 Vessel Ice Capability Assessment

The main concern is to ensure that the carriers and alternate iron ore carriers selected are capable of operating in the ice conditions which are forecast for the period when the vessel will be operating in the approaches to Steensby Inlet or within Steensby Inlet.

The ice capability requirement is dependent on updated ice forecasting, based on current radar satellite information, related to the vessel's design, construction, ice performance, and operating procedures. The calculation is based on the following:

i. The ice numerals of a vessel being considered for operations into Steensby Inlet ice, which will be calculated under the Arctic Ice Regime Shipping System (AIRSS);
ii. The vessel's Class and Type in accordance with Canadian Regulations (i.e., Canadian Arctic Class or equivalent); and
iii. The thickness and character of the ice in Steensby Inlet during the period of the charter.

7.0 Ice Conditions Forecasts and Ice Capability Assessment

The following summary is provided as an aid to understanding Baffinland's vessel selection process for selecting vessels for operation into Steensby Inlet.

1. An Ice Information Contractor, with expertise in ice measurement, forecasting and routing, will be contracted to provide a forecast of the ice conditions expected in the Steensby Inlet area at the time of the proposed shipping.

2. The Owner and Managers of a vessel being considered for a charter shall be required to provide full details of the vessel's design, ice construction, machinery, class, etc. to the Baffinland Independent Contractor responsible for assessing the vessel's ice capability.

3. The Independent Contractor engaged by Baffinland shall consider the vessel's ice design and construction, ice performance and certificates to confirm if the vessel's ice numerals are positive and sufficient to enable the vessel to safely transit the forecast ice conditions in Steensby Inlet during the projected time frame.

   This contract shall be established well in advance of the first charter vessel assessment to enable the Independent Contractor to provide Baffinland with a list of information required to carry out their assessment of the proposed vessel's ice capability.

4. Providing the vessel meets all of the required criteria for navigating in the forecast ice conditions, the Independent Contractor shall determine that the vessel under consideration is structurally and mechanically capable of safely completing the contemplated voyage and will provide that determination to Baffinland.

5. Providing the vessel meets all of the above requirements for the charter, the vessel shall be subject to a general inspection to confirm that the vessel remains in good condition, meeting all of the equipment requirements and operating procedures necessary for vessels operating into Canadian ports. The Surveyor will also ensure that the equipment requirements and operating procedure requirements listed out in the Baffinland Inuit Impacts and Benefits Agreement (IIBA) are satisfied. These equipment requirements and operating procedure requirements are all included in the Baffinland pre-charter bulk carrier inspection checklist (refer to Appendix 4).

   The above inspection will be coupled with a limited audit to ensure that the vessel is operated in conformance with the International Safe Management regulations.

   Providing that the vessel satisfies all of the above inspections and the limited audit, the vessel may be placed on charter.

   Note: Surveyors conducting the pre-charter inspection will be informed of any special inspection requirements related to ice procedures and route planning not otherwise included in the Baffinland IIBA. The provision of a Berthing Master provides the necessary source of information and advice to a Master unfamiliar with the conditions in Steensby Inlet.

6. Twenty four hours before the chartered vessel enters the ice outside Steensby Inlet, the Ice Information Contractor shall provide an updated estimate and forecast of the ice conditions which the vessel will encounter in and outside of Steensby Inlet. The vessel's AIRSS ice numerals will again be calculated.

   If the ice numerals remain positive for the updated ice report, the vessel may enter Steensby Inlet.

   If the ice numerals are negative, the vessel may not enter port until ice conditions improve and a positive numeral results.

APPENDIX 4

Baffinland Pre-Charter Inspection Checklist and Limited Audit

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BAFFINLAND PRE-CHARTER BULK CARRIER INSPECTION CHECKLIST AND LIMITED AUDIT

1.0 Introduction

Baffinland Iron Mines Corp. has developed an Iron Ore mine at Mary River, Baffin Island, and shipping terminals at Steensby Port Site and Milne Inlet on Baffin Island in Nunavut.

In order to preserve the environment and the Inuit way of life, BAFFINLAND have signed the Inuit Impacts and Benefits Agreement (IIBA) which, among other things, provides for the shipment of Iron Ore.

2.0 Shipping Operations

The Iron Ore Carrier will follow the same track in and out of Steensby Inlet, to the extent practicable, during each round-trip transit during the "Winter Shipping Season".

Carriers and alternate Iron Ore Carriers (should these be required) must be classed for ice navigation according to the expected ice conditions.

3.0 Completion of Pre-Charter Bulk Carrier Inspection and Limited Audit

It is not the intention that the Baffinland inspector/surveyor inspect a bulk carrier and carry out a complete ISM Type audit in the course of the vessel's normal turn-around in port.

However, an experienced surveyor can examine the vessel's documentation or computerized safety and maintenance programs in sufficient depth to satisfy themselves as to the standard of operation and management of the vessel. This information coupled with a visual inspection of the hull and superstructure, machinery spaces, deck and safety equipment is normally sufficient for the Charter to decide whether the vessel is capable of working safely in Canada or otherwise. In order to save time we suggest that the surveyor uses a digital camera to photograph points of interest, general layout of the vessel, hull condition, etc., or any items which cause concern.

The following pre-charter bulk carrier inspection checklist is a combination of a Transport Canada Ship Safety Checklist, which is the standard required for all foreign ships entering Canada, to which we have added the requirements as identified by Baffinland as the outcome of the Environmental Assessment Process.

The limited audit outlined is sufficient to confirm that the vessel is maintaining ISM Standards.

PART 1 — PRE-CHARTER BULK CARRIER (INSPECTION As per the following checklists)

Section 1: General Information

Section 1: General Information		
1.1	Date this document completed	
1.2	Name of ship	
1.3	LR/IMO No.	
1.4	Date of name changes	
1.5	Flag	
1.6	Call sign	
1.7	INMARSAT number	
1.8	Ship's fax number	
1.9	Ship's telex number	
1.10	Ship's e-mail address	
1.11	Type of hull: (1) Single Hull, (2) Double Hull, (3) Double Bottom (4) Double Side, (5) Other (if	
Section 1.2: Ownership and Operation		
1.12	Registered Owner	
1.13	Full Address Office telephone number:	
1.14	Name of Operator (if different from	
1.15	Full Address	
	Office telephone number	
	Office fax number	
	Office email address	
	Contact person	
1.16	Contact person after hours telephone	
	Emergency callout number	
	Emergency callout pager number	
	Contact details for person responsible for oil spill response	
1.17	Total number of ships operated by this Operator	
Section 1.3: Builder		
1.18	Builder	
1.19	Date delivered	
1.20	If applicable, date of completion of major hull changes	
1.21	If major hull changes, what changes were made?	

Section 1.4: Classification		
1.22	Classification Society	LLOYDS REGISTER
1.23	Class Notation	
1.24	Date of last dry-dock	
1.25	Date next dry-dock due	
1.26	Date of last special survey	
1.27	Was last special survey an enhanced special survey?	
1.28	Date next special survey due	
1.29	If ship has Condition Assessment Programme (CAP) rating, what is the latest rating?	
1.30	Date of last annual survey	
1.31	Date of last boiler survey - port boiler	
1.32	Date of last boiler survey – starboard boiler	
1.33	If machinery on Continuous Survey are any item overdue or extended?	
1.33.1	If Yes give details:	
1.34	Is ship subject to any conditions of class, class extensions, outstanding Memorandums or class recommendations?	
1.34.1	If Yes, give details:	

Section 1.4: Dimensions		
1.35	Length overall (LOA)	
1.36	Length between perpendiculars (LBP)	
1.37	Extreme breadth	
1.38	Moulded breadth	
1.39	Moulded depth	
1.40	Does ship have a bulbous bow?	
Section 1.5: Tonnages		
1.41	Net Registered Tonnage	
1.42	Gross Tonnages	
1.43	Moulded depth	

Section 1.6: Loadline Information					
		Freeboard	Draft	Deadweight	Displacement
1.44	Summer				
1.45	Winter				
1.46	Lightship				
1.47	Normal Ballast Condition				
1.48	Segregated Ballast Condition				

Section 1.7: Recent Operational History		
1.49	Has ship been involved in a pollution incident during the past 12 months?	
1.50	Has ship been involved in a grounding incident during the past 12 months?	
1.51	Has ship been involved in a collision during the past 12 months?	

Section 2: Certification and Documentation

	Certificates	Issue Date	Expiry	Last Annual
2.1	CERTIFICATE OF REGISTRY			
2.2	SAFETY EQUIPMENT CERT			
2.3	SAFETY RADIO CERTIFICATE			
2.4	SAFETY CONSTRUCTION CERTIFICATE			
2.5	LOAD LINE CERTIFICATE			
2.6	IOPP			
2.7	ISM			
2.8	INTERNATIONAL SEWAGE POLLUTION			
2.9	USCG (LETTER OF COMPLIANCE) CFR			
2.10	UNATTENDED MACHINERY SPACE CERTIFICATE			
2.11	INTERNATIONAL TONNAGE CERTIFICATE			
2.12	MINIMUM SAFE MANNING CERTIFICATE			
Documentation - Are the latest editions of the following publications t˙ted on board?				
2.13	IMO *Safety of Life at Sea Convention (SOLAS 74)*			
2.14	IMO *International Code of Signals (SOLAS V-Reg 21)*			
2.15	IMO *international Convention for the Prevention of Pollution from Ships (MARPOI. 73/78)*			
2.16	IMO *Ships Routing*			
2.17	IMO *International Regulations for Preventing Collisions at* Sea *(COLREGS)*			
2.18	IMO *Standards of Training, Certification and* Watch *Keeping (STCW Convention)*			
2.19	Does the Vessel carry a SOLAS Safety Manual available to Crew?			
2.20	ICS *Guide to Helicopter / Ship Operations*			

Section 3: Crew Management

Date of Minimum Manning Certificate			
	Minimum Manning	Officers	Rating
3.1	Minimum manning required		
3.2	Actual required		
3.3	Nationality		
	Nationality		
	Nationality		
3.4	Common language used		

Section 4: Navigation Equipment

4.1	Is the vessel equipped With the following equipment?	Yes / No	Type	No Of Units
4.2	Standard Magnetic Compass			
4.3	Steering Magnetic or Periscope compass			
4.4	Gyro Compass			
4.5	Gyro Repeaters			
4.6	Radar 1 X Band (9 GHz)			
4.7	Radar 2 S Band (4 GHz)			
4.8	Are radars gyro stabilized?			
4.9	Radar plotting equipment			
4.10	ARPA			
4.11	Depth sounder with recorder			
4.12	Speed / distance indicator			
4.13	Doppler log			
4.14	Docking approach Doppler			
4.15	Rudder angle indicator			
4.16	RPM indicator			
4.17	Controllable pitch propeller indicator			
4.18	Bow thruster indicator			
4.19	Rate of turn indicator			
4.20	Radio direction finder			
4.21	Navtex receiver			
4.21	Satellite navigation receiver			
4.22	GPS			
4.23	Differential GPS			
4.24	ECDIS (Electronic Chart Display and Information System)			

4.25	EPIRB			
4.26	GMDSS Installation			
4.26	VHF Dual Installation			
4.28	VHF Portable hand Sets			
4.29	MFIHF Installation			
4.30	Inmarsat Installation			
4.31	Loran C receiver			
4.32	Course recorder			
4.33	Off — course alarm — gyro			
4.34	Off — course alarm — magnetic			
4.35	Engine order printer			
4.36	Anemometer			
4.37	Several pairs of binoculars			
4.38	Weather fax			
	Other Equipment			
4.40	Does vessel carry sextant(s)?			
4.41	Does vessel carry a signal lamp?			
4.42	Are steering and machinery controlled from the bridge?			
4.43	Are bridge controls available on bridge wings?			
4.44	Internal communications system?			
4.45	P.A. system?			
4.46	Sound signals, whistle, and fog horn?			
4.47	Navigation lights?			
4.48	Two powerful searchlights?			
4.49	Does the vessel have properly equipped pilot ladder clw manropes?			
4.50	Does the vessel have a substantial accommodation ladder either side?			
4.51	Does the vessel have a short light weight gangway with side ropes?			
4.52	Does the vessel have current navigational charts for the port and route?			

Section 5: Pollution Prevention

5.1	is spill containment fitted under the cargo manifold?	
5.2	is spill containment fitted under all bunker manifolds?	
5.3	Is containment fitted under the bunker tank vents?	
5.4	Is containment fitted around the deck machinery?	
5.5	Specify type of scupper plugs	
5.6	Are means provided for draining or removing oil from deck area/containment?	
5 . 7	Does the vessel have on board the equipment, procedures and resources for use in event of an oil spill?	
5.8	Does the vessel have a shipboard oil pollution emergency plan (SOPEP) that complies with the requirements of the MARPOL convention?	
5.9	Is the following pollution control equipment available to clean up oil spilled on deck?	
5.9.1	Sorbents?	
5.9.2	Non-sparking hand scoops/shovels?	
5.9.3	Containers?	
5.9.4	Emulsifiers?	
5.10	Does the vessel have a certified sewage system?	
5.11	Does the vessel have a sewage storage tank?	
5.12	Does the vessel have on board holding of bilge water?	
5.13	Does the vessel have on board holding of oily waste?	
5.14	Does the vessel have on board holding of solid wastes?	
5.15	is a garbage incinerator fitted?	

Part 2: LIMITED AUDIT OF THE OUTBOARD OPERATION OF THE ISM SYSTEM

International Safety Management Certificate	
Issued By Classification Society Name	
Last 5 year renewal	Date:
Intermediate audit	Date:
Internal audit	Date:
Name of Designated Person Ashore (DPA)	
Contact Phone Number Contact email address	

General	Yes / No
Are the ISM system manuals available to the crew?	
Are the Master, officers and crew familiar with the ISM system?	
Are crew familiar with the Ship's Contingency Plans & their responsibilities?	
Are crew familiar with safe working practices required onboard?	
Are crew wearing Personal Protective Equipment and Clothing as appropriate?	
Are safety signs exhibited throughout the vessel?	

Are ear defenders/plugs used in the machinery spaces?	
Are eye protectors available near burning and grinding gear?	
Is the Safety Officer named & familiar with his responsibilities?	
Are minutes of safety meetings kept and forwarded to Safety Officer/DPA?	
Are concerns raised at meetings dealt with effectively onboard?	
Are concerns beyond the ship's capacity attended to promptly by the ship's management?	
Is the secondary emergency control center maintained?	
Does the vessel have a Material Safety Data System (MSDS) in place?	
Accomodation	
Are the ship's accommodations clean, tidy and hygienic?	
Are lifejackets and survival suits stored in each cabin?	
Are fire extinguishers, alarms, etc. in place and in date?	
Are public rooms, mess rooms etc. clean, tidy and hygienic?	
Are the galley and food stores clean with refrigerators operational?	
Is proper food handling and food hygiene in effect?	
General Exterior Inspection	
Is the ship's hull in good external condition & well coated?	
Is the visible lower hull free from fouling?	
Is an organotin, tributalin or biocide based anti-fouling coating used?	

Machinery Spaces						
Machinery Space						
Main Engines						
Generators						
Boilers						
Inert Gas System			Nitrogen		CO_2	Yes
General Cleanliness	Good					
Bilge Cleanliness	Good					
Oily Water Separator						
Oil Sludge Tank			Capacity	21.7 m3		
Ballast Pumps			Capacity	cu. metres/Hr		
Sewage Pumps	Type					
Sewage Holding Tank	Capacity		m^3		Days	

Engine Rooms Records	
Engine Room Log Book (Note engine/generator/bolier breakdowns in port or shut downs at sea during the last two voyages)	
Fuel consumption per day	Mt/Day
Lube oil consumption	Ltrs/Day
Planned Maintenance System (Note if up to date and any outstanding work)	
Oil record book (Must be up to date and signed by C/E and Master)	

Deck Log Book – For Last Voyages	
Average Speed	kts
Weather	
Are charts and publications corrected up to date?	
Has the Master been provided with a Port Information Book?	
is the Master aware that he must carry all the necessary Canadian charts and publications before arrival in Canada?	
Are ballast transfer/changes recorded in a ballast log book records (Last Voyage)?	

Life Saving Appliances						
Lifeboats	Total No		Open/Enclosed			
	Type		Motor		Enclosed	
Davits	Type					
No. of Survivors	Capacity					
Rescue Boat	Condition					
Davits						
Life Rafts	Date		Capacity:			
Life Raft Davits for above						
Survival/Immersion Suits	Total					
SARTS						
Records of Lifeboat Drills, Fire Drills, etc.						
Are post exercise debriefings he d after each exercise and are all crew invited to comment as to how to improve the effectiveness of the fire team, first aid teams, etc.?						

CREW CERTIFICATION

Requirements:

All crew to have Certificate of Training in Emergency Duties and Fire Fighting issued by an accredited institution. The Master, 1St Mate and two Senior Engineers shall be certified for all Emergency Command and Control Issues. At least two Officers shall be qualified GMDSS operators.

All new crew shall be provided with an orientation of the ship on joining. This will include an introduction to his duties, the emergency signals and his emergency station under the various contingencies.

A booklet setting out details of the vessel should be provided in each cabin along with notices showing how to don a lifejacket and or survival/immersion suit.

Every vessel shall have a SOLAS manual onboard available to all crew members. This manual describes in the common language(s) of the crew, each piece of safety equipment, its position onboard and how to operate it.

Check make up and qualifications of all watch-keeping Officers and Engineers.

Can the vessel operate with the machinery spaces unmanned (UMS)? If so, the machinery space must be manned by at least one watch-keeping engineer when the vessel is reduced to manoeuvering speed for entering or leaving port.

Qualification of Master and Watch Keepers

Crew First Aid Training: Numbers:

Advanced First Aid Training: Numbers:

Rescue Craft Training: Numbers:

Crew	Certificate of Competency			Basic Safety Certificate		Adv. Safety Certificate	
	Level	State	Date	State	Date	State	Date
Master							
1st Mate							
2nd Mate							
3rd Mate							
Chief Eng.							
1st Eng.							
2nd Eng.							
3rd Eng.							
4th Eng.							
Seamen							

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Other Information	Yes/No	Comments
The suitability of the winterization of the vessel's onboard systems and equipment, including deck and cargo equipment, evacuation craft, etc. for operation in cold temperatures and icing according to all expected conditions.		
The provision of clear vision systems for unimpaired forward and astern vision in cold temperatures, icing, etc		
The suitable of the vessel's navigation equipment and appliances for safe navigation through ice in all expected conditions.		
The suitable of key safety-related and survival equipment for cold temperatures, ice and icing conditions – including survival kits and immersion suits.		
Confirmation that the vessel's officers and crew are familiar with cold weather survival procedures and the environmental conditions which they can expect to encounter.		
Confirm that the vessel's ice navigation history has established that the vessel has a record of successful navigation in ice conditions comparable to those expected in Anaktalak Bay during the voyage.		
Confirm that the vessel's operating manuals include a clear statement of the operating limitations for the vessel and its essential systems in all anticipated ice conditions, temperatures and other environmental conditions.		
Confirm that the vessel's operating manuals include passage planning procedures accounting for anticipated ice and other environmental conditions and transit speeds having due regard to the vessel's class and type in the anticipated conditions.		
Confirm that the vessel's operating manuals include deviations from standard operating procedures when navigating in ice-covered waters, including the operation of machinery systems, remote control and warning systems, electric and electronic systems.		
Confirm that the vessel has appropriate escape and evacuation procedures into cold water and ice, etc		
Confirm that the vessel is adequately equipped and its crews are properly trained to provide effective damage control and minor hull repair under all expected conditions.		

APPENDIX 5

Standard Format for the Ballast Water Management Plan

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STANDARD FORMAT FOR THE BALLAST WATER MANAGEMENT PLAN

(as prescribed under *A Guide to Canada's Ballast Water Control and Management Regulations* (Transport Canada 2007))

Preamble

The ballast water management plan should contain the information required by Regulation B-1 of the Control and Management of Ships' Ballast Water and Sediments, 2004 (the Convention).

For guidance in preparing the plan the following information is to be included. The plan should be specific to each vessel.

Introduction

At the beginning of each plan, wording should be included to reflect the intent of the following text.

1. This Plan is written in accordance with the requirements of Regulation B-1 of the International Convention for the Convention and the associated Guidelines.

2. The purpose of the Plan is to meet the requirements for the control and management of ship's ballast water and sediments in accordance with the Guidelines for Ballast Water Management and the Development of Ballast Water Management Plans resolution MEPC.127(53) (The Guidelines). It provides standard operational guidance for the planning and management of ships' ballast water and sediments and describes safe procedures to be followed.

3. This Plan has been approved by the Administration and no alteration or revision shall be made to any part of it without the prior approval of the Administration.

4. This Plan may be inspected on request by an authorized authority.

Note: The Plan is to be written in the working language of the crew, if the text is not in English, French, or Spanish, the plan is to include a translation into one of these languages.

Vessel Particulars

At least the following details should be included:

- Vessels' name;
- Flag;
- Port of registry;
- Gross Tonnage;
- IMO number*;

*In accordance with resolution A.600(15), IMO Ship Identification Number Scheme.

- Length (BP);
- Beam;
- International call sign;
- Deepest ballast drafts (normal and heavy weather);
- Total ballast capacity of the ship in cubic meters and other units if applicable to the ship;
- A brief description of the main ballast water management method(s) used on the ship; and
- Identification (rank) of the appointed ballast water management officer.

Index

An index of sections should be included to reference the content of the Plan.

Purpose

Should contain a brief introduction for the ship's crew, explaining the need for ballast water management, and the importance of accurate record keeping.

Plans/Drawings of the Ballast Water Treatment System

Plans or drawings of the ballast system for example:

1. ballast tank arrangement;
2. ballast capacity plan;
3. a ballast water piping and pumping arrangement, including air pipes and sounding arrangements;
4. ballast water pump capacities;
5. the ballast water management system used onboard, with references to detailed operational and maintenance manuals held on board;
6. installed ballast water treatment systems; and
7. a plan and profile of the ship, or a schematic drawing of the ballast arrangement and sampling locations.

Description of the Ballast System

A Description of the Ballast System.

Ballast Water Sampling Points

Lists and/or diagrams indicating the location of sampling and access points in pipelines and ballast water tanks.

A note that sampling of ballast water is primarily a matter for the authorized authority, and there is unlikely to be any need for crew members to take samples except at the express request, and under the supervision, of the authorized authority.

Operation of the Ballast Water Management System

A detailed description of the operation of the Ballast Water Management System(s) used on board.

Information on general ballast water management precautionary practices.

Safety Procedures for the Ship and the Crew

Details of specific safety aspects of the ballast water management system used.

Operational or Safety Restrictions

Details of specific operational or safety restrictions including those associated with the management system which affects the ship and or the crew including reference to procedures for safe tank entry.

Description of the Method(s) Used on Board for Ballast Water Management and Sediment Control

Details of the method(s) used on board for the management of ballast and for sediment control including step-by-step operational procedures.

Procedures for the Disposal of Sediments

Procedures for the disposal of sediments at sea and to shore.

Methods of Communication

Details of the procedures for co-ordinating the discharge of ballast in waters of a coastal State.

Duties of the Ballast Water Management Officer

Outline of the Duties of the Designated Officer.

Recording Requirements

Details of the Record-keeping Requirements of the Convention.

Crew Training and Familiarization

Information on the provision of crew training and familiarization.

Exemptions

Details of any exemptions granted to the ship under Regulation A-4.

Approving Authority

Details and stamp of approving authority.

APPENDIX 6

IMO Ballast Water Treatment System Approval Process

IMO Ballast Water Treatment System Approval Process

A ballast water treatment system (BWTS) will be installed on the ore carriers to prevent non-native organisms from being accidentally introduced into Canadian waters. The BWTS will be selected based on various parameters such as system type, size and cost. The BWTS selected will also be IMO and North American (Canadian) Coast Guard Approved. Baffinland is committed to meeting the Phase 2 discharge standards as described by the IMO.

The IMO Phase 2 discharge standards are:

- 1 organism (dimension of 50 u or greater) per 100 m^3;
- 10 organisms (dimension of 10 to 50) per 100 mL;
- 1,000 bacteria and 10,000 virus per 100 mL;
- 1 colony-forming unit (cfu) of *Vibrio cholerae* (O1 and O139) per 100 mL or 1 cfu of *V. cholerae* per g (wet weight) of zooplankton;
- 126 cfu of *Escherichia coli* per 100 mL; and
- 33 cfu of intestinal enterococci per 100 mL

The IMO has a two-step Procedure for Approval of Ballast Water Management Systems that make use of Active Substances (G9) (resolution MEPC.126(53)). The first step, Basic Approval, requires that the manufacturer provide the IMO with detailed information on all active substances used in the process. All chemicals must be identified and described, including those generated onboard. Data required includes the following:

1. Data on effects on aquatic plants, invertebrates, fish and other biota including sensitive and representative organisms:
    a. Acute aquatic toxicity;
    b. Chronic aquatic toxicity;
    c. Endocrine disruption;
    d. Sediment toxicity;
    e. Bioavailability/biomagnification/bioconcentration; and
    f. Food web/population effects
2. Data on mammalian toxicity:
    a. Acute toxicity;
    b. Effects on skin and eye;
    c. Chronic and long-term toxicity;
    d. Developmental and reproductive toxicity;
    e. Carcinogenicity; and
    f. Mutagenicity
3. Data on environmental fate and effects under aerobic and anaerobic conditions:
    a. Modes of degradation (biotic and abiotic)
    b. Bioaccumulation, partition coefficient, octanol/water coefficient;
    c. Persistence and identification of the main metabolites in relevant media (ballast water, marine and freshwater);
    d. Reaction with organic matter;
    e. Potential physical effects on wildlife and benthic habitats;
    f. Potential residues in seafood; and

g. Any known interactive effects.

4. The following physical and chemical properties for the Active Substances and Preparations and treated ballast water, if applicable:
    a. Melting point;
    b. Boiling point;
    c. Flammability;
    d. Density (relative density);
    e. Vapour pressure, vapour density;
    f. Water solubility/dissociation constant (pKa);
    g. Oxidation/reduction potential;
    h. Corrosivity to the materials or equipment of normal ship construction;
    i. Autoignition temperature; and
    j. Other known relevant physical or chemical hazards.
5. Analytical methods

Testing of the active substances and preparations must be done in accordance with internationally recognized guidelines, preferably Organization for Economic Cooperation and Development (OECD) Guidelines for Testing of Chemicals (1993). These tests must be carried out following a strict Quality Management Plan (QMP) and Quality Assurance Project Plan (QAPP).

A risk characterization must also be carried out by the manufacturer in order to receive the Basic Approval. The risk characterization must include:

- Screening for persistency, bioaccumulation and toxicity
    - Persistence test should be assessed in a simulation test system that determines the half-life under relevant conditions. The determination of half-life should include assessment of all relevant chemicals. Biodegradation screening tests may also be included.
    - Bioaccumulation tests should measure bioconcentration factors in marine (or freshwater) organisms. Where these tests are not applicable, Bio Concentration Factor (BCF) values may be estimated using quantitative Structure-Activity Relationship models.
    - Toxicity tests should cover the life stages for both acute and chronic toxicity.
- Toxicity test of the treated ballast water
    - Discharge testing should be performed in a laboratory using techniques to simulate ballast water discharge following treatment by the system.
    - Provide both acute and chronic toxicity data using standardized test procedures.
    - Tests should be conducted on samples draw from land-based test set-up.
    - Tests should include multiple test species (a fish, an invertebrate and a plant) that address sensitive life-stages.
    - Tests results provided:
        - Acute (24, 48, 72 and 96 hr)
        - Lethal Concentration
        - No Observed Adverse Effects Concentration
        - Chronic No Observed Effect Concentration

Once the data has been submitted, the IMO will evaluate all the information. One major aspect they will be considering is whether the active substance or associated relevant chemicals are persistent, bioaccumulative or toxic (PBT) as per the criteria outline in Table 1.

Table 1 Criteria for Identification of PBT substances (from Procedure for Approval of Ballast Water Management Systems that make use of Active Substances (G9) (resolution MEPC.126(53))

Criterion	PBT criteria
Persistence	Half-life: • >60 days in marine water, or; • >40 days in freshwater*, or; • >180 days in marine sediment: or; • >120 days in freshwater sediment*
Bioaccumulation	• BCF > 2,000, or; • $LogP_{octanol/water}$
Toxicity	Chronic NOEC , 0.01 mg/L

* *For the purpose of marine environmental risk assessment half-life data in freshwater and freshwater sediment can be overruled by data obtained under marine conditions.*

The second step, Final Approval, commences once a Basic Approval has been awarded and is conducted according to the *Guidelines for Approval* of Ballast Water Management Systems (G8) MEPC.174(58). This involves the manufacturer submitting information regarding the design, construction, operation and functioning of the system. This includes manuals, drawings, system limitations, routine maintenance and troubleshooting procedures.

The testing itself will require a QMP and QAPP to ensure that the quality control management is in place. A set of tests will be conducted onboard an actual vessel where the vessel will be required to:

- Uptake ballast water;
- Store the ballast water;
- Treatment of ballast water consistent with normal ballast water management (except in the control tank); and,
- Discharge of treated ballast water.

Land-based testing is also required and include:

- The uptake of ballast water via pumping;
- Storage of ballast water for at least 5 days;
- Treatment of ballast water (except a control tank); and,
- Discharge of ballast water via pumping.

Samples will be taken from both the onboard and land-based tests to determine if the discharged ballast water meets the Phase One standards.
To receive Final Approval a system, must undergo various tests which include:

- Vibration tests;
- Temperature tests;
- Humidity tests;

- Test for protection against heavy seas;
- Fluctuation in power supply; and,
- Inclination test.

As well, all samples analyzed from the onboard and land-based testing must pass the D-2 Regulations set out by the IMO. Should all these tests pass then the ballast water treatment system will be awarded the Final Approval and be considered an approved IMO treatment system to meet Regulation D-2 of the BMW Convention.

As previously noted, the Project ore carriers will only employ BWTS that have received this IMO Final Approval.